(Open) Educational Resources around the World

An International Comparison

Victoria I. Marín, Laura N. Peters, & Olaf Zawacki-Richter

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Preface

Olaf Zawacki-Richter

The Center for Open Education Research (COER) is an international research consortium, that was established in 2018 in order to increase international collaborative research projects, furthering innovation and understanding in the areas of open education, educational technology, lifelong learning, and international education.

At a meeting in September 2019, hosted by Maltepe University in Istanbul, the COER Group agreed that "open education in the context of higher education refers to a set of educational practices, in which the notion of access is complex and has broadened over time, from the initial understanding of it relating only to university entrance. Such efforts are supported by a variety of media, learning materials, assessments, tools, and systems to provide flexible learning opportunities" (Zawacki-Richter et al., 2020, p. 320).

Open Educational Resources (OER) are a constituent element of open education and open educational practices. OER has flourished globally over the last two decades, enjoying funding from prestigious organizations such as the Bill and Melinda Gates Foundation. In many countries, supporting infrastructures have been established for the distribution of digital learning materials as OER. Now with the global Covid-19 pandemic, the sharing of digital content for teaching and learning that has been created in times of emergency online teaching and beyond, the topic of OER has gained additional importance.

The aim of a research project as part of a wider project on distributed learning infrastructures for OER and digital learning content in higher education (EduArc), coordinated by Professor Michael Kerres (Learning Lab, University Duisburg-Essen, Germany), was to provide an overview and comparison of the international developments of OER. The project was funded from October 2018 to March 2022 by the German Ministry of Education and Research (BMBF, Grant 16DHB2129).

By using the macro, meso, and micro (3M-)Framework outlined by Zawacki-Richter (2009) and Zawacki-Richter and Bozkurt (2022), COER members from Australia, Canada, China, Germany, Japan, South Korea, South Africa, Spain, Turkey, and the USA explored issues of OER on the three levels:

1. questions about national policies and frameworks for the design of a cross-university (national) infrastructure for the dissemination of OER (macro-level),
2. issues related to the provision of OER in higher education institutions, e.g. technical and support infrastructure, professional development, and quality assurance (meso level), and
3. questions about the creation and use of OER in higher education teaching and learning, and their sharing between faculty members (micro-level).

This book is a collection of the full country reports and working papers created by the COER members from the countries that were included in the study. Cross-comparative analysis of the country studies are also published in a series of journal articles: *Open Praxis* (macro-level), *Open Education Studies* (meso-level), and *Research and Practice in Technology Enhanced Learning* (micro-level) - see Marín et al. (2020), Marín et al. (2022a), and Marín et al. (2022b).

I would like to express my gratitude to Victoria I. Marín who played a leading role in coordinating the international comparison study in the EduArc research project, and to our distinguished COER members for their dedicated contribution to this book and the journal publications. Furthermore, I thank Laura N. Peters for the editing and preparation of the manuscript for publication in the EdTech Books Series and Beate Grojsman for her support in editing the country reports.

I hope that this volume will be helpful for practitioners, administrators, and researchers, who wish to gain a solid overview of international developments in OER.

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August, 2022

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Part I

Context

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Note: The case of the United States was only prepared for the macro level analysis, therefore it is not included in the meso and micro level analysis, and it does not have its full country case.

Introduction
Understanding (O)ER
Digital Transformation in the World
Higher Education Systems and Institutions in their Contexts

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1

Introduction

This report is part of an endeavor of the project "Digital educational architectures: Open learning resources in distributed learning infrastructures – EduArc", funded by the German Federal Ministry of Education and Research (BMBF). This study compares the digital transformation of nine[1] different higher education (HE) systems, with the intention to elicit information of how this transformation occurs as well as with the hope to learn from the practices of other countries and apply them to the German context where appropriate.

With the term „digital transformation" being broadly understood to encompass „the changes that the digital technology causes or influences in all aspects of human life" (Stolterman & Fors Croon, 2004, p. 689), the US American association EDUCAUSE (2018) defines it in view of higher education campus leadership as „a cultural, technological, and workforce shift" (p. 6). Whilst such transformation is undoubtedly driven by technological developments, it also encompasses a variety of transformation including pedagogical, instructional, and learning changes. A specific area of practice and research that has emerged over recent years is the concept of open (Weller, 2014), in the context of which MOOCs and the creation, distribution and use of open educational resources (OER) occur; intended to open up education to new audiences and enable access to study (Orr, Rimini, & van Damme, 2015).

However, while research focusing on the pedagogical merits and challenges of OER, the technical side of their distribution and storage has not yet been thoroughly analyzed, let alone the establishment of standardized practice in higher education. Germany, in this respect, is no exception. At first sight, it can be stated that OER are being produced somewhere, sometime by someone, although accessing them easily, beyond institutional IT systems - and subsequently leading to potentially higher use and acceptance amongst students and staff - is still an idea, rather than established practice.

Despite an increasing number of initiatives in German HE, such as open, institution-specific and state-wide initiatives to establish OER repositories, individualistic solutions are being sought, which can prohibit potential users and contributors being able to identify them (Atenas, Havemann & Priego, 2014), and which arguably works against the very idea of open.

The project EduArc approaches this topic by seeking to investigate the informational and computational aspects of repositories for (open) educational resources. Bringing together the disciplines of computer, information and education sciences, the project intends to model possible solutions to conceptualizations of either centralized repositories or hubs, enabling users and contributors greater access to (O)ER[2]. With information and computer scientists addressing the actual developing, modeling and testing of such approaches, the education scientists are addressing the prevailing question of OER quality (assurance), alongside conducting an international comparative study on the approaches and solutions that other countries have chosen. The international comparison also includes this report on the digital transformation of the different higher education systems, focusing on the macro-, meso- and micro- level of this transformation and emphasizing the informational and computational side of the process.

[1] Australia, Canada, China, Germany, Japan, South Korea, South Africa, Spain and Turkey.

[2] We use (O)ER to consider both open and not-open educational resources. When it is explicitly written OER, it does refer just to Open Educational Resources.

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2

Understanding (O)ER

Whilst a new OER definition has recently published by the UNESCO (2019), the previous UNESCO definition of OER has received broad agreement across the countries under investigation, which was the available definition at the moment of this study:

> *Open Education Resources (OER) are teaching, learning and research materials in any medium -digital or otherwise – that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no limited restrictions (UNESCO, 2012, p. 1)*

Other definitions that are highlighted are the one from the William and Flora Hewlett Foundation (Canada), which is the same that the one from the UNESCO (2012; 2018), and the definition from the OER Foundation (Australia), which follows:

> *A definition of OER ideally needs to incorporate three interrelated dimensions:*
>
> 1. *Educational values: OER should be free;*
> 2. *Pedagogical utility: OER should embed the permissions of the 4Rs (reuse, revise, remix and redistribute); and*
> 3. *Technology enablers: Technology and media choices should not restrict the permissions of the 4R framework. (OER Foundation, 2014)*

Since in the project we are not only referring to OER but also to educational materials that may not be open, we include here another suitable definition, provided by Spanish authors, that covers the purpose of describing them:

> *Resources used in the teaching-learning process of the courses taught by teachers or the collection of resources that a teacher or a student uses to pursue a course: a lesson plan, a calendar, the teaching guide, a proposal of activities, tutorials... (Fernández-Pampillón, Dominguez, & de Armas, 2013, p. 14)*

According to the understanding of education in each country as a public or private good, which is very much reflected in Figure 1, conceptions of (O)ER differ. For instance, in the US education is considered a private good where students bear most of the costs of HE (Saunders, 2010), and therefore, (O)ER are usually not (completely) free; whereas in Germany education is a fundamental value and considered a public good (Kehm, 2017), and (O)ER are usually mostly free. On another level, (O)ER can be considered as part of an educational system's ideology, as noted in South Africa (Apple, 2010; Arinto, Hodgkinson-Williams, King, Cartmill & Willmers, 2017; Bernstein, 2015).

Open Education and OER are currently "hot topics" in Germany, which can be seen from the number of initiatives and projects under that umbrella. However, does reality follow rhetoric? This is a question that could be applied to the other countries, as well.

Another aspect related to (O)ER is that, in some countries, they are more popular in K-12 than in HE, where OER have special consideration even in the digital strategies of the countries or national (or even province[1]) repositories. In Japan only the Open University of Japan uses OER, they are not commonly used in traditional HEI.

Other cases follow: Procomún is an OER national repository in Spain for K-12 and teachers of that level can join professional development MOOCs developed and provided by public entities dependent on the Spanish Ministry of Education. The National Digital Learning Resources Network is a resource collection, delivery of infrastructure and establishment of metadata standards for Australian Schools, and Scootle is a national repository of over 20,000 learning and teaching resources for K-12 Australian teachers. In Turkey, the Educational Informatics Network (EBA) was created to offer suitable, reliable and right content. In the US, many initiatives for K-12 have been developed, mostly not along the lines of OER (Open Textbook in California as an exception, although no longer exists), but rather (O)ER, regarding the 4Rs permissions; for instance, Curriki or Khan Academy. In Germany, Edutags is the referatory that provides metadata to (O)ER in repositories.

[1] In Germany the provinces are called states, but for purposes of clarity and to avoid confusion with state as nation, we will use provinces also in all cases.

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3

Digital Transformation in the World

For a general overview for comparison of the developments in Information and Communication Technology (ICT) between countries, the ICT Development Index can be considered. This Index looks at indicators connected to ICT infrastructure and access (ICT readiness: availability of technology, such as telephone, mobile-cellular telephone, computer, and Internet access in households), ICT intensity (ICT use of Internet) and ICT skills (ICT capability: schooling) (ITU, 2017a).

The latest published statistics of the Index (2017) show the following ranking for the countries included:

Table 1

IDI 2017 Rank of the countries of this international comparison (out of 176 countries). Source: own elaboration based on data of the ICT Development Index 2017 (ITU, 2017b).

IDI 2017 Rank	Country	IDI 2017 Value	IDI 2016 Rank	IDI 2016 Value	Rank Change
2	South Korea	8.85	1	8.80	<
10	Japan	8.43	11	8.32	>
12	Germany	8.39	13	8.20	>
14	Australia	8.24	16	8.08	>
16	United States	8.18	15	8.13	<
27	Spain	7.79	27	7.61	-
29	Canada	7.77	26	7.64	<
67	Turkey	6.08	72	5.66	>
80	China	5.60	83	5.17	>

Within the 10 first positions, South Korea (2nd) and Japan (10th) stand out as the two most developed countries included in our study in terms of ICT, being closely followed within the 10 next positions by Germany (12th), Australia (14th) and the United States (16th). Turkey (67th), China (80th) and South Africa (92th) are in last positions of the Index.

The development of ICT in a country is one important aspect to be considered when taking into account digital transformation; nevertheless, other elements are also relevant to the extent that they show commitment with digital transformation; for instance, the existence of digitalization strategies or digital agendas to boost the use of ICT in all the spheres of the society (South Korea is highlighted as the first country with a digital strategy, already in 1996; Lim, Lee & Choi, 2019). Some examples and issues regarding digital transformation in some of the countries follow, being the national digitalization strategies for higher education systems left to the section Policy.

According to the last annual report "Digital Society in Spain" (Martín Carretero, Suero García, Suso Araico, & Torres Mason, 2019), Spain maintains a strong commitment with the digital transformation and is one of the best-connected

countries in the world, being leader in the deployment of the fiber optic broadband in Europe and the third country among the OCDE countries.

Similarly, digital transformation is one of the ultimate goals of Turkey; therefore, some developments have been notable: the eGovernment services, Vision 2023 Project and the foundation of Presidential Digital Transformation Office. The ones related to HE will be described in the section Policy.

In the case of Australia, digital connectivity and literacy issues are ongoing concerns, as well as with the substantial digital divide between richers and poorers Australians.

In the case of Canada, there are no digital strategies at the national level, which can be explained by the political structure of the country based on provinces. On the other hand, according to Bates (2019a); Ontario leads Canada in digital transformation.

In Germany, national strategies that address more general elements do exist: a Digital Agenda for 2025 was put into place in 2016, and concrete measurements in 2018. This digital agenda addresses general elements discussion on digital infrastructure, exchange of data and information within higher education institutions (HEI).

For other countries, digital transformation is not the priority of the government, since other issues are still to be solved. That is the case of South Africa; where in its National Development Plan 2030 it focuses on increasing employment opportunities through improving the quality of education, skills development and innovation, vocational training and work experience. Another case is Japan: although its high IDI value and the e-Japan Strategy (since 2001), digital transformation including e-learning has never been an integral part of important strategic planning of the Japanese government and most universities.

On the other hand, the Index of Readiness for Digital Lifelong Learning (IRDLL) (Beblavy, Baiocco, Kilhoffer, Akgüç & Jacquot, 2019) should be also mentioned, since it gives a supplementary perspective to the ICT Development Index described above and provides another approach to digital transformation, more connected to learning, although only focused on the European countries. This Index includes items related to learning participation and outcomes, institutions and policies for digital learning, availability and use of digital learning. Of the two EU countries in the study (Spain and Germany), Germany is ranked 27th and Spain 8th, essentially having flipped their positions from the ICT Development Index. The report highlights for Germany that, "while Germany has a strong economy and fairly good education system, investment in digital infrastructure and programs is sorely lacking," and "German attitudes towards digital innovation are highly skeptical" and "German policymakers are aware of the importance of digitalization, but efforts to date lack ambition" (Beblavy et al., 2019, p. 53). On the other hand, the report states for Spain that "people's attitudes towards digitalization are still quite negative", "in higher education, blended learning and virtual campuses are more and more widespread. There are no significant regulatory barriers, even though the law has not been changed since 2001" but "the autonomy of universities prevents the development of a comprehensive national digitalization strategy in higher education" (Beblavy et al., 2019, p. 68).

Last but not least, as a final consideration before comparison among the aspects, the importance of context and culture when looking at digital transformation and infrastructures for (O)ER in different countries is to be highlighted, though not the main focus in this report.

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4

Higher Education Systems and Institutions in their Contexts

The context of the EduArc project is HE; therefore, the start point is the presentation of the different HE contexts of the countries involved in the study.

As an overview of the higher education context of each of the countries, a summary table is included as follows (Table 1), considering population in the country, number of university students (ranked from more to fewer students) and number of HEI [1]:

Table 1

Summary of data regarding HE systems and population data, ranked on number of students.

Country	Population	Number of university students	Number of HEI
China	1,404 Million	37.8 Million	2,914 HEIs (2,631 universities)
US	327 Million	20.2 Million	4,298 HEIs (2,818 universities)
Turkey	83 Million	7.5 Million	205 HEIs (200 universities)
Germany	83 Million	2.8 Million	396 HEIs (121 universities & 218 universities of applied sciences)
Spain	47 Million	2.2 Million	3,375 HEIs (84 universities)
Australia	25 Million	1.5 Million	176 HEIs (40 universities)
Canada	38 Million	1.4 Million	234 HEIs (72 universities)
South Africa	58 Million	1 Million (public sector) [2]	143 HEIs (43 universities)
South Korea	52 Million	0.7 Million	359 HEIs (191 universities)
Japan	127 Million	0.7 Million	1,200 HEIs (778 universities)

Within the countries under investigation in this project, China has both the largest population and the largest number of university students, but it is the United States that has the largest number of higher education institutions (HEIs), including twice the number of universities. Countries such as Japan and South Korea are experiencing a decrease in the number of HE students due to their ageing populations, whereas in Turkey a demand for HE is growing, given that a large majority of the population are young citizens.

The differentiation between private and public HE systems is also relevant in understanding the differences between these countries (Figure 1):

Figure 1

Spectrum Private HE system-Public HE system

On the extreme left of the spectrum, approximately 80% of HEIs in South Korea and Japan are private, and so are too around 62% of HEIs in the US, both non-profit and for profit [3]. Students have to pay for the complete cost of their studies (or ask for different types of loans/scholarships). In South Africa, only 23 out of the 143 HEIs are state-funded and the rest are private (84%). On the other extreme of the spectrum, the majority of German and 75% Chinese HEIs are state funded [4], with HEIs in China affiliated with the Chinese Ministry of Education, with other ministries or with provincial governments. Students in Germany can study their undergraduate studies without paying for them. Turkey and Spain have a higher number of public HEIs than private ones: Turkey has 129 public universities, 71 non-profit foundation universities and 5 foundation vocational schools, whereas Spain has 2,230 public HEIs, 50 of which are universities [5], and 34% of the HEIs are private (n = 1,145, 34 universities). Even if students have to pay for their studies, they are partly subsidized by the state and there is the possibility to apply for state scholarships, if familiar incomes are not higher than specific sums.

It can be observed that countries with a higher number of private universities (e.g. Japan, South Korea, US) leave the responsibility for (own) digital transformation to the HEIs (instead to the national or province government). However, support from government greatly varies, as we will see in the next section (e.g. South Korea vs. Japan).

[1] Some countries mention the existence of different kind of HEI and universities are one of them.

[2] It has to be noted the "decreased public spending on HE as a percentage of GDP".

[3] Only public institutions in the US receive operational funding from the national government.

[4] China has 747 private HEI, which represent the 17% of the total HE student population in China.

[5] In Spain, HE includes university education, advanced vocational training and specialised education (artistic education, professional Plastic Arts and Design studies, and advanced Sports education).

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Part II

The Country Studies

The Case of Australia
Digital Transformation in Canada
China's Approach to Digital Transformation of Higher Education
Open Educational Resources within the Digital Transformation of German Higher Education
The Case of Japan and Korea
Analysis of Higher Education (HE) Systems' Approach in South Africa
The Case of Spain
Digital Transformation and Openness in the Turkish Higher Education System

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1

The Case of Australia

Melissa Bond

1. Introduction

Australia is an Oceanic federal parliamentary constitutional monarchy and a member of the British Commonwealth, with a population of 25.7 million people (Australian Bureau of Statistics, 2021). The Prime Minister of Australia, currently the Hon Scott Morrison MP, resides in the capital city of Canberra, where the Australian Federal Parliament establishes national policies. Each of the six states and two territories, however, have the power to legislate on education, with the Parliament only prevailing over state law in the case of inconsistencies (Commonwealth of Australia, 2016, p. 26). There are currently 188 registered higher education providers (Tertiary Education Quality and Standards Agency, 2022), including 42 universities and one overseas university. Both public and private universities are legally distinct from the government and, whilst education ministers have no operational control, the Federal Government dominates policy making (Norton & Cherastidtham, 2018). Higher education is the responsibility of the Department of Education and Training, including a Higher Education Standards Panel, appointed by the Higher Education Minister. All higher education courses in Australia must be accredited by the Tertiary Education Quality and Standards Association (TEQSA) against the Australian Qualifications Framework.

Prior to the COVID-19 pandemic, education was Australia's fourth largest export, with international education worth $35.2 billion to the Australian economy in 2019 (Australian Government Department of Education, 2019) and overseas higher education student revenue growing by $2.2 billion from 2014 to 2017 (Tertiary Education Quality and Standards Agency, 2018). Despite the impact that the coronavirus has had on international education, the sector was still worth $26.7 billion to the Australian economy in 2021 (Hare, 2021). In 2019, 1.6 million students undertook higher education study, including 17.6% of domestic students from low socio-economic backgrounds, 18.9% of domestic students in regional areas, and 32.4% international students (Department of Education, Skills and Employment, 2020).

Australia has a strong commitment to digital transformation, as evidenced by an additional $1.2 billion investment outlined in the latest Digital Economy Strategy (Commonwealth of Australia, 2021), and it is ranked third globally for open data initiatives, after Canada and the UK. However, digital connectivity and literacy remain ongoing concerns (Australian Digital Council, 2019). According to the latest Australian Digital Inclusion Index (Thomas et al., 2021), Australia's average Digital Inclusion score is 71.1, measured across Access, Affordability and Digital Ability, with the Australian Capital Territory (ACT) the highest at 77 and Tasmania the lowest at 66. There is a substantial digital divide between richer and poorer Australians, with 67% of Australians in the lowest income quintile having to pay more than 10% of their household income for connectivity. Despite progress being made with rolling out the National Broadband Network (NBN) (Australian Communications and Media Authority [Commonwealth of Australia], 2021), only 86.1% of households have access to the internet (OECD, 2022) and there are still more than two million Australians (9%) whose access to the internet is solely through mobile connections. The Government has now made the NBN available to over

91% of Australian homes and businesses, and invested $220 million in the Mobile Black Spot Program to improve mobile connectivity (Australian Government, 2019).

Australia ranks in the bottom 40% of OECD countries for aligning skills to labour market demand, and for improving the skills of workers (OECD, 2019b). In 2017, only 31% of adults had participated in formal or non-formal job-related training, with only 26% of workers in jobs at high risk of automation undertaking training (OECD, 2019a). Recommendations from industry, academia, government and NGOs have included introducing policies to support lifelong learning, building integrated portals, and redefining funding models to allow the funding of online and modular learning (Australian Technology Network of Universities, 2018; Business Council of Australia, 2018; OECD, 2019a). The Australian Government has pledged $52.5 million over four years from 2019-20 to support the development of literacy, numeracy, language and digital skills, particularly in at-risk workers (Education and Training Portfolio, 2019). The introduction of formalised national policies, coupled with Federal funding and support for the adoption of open educational resources (OER), could support the Government to increase higher education access at a lower cost to rural, remote and lower-socio economic students, alongside lifelong learners and time-poor workers who need to upskill (Bossu & Meier, 2018; Bossu & Stagg, 2018; Orr et al., 2015).

The understanding of OER in Australia [1] follows that of the Paris Declaration (UNESCO, 2012):

> *teaching, learning and research materials in any medium, digital or otherwise, that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions. Open licensing is built within the existing framework of intellectual property rights as defined by relevant international conventions and respects the authorship of the work.*

However, major Australian higher education OER projects and case studies (e.g., Bossu & Meier, 2018) have used the following definition by the OER Foundation (2011):

> *Educational materials…licensed in ways that provide permissions for individuals and institutions to reuse, adapt and modify the materials for their own use. OER can, and do include full courses, textbooks, streaming videos, exams, software, and any other materials or techniques supporting learning.*

As of 2018, 65% of Australian universities were using or providing access to OER, 42.5% were creating, sharing and managing OER, and 70% were participating in or facilitating MOOCs (Stagg et al., 2018). All except one university are using institutional repositories to manage and disseminate research outputs and learning resources, which was funded through the Australian Research Repositories Online to the World (ARROW) project and by the Australian Scheme for Higher Education Repositories (Picasso & Phelan, 2014). However, in a study involving interviews with representatives from 18 Australian institutions, most revealed that they were not involved in collaborative OER initiatives either nationally or internationally, and that most institutions did not include OER practices and initiatives in current strategic policies (Bossu et al., 2012). Further empirical research into institutional open educational practices (OEP) and OER practices has been called for, in order to gain a "more nuanced understanding of openness in Australian higher education learning and teaching" (Stagg et al., 2018, p. 190).

Against this background, this book chapter provides an overview of digital transformation in Australian higher education at the macro, meso and micro levels. The macro level explores aspects related to infrastructure, including digital repositories, quality, policies related to digitalization and the use of OER/OEP, and change occurring at the national level. The meso level reports initiatives occurring within states and institutions, using a desk audit of state government and education digitalization plans, alongside data gathered from a survey conducted in 2019, including participations from 22 higher education institutions from across Australia. The micro level then explores participants' knowledge and awareness of OER, alongside institutional OER projects and initiatives. This investigation provides much needed further insight into (O)ER infrastructure, policies, quality issues and measures for change across three levels within Australian higher education.

2. Macro level

2.1 OER Infrastructure

In 2002, Australia's chief scientist highlighted the need for access to and dissemination of research, which resulted in the Federal Government funding 'Backing Australia's Ability' to support the development of research information infrastructure (Shipp, 2006), followed by the Australian Scheme for Higher Education Repositories and the Implementation Assistance Program (Mamtora, Yang, & Singh, 2015). By 2009, 32 institutions had an active repository, 31 of which were open access (Kennan & Kingsley, 2009). Initiatives developed during this time included the Australian Digital Theses Program, which housed some 30,000 Australian theses when it was decommissioned in 2011 [2], the Australian Partnerships for Sustainable Repositories Project, Australian Research Repositories Online to the World (ARROW), and Regional Universities Building Research Infrastructure Collaboratively (RUBRIC). The ARROW project, led by Monash University, investigated how the National Library of Australia could develop a repository and associated metadata, harvested from institutional repositories, to support open access to institution data, including housing Australian theses.

In 2014, an audit was conducted of national government ICT infrastructure, leading to a 'Digital Transformation Agenda' (Hamilton, 2019). Whilst Australia has since implemented a range of measures to identify priority state and national digital infrastructure needs, such as Infrastructure Australia, the Digital Transformation Agency and the Australian Digital Council, the focus has thus far been on infrastructure as it relates to telecommunication connectivity (Australian Digital Council, 2019), ageing tertiary buildings (Infrastructure Australia, 2019a) and digitising government services (Commonwealth of Australia, 2018). The Infrastructure Priority List 2019, for example, focuses purely on roads, transport and housing (Infrastructure Australia, 2019b). However, the National Research Infrastructure Roadmap (Australian Government, 2016) did identify digital data and eResearch platforms as one of nine priority areas for the next decade, with a new Australian Data Strategy released in December 2021.

Australia currently has two Tier 1 High Performance Computing research facilities, the National Computational Infrastructure (NCI) and the Pawsey Supercomputing Centre. The NCI National Research Data Repository houses primarily scientific datasets, such as international climate modelling and geophysics reference datasets. The Australian Government recently released a Research Infrastructure Investment Plan (Australian Government, 2018b) in response to recommendations made in the 2016 National Research Infrastructure Roadmap (Australian Government, 2016), announcing $76.3 million towards commissioning a next-generation supercomputer, and a further $72.2 million for eResearch projects (NCI Australia, 2018). The funding "will enable critical upgrades to virtual laboratories, research cloud storage and data security" (Australian Government, 2018b, p. 6), however the focus of this investment is heavily focused on scientific research and the reusability of scientific data, rather than on educational resources.

Current state of digital educational repository infrastructure

The Trove platform is run by the National Library of Australia and is "an aggregation of metadata, and a growing repository of full text digital resources" (National Library of Australia, 2019). It hosts a range of resources from Australian universities, libraries, museums, data repositories and archives, including Australian theses. The Trove Application Programming Interface (API) enables users to integrate Trove into their own site.

The Australian National Data Service, National eResearch Collaboration Tools and Resources, and Research Data Services combined in 2018 to form the Australian Research Data Commons (ARDC). The ARDC provides access to eInfrastructure and platforms, such as the Nectar Research Cloud and Research Data Australia. Whilst Research Data Australia does not store the data, it does provide links to a range of research from over one hundred Australia research organisations, cultural institutions, and government agencies.

AARNet is a not-for-profit National Research and Education Network, owned by 38 Australian universities and the CSIRO, which provides high speed broadband, data storage and high performance computing facilities to a range of institutions such as universities and schools (AARnet, 2018). They also partner with institutions on collaborative projects, such as

training and development to enhance digital skills, and the digitisation of records for research use, which are then shared with users in their CloudStor repositories. There is potential, then, for this service to be expanded to host OER.

The Learning & Teaching Repository is run by Universities Australia and contains higher education learning and teaching materials, resulting from projects funded by the Australian Government from 1994 to 2018. It includes a project archive, currently at 694 projects, and a resources list (1,119 records), all of which are licensed CC BY-SA. A search conducted on 30 August 2019 for the phrase open educational resources resulted in 14 records. These projects included:

- 'A national, open access Learning and Teaching Induction Program (LTIP) for staff new to teaching' (Fraser et al., 2019), led by Swinburne University of Technology and partnered by nine other institutions. This project led to the creation of a MOOC 'Contemporary approaches to university teaching', run on the Canvas Network, with staff from 39 out of 42 universities having enrolled.
- 'Developing Australian academics' capacity: supporting the adoption of open educational practices into curriculum design' (Bossu, Fountain, Smyth, & Brown, 2016), led by the University of Tasmania in conjunction with the University of Southern Queensland.
- 'INSIGNIA - digital badges for research education' (Mewburn et al., 2016), run by the Australian National University.
- 'Adoption, use and management of open educational resources to enhance teaching and learning in Australia' (Bossu, Brown, & Bull, 2014a), led by the University of New England in conjunction with the University of Southern Queensland and Massey University (New Zealand).

An Open Education Licensing toolkit was developed through the government funded Open Education Licensing Project by Swinburne University of Technology and the University of Tasmania in 2015/16. This provides higher education institutions with a web application to support the creation, use, modification and sharing of OER.

The schooling sector is where the Australian Government has invested most heavily in, in terms of OER. The National Digital Learning Resources Network is a resource collection, delivery infrastructure and metadata standards for Australian schools, run by Education Services Australia. It provides access to resources aligned to the Australian and state curricula, accessible via Scootle. Scootle is a national repository of over 20,000 learning and teaching resources for Australian school teachers, aligned to the Australian Curriculum, including a range of OER licensed under Creative Commons. The site also includes access to a range of other tools and resources, such as the Digital Technologies Hub, which support the Digital Technologies Curriculum, and the myskills website, which helps students find information related to future training and employment opportunities.

2.2 Quality of OER

The Australian Quality Framework (AQF) is the national policy for regulating Australian education and training, across higher education, vocational education and training (VET) and schools, and accredited by TEQSA, however this does not relate to OER specifically. There are currently no official national standards in regard to OER creation, dissemination and quality assurance. There are, however, guidance materials for higher education institutions, developed as a result of government-funded projects.

The Government made a number of grants between 2010-2014, funded by the Australian Government Office for Learning and Teaching [3], to explore the use, management and adoption of OER. This included:

- OpenEdOz project, resulting in the Students, Universities and Open Education report (Wills, Alexander, & Sadler, 2016)
- 'Adoption, use and management of open educational resources to enhance teaching and learning in Australia' project (Bossu et al., 2014a), which led to a Feasibility Protocol (Bossu et al., 2014b) to assist higher education institutions to make informed decisions on the adoption of OER and OEP at various levels, as well as the document 'Supporting OER engagement at Australian Universities' (Scott, 2014), which provides advice on intellectual property rights, copyright and policy.

In 2016, Universities Australia convened a working group to develop a policy statement on access to research outputs. The working group included members of the Council of Australian University Librarians (CAUL), Australian Health Policy Collaboration, Australasian Open Access Strategy Group, The AiGrioup, The Conversation and Universities Australia, alongside advice from the Australian National Data Service, Australian Research Council (ARC), Department of Education and Training (DET), Department of Industry, Innovation and Science (DIIS), and the National Health and Medical Research Council (NHMRC). Together, they created the F.A.I.R Policy Statement (CAUL, 2016), based on international standards, which stresses the need to ensure that Australian research output data remains Findable, Accessible, Interoperable and Reusable. It was hoped that this policy would be implemented by 2020, and it stipulates that any publicly funded research must be made openly accessible using Creative Commons licences and utilising international metadata standards.

The Australasian Council on Open, Distance and e-learning developed the Benchmarks for Technology Enhanced Learning (ACODE, 2014), to assist institutions improve TEL quality. They cover institution-wide policy and governance, quality improvement, technology systems, staff professional development and support, and student training and support. They do not refer specifically, however, to the creation and development of OER.

2.3 OER Policy

The Australian Government currently has no explicit OER or OEP policies, framework or regulation for use in higher education (Bossu & Stagg, 2018; Stagg et al., 2018; Stagg & Bossu, 2016), which has affected widespread ongoing adoption, aside from a few project-based initiatives, most of which have since been discontinued (Bossu & Meier, 2018). Whilst the National Copyright Unit is developing a proposal that recommends the creation of one, and OER will be a key initiative in the future, policy makers remain unsure as to whether a policy should be implemented at the national or state/territory level (Orr et al., 2015). In 2016, the Productivity Commission recommended the need for a National Open Access Policy, which was accepted by the government in 2017, however this has still not yet been created (CAUL-AOASG, 2019). The Federal focus has instead been on economic growth, global competitiveness and opening research and data, including creating a more transparent government (Stagg et al., 2018).

In July 2010, the government made a Declaration of Open Government, which included passing legislation reforming the Freedom of Information Act and establishing the Office of the Australian Information Commissioner. In the second Open Government National Action Plan (Australian Government, 2018a), priority has been placed on improving the sharing, use and reuse of public-sector data and enhancing state participation in the Open Government Partnership, amongst other priorities. The Australian Government Open Access and Licensing Framework (AusGOAL) provided support and guidance on open access to publicly funded information and provided a framework to assist organisations manage risk. It incorporated a licence suite including the Australian Creative Commons Version 3.0 and a Licence Chooser tool.

In December 2015, the government announced the National Innovation and Science Agenda (Australian Government, 2015), investing $1.1 billion over 4 years, including the establishment of Innovation and Science Australia (ISA), an advisory body on innovation, research and science. ISA developed a national roadmap for innovation, Australia 2030: Prosperity through Innovation (Australian Government Innovation and Science Australia, 2017), which makes long-term investment recommendations for policy makers. Education is recognised as the first imperative, in order to equip Australians with necessary skills relevant for 2030, as well as highlighting a strategic opportunity in improving Australia's high-performance computing facilities. However, it particularly focuses on the school and VET sectors, including investment in professional development (PD) for teachers and school leaders, particularly in the areas of 21st-century skills and pedagogical methods, alongside subject specific PD. The paper specifically mentions social economic factors for students at all levels of education, but does not make the connection with OER, although the Government will invest $9.5 million over four years from 2019-20 for online maths and phonics courses, which will be freely available to teachers (Education and Training Portfolio, 2019).

At the state level, the Tasmanian Adult Learning Strategy 2019-2022 (Tasmanian Government, 2019) focuses on lifelong learning and improving literacy, numeracy and digital literacy, with Phase 2 exploring the development of an online

portal/repository. The Western Australian government undertook the first audit of regional telecommunications infrastructure in 2017, and the Northern Territory government has funded The Centre for Appropriate Technology to install 27 mobile hotspots (Australian Digital Council, 2019).

2.4 OER Change

Change in the Australian OER landscape is predominantly happening at the meso and micro levels. However, many government, university and industry bodies have the potential to promote change on OER and OEP infrastructure, policy and practice in the future. One major agent for change in Australia is Infrastructure Australia (IA), which is an independent statutory body that audits Australia's infrastructure needs, developing 15 year rolling plans to identify state and national priorities (Infrastructure Australia, 2019b). Given the importance of IA to the future of Australia's economic development, the identification of increased provisions for data repositories and national policy agenda setting as a priority, would garner government attention.

As noted previously, Innovation and Science Australia is an advisory board to the Australian Government, providing recommendations on innovation, research and science. In response to their latest report, the government is investing $1.9 billion in Australia's National Research Infrastructure to 2028-29, in addition to the $140 million funding for the Pawsey Supercomputing Centre and the National Computational Infrastructure (Australian Government, 2018c). The Australian Digital Council was developed in 2018 to help foster across-government collaboration on data and digital transformation, and includes ministers from each state and territory (Riley, 2019). Its priorities include promoting initiatives to reform national data sharing arrangements and to enable equitable access to digital transformation, including reducing the digital divide.

The Australian Technology Network of Universities (ATN) is a consortium of four research-intensive universities (University of Technology Sydney, RMIT University, University of South Australia and Curtin University), which educates 20% of Australian university students. ATN has a particular focus on industry collaboration, with over 18,000 industry partnerships (Australian Technology Network of Universities, 2018), and one of its prime objectives is to influence government policy formation.

The Business Council of Australia is also heavily invested in improving post-secondary education and skills, releasing its reform plan Future-proof: Australia's future post-secondary education and skills system in 2018 (Business Council of Australia, 2018). The plan stresses the development of a lifelong-learning culture, alongside a shared governance model between government and industry. The Council's Digital Economy and Telecommunications Working Group has also developed a digital reform agenda (Ernst & Young Australia, 2021), which stresses the need to pilot digital micro-apprenticeships and the expansion of higher education short course funding.

The Australasian Open Access Strategy Group (AOASG) advocates for Open and Fair Australasian research and is supported by 19 Australian universities, alongside eight New Zealand institutions and two affiliate organisations. AOASG collaborates with organisations such as the Australian Digital Alliance and the Council of Australian University Librarians (CAUL), in order to advocate for openness. The Australian F.A.I.R. Access Steering Group is comprised of representatives from CAUL, Universities Australia, AOASG, KPMG, DVC, Australasian Research Management Society, and the Australian National Data Service, and they also receive advice from the Australian Research Council, DET, DIIS, and the NHMRC. Their role is to support implementation of the previously mentioned F.A.I.R Policy Statement.

3. Meso level

As Australia is divided into six states and two territories, with the responsibility for the majority of Education legislation and governance, the second part of this report will focus on state level initiatives, as well as institutional level strategic planning and policies.

A number of studies investigating OER practices in Australian higher education institutions have previously been undertaken, including large projects funded by the Federal Government. The project Adoption, use and management of

open educational resources to enhance teaching and learning in Australia (see Bossu et al., 2014a) aimed to gain further understanding of OER use and management, in order to inform the development of a Feasibility Protocol (Bossu et al., 2014b), as well as to make recommendations to assist in the adoption of OER and OEP in Australia. Led by the University of New England, the first phase of the project involved a comprehensive literature review, including a review of institutional educational policies relating to OER (Bossu et al., 2011). This review found that the lack of government policies on the use and adoption of OER and OEP were limiting or at best slowing down the rate of OER adoption amongst Australian higher education institutions.

In order to gain further insight, the project then issued an online survey with 33 questions to capture respondents' experience and knowledge of OER, as well as their institution's involvement in OER initiatives, the need for OER policies, and perceived barriers to OER adoption and use. Semi-structured interviews were also conducted with 24 (out of 100) participants. Overall, 30 out of 39 Australian institutions were represented. 36% of respondents said that their institution had some form of OER initiative and only 15% reported that their institution included OER initiatives and practices in their current strategic planning. Respondents suggested that the Federal Government could support HEIs through grants, to further develop OER in Australia.

Another study that was undertaken, following on from this project, was a joint effort by the University of Tasmania and the University of Southern Queensland entitled Developing Australian Academics' Capacity: Supporting the Adoption of Open Educational Practices in Curriculum Design (Bossu et al., 2016). The project aimed to design, develop and test a free, open and online professional development course about curriculum design, in the form of a micro Open Online Course (mOOC), which would then be licensed by CC-BY-SA and hosted by OERu. Feedback for the course identified that it made it easier to apply OEP concepts in practice, but that further refinement was needed.

A similar approach was undertaken in the project A national, open access Learning and Teaching Induction Program (LTIP) for staff new to teaching (Fraser et al., 2019), which involved a collaboration between Swinburne University of Technology, Australian Catholic University, Charles Sturt University, CQUniversity, Curtin University, Flinders University, University of Canberra, University of the Sunshine Coast, University of Tasmania and the University of Western Australia. In response to less than 25% of Australian universities providing teaching induction to those who were new to teaching, this project saw the development of a fully online, open access learning and teaching induction program, specific to Australia. The MOOC, called Contemporary Approaches to University Teaching (HE), is housed on the Canvas Network and is a 12-week self-paced course. Staff from 39 of the 42 Australian universities have enrolled in the course since it was first developed. This, coupled with the sheer number of institutions involved in its development, points to a potential heightened recognition of the benefit of OER and OEP within Australia, however further investigation is warranted.

3.1 Methodology

In order to find out more about current OER practices in Australia at both the meso and micro levels, a two-pronged approach for this study was undertaken. The first was an email sent to all university vice-chancellors regarding their institutional digitalization and OER strategies (sent on the 28th October 2019), and the second was a survey, conducted under the Carl von Ossietzky University of Oldenburg Ethics approval number Drs.EK/2019/068. The survey consisted of 32 questions and was largely based on the surveys by Bossu et al. (2014a) and Seaman and Seaman (2018), as well as the questions posed within the overall EduArc project. It was sent on 13th November 2019 to 378 Australian HEI vice-chancellors, faculty deans and library professionals, as well as advertised on Twitter with a public link for others to complete. Requests were also sent to the following organisations:

- Australian Society for Computers in Learning in Tertiary Education (ASCILITE)
- Australasian Council on Open, Distance and e-Learning (ACODE)
- Open & Distance Learning Australia (ODLAA)
- Higher Education Research and Development Society of Australasia (HERDSA)
- Council of Australasian University Directors of Information Technology (CAUDIT)
- Council of Australasian University Leaders in Learning and Teaching (CAULLT)
- Council of Australian University Librarians (CAUL)

As of 31st January 2020, the survey had 41 full responses and 29 partial responses from members of 22 different institutions from every Australian state except for Tasmania, unless an anonymous responder from the public link was from the University of Tasmania, indicating an overall response rate of at least [4] 53% of Australian institutions. The institutions involved that were able to be identified (see Table 1) represent at least 50% of universities in the ACT, Queensland, South Australia, Northern Territory, and Victoria, and represent 45% of universities in New South Wales and 20% of universities in Western Australia.

Table 1

Institutions Represented in the OER Survey

Institution	State	Institution	State
Australian National University	ACT	Deakin University	Vic
University of Southern Queensland	Que.	La Trobe University	Vic
Queensland University of Technology	Que.	Monash University	Vic
Bond University	Que.	University of Melbourne	Vic
University of Queensland	Que.	RMIT	Vic
University of the Sunshine Coast	Que.	Swinburne University	Vic
Griffith University	Que.	University of New England	NSW
Flinders University	SA	Sydney University	NSW
University of South Australia	SA	Western Sydney University	NSW
Edith Cowan University	WA	Southern Cross University	NSW
Charles Darwin University	NT	University of Wollongong	NSW

Note ACT = Australian Capital Territory; Que = Queensland; SA = South Australia; WA = Western Australia; NT = Northern Territory; Vic = Victoria; NSW = New South Wales

A copy of the survey, raw results and aggregated results are available from ResearchGate.

Given that most questions were not mandatory, respondents were free to choose how much information to share. This has resulted in missing or incomplete data, however in order to capture as much information as possible, no records were deleted. Therefore, where appropriate, response percentages are reported according to the number of participants who responded to that particular question. The aggregated percentages based on the full 70 partial and complete responses are available, however, via the ResearchGate link.

Survey Participants

The majority of respondents were library professionals (n = 24, 34.29%), followed by educators (n = 10, 14.29%), researchers and senior managers (n = 6 each, 8.57%). One Vice Chancellor began the survey, but only completed the first three sections, and five Pro Vice Chancellors began the survey, with two completing all sections. The majority of respondents have been working at their institution for eight or more years (n = 30, 42.86%), although interestingly 20%

of respondents (n = 14) have been working there for less than two years. Some of these respondents identified that they may not be fully aware of the state of OER across their institution, which should be considered when interpreting the results. The faculty most represented was Library Services (38.57%, n = 27), followed by Education (n = 8, 11.43%) and Health & Welfare (n = 6, 8.57%).

Participants' Knowledge and Awareness of OER

Of the participants who responded to the question about awareness of OER, 83% (n = 48) had previously heard of OER, but 17% (n = 10) had not, and 32.86% of respondents had been aware of OER for 5-10 years (n = 23). Respondents were generally either very aware of OER and know how they can be used (31.43%) or aware of OER and some of their uses (22.86%). Most (n = 24, 34.29%) ranked themselves as having Intermediate knowledge, with 12.86% having no knowledge, 20% with basic knowledge, and 14.29% with advanced knowledge.

3.2 OER Infrastructure

According to the participants of the OER survey, Australian higher education institutions remain only partially committed to using OER (n = 26, 52%), with five people indicating that their institution is very committed (10%), eight indicating that their institution is not committed at all (16%), and 11 people being unsure (22%). This might also shed light on why OER infrastructure is still in development in Australia. Of the 51 participants who responded to a question about infrastructure, 11 (22%) indicated that their university has an institution-only OER repository, 30 (58%) stated that their university does not have one, and 10 were unsure (20%). Further to this, when asked about specific technological infrastructure for OER, 16 participants out of 39 who responded (41%) indicated that infrastructure for OER is non-existent in their institution, with only eight (21%) indicating that infrastructure is implemented organisation-wide. Despite this, all institutions have at least a research repository (see Appendix A), where researchers can disseminate their work.

A very low number of participants indicated that their institution uses commercial or other freely accessible OER infrastructure (see Table 2), although unfortunately there is no way of knowing whether these participants are from the same or different institutions. Of the 38 participants who responded, two people (5%) indicated that their institution has a partnership with other organisations or institutions on OER creation and storage and implemented organisation-wide. Ten people (26%) indicated that partnerships were implemented in some departments/faculties/units, eight people (21%) said that there were individual efforts occurring, and 18 people (47%) indicated that OER creation and storage partnerships are non-existent.

Table 2

Use of OER Infrastructure (n = 70)

Platform	Number	Percentage
MIT Open Education Consortium	5	7.14%
OpenLearn	6	8.57%
FutureLearn	9	12.86%
OER Foundation	5	7.14%
WikiEducator/WikiResearcher	4	5.71%
OER University	4	5.71%
Community College Consortium for OER	1	1.43%
College Open Textbooks Community	3	4.29%
OpenDOAR	6	8.57%
USQ OpenCourseWare	3	4.29%

Platform	Number	Percentage
Flat World	1	1.43%
OER World Map	4	5.71%

Some institutions indicated that they have infrastructure through their University Press or library services, including storing OER materials in their institutional repository, and establishing dedicated OER portals in rare cases. Here are some of the representative responses:

> *"There's a push through our specialist materials production area to tag everything as being an Open Educational Resource upon completion. There is very small uptake."*
>
> *"Liaison Librarians are identifying OER titles from all identified sources for creation of a 'special' OER collection via the catalogue."*
>
> *"The Open Textbook project is an initiative of the university library. The university press is managing the project to create an open textbook."*
>
> *"We have created awareness using our Copyright web site to promote OER as part of Open Access and Creative Commons. We expect to launch this in 2020."*
>
> *"The purpose of this project is to establish a university culture in the use and adoption of open educational textbooks as an alternative. One of the key objectives is to partner with key learning and teaching staff to curate and review resources for inclusion into the curriculum, encourage adoption of open educational resources (OER), create an OER portal to facilitate access to quality materials, and ultimately create a consortium of OER Librarians. This project aims to increase student satisfaction by easing the financial burden of textbook costs and increasing student engagement with the curriculum, and to provide access to engaging and up-to-date global open learning resources, in support of new evolving learning experiences and futures."*
>
> *"Pilot project to develop an open textbook in Australian politics and policy. The content has been commissioned by a set of editors, and authored by many academics across most of the universities in Australia. The text has been professionally edited by the university press, and is available from the custom-developed platform. The chapters are available in undergraduate and postgraduate versions, and academics can request a custom PDF or ePub containing only the chapters (and level) they have chosen. The content is licensed using CC BY-NC-SA."*
>
> *"Bond University Library Services has an ongoing initiative to upload open access resources into our Digital Collections and we provide these under an Open Educational Resources heading. The collection consists of archived journals, conference papers and out of print books as well as image collections that form part of a humanities data set."*

Example institutional press services offering OER include the Australian National University, and the University of Sydney. The Queensland University Libraries Office of Cooperation (QULOC) has recently joined the Open Textbook Network, which is an international open textbook library, hosted by the University of Minnesota in the US.

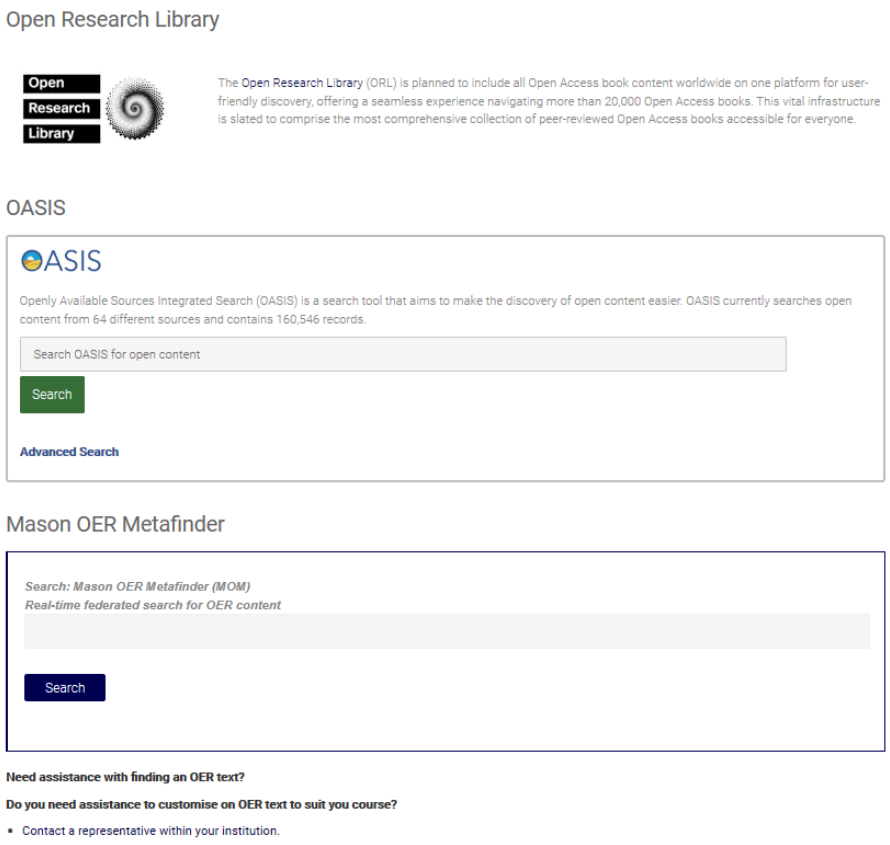
One of the open textbook projects, mentioned by the participants, is the Australian Open Textbooks as Social Justice project at Deakin University. Created in November 2019, the project has been funded by the National Centre of Student Equity in Higher Education to undertake a scoping study into the potential of open textbooks to act as social justice (Lambert, 2018). One of the goals of the project is to increase the visibility of underrepresented groups, such as indigenous academics. The project will include a comparison of three years of student equity success data with post-textbook adoption data for first year undergraduate courses, and will then compare the results with those obtained in a

similar US study. Following this, the project will replicate the Open Textbook national academic readiness survey from the UK, as well as undertaking case studies of Deakin courses.

Another project is the Open Textbook Initiative, a joint effort between RMIT University, Queensland University of Technology, University of South Australia, University of Technology Sydney, Auckland University of Technology (NZ) and Curtin University. The website provides key information about OER and available textbooks to academics and librarians, as well as offering webinars, a student savings calculator, and the facility to request an OER session from experts. Webinars available include 'Strategies for Increasing Engagement with OER', 'RMIT Open Access Webinar', and the 'Open textbook initiative'. The 'Find a textbook' facility, enables academics to search within the catalogues of six institutions, as well as to search global databases such as the Open Research Library (see Figure 1). A list of 'Featured disciplines' provides suggested open textbooks by subject area, and the website also provides promotional material for websites (e.g. GIFs and images), as well as posters to promote the use of OER in Australia. The website also promotes the Australasian Open Educational Practice Special Interest Group [5], who also offer the webinars 'Course development by higher education partners of the OERu', 'From Business School to Business as Usual', and 'Open Textbook Publishing in Australia'.

Figure 1

Open Textbook Initiative, Find a Textbook



When asked what the role of their institutional library is specifically, in the creation and storage of OER, five people said that they were unsure, five participants said that they played no role and four people indicated that their library is leading the way. Further participants indicated that their library acts as more of a support function to academics, that it "provides advice and is business process owner for repository systems", or that they "are involved in this process and host the Creative Commons". Representative responses include:

"They do have a role but it seems largely unexplored. They assist academics locate materials. They are currently engaged in significant restructuring so any extraneous services such as this have largely ceased until things calm down."

"Library team is happy to support instructors with the hosting of OERs, and can consult on aspects of creation. However, limited resourcing so this is not widely advertised. We are also waiting on an imminent new feature in our system to be able to publish OERs for Google indexing."

"We have some open educational content in the institutional repository which is run by the library. This is fairly small in scale though."

"Currently our Library does not have much to do with creating or storing OERs (no initiative in place for their creation and no repository to store them), but as the Copyright Officer, I can advise on open licensing and copyright as it relates to OER. Liaison Librarians can advise on the use of OERs in teaching."

"We educate users about OERs, we encourage use of OERs, but do not have a formal creation and storage process. We are participating in the CAUL Digital Dexterity initiative and will make use of and contribute to a digital object repository that is being produced by member institutions."

"We have a digital repository that holds some streaming video resources but currently no e-textbooks or similar resources."

"The pilot initiative is led by the university library. The university press is part of the library. The university copyright team (who advise academics on content included in MOOCs) are part of the library."

Within the context of Australian higher education, each institutional library offers copyright advice and often has someone in the role of a Copyright Officer, such as at the Queensland University of Technology who can provide "general information and advice on copyright issues… as well as information sessions and workshops", or a Copyright Coordinator, as in the case of the University of Adelaide. Their Copyright Advice website offers "knowledgeable and friendly advice on a whole range of copyright issues, including using and creating copyright material for teaching, author rights, open educational resources, Creative Commons licences, and how to make research more accessible through incorporating open access principles". The website offers an online copyright induction course for staff, as well as specific information about rights, educational licences (including discipline specific licences, such as music), and copyright in terms of research (see Figure 2).

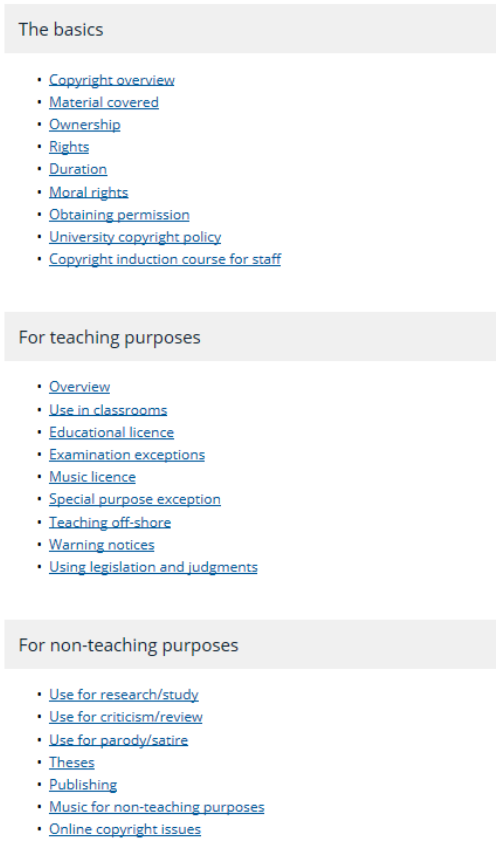
As mentioned by one of the participants above, and in the macro report for this study, CAUL (Council of Australian University Librarians) is the peak body for university libraries in Australia. One of its strategic priorities for 2020 is Advancing Open Scholarship using the FAIR principles (Findable, Accessible, Interoperable, Reusable). Their Review of Australian Repository Infrastructure project investigated how repository infrastructure can improve the findability, accessibility, interoperability and reusability of Australian-funded research, and a report was published in 2019, providing recommendations on possible ways forward (Harrison, Frances, O'Connor, & Steel, 2019). The key recommendations to CAUL included establishing an ongoing repository technical advisory working group to "oversee training, minimum metadata standards and repository system requirements and open access policy" (p. 8), and to work with the National Library of Australia to develop a Research Outputs section in the Trove database to provide "a comprehensive Research Australia style collection".

One of CAUL's programs mentioned by a participant in this study, Digital Dexterity, has developed a range of resources to encourage the development of digital dexterity within universities. This has included a position statement, an Advocacy Toolkit, and a Digital Dexterity Framework for library professionals, which is based on the Jisc digital capabilities framework. The Digital Dexterity Framework outlines the skills and capabilities that library professionals need to encourage students "to succeed in the workforce of the future" across six areas;

- ICT proficiency and productivity;
- Digital learning and development;
- Digital creation, problem solving and innovation;
- Collaboration, communication and participation;
- Information literacy, media literacy and data literacy; and
- Digital identity and wellbeing.

Figure 2

University of Adelaide Library Copyright Advice



It seems that, aside from a couple of new initiatives, not much has changed since a similar study was conducted eight years ago (Bossu et al., 2012), which found that "[e]ven though some of these repositories support the Creative Commons license, very few allow for re-designing and repurposing of the content, which therefore limits the value of these resources" (p. 3). Several of the respondents in that study, suggested that "adopting a standardised metadata for OER and/or a national or institutional repository [were] potential solutions" (p. 7). However, it seems that Australian higher education has not yet come very far in this respect.

3.3 Quality of OER

Quality assurance processes for the creation of OER in Australian higher education institutions can be described as sparse at best. In a previous study (Bossu et al., 2012), poor quality of OER was identified as a serious problem, and a subsequent article (Stagg et al., 2018) found that no Australian university had a quality assurance framework for OER. Four people out of 39 (10%) in the present study, indicated that quality assurance processes are implemented across their institution, eight people (21%) indicated that they are implemented by some departments or faculties, 12 people (31%) indicated that this is up to individuals, and 15 respondents (38%) indicated that quality assurance processes are

non-existent. Of the 19 people who responded to a question about quality assurance mechanisms at their institution, the following responses were notable:

> *"It's left to individual academics."*
>
> *"No formal measures exist, guidance is offered by the library."*
>
> *"The press has a very strong peer review and quality control process."*
>
> *"Policy procedures and specific committee for review. Own faculty based processes on top around assurance of learning and review. Online system based checking through LMS."*
>
> *"Mainly undertaken through academic self-assurance before submission."*
>
> *"OERs are checked by the Canvas Support team. The open textbook is checked using the university's press standard editorial processes – peer review, editorial review, rounds of proofing and checking."*
>
> *"All materials uploaded into Digital Collections are curated by Library Services and aim to meet best practice in this area, although some resources do need CC licenses."*
>
> *"Very few, and mainly implemented through the library."*

The Canvas platform is the MOOC platform of choice for some Australian higher education institutions, including Swinburne University. The Canvas Network mission is to promote openness in education, including open content and open data. However, information on how they quality check OER was not readily available via their website.

When asked which actors are involved in setting OER quality assurance, only nine people were able to answer with any authority. The answers were:

> *"We have a policy framework with an education procedure as well as a well established press. You can see the large number of editorial boards on the website. External peer reviewers and internal peer reviewers are a key part of the process. No title is published unless it meets the quality review, is copy edited and taken through the full publication review and production purposes."*
>
> *"Individual academics, librarians, Copyright Officer."*
>
> *"Elearning Library Academics"*
>
> *"Librarians, academics, research professional services staff"*
>
> *"Liaison Librarians and Library management"*
>
> *"Open textbook has been peer reviewed and edited using the university's current QA processes and standards."*
>
> *"Individuals and learning teaching and curriculum"*
>
> *"Educational Innovation team"*
>
> *"Library services repository and digital services team members"*

In two cases, respondents referred to the internal and external peer review of open textbooks. However, they did not clarify whether this extended to other OER content. The Sydney University Press states that all books published by them "have undergone standard quality assessment and peer review", however further information is not available. The Australian National University Press has published over 800 open-access publications and "collaborates with expert editorial boards to produce high-quality publications in accessible timeframes". Once a manuscript has been submitted

to ANU Press, it “will then undergo a rigorous peer-review process in which at least two referee reports will be obtained (at least one external to ANU) before the Editorial Board determines whether the work is to be published”.

When asked how their quality assurance mechanisms relate and adhere to international eLearning standards and specifications, even less participants responded:

> *"Resources created here through our specialist resource production area follow open access guidelines and are hosted on externally available webservers. Many structured serving elements seem to be purchased/implemented OER-ready. Examples are openpress, H5P etc."*
>
> *"They relate to standards of copyright and access."*
>
> *"Still to be specified but identified through CAUL and QULOC groups."*
>
> *"Assessment of centralised resources for accessibility and learning practice."*
>
> *"We aim to provide Open Access materials that meet the FAIR principles."*

As previously mentioned under Infrastructure, CAUL is committed to advancing open scholarship using the FAIR principles (Findable, Accessible, Interoperable, Reusable). The F.A.I.R. Access Policy Statement states that “by 2020, Australian publicly funded researchers and research organisations will have in place policies, standards and practices to:

1. Make publicly funded research outputs findable, accessible, interoperable and reusable.
2. make research publications immediately free to read at the time of publication through a range of different strategies, either via a publisher’s website or an institutional or other acceptable public repository.
3. Make research data directly related to research publications as open as possible and as closed as necessary, in accord with the Australian Government Public Data Policy Statement.
4. Apply Creative Commons licences and utilise international metadata standards to research outputs to ensure accessibility, interoperability and reusability.
5. Ensure that authors/creators obtain and retain all necessary rights to enable the authorisation of publication and re-use in any format at any time.
6. Support the development of incentives for researchers to make research outputs available in accord with this policy.
7. Value and practically support a range of dissemination models, recognising discipline diversity, whilst maintaining a commitment to the principles of this policy.
8. Ensure that the application of this policy is in accordance with the Australian Code for the Responsible Conduct of Research and other codes of practice which lay out requirements to disseminate research responsibly, ethically and for the benefit of the Australian and international community.”

In support of this, CAUL released a Statement on Open Scholarship in 2019, in which they stated that they and their members are committed to action, including providing resources as well as to advance open scholarship in the areas of advocacy, competency, publishing, infrastructure, content acquisition and educational resources.

The Queensland University Libraries Office of Cooperation (QULOC) is an organisation of university libraries in and around the state of Queensland. They have an OEP Community of Practice, in which members “share ideas and experiences”. Specific information about how they influence quality assurance, however, was not available via their website.

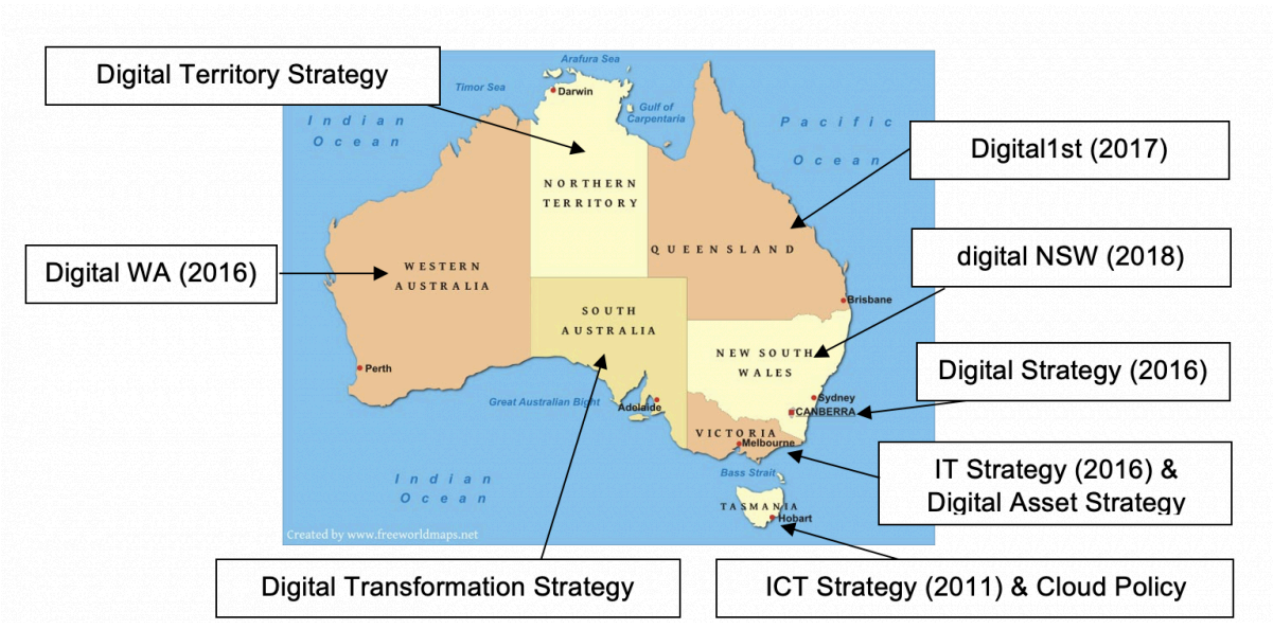
Despite the advice that has been provided to Australian higher education institutions and the Australian government (e.g. Bossu, Bull, & Brown, 2012; Stagg & Bossu, 2016), little progress has been made towards improving quality assurance mechanisms at the institutional level.

3.4 OER Policy

All Australian states and territories have their own digitalization strategies, although these documents tend to focus more on government and/or industry digitalization (e.g., Northern Territory Government, 2018), rather than education specifically (see Figure 3), although the Queensland Digital Strategy (Queensland Government, 2017, p. 16) does refer to embedding digital technology in education, including partnering with industry, universities and researchers. Some of the strategies are quite progressive, explicitly mentioning the use of open and reusable data, cloud infrastructure and investment in repositories. The Australian Capital Territory digital strategy (ACT Government, 2016), for example, is aiming to "promot[e] the use of open data and access to services for those at every level of digital maturity" as well as to influence "all organisations to further the digital agenda" (p. 10). They further state that "[t]his is as much about effecting cultural change as it is about technology adoption" (ibid). The New South Wales digital strategy (NSW Government, 2018) is exploring ways of using predictive tools to measure data quality, as well as removing legislative barriers to digital transformation, and the Tasmanian digital strategy (Tasmanian Government, 2019a) includes a focus on developing opportunities for citizens to develop lifelong digital skills learning, aligning with their Adult Learning Strategy (Tasmanian Government, 2019b).

Figure 3

Digitalization Strategies in Australia



Four states and territories have an Education digitalization plan (South Australia, Department for Education and Child Development, 2016; Northern Territory, Northern Territory Government, 2019; New South Wales, NSW Department of Education, 2016; Queensland, Queensland Government Department of Education, 2019), with Western Australia having conducted a report into ICT in schools (Education and Health Standing Committee, 2012). However, these digital strategies are generally centred on schooling up to Year 12, prior to higher education.

In order to gain further insight into the current state of digitalization within Australian higher education institutions (HEIs), a desk audit was conducted at the end of October 2019, in combination with contacting HEIs via email, which resulted in a 24% response rate. Nine universities (21%) have a current digitalization or information technology strategy document, one university is currently revising their digitalization strategy, one has a Digital Literacy Framework, two have blended learning strategies, one university has a Library Strategic Plan relating to OER, and one university includes digitalization within their Learning & Teaching Plan, which is not publicly available.

Given the decentralised nature of digital transformation in Australian HEIs, each strategy has a different name, ranging from 'Digital Strategy' (Griffith University, 2016), to 'Information Technology Strategy' (Moffatt, 2017) to 'Securing Digital Success' (Western Sydney University, 2018), which makes them very difficult to locate. The strategies vary from being very business and value for money oriented promotional brochures, to being highly teaching and learning focused, with clearly defined digitalization strategies and action plans. Following the study of 15 German digitalization strategies by Gilch et al. (2019), the 11 publicly accessible Australian HEI digitalization strategies were read and coded according to the following goals:

- Improvement of the quality of teaching
- Increase in the quality of services provided by higher education administration and services
- Increase the efficiency of higher education administration and services
- Skills training for a digital world
- Increasing the university's ability to control itself through digitised support for governance
- Profile building at the university
- Intensifying research for the digital society
- Acquisition of new target groups for study and further training offers
- Internationalisation of the university
- Increase in research quality
- Intensification of transfer activities (research and technology transfer)
- Increase in research performance
- Increase in diversity and heterogeneity of the student body

The goals of digitalization strategies within Australian and German HEIs (see Table 2) are similar within the top five, although with a substantial difference in the percentage of documents. Whilst there were slightly more German strategies analysed (15 compared to 11 Australian documents), a far higher percentage discussed the use of digitalization to improve the quality of teaching. There was also a stark difference between the focus on digitalization to increase the efficiency of higher education administration and services in Germany (90%) as opposed to Australia (55%). Another surprising difference was the low number of Australian strategies referring to an improvement in research quality (27%) and internationalisation (18%), as opposed to German strategies (45%).

The Australian documents were also open coded for other themes, resulting in the addition of the following goals and strategies:

- Normalising blended learning
- Infrastructure improvement
- Learning designers to support teaching and learning
- Short course development/Micro-credentials
- Learning analytics and personalisation
- Promoting student agency
- Increased support for staff
- Maximise engagement in OER
- Increased openness to research outputs
- Industry partnerships
- Artificial intelligence and data visualisation
- Collaboration with other universities
- Review data management procedures
- eAssessment and online examinations

Table 3

Goals of Australian and German HEI digitalization Strategies, as per Gilch et al. (2019)

Rank	Australian Goal	%	German Goal	%
1	• Increase in the quality of services provided by HE administration and services • Skills training for a digital world	82%	• Improvement of the quality of teaching	91.7%
2	• Improvement of the quality of teaching • Profile building at the university	73%	• Increase in the quality of services provided by HE administration and services • Increase the efficiency of HE admin and services	90%
3	• Increase the efficiency of HE admin and services • Intensification of transfer activities (research and tech transfer) • Increase in research performance	55%	Skills training for a digital world	86.7%
4	Intensifying research for the digital society	45%	Increasing the university's ability to control itself through digitised support for governance	73.3%
5	• Increasing the university's ability to control itself through digitised support for governance • Acquisition of new target groups for study and further training offers	36%	Profile building at the university	66.7%
6	Increase in research quality	27%	Intensifying research for the digital society	50%
7	Internationalisation of the university	18%	Acquisition of new target groups for study and further training offers	48.3%
8	Increase in diversity and heterogeneity of the student body	0%	• Intensification of transfer activities (research and tech transfer) • Increase in research quality • Internationalisation of the university	45%
9			Increase in research performance	43.3%
10			Increase in diversity and heterogeneity of the student body	38.3%

When adding the newly created themes from the open coding of Australian digitalization strategies (see Table 4), a clearer picture is gained of the HEI policy priorities. All 11 documents mentioned the enhanced use of learning analytics to gain further understanding of student technology use and the overall student experience, alongside personalisation of services and learning. Ten (91%) strategies discussed the normalisation of blended learning, with a key focus on mobile, on-demand digital solutions, as well as key infrastructure improvements needed. Specific infrastructure mentioned included the increased use of High-Powered Computers, agile software, and data warehouse capability (e.g., Griffith University, 2016). Aside from a focus on service quality and digital skill development of both students and staff, 82% (n = 9), strategies also included increased support for staff, in terms of resources, professional development, and aligning learning and teaching with sound learning design principles, as well as collaborating with other institutions to share the cost of resources.

Table 4

Overall goals of Australian HEI digitalization Strategies

Goal	Rank	%
Learning analytics and personalisation	1	100%
Normalising blended learning	2	91%
Infrastructure improvement	2	91%
Increase in the quality of services provided by HE administration and services	3	82%
Skills training for a digital world	3	82%
Increased support for staff	3	82%
Collaboration with other universities	3	82%
Improvement of the quality of teaching	4	73%
Profile building at the university	4	73%
Industry partnerships	5	64%
Increased openness to research output	5	64%
Review data management procedures	5	64%
Increase the efficiency of higher education admin and services	6	55%
Intensification of transfer activities (research and technology transfer)	6	55%
Increase in research performance	6	55%
Maximise engagement in OER	6	55%
Intensifying research for the digital society	7	45%
Learning designers to support teaching and learning	7	45%
Short course development/micro credentials	7	45%
Student agency	7	45%
Increasing the university's ability to control itself through digitised support for governance	8	36%
Acquisition of new target groups for study and further training offers	8	36%
Increase in research quality	9	27%
Internationalisation of the university	10	18%
Artificial intelligence and data visualisation	10	18%
eAssessment	11	9%

OER Policy in higher education institutions

Concerning OER specifically, there are very few OER projects at the national level, as evidenced by entries on the OER World Map (see Figure 4). However, a number of specific institutions are now making the creation, storage and dissemination of OER a priority within their digitalization and strategic plans, with 55% of institutions explicitly mentioning maximising engagement with OER in their digitalization strategies and 64% mentioning increased openness to research output. For example, the University of Wollongong digitalization strategy (University of Wollongong, 2015) has explicitly made Open Learning a priority. Their actionable items include the following (p. 10):

> *4.1 Develop a policy on MOOC quality*
>
> *4.2 Develop an international MOOC platform*

4.3 MOOC development and maintenance

4.4 Create an open Graduate Certificate in International Studies on OERu

4.5 Creation of online postgraduate courses

4.6 At least one faculty to conduct an OER textbook pilot

4.7 Review teams to consider how in-course use of MOOCs might support students in their learning and reduce costs

4.8 Manager of Open Education to maintain a repository of resources on the UOW YouTube channel and to encourage the creation and reuse of OER videos by faculty members

Naturally, plans do change over time and as of November 2019, the University of Wollongong (UOW) are not a partner with OERu, but rather have six courses currently on the FutureLearn platform, including four free MOOCs. They do have a YouTube channel, although this predominantly features videos about life at the university, overseas study opportunities, and marketing videos. There is a UOW Research playlist, featuring conference presentations and research information by UOW staff, although not teaching and learning materials per se.

Figure 4

OER World Map for Australia (https://oerworldmap.org/country/au)

Aligning with the Australian F.A.I.R policy (CAUL, 2016) of keeping research Findable, Accessible, Interoperable and Reusable, any research funded by the Australian Government National Health and Medical Research Council, is mandated to share publications as open access by the NHMRC Open Access Policy (National Health and Medical Research Council, 2018). This includes listing patents resulting from NHMRC funding in SourceIP, a national repository for patent holders, whose goal is to boost collaboration between science and industry. Likewise, any research funded by the Australian Research Council, must be made open access within 12 months after publication, either in an

institutional repository or through a publisher's website, or other data repository (Australian Research Council, 2017). They must also include the Australian Research Council (ARC) Project ID, contain a DOI, and list the ARC as a funding source in the metadata. This has resulted in the improvement of Australian institutional repositories (see Appendix A) and likewise institutional open access policies (e.g., Australian National University, 2017).

The landscape of OER and open educational practices (OEP) strategies in Australia as of 2016, however, was quite bleak. In their national audit of Australian higher education institutions and OEP strategies in 2016, Stagg et al. (2018) found that no Australian university had an open licensing policy, open assessment, or a quality assurance framework to support OEP, with only 37.5% of institutions having an open access policy. A mere 25% of institutions had an OER and/or OEP policy and 15% had OER/OEP guidelines, despite 65% of institutions using or making OER available. Unfortunately, that particular study did not provide further information or specific institutional examples, and therefore a new study was undertaken for the purposes of this report, which can be found below. A positive outcome of this audit, however, was the development of a Feasibility Protocol (Bossu, Brown, & Bull, 2014b), which is "a set of guiding principles that prompts questions and raises issues to be considered by universities and tertiary institutions wishing to take advantage of OER and OEP" (p. 4). The Feasibility Protocol raises questions on four aspects;

- "the Opportunities involved with the adoption of OER and OEP;
- factors related to the Challenges associated with the adoption of OER and OEP;
- Strategic Directions that need to be considered for an effective adoption of OER and OEP; and
- some Policy Recommendations for higher education institutions in Australia." (Bossu et al., 2014b, p. 6)

OER in Australian higher education study

Participants were asked to rank how committed their institution is to using OER. 10% (n = 5) said that their institution is very committed, 52% (n = 26) that it is partially committed, 16% (n = 8) that their HEI is not committed at all, and 22% (n = 11) were unsure. When asked about explicit institutional OER policies or frameworks, 25 respondents out of 39 (64%) indicated that these are non-existent in their institution. Five people (7.14%) indicated that OER practices have been incorporated in their institution's current strategic plan, six people (9.48%) indicated that their institution has no plans to consider OER practice in future strategic plans, and fourteen people (20%) indicated that their institution will incorporate OER practice into their future strategic plans. These results are far lower than results obtained in 2014 (Bossu et al., 2014a). At the moment, OER policy making is largely occurring through library staff and/or the university executive committee, with some institutions involving academics, Associate Deans and Pro Vice Chancellors, although some respondents were unsure.

The University of Technology Sydney (UTS) is an example of an institution that does not currently have a specific digitalization plan; however, an email response revealed that they do have a targeted strategy to openness along four domains (see Figure 5), aligned to a key imperative within their 2027 Strategy of "transforming to a lifetime of learning". The UTS library manages UTS ePRESS, which currently publishes 12 Open Access journals, as well as eBooks and conference proceedings. UTS is also the NSW Node of the Australian Data archive and manages the Aboriginal and Torres Strait Islander Data Archive (ATSIDA). ATSIDA stores Aboriginal and Torres Strait Islander research data, in order to reduce the burden on Australian Indigenous communities in responding to enquiries.

Table 5

UTS Openness Strategy

Open Education	Open Research	Open Platforms	Community Engagement
• Promotion and support for integration of OER into learning design. • Support in relation to copyright provided via dedicated staff, as well as online tools and resources. • Publishing of OER (through UTS ePress) and distribution through global databases (e.g. Khan Academy)	• Support for publication in Open Access platforms (Green). • Internal advocacy for Open Research integrated into all research training. • Support for Open Data through provision of specialist curation services. • Institutional repository with ongoing program for the provision of Open Research (currently 40% of resources available freely).	• Leadership in the use of Open Source platforms (e.g. DSpace). • UTS Open learning platform provides a range of free online courses to the public via micro credential study, alongside core curriculum.	• Members of SPARC, DOAJ, SCOSS and COAR. • Active involvement with the Council of Australian University Librarians (CAUL) in relation to FAIR principles and ongoing research and advocacy e.g. national repository infrastructure, cost of Open Access. • Leadership in the negotiation and implementation of transformational agreements.

3.5 OER Change

Change within Australian higher education is largely shaped by government policy and target-setting, although this has been focused on open research and open research data, including the aforementioned mandate to share funded research data. However, the universities do come together at the national level, to help drive policy and change forwards together. Universities Australia, for example, is comprised of 39 higher education member institutions who "make submissions, develop policy across the sector, represent Australia's universities on government and industry-appointed bodies and partner with university sectors in other countries to enable bilateral and global collaborations" (Universities Australia, 2019). In the 2016 policy document Keep it Clever (Universities Australia, 2016), Australia's weakening position in the World Economic Forum Global Competitiveness Index was highlighted, alongside the need to strengthen digital literacy, provide flexible, online courses to support lifelong learning, and increased federal funding to support innovation and entrepreneurship. The potential of OER to support this, however, was not made (Stagg et al., 2018).

The Council of Australasian Directors of Information Technology (CAUDIT) is owned by Australasian universities and major Australian research organisations, and is comprised of the most senior IT people in each organisation. Each year, members are surveyed to determine the top ten topics affecting the strategic development and application of IT, with 42 university members surveyed in 2019 (Council of Australasian University Directors of Information Technology, 2019). The top ranked topics were consistent across the previous three years, namely 'Supporting Student Success' and 'Information Security' (see Figure 6), with 'Business Transformation' holding steady at rank 3. However, 'Strategy' has dropped from rank 2 to rank 7, which is the first time it has been out of the top 5 since 2015. 'Digital Integrations' has risen to rank 6, which was also identified as a high impact topic, alongside 'Delivering Services', 'Strategy', 'Educational Technology', and 'Workforce Evolution'. 'Educational Technology' and 'Information Security' were considered the most significant and ongoing topics. Compare this to 2021, where the report is now only available to members, 'New Models of Teaching and Learning' has been added at rank 4, and 'Seamless User Experience' at rank 6.

CAUDIT member institutions are looking towards cloud computing, big data, agility and scalability, as well as mobile network infrastructure on and off campus, and blockchain. ICT leaders, however, are also focused on cost-effectiveness, whilst attempting to meet the needs of students and staff, which is reflected in the ranking of 'Delivering Services' at position 4. CAUDIT stresses the need to "position digitisation as the great enabler" (Council of Australasian

University Directors of Information Technology, 2019, p. 19), but that this relies on leaders to "[act] as bridges between institutions and innovation in digital technologies". This leads to the question, what role do ICT leaders play in digital infrastructure strategic planning?

Figure 6

Trends from 2017-2019, CAUDIT (2019, p. 4)

Institutional Strategic Planning

The investigation undertaken within the Policy section above indicates that institutional strategic planning is only being undertaken through digitalization strategies to a small extent, with 27% of institutions having a publicly accessible policy document. Whilst other institutions do include digital infrastructure within Learning and Teaching policies or their institution strategic plans, some of these are not publicly available, which makes it difficult to gain an accurate understanding of institutional strategic planning. One non-public plan was provided to this researcher via email, however, and it includes priorities such as ensuring consistent Wi-Fi across campuses, reviewing and improving teaching spaces, increasing video conference facilities, providing subsequent staff professional development in the equipment, and increased IT support for staff.

The HEI survey indicated that change regarding digital infrastructure is largely occurring through bottom-up approaches, including a strong push from library staff and through teaching and learning communities of practice. However, many respondents were unsure or provided an interesting insight into their institution's strategic planning, as the following quotes illustrate:

> *Bottom-up though after twenty months of restructuring and job losses, any collaboration in this area – which was significant at a grass-roots level – has all but died. (Learning Technologist, Health & Welfare, 8 years at institution)*

Neither, it's a bit disorganised with local and institutional working patchily together. (Associate Dean, Business, Administration & Law, 0-2 years at institution)

Funding to support the development of OER at the institutional level is rare (Stagg et al., 2018), although there are a couple of notable exceptions. The University of Southern Queensland funded an Open Textbook Grant Scheme in 2015, later renamed the Open Educational Practice Staff Scholarship Scheme (Stagg & Partridge, 2019). The focus was on building professional networks and facilitating communities of practice, alongside producing OER. Participants of the grant program felt that ongoing meetings helped them to generate and refine ideas, as well as a deeper understanding of openness as a result of connecting with other institutions around the world. Another example is the University of Wollongong, as previously mentioned, who have explicitly made the creation of open access textbooks a priority in their strategic plan.

Initiatives that are occurring at Australian HEIs include:

- Dedicated library staff, consolidating OER information and resources. For example, one institution has funded a staff member to work on this for 6 months.
- Provide increased library services, to connect academics and digital educators about OERs.
- Providing OER materials (not publications) in the institutional repository.
- A PhD candidate at one institution has been funded to investigate OER adoption to further inclusive content and texts in Australia, with hopes for OER text uptake by 1 or 2 course units in 2020.
- Providing online courses for Open University.
- A work group collaborating across the institution to raise awareness and promote creation and reuse.
- A research study being undertaken into the impact on student access and engagement as a result of changing to OER.
- Three universities are part of the Open Education Consortium (Charles Sturt University, Swinburne University of Technology, and the University of Southern Queensland).
- Five universities offer online courses through OERu (Charles Sturt University, University of Tasmania, University of Southern Queensland, University of Canberra, Curtin University, see Appendix B for a list of courses offered).

Unfortunately, not a lot of information about these initiatives is available publicly, aside from the institutional repositories (see Appendix A), which limits the ability to share good practice across campuses and between institutions.

3.7 Summary of the meso level and preliminary conclusions

In this second section, the meso level was investigated using a number of methods; a desk audit of state government and state education digitalization plans, analysing Australian HE institutional digitalization plans and then comparing them to those in Germany (see Gilch et al., 2019), contacting Australian HEI vice-chancellors via email about their digitalization and strategic plans, and issuing a survey to more than 350 HEI academics, deans, administrators, and professional staff. Whilst survey responses and information from HEI executives was limited, this data has already provided valuable insight into the state of OER policy and change plans and processes.

Whilst many state government digitalization plans stress the need for digital and lifelong learning skills, as do HE institutions, there seems to be a disconnect between the goal and the reality. Limited funding appears to be available at the national, state and institutional level, to support the investigation into and subsequent growth of OER use and storage (Bossu et al., 2011). Isolated, (generally) bottom-up initiatives do exist, however these are rarely publicly emphasised, or part of a longer-term, ongoing commitment to embedding open access approaches within strategic planning. Quality assurance in particular is an area requiring further development. As previously asserted by Bossu et al., (2014a), the OER movement has moved more efficiently and effectively in countries where national support was provided, therefore further top-down approaches are needed at both the macro and meso levels.

4. Micro Level

4.1 Methodology

The case studies and projects funded by the Australian Government mentioned above will be analysed against the guiding research questions of this study. However, in order to delve deeper into current OER practices in Australia at the micro level, a further two-pronged approach for this report was also undertaken, and reported in section 3.1 of this chapter.

4.2 Results

Participants' Knowledge and Awareness of OER

Participants were asked how aware they are of Public Domain, Copyright and Creative Commons, with Creative Commons the receiving the most 'Aware' or 'Very Aware' responses (70%), and 55.71% (n = 39) of participants' institutions using Creative Commons licenses.

The majority of participants who answered questions to rate various statements about the use of OER in higher education were very positive. 34.29% stated that they either agreed or strongly agreed that using OER leads to institutional innovation (see Table 5), and 36.71% agreed or strongly agreed that the adoption of OER promotes the sharing of knowledge and the university service mission (see Table 6). However, they also recognised the need to provide specific skill support for the development and use of OER (see Table 7).

Table 6

How would you rate the following: Using OERs leads to institutional innovation

Answer	Number	Percentage
Strongly agree	7	10.00%
Agree	17	24.29%
Neither agree nor disagree	7	10.00%
Disagree	1	1.43%
Strongly disagree	1	1.43%
No answer	8	11.43%
Not completed or not displayed	29	41.43%

Current institutional OER projects/initiatives

Participants were asked whether their institution currently has an OER project or initiative. 30% (n = 21) indicated that they do, 21.43% (n = 15) responded that their institutions does not, and 20% (n = 14) said that they were unsure. The most frequently mentioned initiative involved the institutional library (n = 6), in order "to better connect academics and digital educators to OERs". The next most frequently mentioned activity was the promotion of using OER (n = 3), as well as one participant mentioning there is a push to "tag everything as being an Open Educational Resource upon completion" but that there "is very small uptake", as well as storing OER (not just open access publications) in institutional repositories (n = 3). One participant commented that "Liasion Librarians are identifying OER titles from all identified sources for the creation of a 'special' OER collection within the catalogue".

Table 7

How would you rate the following: The adoption of OER promotes the sharing of knowledge and the university service mission

Answer	Number	Percentage
Strongly agree	11	15.71%
Agree	14	20.00%
Neither agree nor disagree	5	7.14%
Disagree	1	1.43%
Strongly disagree	1	1.43%
No answer	9	12.86%
Not completed or not displayed	29	41.43%

Table 8

How would you rate the following: In order to stimulate the use of OER, specific skill support is needed

Answer	Number	Percentage
Strongly agree	11	15.71%
Agree	15	21.43%
Neither agree nor disagree	5	7.14%
Disagree	2	2.86%
Strongly disagree	0	0.00%
No answer	8	11.43%
Not completed or not displayed	29	41.43%

Two participants reported current research studies into the impact of OER adoption, and two mentioned the publication of OER through their university press. One participant reported on a pilot project for the development of an open textbook in Australian politics and policy:

"The content has been commissioned by a sect of editors, and authored by many academics across most of the universities in Australia. The text has been professionally edited by the university press, and is available from a custom-developed platform. The chapters are available in undergraduate and postgraduate versions, and academics can request a custom PDF or ePub containing only the chapters (and level) they have chosen. The content is licensed using CC BY-NC-SA."

The Open Textbook Initiative, a collaboration between RMIT University, Queensland University of Technology, Auckland University of Technology (NZ), University of Technology Sydney, University of South Australia and Curtin University, was an example of an OER project given by a participant, which not only provides advice on a range of OEP topics for academics and librarians, but also provides multiple ways of helping people to locate open textbooks. The following is a list of Australian higher education institutions that offer OER repositories.

Table 9

List of Australian higher education institutions that offer OER repositories

Institution	Website Address
Australian National University	https://edtechbooks.org/-jsfA
Charles Darwin University	https://edtechbooks.org/-Nkju

Institution	Website Address
LaTrobe University	https://edtechbooks.org/-MZZm
Queensland University of Technology	https://qut.pressbooks.pub/
RMIT (textbooks)	https://edtechbooks.org/-utnq
RMIT (self-created)	https://edtechbooks.org/-Vuje
Sydney University	https://open.sydneyuniversitypress.com.au/
University of Adelaide	https://edtechbooks.org/-VfzC
University of Southern Queensland	https://usq.pressbooks.pub/
University of Technology Sydney	https://edtechbooks.org/-iBILS
Swinburne University	https://commons.swinburne.edu.au/

4.3 OER Infrastructure

The role of libraries in the creation and storage of OER was reported by survey participants in divergent terms. On one hand, many reported that they are vital and central to OER storage and promotion, including creating awareness of institutional repositories and other platforms available for housing OER, such as the eLearning Objects Repository (eLOR) at the University of Southern Queensland. One participant reported that their library was waiting on a new feature to be added to their system, to enable them to publish OER so that they are indexed by Google. On the other hand, some survey participants felt that the role of libraries seems "largely unexplored", and whilst library teams are happy to support educators with hosting OER and consultation, there was limited resourcing available for this to occur. They are also often pressured by academics and publishers to promote the use of licensed materials (Kandlbinder & Chelliah, 2015). According to prior projects, libraries should be further encouraged to share OER, including changing learning and teaching grants to be weighted towards OER adaptation, rather than creation.

Survey participants indicated that FutureLearn as the non-institutional platform they are most using (12.86%, n = 9) to house their OER and other short courses. Australian universities that are currently offering courses via FutureLearn include Central Queensland University (e.g. Orientation to Educational Neuroscience), Queensland University of Technology (e.g. Child Protection for Teachers), and Griffith University (e.g. Big Data Analytics: Opportunities, challenges and the future). The next most used platforms are OpenLearn and OpenDOAR (both 8.57%, n = 6), followed by MIT Open Education Consortium and the OER Foundation (both 7.14%, n = 7), OERu, the OER World Map and WikiEducator (all 5.71%, n = 4).

Educator knowledge about and use of existing local infrastructure, including the use of institutional repositories, is embedded in institutional practice in rare cases (e.g. University of Tasmania). However, the survey conducted for this report, as well as the literature review conducted, point to a lack of knowledge about tools and repositories available. One example of an effective OER information dissemination strategy was an email from OER project coordinators to all staff in the faculty, which prompted increased engagement (Lambert, 2015).

The 'Dying2Learn' MOOC, developed by Flinders University in South Australia, used the OpenLearning platform (Rawlings et al., 2017), which was chosen due to its community and social/peer-to-peer capabilities. The OpenLearning platform allowed "a hybrid approach to be taken where many of the learners' interactions are akin to the cMOOC experience" (p. 3), which meant that rather than using a range of social media tools in conjunction with the MOOC, all of the conversations could take place within the one platform. The platform developers were also more than willing to assist with the extraction of data and the modification of the interface.

Educators prefer to use OER that requires little modification, for example freely available videos such as TedX talks and YouTube clips, (Kandlbinder & Chelliah, 2015). These were seen as particularly beneficial as "they brought in expertise that didn't reside with the lecturer" and "they required minimal intervention from the lecturer" (p. 3). However, it was also

pointed out that students are finding their own OER. In contrast, other lecturers at the same university had the view that, although students could easily access Khan Academy and iTunes U, they did not necessarily match course aims as closely as their own content would (Kandlbinder, 2015). More than half the lecturers of large classes at the University of Technology Sydney "do not create any additional materials beyond the lecture recordings" (p. 1), most often due to lack of time, and some of the lecturers at the University of Technology Sydney cited a lack of knowledge about video creation as a reason behind their lack of resource creation (Kandlbinder, 2015).

The need to include metadata to improve OER searchability was identified as a barrier for educators (Open Education Licensing Project, 2016c). Therefore, an advanced function to support the input of metadata in a repository would be very helpful, as would an obvious place to input licensing details. One survey participant stated that "unfortunately the repository does not have a visible licence field which undermines our ability to support content in terms of infrastructure". The ability for a repository to somehow include information about licensing and metadata options, available alongside where to input the information, would possibly also improve educator understanding and ease of use.

4.4 Quality of OER

As reported in the Meso level report, the quality of OER is a major issue and barrier to adoption for Australian academics (Kandlbinder & Chelliah, 2015). In a previous study (Bossu et al.,2012), poor quality of OER was identified as a serious problem, and a subsequent article (Stagg et al., 2018) found that no Australian university had a quality assurance framework for OER. 10% of participants (n = 4) in the present study indicated that quality assurance processes are implemented across their institution, 21% (n = 8) indicated that they are implemented by some departments or faculties, 31% (n = 12) indicated that this is up to individuals, and 38% (n = 15) indicated that quality assurance processes are non-existent. A case study of educators at the University of Southern Queensland indicates that teachers remain concerned about pre-publication quality assurance processes, despite explicit grant programmes and mentoring put into place there (Stagg & Partridge, 2019).

The University of Tasmania (UTAS) was an early adopted of OEP and has instituted a range of policies around OER development and implementation (see Policy section for more information). In the early stages of their OEP adoption, UTAS recognised that there would be a risk to quality and their institutional reputation if OER were not maintained, and therefore highlighted the need to embed good practice from the beginning (Brown et al., 2013). One of the Teaching Performance Expectations for educators in the domain of 'Excellence in contemporary curriculum design and engagement', therefore, is 'Undertakes and/or leads quality assurance and evaluation of curricula, frameworks and standards, accreditation'. There is an institutional expectation that educators are involved in peer review procedures, both for their own work, but also to review the work of colleagues. Staff are encouraged to use the Quality Matters framework and to undertake the professional development course offered, which can then be used in support of applications for promotion.

The course 'Foundations of University Teaching Practice' offered by Southern Cross University is a foundation-level program, developed as an online, open-learning, granulated course, integrating a range of OER (G. Wilson, Myatt, & Purdy, 2018). A lot of time was given to the identification of suitable OER, with the identifying markers of good quality OER being "currency, clarity, relevance and brevity" (p. 6). However, the course designers needed to ensure that the OER applied to their learning context, and they also tried to facilitate an environment of reflection on the OERs used. Educators at the University of Technology Sydney were also happy to use OER, as long as they were deemed to be as good as material they could produce themselves and that they required minimal modification (Kandlbinder & Chelliah, 2015): "In most cases, OERs are not seen as high enough quality or not coming as a complete package and therefore required modification to integrate them into their specific subject." (p. 3)

The library plays a key role in OER development at the Queensland University of Technology, through an optional stage of quality assurance (Stevens et al., 2017). The University Copyright Officer or a Learning Designer can provide guidance to educators on the quality or suitability of OER, as well as appropriate repositories. The library also manages the promotion, education and curation of OER content, including Faculty Liaison Librarians who "provide support and

guidance to teaching staff on content suitable for OERs, licensing requirements, and the most appropriate repositories to host the final OER" (Stevens et al., 2017, p. 253), alongside the management of several institutional repositories, such as QUT ePrints, QUT Media Warehouse (video content), and the Research Data Finder (research data). If an educator wants to house their OER in a repository outside of the institution, the repository must enable the content to be open, reusable and shareable, as well as preferably to be licensed under Creative Commons.

4.5 OER Policy

As mentioned in the Meso report, very few formalised institutional policies exist for digitalization, let alone OER development and storage. In their national audit of Australian higher education institutions and OEP strategies in 2016, Stagg et al. (2018) found that no Australian university had an open licensing policy, open assessment, or a quality assurance framework to support OEP, with only 37.5% of institutions having an open access policy. A mere 25% of institutions had an OER and/or OEP policy and 15% had OER/OEP guidelines, despite 65% of institutions using or making OER available. When asked about explicit institutional OER policies or frameworks in the present study, 25 respondents out of 39 (64%) indicated that these are non-existent in their institution. Five people (7.14%) indicated that OER practices have been incorporated in their institution's current strategic plan, six people (9.48%) indicated that their institution has no plans to consider OER practice in future strategic plans, and fourteen people (20%) indicated that their institution will incorporate OER practice into their future strategic plans.

When asked which actors are involved in OER policy making at their institution, 30% (n = 21) of survey participants provided some level of response. Four participants stated that it was not applicable to them, two participants were unsure, four participants mentioned the Pro Vice-Chancellor's office or Associate Deans of Education for faculties, one mentioned Learning Design and one mentioned IT. The most involved actors of OER policy mentioned were libraries and, whilst seven respondents mentioned educators in some respect, it seemed that only "individual academics" were involved, or "individual/small groups of educators who are OER champions". Only one participant indicated that they were aware of an OER policy for individual departments at their institution, with another responding that "unofficially, slight pressure is being applied to lecturers at a very low level to encourage them to consider open textbooks as a cost-reduction measure for students". Furthermore, whilst 22 participants (31.43%) either agreed or strongly agreed that 'using OER leads to improvement in educational practices', only six participants (8.57%) either agreed or strongly agreed that 'teaching strategies promoting the use of OER are supported in [their] institution', and only seven (10%) agreed or strongly agreed that the 'adoption of OER is supported in [their] institution'. The following remarks are notable here:

> *"We have a distinct lack of policy support across the university to provide _any_ form of guidance related to teaching. Academic use of OER is guided far more in relation to workload, assessment and reporting requirements than any pedagogical needs."*

> *"In the College I work in there is a culture of keeping IP for yourself, sad to say there is little sharing of resources even within our unit. This was a shock for me as the last organisation I worked for shared resources widely, and reaped the rewards, e.g. others shared and developed resources with us."*

A lack of awareness of OEP and OER, as well as a dearth of institutional policies, was also noted in the Open Education Licensing Project case studies (Open Education Licensing Project, 2016a).

The University of Southern Queensland have been leaders in OEP in Australia, with moves towards an institutional IP policy, open textbook program and promoting an 'open first' agenda (Udas, Partridge, & Stagg, 2016). This also includes ensuring that software procurement is open source friendly. However, a case study of educators who had received an OEP grant (see Change below for further details) revealed that concerns around staff knowledge of copyright and intellectual property policies still abound (Stagg & Partridge, 2019). It is important to note that in many Australian higher education institutions, teaching and learning resources "are traditionally closed to those outside of a course or unit, and ownership is retained by the university – the lecturer must seek policy approval to release course materials outside of the institution" (Stagg & Partridge, 2019, p. 479).

The University of Tasmania (UTAS) has also been a leader of OEP in Australia, with the development of a blended learning model in 2013 (Brown et al., 2013), which saw the beginning of discussions on how to embed OER within teaching and learning practices at UTAS (Bossu & Meier, 2018). The Strategic Plan for Teaching and Learning 2016-2020 then outlined a focus on supporting staff in planning and development of OER, as well as the integration of recognising contribution to OEP through the Teaching Performance Expectations. For example, a Level A academic is meeting expectations by using learning technologies and curating online resources for teaching, but they exceed expectations if they "produce online resources for students, [add] to the online resources and activities available to students or [produce] open educational resources in discipline area". Despite this, there is still "an overall lack of understanding about the use of open licences and institutional practices in terms of copyright permissions" (Bossu & Meier, 2018, p. 5).

The Queensland University of Technology OER policy was approved in 2016 and outlines how OER is supported and used, as well as the obligations of staff and students (Stevens et al., 2017). It was developed with the input of the University Copyright Officer, Learning and Teaching Unit, Technology, Information and Learning Support, eLearning Services, and various individual academics interested in OER and OEP (Open Education Licensing Project, 2016b). QUT also has an institutional Intellectual Property Policy, which incorporates the use of OER. Before staff are able to release teaching and learning materials as OER, they must first receive approval from their Head of School and then seek approval from the Deputy Vice-Chancellor (Technology, Information and Learning Support). Despite the creation of policies and frameworks, and increasing awareness of OER, OER use and creation remains low.

4.6 OER Change

When asked how teachers are involved in the technical and informational aspect of creating OER and advancing infrastructure, only 14 participants (20%) provided a response, although two of these said it was not applicable to their context, and three were unsure. The more detailed responses, which are provided below, paint a picture of predominantly a handful of educators becoming involved in limited, predominantly less technical ways.

> *"Academics are involved as authors in the same way they author non OER works."*
>
> *"On occasion, academics may provide OER to someone like myself indicating that they'd like to use it. We'd examine the resource to see whether it could be technically incorporated or to repurpose it should the original not be suitable for reuse (specifically, Flash)."*
>
> *"Educators work with the Library eBureau unit to create open educational etextbooks – academics are particularly involved in the writing/content/subject expertise aspect."*
>
> *"My understanding is educators play a quite limited role in the technical aspects of creating OER, which is mainly done by the Library…"*
>
> *"For works in the press and repository, academics are not required to develop new technical skills."*
>
> *"It is a personal choice. Some stumble upon them by accident whilst others seek to create or use them. There is no overt reward for their development."*

Educators at Swinburne University reported creating videos and MOOCs as OER, with some expressing the desire to share their videos, but also to licence them correctly, so as to not to allow their being "cut up" and redistributed. The move of academics at Charles Sturt University to offer two courses on OERu involved a lot of technical and learning design capabilities, which not all educators have (Ward, 2015). This further highlights the need for developing educator digital capabilities, prior to (or alongside) implementing OER strategies.

When asked how teachers are being supported in the technical-informational aspects of OER material creation, a number of participants mentioned being supported by their libraries, including workshops and sessions conducted by them or by OER working groups. Another participant reported that each college in their university "has a full-time learning technologist assigned to it for support and advice. This takes place at an informal level." Only one participant

mentioned the existence of an annual grant for OEP that academics at their institution can apply for, in order "to transform a subject they teach". They also indicated that their university is "overtly committed to transforming 2 degree programs each year into fully OEP over the next 3 years".

In the Learning2014 project at the University of Technology Sydney (Kandlbinder & Chelliah, 2015), learning and teaching grants were offered to participating academics, which was primarily used to pay learning technologists to develop resources, rather than for academics to develop resources themselves. A special category was also created in the annual Vice Chancellor awards. "Of the three approaches used in the Learning2014 strategy – recognition, reward and monitoring progress – it was recognition that had the greatest impact on early adopters' decisions to make a change to their teaching practice" (Kandlbinder & Chelliah, 2015, p. 3).

In 2015, the University of Southern Queensland (USQ) introduced an Open Textbook Grants Scheme, later renamed the Open Educational Practice Staff Scholarship Scheme, which provides funding to academics to develop an open textbook or alternative OER (Partridge, 2015). The grants were developed, based on Fullan and Stiegelauer's (1991) Theory of Educational Change and Wenger's (2010) Communities of Practice, which highlights the need for staff to actively participate in behavioural and attitudinal change. Information sessions and direct coaching sessions to prepare grant applications were provided, followed by successful applicants attending fortnightly learning community sessions, to share progress and best practice, which were highly valued by the educators (Stagg & Partridge, 2019).

USQ now have annual Open Educational Practice Grants, with one granted in 2019 for Open Assessment and two for open textbooks (University of Southern Queensland, 2020). However, those responsible for OEP at USQ have admitted that they "have learned that open practice by academic staff needs to be an individual decision but the University can reward and recognise open behaviour and support experimentation" (Udas et al., 2016, p. 338).

Academics at the University of Technology Sydney, the University of Tasmania and the University of Southern Queensland have found it difficult to find suitable OER for their subject, outside of TedX talks and YouTube videos (Bossu, 2015a; Kandlbinder & Chelliah, 2015; Stagg & Partridge, 2019), particularly in regard to licensing and university policy environments. Educators' limited knowledge about OER, as well as licensing issues, was also mentioned as a barrier at Queensland University of Technology (Open Education Licensing Project, 2016b) and Swinburne University (Open Education Licensing Project, 2016c). This was also raised in a case study by the Higher Education Standards Panel (Ewan, 2016), which suggested "the need to develop the abilities of academics to select and curate content from multiple sources" (p. 2).

Some of the academics at USQ, who were successful in receiving an OEP grant, chose to "[add] value to curated OER by providing an explicit learning design that sequenced and aided students in 'sense-making'" (Stagg & Partridge, 2019, p. 479). This indicates that educators felt it was not quite enough to simply make OER available to students as they were, but that further scaffolding and guidance was still needed, in order for students to successfully integrate OER into their learning.

5. Conclusion

Educator capacity for OER creation and adaptation remains an area requiring improvement in Australian higher education (Stagg, 2014; Udas et al., 2016). As pointed out by Kandlbinder and Chelliah (2015, p. 3), "the encouragement to use OERs is only likely to succeed if there is an institution-wide approach that makes adoption and modification of OERs more attractive to subject coordinators". Furthermore, support from senior administrators and at the national level, would also assist institutions in making changes towards further OEP development (Bossu & Meier, 2018; Bossu & Stagg, 2018; Open Education Licensing Project, 2016a, 2016b). Remarkably, evidence is still needed for university administrators (and educators) regarding the advantages of OER and OEP in general, compared with the investment of time and (in some cases) money required (Wills, 2015).

Future Research

A limited amount of research has been undertaken at the micro level in Australian higher education to date, particularly in the area of infrastructure, such as platforms and tools to create OER, and this represents an area ripe for future research, beyond the capabilities of the present study. Case studies, such as that conducted by Baas, Admiraal, and van den Berg (2019) in the Netherlands, are needed to help further answer the following questions posed by the present study:

1. How do educators know about and use existing local infrastructures?
2. Which infrastructures/working environments (e.g. tools and platforms) do educators prefer to use to create and edit OER?
3. Which types of OER do educators prefer to use in their teaching?
4. Which functionalities would be helpful for educators to edit their own or others' OER and/or for collaborative work?

Whilst this investigation revealed that educators at most Australian higher education institutions are involved in defining OER quality, further investigation of the role that academics play in this is also warranted, with one respondent commenting:

> *"I caution against an approach that does not consider quality and focuses on repositories. I think there is much we can learn from innovative educators and work with them to create new digital entities and experiment including co-researching user experience including the students (sic) experience."*

Therefore, specific questions that require further investigation include:

1. Are educators involved in defining quality of OER and their infrastructures?
2. Are educators aware of how institutional quality procedures related to OER work and who is in charge of them?
3. With whom, where and how do educators share OER?

Recommendations

Through conducting a combination of desk-based and empirical research, a number of recommendations are suggested:

1. National policies, including incentives, regarding OER and OEP are needed (Bossu & Meier, 2018; Stevens et al., 2017).
2. Consider ease of inserting metadata and licensing information in the development of OER repositories (Ponte et al., 2021).
3. Explicit institutional policies regarding the development of OER, especially in intellectual property, are needed (Stagg & Partridge, 2019), as well as increased funding for educators' professional development in the area of OER development and implementation (Bossu & Willems, 2017).
4. Creating communities of practice that are led by knowledgeable mentors and that facilitate open dialogue and a supportive environment, can lead to enhanced outcomes at the teaching and learning level (Stagg & Partridge, 2019).
5. Develop and promote a range of free online educator professional development courses on the use and creation of OER, such as 'Learning to (Re)Use Open Educational Resources', offered through the OpenLearn platform, and the 'Curriculum Design for open education' micro course, available on the WikiEducator platform. Consider offering incentives to staff who complete the courses.
6. By changing the focus of funding from OER creation to OER adaptation, more academics might be persuaded to change their practice (Kandlbinder & Chelliah, 2015). However, this would also require the further development of educator digital skills and capabilities, especially in regards to moving courses from institutional LMS to other repositories (Ward, 2015).

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Wright, R. (2015). Exploring effective open licensing policy and practice for Australian universities. OpenEdOz Project website. https://edtechbooks.org/-FtRn

Appendix A

Institutional Repositories

Institution	Data Repository	Address
Australian Catholic University	Research Bank	https://researchbank.acu.edu.au/

Institution	Data Repository	Address
Australian National University	Open Research	https://openresearch-repository.anu.edu.au/
Bond University	Research Portal	https://research.bond.edu.au/
Central Queensland University	Acquire	https://edtechbooks.org/-nazs
Charles Darwin University	Research Webportal	https://researchers.cdu.edu.au/
Charles Sturt University	Research Output	https://researchoutput.csu.edu.au/
Curtin University	eSpace	https://espace.curtin.edu.au/
Deakin University	DRO	https://dro.deakin.edu.au/
Edith Cowan University	Research Online	https://ro.ecu.edu.au/
Federation University Australia	Research Online	https://edtechbooks.org/-Suyx
Flinders University	DSpace	https://edtechbooks.org/-eEPv
Griffith University	Research Online	https://research-repository.griffith.edu.au/
James Cook University	Research Online@JCU	https://researchonline.jcu.edu.au/
La Trobe University	Research Online	https://edtechbooks.org/-pqE
Macquarie University	Research Online	https://edtechbooks.org/-HfWg
Monash University	Research Portal	https://edtechbooks.org/-WgsA
Murdoch University	Research Repository	https://researchrepository.murdoch.edu.au/
Queensland University of Technology	ePrints	https://eprints.qut.edu.au/
RMIT	Research Repository	http://researchbank.rmit.edu.au/
Southern Cross University	ePublications@SCU	https://epubs.scu.edu.au/
Swinburne University of Technology	Research Bank	https://researchbank.swinburne.edu.au
University of Adelaide	Adelaide Research & Scholarship	https://digital.library.adelaide.edu.au/
University of Canberra	Research Output	https://edtechbooks.org/-sQrh
University of Melbourne	Minerva Access	https://minerva-access.unimelb.edu.au/
University of Newcastle	NOVA	https://edtechbooks.org/-gZBU
University of New England	Research UNE	https://rune.une.edu.au/web/
University of NSW	UNSWorks	https://edtechbooks.org/-jZgd
University of Queensland	eSpace	https://espace.library.uq.edu.au/
University of South Australia	Research Outputs Repository	https://edtechbooks.org/-ZjrH
University of Southern Queensland	ePrints	https://eprints.usq.edu.au/
University of the Sunshine Coast	Research Bank	https://edtechbooks.org/-ntgk
University of Sydney	eScholarship Repository	https://ses.library.usyd.edu.au/
University of Tasmania	Open Access Repository	https://eprints.utas.edu.au/
University of Technology Sydney	OPUS	https://opus.lib.uts.edu.au/
University of Western Australia	Profiles and Research Repository	https://research-repository.uwa.edu.au/
University of Wollongong	Research Online	https://ro.uow.edu.au/

Institution	Data Repository	Address
Western Sydney University	ResearchDirect	https://researchdirect.westernsydney.edu.au/
Victoria University	Research Repository	http://vuir.vu.edu.au/

Appendix B

Courses offered by Australian HEIs on OERu

Institution	Course
Charles Sturt University	Indigenous Australians: the dreaming and relationships to country
	Human rights and indigenous Australian peoples
	Indigenous Australian histories
	Contemporary realities for indigenous Australians
University of Tasmania	Social Entrepreneurship in the Digital Age
	Understanding Earth Shaping
University of Southern Queensland	Introduction to Regional Relations in the Asia-Pacific
	Understanding Culture in Asia and the Pacific
	Regional Economics in Asia and the Pacific
	Tourism in Asia and the Pacific
University of Canberra	None currently available
Curtin University	None currently available

[1] As provided on the Smartcopying website by the National Copyright Unit

[2] https://edtechbooks.org/-Dhqh, theses are now meant to be stored in institutional repositories, as well as entered into the National Trove database

[3] The OLT has since been closed, see Pitman and Bennett (2016)

[4] Respondents using an anonymous public link were not required to enter any identifying information and may have come from other Australian institutions.

[5] https://oepoz.wordpress.com/

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2

Digital Transformation in Canada

Non-centralized and Diverse

Dianne Conrad & George Veletsianos

1. Introduction

Canada is a vast country in every way – geographically, socially, politically, and economically. It comprises 10 provinces, each joining the Confederation at different times; and two enormous territories in the north. It should come as no surprise, then, that Canada does not have, nor has ever had, a single, unifying educational system or policy at national level. Education was deemed the purview of provincial and territorial governments at the time of the signing of the British North American Act, which brought Canada into existence in 1867.

There is, therefore, no concept of national or federal entity, understanding, or agreement on the nature of higher education in Canada. Whereas the British North American Act assigned educational responsibility to the provinces, another challenge for Canada with regard to developing a national education or training system is the country's wide and diverse range of participants and stakeholders, all of whom are perceived to have their own views on educational issues.

In this chapter, we explore the relationship between open educational resources (OER) and digital infrastructure/transformation in the context of Canada's lack of national education systems or policy, situated at micro, meso, and macro levels. In Canada, as in much of the world, OER have been a fast-growing phenomenon and resource. In much of the work done in Canada, and for the purposes of this chapter, we use the OER definition from the William and Flora Hewlett Foundation:

> *OER are teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use and re-purposing by others. Open educational resources include full courses, course materials, modules, open textbooks, streaming videos, tests, software, and any other tools, materials, or techniques used to support access to knowledge. (2019)*

The definition above situates Canadian OER use in global theory and practice. That said, Canada's implementation of OER is hindered, on a national level, by the jurisdiction issue outlined above and the inability of any one powerful body to champion the OER cause. As we will see, OER and digitization are thriving in pockets – largely academic and library-based pockets – across the country, spearheaded and maintained by their avid stakeholders and proponents at institutions of higher learning.

Given Canada's lack of a national education agency or policy, this report will focus on two key provinces within the country as they represent the macro level within the context of a lack of federal oversight. Further, there is a lack of

national data on digital transformation in Canada even though two years ago a non-profit organization called the Canadian Digital Learning Research Association (CDLRA) began surveying the state of digital learning in Canada, following a related initiative by Tony Bates. The organization works in a similar way to the Babson surveys in the U.S.

The writers of this report deem the provinces of British Columbia and Ontario key for several reasons: digital transformation initiatives, population, geographical location, and familiarity. The state of digital transformation of each province is examined below according to four criteria: infrastructure, quality, policy, and change.

2. Digital Transformation at the Macro Level

2.1 OER Infrastructure in Ontario and British Columbia (BC)

The Province of Ontario is the most populous province in Ontario with a population of 15 million and 274 designated postsecondary institutions.

In this section, we will discuss known facts as they exist at the time of writing as well as some future projections, which are, of course, connected to the government in power, as education is a provincial matter. Following are Ontario's facts relevant to digital transformation:

- Ontario leads Canada in digital transformation (Bates, 2019).
- e-Campus Ontario reports that 90% of its institutions offer elearning.
- Most institutions have an elearning strategy already implemented or being implemented (Bates, 2019).
- Government funding to date has made these initiatives possible.
- Ontario has 41% of all digital post secondary registrations (Bates, 2019).
- There are no open institutions in Ontario.

Future projections

Unfortunately, infrastructure and its necessary funding are always connected politically to the government in power. Ontario has recently (2017) elected a conservative government whose aim, it appears, is to conduct major cuts to many services. The previous government, however, outlined its intended infrastructure for these digital transformation outcomes: to boost scientific discovery and innovation through advanced research computing and big data; and to invest $75 million to help Ontario's leading researchers solve real world problems using sophisticated computers with massive data storage capabilities and computing power.

Implementation would include these four major thrusts:

1. Install two new hardware platforms at major universities with a $20.5 million investment through the Ontario Research Fund. This will be the first major upgrade to Ontario's advanced research computing infrastructure since 2007.
2. Support the operating costs of advanced research computing across the province with a $34 million investment to provide Ontario's advanced research computing centres with the steady funding for efficient multi-year planning.
3. Invest in projects that bring together groups of researchers to develop tailored, shared and integrated data resources capable of data analytics and large-scale computational modelling with a $12 million investment through the Ontario Research Fund-Research Data Infrastructure initiative.
4. Support Compute Ontario in coordinating advanced research computing with an $8.5 million-investment.

Interestingly, although the government's report was published in 2017, it was updated in April 2019, under the aegis of the recently elected Conservative government. The revision contains commitment to these initiatives recognizing that "expertise in areas such as health informatics, neuroscience, genomics, energy, clean water and astrophysics" (Government of Ontario, 2019) is essential for global competition.

A suggested five-year strategic investment in Ontario's digital ecosystem of researchers, start-ups, and entrepreneurs is envisioned to include these benefits: helping researchers address key social challenges related to health, the environment, an aging society, poverty, and other pressing concerns; educating, training, and nurturing the next generation of talented people who will make research discoveries and develop innovative products; and giving Ontario companies the opportunity for advanced technology partnerships and collaborations to increase their share in global markets. The province's smart, highly skilled workforce is well-positioned to support Ontario companies in these endeavours.

A current problem for Ontario is that most of Ontario's population resides along the Canada-U.S. corridor and in Southeast and Southwest Ontario. Northern Ontario, a large and underpopulated area, suffers poor access and infrastructure. ORION, a provincial self-labeled "only provincial research and education network" (ORION, 2018) might offer a solution. ORION states that its "fibre optic network covers 6,000 km, connecting regions all over the province and more than a hundred institutions including universities, colleges, libraries, hospitals and research centres, as well as most of Ontario's school boards."

The recent ORION report has identified four recommendations to move toward the goal of ensuring greater access to connectivity across Northern Ontario. These include:

- An assessment of the shared technology service requirements in Northern Ontario that would likely reveal overlapping requirements. This will present a unique opportunity to reduce costs and share expertise.
- Collaboration with a range of partners at the local, regional, and national level.
- Boosting capacity and resilience across the research and education network. Northern innovation institutions should be able to access improved connectivity through an extended research and education network that would future-proof the North's ability to support economic development.
- Produce a comprehensive plan for shared technology services. Northern Ontario institutions should benefit from shared, hosted Canadian-based cloud and other shared technology services.

In conclusion, we suggest that Ontario has both centralized and non-centralized systems: the government offers assistance to centralized efforts while the large universities (there are 10) continue to chart their own progress. As outlined above, the government is currently most concerned about Ontario's remote northern learners.

The Province of British Columbia on Canada's West Coast has a population of approximately five million, with 256 designated post-secondary institutions.

At the time of writing, these are the known facts about digitization in BC:

- British Columbia established the Open Learning Agency, Thompson Rivers Open University, Royal Roads University and BCcampus over the last 30 years, leading Canada in open, distance, and online learning.
- Most institutions have an elearning strategy already implemented or being implemented (Bates, 2019).
- Open Textbooks have recently received much interest and funding in BC.
- Numerous indigenization and decolonization efforts are underway, resulting from recommendations put forth by the Truth and Reconciliation Commission Calls to Action.
- Significant organizations in BC include BCCampus, which supports numerous educational technology and open learning initiatives and innovations; and BCNET, which facilitates use of shared services across the post-secondary education sector (e.g., access to Kaltura, Moodle, etc).

Similar to Ontario, British Columbia has both centralized and decentralized systems. The government offers support, funding, and strategic direction, directing efforts and resources. Universities and other agencies (e.g., BCNet, BCCampus) lead efforts on the ground and engage in back-and-forth discussions with the government pertaining to that work. For instance, universities are sent mandate letters by the Provincial government on an annual basis, highlighting government commitments and obligations (e.g., Government of BC, 2019a).

2.2 The Quality of OER

Bates points out that the first step in discussing the large and complex topic of quality is to define it. He suggests that "quality" in digital learning refers to teaching methods that successfully help learners develop the knowledge and skills they will require in a digital age (Bates, 2015). Within this broad definition, Bates acknowledges these items: institutional/program accreditation; academic quality assurance processes; differences in quality assurance between traditional classrooms and online and distance education; the relationship between quality assurance processes and learning outcomes; "quality assurance fit for purpose:": meeting educational goals in a digital age.

The province of Ontario has long worked within the parameters of a quality council that operates at arm's distance from its institutions. The most recent iteration of the council is the Ontario Universities Council on Quality Assurance (the Quality Council). The Quality Council was established by OCAV in 2010 and its work is supported by an Appraisal Committee and Audit Committee. The OCAV "fully acknowledges that academic standards, quality assurance and program improvement are, in the first instance, the responsibility of universities themselves."

Quality assurance as described by Bates (2015) works at micro, meso, and macro levels in the province of British Columbia. At the macro level, universities are invited to submit Institutional Accountability Plans and Reports to the Ministry of Advanced Education on an annual basis. These include "the institution's goals, objectives and performance measure results along with contextual information to describe the institution's role in providing service to their students and communities" (Government of BC, 2019b). Further, the government developed the Education Quality Assurance designation which, for institutions to receive, requires an institution to meet or exceed certain quality assurance standards as described in the EQA Policy and Procedures Manual (2018).

2.3 OER Policy

Keeping in mind that Canada does not have a national education agency to guide policy development, guiding parameters and direction must come from elsewhere, if at all. The recently elected Conservative government envisions Ontario at the forefront of digital fluency. However, the Information Technology Association of Canada (ITAC), a national business-technology association with the ear of the government, does not mention OER or higher education in its literature.

In Ontario, the Law Commission of Ontario is another association closely concerned with digital progress and transformation. Both these associations, while keenly interested in the effects of digital change on the economy, do not mention education.

At a public forum where the results of the Ontario Digital Inclusion Summit were presented, diverse stakeholders presented their concerns about digital inclusion. Regarding the academic realm, these concerns were recorded:

- Impact on the workforce and society through education and research;
- Incentive structures do not necessarily encourage or enable digital inclusion;
- A lack of time, money, and educational resources to provide digital capacity to educators, academics and institutions;
- Create learning opportunities and curriculum for educators, academics, and institutions so they can be more effective at digital inclusion;
- Encourage stronger cross-sector and cross-institution collaboration that goes beyond academic silos;
- Make fuller use of the technologies available to support education's role in digital inclusion, with an eye to addressing barriers to participation.

The province of British Columbia includes education as a major focus in its 2018/19 - 2021/22 strategic plan, describing "investment in education" as "investment in our future." With regard to post K-12 education, the government of BC notes that students should be provided with "the tools and information they need to find the right career path." Important to this endeavor is the effort to make education more affordable; this has led the government to eliminate tuition fees for Adult Basic Education and English language Learning programs as of September 2017. While the earlier

government heavily emphasized trades training, the current government is still supportive of that endeavor but has directed resources other areas as well. These broad goals are more clearly delineated in the 2018/19 - 2021/22 service plan produced by the BC Ministry of Advanced Education, Skills and Training (which is the ministry responsible for higher education). The service plan includes the following relevant goals and objectives:

- To support learners to achieve their full potential with accessible, affordable, and equitable education and training opportunities.
  - Objective 1: Ensure affordable access to post-secondary education and skills training.
  - Objective 2: Respond and adapt to the diverse and changing needs of learners.
- To ensure a high quality and relevant post-secondary education and skills training system that provides the services people count on for good-paying jobs and opportunities to reach their full potential.
  - Objective 1: Build on current strengths to enhance the quality and relevance of the post-secondary education and training system.
  - Objective 2: Empower learners, educators, industry, and government to make informed decisions.

Relevant strategies within these objectives include the following:

- Ensure access to post-secondary education by providing operating funding to support public post-secondary education delivery throughout the province.
- Provide tuition-free Adult Basic Education and English Language Learning programs for domestic learners.
- Continue to advance the development of free digital open textbooks and open education resources.
- Provide learners hands-on experience to explore a variety of careers, as well as valuable information on high-demand jobs offered by employers in specific regions and throughout B.C. through the Find Your Fit Tour.
- Leverage digital technology options to cost-effectively expand the ability for post-secondary institutions to deliver education and training programs to more rural and remote communities.
- Support BC's comprehensive transfer system that enables students to easily transfer courses and credits across the public post-secondary system.
- Continue to ensure a seamless transition of students from the K-12 system into post-secondary education and training.
- Maintain a two per cent annual cap on tuition and mandatory fee increases at all public post-secondary institutions.
- Provide programs, services, tools, and resources for those who are struggling to gain a foothold in the job market through targeted programs for youth, Indigenous persons, persons with disabilities and women in the trades to help them to gain needed skills and secure sustainable employment.
- Under a new Canada-BC Workforce Development Agreement, ensure vulnerable, unemployed, and under-employed people can access skills training needed for high- paying jobs.
- Develop, in partnership with the post-secondary system, a single, unified application system to make it easier for students to plan, search and apply to public post-secondary institutions in BC.
- Partner with employers and economic sectors to deliver skills upgrading to employees.
- Work with other provincial ministries and partners to ensure BC students have the skills, experience, and creativity that they need for careers that support the tech industry.
- Ensure the best available labour market information is used to align skills training priorities with labour market needs.
- Continue to share labour market information on WorkBC.ca using innovative platforms and social media to help all British Columbians make informed education, training, and career decisions and to promote entrepreneurship.

These strategies and objectives reflect the broader concerns of the current government in British Columbia, which is currently a minority government led by the BC New Democrats in coalition with the Green Party member elected in May 2017. In this landscape, an area of concern in BC is climate emergency and its impact on the people and natural resources of the province. This is significant in analyzing the digital transformation in the province because it means considering how climate emergency may impact educational institutions, not just in terms of the content they teach but also in terms of delivery models and preparing for a future that may be radically different in terms of access, equity, and migration.

2.4 OER Change

What change will be coming to Ontario in terms of national issues such as infrastructure and funding? As noted, we cannot expect anything to trickle down from the national platform. Our recently elected government has appointed a Deputy Minister Responsible for Digital Government. This Chief Digital Officer (CDO) recently issued a statement that assured Ontarians that we are at the cutting edge of change given the centrality of technology in our daily lives. The advances listed by the CDO are changes to access and services for the public.

At the same time, the new budget contains devastating cuts for many important sectors, including education. Higher education sees no joy in the coming years – with no increased funding, in fact severe decreases will occur across the province. Any change to digital structure will remain the purview of individual institutions without any expectation of large-scale help from the province.

However, federal support that is available for university research, some student assistance, and miscellaneous other programs, such as Canadian studies, literacy training, and international education might enable change and growth in the digital sector.

There is much to celebrate in the current BC government's efforts to support higher education in the province, including its expanded support of adult basic skills, open educational resources, and efforts at expanding affordability. Nonetheless, Bates (2019b) sees an imminent crisis in Canadian post-secondary education due to a confluence of factors including the rise of networked learning providers that aren't facing the obstacles to innovation that universities face. One of the solutions he proposes to address the crisis involves the federal government launching five new digital universities. He describes this proposal in the following way:

The proposition is simple: establish five new regional universities-colleges that are designed from scratch as possible prototypes for the higher education institution of the future, but also designed to maximise the impact they have on existing institutions…This would be a joint venture between the federal government and the provinces, with the feds responsible for funding the physical and technological infrastructure and the provinces responsible for the operational costs of the new institutions.

3. The State of Digital Transformation at the Meso Level

Given Canada's lack of a national education agency or policy, this report focuses on two key provinces within the country, chosen to represent the macro, meso, and micro levels: Ontario and British Columbia. The rationale for these choices has been explained earlier. The lack of national data on digital transformation in Canada makes it even more reasonable to examine these two key provinces.

The state of digital transformation of each province is examined below according to four criteria: infrastructure, quality, policy, and change.

3.1 OER Infrastructure in Ontario and British Columbia (BC)

In this section, we answer the question: "What is the current state of higher education institutions' digitization strategies?"

Statistical known facts at the time of writing regarding infrastructure were presented at the beginning of this chapter.

There are approximately 50 post-secondary institutions in Ontario. The approximation is due to the division of some universities into various colleges. Universities acknowledge the need for digitization in statements such as this: "Universities are embarking on initiatives to seek productivity improvements through technology and partnerships. From creating safer campuses to collaborating with local partners to save money in the procurement process, universities are committed to transforming the way they do business."

At the institutional level in Ontario, digitization is occurring in the following systems and activities:

Research libraries

Many digitization projects are based in institutional libraries, for example, the University of Waterloo's Historical Air Photo Digitization Project (http://www.lib.uwaterloo.ca / locations /umd/project). As Machovec (2018) points out, "academic libraries and consortia are spending the vast majority of their material budgets on digital content, including ebooks." Some universities are connected to the Canadian Association of Research Libraries (CARL) which is working toward strengthening capacity and advancing a network of research opportunities across Canada. CARL understands the benefits of digitization as important for "the long-term preservation of our documentary heritage. It also affords greater accessibility to these invaluable materials. Certainly, digital access to our national heritage has a positive impact on research and education, and furthers our cultural production, national pride and unity."

It is important to note that CARL is listed as a charitable institution. Ontario members at the time of writing include these universities: Brock, Carleton, Guelph, McMaster, Ottawa, Queen's, Ryerson, Toronto, Waterloo, Western, Windsor, and York. These are all large, research-intensive universities.

The Ontario Council of University Libraries' (OCUL) Open Educational Resources White Paper (2017) asked why libraries are so well situated to play such a central role in the development of OER, and concluded that:

Advocacy work around OER/ACC can build on existing foundations of librarian expertise (copyright, content, etc.) in parallel with established channels of outreach to faculty and other campus partners. In other words, libraries can play a vital role in helping faculty find and identify open content, and connect them with additional services. (Walz, Jensen, & Salem, 2016, p.4, cited in OCUL, 2017)).

Throughout Ontario, aside from the collaborative eCampusOntario consortium, libraries have been, and are, the most dynamic players in OER advancement.

Resource collaboration

The most inclusive collaboration in Ontario is eCampusOntario which includes in its mandate the following:implementing and maintaining digital access projects the following: developing and implementing metadata strategies; digital curation and OER development and promotion; training staff on use and workflows; and recommending changes for continuous quality improvement.

ECampus Ontario is the largest, most over-arching and ambitious OER resource in Ontario, managed by a government-appointed board, and providing educators and learners access to over 250 free and openly-licensed education resources by hosting its Open Library, launched in 2017 in collaboration with BCCampus. Via an ongoing effort between eCampusOntario and Ryerson University in Toronto, the Open Library is integrated with the publishing infrastructure. eCampusOntario also supports "enhancements to the PressbooksEDU platform, including the integration of H5P interactive content, version tracking, and cloning support" (Open Library, n.d.). ECampusOntario has a partnership agreement with PressbooksEDU for the creation of digital resources. Access is free to eCampusOntario members.

Two more consortium efforts include the Ontario Digital Libraries Research Cloud (OLRC) and the Ontario Council of University Libraries (OCUL). Members of these groups close resemble the universities listed above; that is, most of the major institutions in Ontario. Administratively, universities are collaborating on IT initiatives to save money. As well, certain core university functions such as safety, admission procedures, space management and procurement are centralizing in order to provide more cost-effective and effective service to stakeholders.

Libraries, as indicated above, have been leaders in Ontario in OER. A portal site contains another source of all relevant information for OER users.

Institutional repositories

Many institutions in Ontario, especially at college level, promote OER accessibility through their websites. Georgian College lists 15 open sources at national and international levels. Algonquin College has an extensive website that provides a full suite of information and resources around OER use in a learning portal toolkit, including about OER, teaching, curating, creating, licensing, collaborating, advocacy, and sustainability (Algonquin College, 2019).

Individual institutional projects

Notwithstanding the collaborations outlined above, many (or most) digitization efforts appear as one-off projects. The following are some examples in Ontario's smaller universities:

- Brock University: Digitization of photos and archival materials.
- Lakehead University: Digitalization of 50 years of yearbooks.
- Laurentian University: Digitalization of old exams. Further efforts are connected to the library initiatives through Ontario Council of University Libraries.

While Brock University features a link to eLearningOntario's OER open textbook resources, it is a tie-in to library-sponsored site. Similarly, Queen's University, one of the larger and more prestigious Ontario universities, features a repository list from its "Commons." Lakehead University's Teaching Commons features a long list of repositories, at national and international locations. And the University of Toronto, arguably the most prestigious university, and the largest, in Ontario, addresses OER in this way, followed by a long list of materials:

Open Education Resources (OERs) are teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use or re-purposing by others. We have many digital collections that are developed here at the University of Toronto. (n.d.)

At the college level, Durham College provides a good example. Needing to replace a course, a professor who had had previous good experiences with OER searched around to find suitable materials. On Mozilla, the free software community site, he found course content that met all of his requirements. Its content was up-to-date, developed and constantly updated by industry leaders. It included formative exercises with feedback are integrated into all material and could be copied and pasted for storage within the Durham College learning management system (LMS) (TeachOnLine, 2019).

An interesting challenge arose from the professor's use of OER. A student who did not understand OER accused him of stealing material. The situation was resolved positively, but these lessons were learned:

- Provide clear and detailed information for students on the purpose and benefits of OER;
- Provide information on OER to all those involved in the development process, including management and administrative staff;
- Develop an institutional policy on use of OER; and
- Develop a network of OER users, inside and outside the institution. (2019)

In conclusion, most Ontario universities have statements that recognize the value of digitalization but, apart from several library-networks, it is hard to find examples of their progress. University libraries, far and away, have accomplished the most progress in this regard, on the academic side of things. Administrative practices continue to advance with the introduction of new software and technologies.

In British Columbia, there are 25 post-secondary institutions and this number includes both colleges and universities. Digitization strategies and efforts differ markedly across BC's institutions. For example, while the University of British Columbia (a pre-eminent research university) has had a flexible and digital learning strategy since 2014, another university in the province has recently approached one of us to ask for assistance in developing a similar institutional strategy. This example is illustrative of the fact that not only some institutions are much ahead of others in this respect, but that some are able to engage in these efforts in-house, while others require external support for a wide variety of

reasons (e.g., lack of time, lack of capacity, etc). These efforts often focus on a wide variety of reasons having to do with enrolments, modernizing educational approaches, responding to market needs, responding to national and international competition, or responding to government guidance.

At the institutional level in BC, digitization is occurring in a variety of ways. As in Ontario, many efforts are occurring in research libraries, resource collaboration, institutional repositories, and individual projects. The following examples of importance are highlighted.

Research libraries

The UBC library, for instance, recently published digital colouring books, which provide a fun and approachable way to explore maps, landscapes, and art history using rare collections. Digital books are provided at UBC and a dedicated hashtag invites individuals to take photos of their colored drawings and share them on social media, including Instagram. Such efforts position the library in efforts of not just making digital content accessible to researchers, but also in enabling it to reach broader audiences through different modalities.

Resource collaboration

The collaborative organization BCNet supports shared services across universities in the province (e.g., shared access to BlueJeans – a videoconferencing application) and BCcampus supports institutions in the province to advance their teaching and learning practices. While BCcampus works in a wide variety of areas, it has received wide recognition and attention around its OER and open textbook efforts, some of which has been replicated by eCampusOntario. However, there is no infrastructure collaboration happening between BCCampus and eCampusOntario. Instead, processes seem to be shared between the two (e.g., open textbook review processes).

One recent project worth mentioning is the open homework system that is currently under development. In particular, BCcampus is evaluating open source options for hosting and developing an open source system for use in the province. Project details

Lalonde (2019) defines homework systems as follows:

Homework systems are a class of education technology that supports student practice, self-reflection, and self-assessment in order to reinforce concepts they have learned in class. Homework systems may also be known as adaptive learning platforms, personalized learning platforms, or digital tutoring systems, and contain interactive elements, self-quizzes, prompts for student reflection, simulations, and offer hints and suggestions. Homework systems may also include adaptive engines that can respond to learners as they work their way through problem sets and assess their performance as the work through the sets, changing and adapting new questions based on a student's input. While a homework system can be a stand-alone application installed on a single computer or mobile device for a single user, they are more commonly developed and deployed as web-enabled, network applications. Homework systems can be seen as a compliment technology to Learning Management Systems, Digital Courseware, and Open Textbook platforms, although LMS, Digital Courseware and Open Textbook platforms are not required to use a Homework System…. An *open homework system* (emphasis mine) is a homework system that is released with an open source licence that allows anyone to host their own instance of the system, and to modify and/or reuse the application with no software licensing fees.

Institutional repositories

Many institutions in BC offer institutional repositories and promote OER content and search functionality. Of significant note here is impending policy in Canada around open data. The CanadianTri-council (Canada's three funding bodies) will soon require researchers who receive funding from the Tri-council to make their data openly available for others to use. While the policy hasn't been finalized yet, it's become clear that many university libraries will take on the responsibility of supporting these efforts. For instance, at Royal Roads University, the library will help develop a policy around open data, provide advice to researchers applying for funding, and provide a repository for digital data storage. Since the Libraries of Royal Roads University and Vancouver Island University collaboratively offer VIURRSpace as a digital repository of

scholarly and creative works of the universities, we anticipate that the open data repository will also be a shared endeavour. Significantly, this is also an example of a collaborative infrastructure between two institutions at the province.

Individual institutional projects

As is the case in Ontario, many digitization efforts are one-off projects. Two of the bigger and worthwhile examples to mention are Simon Fraser University's digitization and revitalization First Nations languages and the College of Registered Nurses of BC's digitization of historical archives.

Some BC institutions provide faculty with small grants focused specifically on implementing digital learning or open education efforts. For example, the university of British Columbia recently announced an OER fund to "support affordable and inclusive access to learning materials through the adaption, adoption, development, and integration of OER within UBC credit courses."

The majority of education institutions, if not all, provide guides and resources to support faculty and staff towards digitization efforts. Some institutions provide guides and resources to support openness. These efforts are often supported by centers for teaching and learning.

Some institutions provide faculty awards to recognize excellence in openness digitization efforts.

Significantly, efforts surrounding openness have been encouraged by advocates at the institutional level. These individuals are often faculty, but a vibrant student advocacy body also exists that has launched public advocacy campaigns (e.g., University of Victoria's student society efforts centering around a social media campaign called #textbookBroke).

However, there are no official open education or digitization policies in BC, even at the institutions that provide extensive support and advocacy for open education. In comparison, open access appears more widely supported, especially at large research-intensive universities. The Tri-council requires scholarly products arising from research grants be made available in open access formats, and as mentioned, open data will soon also be required.

3.2 OER Policy and Change

Although there is a lack of national data on digital transformation in Canada, there is, at the national level, a variety of organizations and consortia that support open education efforts. These organizations, working across provinces and operating outside federal and provincial legislation, include organizations such as Creative Commons Canada, Canada OER (a working group that shares information and promotes open education), and the Canadian Alliance of Student Associations. Ontario-specific and BC-specific associations include ad hoc groups set up to pursue open and digital education initiatives as well as established groups that have expressed interest in OER and open education. In BC, these include BCCampus, the BC Open Education Librarians (a group which advocates for open practices), the Educational Technology Users Group (a group of post-secondary educators and practitioners interested in enhancing learning and teaching with technology), and OpenETC (a group of educators and educational technologists developing and supporting open and educational technology infrastructure for post-secondary institutions in British Columbia.

A random selection of university leaders, speaking about the future of higher education in Canada, all envision a progressive future for education, for graduating students with appropriate skills, for adapting to technological innovation and change, for maintaining "excellence," and, more specifically and regionally, coming to terms with social issues such as those concerning the Indigenous population, the French population, and people with disabilities. None spoke specifically about policies in place.

In 2015, a policy forum held at Queen's University, one of Ontario's (and Canada's) top and most highly regarded universities, listed digitization on the agenda; however, their discussion focused instead on these three areas:

- Security and Privacy Policy: How do we ensure the privacy and the security of individuals given the increased collection of data and surveillance by so many of so many? Are there trade-offs that must be made and by whom?
- Innovations in Health: What are the benefits and risks of innovations such as e-health records, computerized assistance to health care workers in diagnostics and treatment, or robotics/remote delivery in health care?
- Culture Policy: Do we need to rethink our current approach to Canadian broadcasting, publishing, film, and music industries? How do we ensure that the Canadian story continues to be told and that Canadian identity continues to survive and thrive?

However, in 2017-2018, Queen's developed a vision and strategy for digitization that produced a "digital planning framework" designed to carry forward to 2020. Its goals are stated thus:

- Building the vision by engaging the community in developing a shared understanding of digital opportunities, and by developing an integrated view of needs and developments across portfolios.
- Building the foundation by Implementing key IT enablers and by establishing digital strategy governance.
- Building momentum by continuing to gather input on digital needs and priorities through existing pathways and by establishing interim decision-making authority for Digital Planning funds. (Digital Planning Framework, 2018)

Finding distinct innovation or presentation of higher education policy on digitization was extremely difficult, even when researched through individual universities.

Ontario's Ryerson University approached a digitization study through a workplace lens but concluded that "despite efforts at Ryerson University to expand wireless access, in the end, much of it still depends upon individual professors and departments" (n.d.). The striking learning here is the admission that digitization is still very much an individual undertaking, especially notable since Ryerson has been regarded as a technical institution until recently when it received university status.

Digitization at McMaster University, another major research university in Ontario, seems to be relegated to its library services. As will be seen in the report on infrastructure, this is not an unusual occurrence.

Another large Ontario university, Western University, did not have a digitization item in their most recent list of policies. Likewise, no digitization policies were located at major Ontario universities either in teaching and learning-oriented policies nor in IT policies. Waterloo University, in 2019, addressed the question "What can institutions of higher learning do structurally to improve the uptake of open educational resources and practices?" The result was the document "A Place for Policy: The Role of Policy in Supporting Open Educational Resources and Practices at Ontario's Colleges and Universities."

In it, they itemized a list of OER policies in place and identified Ontario's University of Windsor as the most progressive noting these developments there:

- The university's tenure and promotion guidelines allow departments some freedom to establish department-level guidelines, allowing at least one unit at the university to include the use and development of open educational resources.
- The university's Senate passed a motion in 2016 advocating the use of free and open course materials in order to reduce costs to students.
- The university has established an Office of Open Learning that supports the development and use of OER/P (uwindsor.ca/openlearning/).

Other Ontario institutions – Cambrian College, Queen's University, and Ryerson University – are mentioned as being "active" in the "OER/P space, though often without formal, governance-driven policies in place to guide their work" (Skidmore, 2019). This lack is explained as mentioned earlier – most OER in Ontario institutions arises from single, individually-driven projects rather than from institutional mandate or mission.

Skidmore's report advocates for the creation of institution-wide policy, stating that policy must be "embedded within a broader academic vision for the institution, [and] seen as just one part of a larger strategy to foster OER/P" (2019).

Recognizing, however, that many institutions may not be able to enact a stand-alone policy, the report suggests a policy model in modular fashion so that portions of interest can be adopted and adapted according to individual need and context. Contained within the policy model are these items: strategic academic plan, tenure and promotion, intellectual property rights, online assessment packages, textbooks and required materials, steering committee (in which representation across campus is outlined), OER coordinator (in which responsibilities are outlined), funding, contract instructors, and repositories.

There are two pan-provincial organizations in Ontario that address, with a broad scope, OER issues. Serving Ontario, the consortium eCampusOntario has created The Open Library, which hosts Ontario's OER repository that has extensive post-secondary membership. Members include, at the college level:

- Algonquin College
- Collège Boréal
- Cambrian College
- Canadore College
- Centennial College
- Conestoga College
- Confederation College
- Durham College
- Fanshawe College
- Fleming College
- George Brown College
- Georgian College
- Humber College
- La Cité Collégiale
- Lambton College
- Loyalist College
- Mohawk College
- Niagara College
- Northern College
- St. Clair College
- St. Lawrence College
- Sault College
- Seneca College
- Sheridan College

At university level:

- Algoma University
- Brock University
- Carleton University
- University of Guelph
- Lakehead University
- Laurentian University
- McMaster University
- Nipissing University
- OCAD University
- Ontario Tech University
- University of Ottawa
- Queen's University
- Royal Military College of Canada
- Ryerson University
- University of Toronto
- Trent University
- University of Waterloo
- Western University
- Wilfrid Laurier University
- University of Windsor
- York University

eCampusOntario includes as its core values for the OER repository the following: quality, research, innovation, accountability, collaboration, and relevance. The repository is also connected to several other national (CNIE) and international organizations that are designed to promote collaboration and sharing of resources. These include The Canadian Network for Innovation in Education (CNIE); The Society for Teaching and Learning in Higher Education; EDUCAUSE;The OERu; and WCET (wcet.wiche.edu).

ContactNorth/ContactNord, another long-standing collaborative distance organization serving Ontario, has also created a repository of resources that are openly available. TeachOnline offers the latest trends, best practices, training opportunities, teaching resources and blogs to highlight online and distance learning.

There are 25 public post-secondary institutions in BC. These are listed below in alphabetical order:

1. British Columbia Institute of Technology (BCIT)
2. Camosun College
3. Capilano University
4. Coast Mountain College (CMTN)
5. College of New Caledonia (CNC)
6. College of the Rockies (CotR)
7. Douglas College
8. Emily Carr University of Art + Design (ECUAD)
9. Justice Institute of British Columbia (JIBC)
10. Kwantlen Polytechnic University (KPU)
11. Langara College
12. Nicola Valley Institute of Technology (NVIT)
13. North Island College (NIC)
14. Northern Lights College (NLC)
15. Okanagan College
16. Royal Roads University (RRU)
17. Selkirk College
18. Simon Fraser University (SFU)
19. Thompson Rivers University (TRU)
20. University of British Columbia (UBC)
21. University of Northern British Columbia (UNBC)
22. University of the Fraser Valley (UFV)
23. University of Victoria (UVic)
24. Vancouver Community College (VCC)
25. Vancouver Island University (VIU)

At the institutional level, digitization in BC is occurring in ways that are similar to those in Ontario, but in the process of compiling this report we identified a number of additional ways that digitization and openness are supported and implemented. These are present in Ontario as well, but for the purposes of the report, here we highlight some BC efforts. In particular, beyond digitization through research libraries, resource collaboration, individual projects, and energy and service, we identified the following efforts:

- Some institutions provide faculty with small grants focused specifically on implementing digital learning or open education efforts. For example, the university of British Columbia recently announced an OER fund to “support affordable and inclusive access to learning materials through the adaption, adoption, development, and integration of OER within UBC credit courses.”
- The majority of education institutions, if not all, provide guides and resources to support faculty and staff towards digitization efforts. Some institutions provide guides and resources to support openness. These efforts are often supported by centers for teaching and learning.
- Some institutions provide faculty awards to recognize excellence in openness digitization efforts.
- Significantly, efforts surrounding openness have been encouraged by advocates at the institutional level. These individuals are often faculty, but a vibrant student advocacy body also exists that has launched public advocacy campaigns (e.g., University of Victoria’s student society efforts centering around a social media campaign called #textbookBroke).

We conducted an environmental scan of BC institutions and were unable to identify any official open education policies, even at the institutions that provide extensive support and advocacy for open education. In comparison, open access appears more widely supported, especially at large research-intensive universities. As in Ontario, libraries throughout the province provide support and assistance with open access efforts.

Libraries often include mention of open access, and this area seems more developed than open education. For example, Simon Fraser University (SFU) adopted an Open access policy in 2017 to acknowledge

the commitment of SFU faculty, students, and postdoctoral fellows to share the products of their SFU research with the broadest possible audience. [inviting] SFU researchers [to] provide an electronic copy of the finalized text of their published articles to the Simon Fraser University Library. The Library will make the articles available to the public, taking into consideration requirements for access delay.

Even though a federal Tri-Agency Open Access Policy is beginning to require researchers to make research outputs available in OA formats, policies like the one developed by SFU seek to expand the reach of OA to researchers who aren't necessarily receiving federal grants. Other institutions, encourage researchers to make their work available in open access manners, though have stopped shy of creating official policies. For instance, UBC offers the following Open Access Position Statement: Whereas:

1. One of the enduring goals of the University of British Columbia is to create and disseminate knowledge;
2. UBC is committed to disseminating the research performed at the university in ways that make it widely accessible, while protecting the intellectual property rights of its authors;
3. Changes in technology offer opportunities for new forms of both creation and dissemination of scholarship through Open Access; which is broadly defined as free availability and unrestricted use of scholarly works;
4. Open Access also offers opportunities for UBC to fulfill its mission of creating and preserving knowledge in a way that opens disciplinary boundaries and facilitates sharing knowledge more freely with the world; and
5. UBC has operated an Open Access repository since 2007 in cIRcle which is operated and maintained by the University Library.

The Senates of the Okanagan and of the Vancouver Campus endorse the following statements:

1. Faculty members are encouraged to deposit an electronic copy of their refereed and non-refereed research output and creative work in cIRcle in accordance with applicable copyright arrangements which may be in place for that work.
2. Where a faculty member has deposited a work with cIRcle, cIRcle shall be granted a non-exclusive licence to preserve and make publicly available the research contained therein.
3. The authors of works deposited with cIRcle will maintain ownership of their rights in the works.

We were unable to find any OA policies in BC that mentioned explicit mention of OER. Guidelines for publishing OER in repositories are largely absent – and even in the cases of posting pre-print copyrighted materials in OA repositories – faculty are often supported by staff members in placing materials in repositories. Typically, offices for supporting teaching (e.g., Centers for Teaching and Learning) share information to support individuals in sharing OER (example).

While efforts at encouraging and fostering openness are not as widespread as one would hope, digitization efforts and policies are more pronounced. These efforts vary by institution depending on institutions' aims and goals. Nonetheless, such efforts highlight institutional needs to strengthen and diversity educational programming, enhance quality, and overall improve institutional standing.

For instance, since 2013, the University of British Columbia has invested in providing institutional support for faculty to enhance their courses with technology. At the institutional level, UBC formed a partnership with edX, hoping to leverage the partnership to implement and enhance learning analytics and learning research on the ground. In describing its flexible learning strategy to stakeholders, a UBC report highlights that the higher education landscape is fraught with uncertainty, and the strategy and efforts may be refined over time.

At Simon Fraser University, two initiatives are worth mentioning. First, the Big Data Initiative aims to bring tools and resources to campus stakeholders to make use of big data to address their needs. Second, SFU's innovation strategy, SFU Innovates – aims to help faculty, staff, and students solve societal challenges through innovation and entrepreneurship. Though not specifically focused on digitization, innovation often entails technology and as part of this

strategy, SFU hosts a variety of events that may be considered to facilitate educational innovation. For instance, as part of a series, SFU hosted a variety of talks and discussions on the future of learning, education, and scaling innovation.

Kwantlen Polytechnic University (KPU), on the other hand, has been a forerunner in the development of Zero-Textbook Cost degrees in the country, launching more than four degrees that do not require students to purchase textbooks, and whose studies instead rely on a combination of open textbooks and library resources. KPU launched its new strategic plan – Vision 2023 – in 2018 and in it includes goals specifically tied to innovation in education. Specifically, the new strategic plans notes that KPU will "expand innovation in teaching, learning, and curriculum" as a specific goal, hoping to support educators in their classroom innovation efforts.

Such efforts are emblematic of the landscape in BC. Rather than digitization per se, institutions seem to focus on entrepreneurship, innovation, addressing global challenges, and solving local problems, while using technology as a vehicle toward those goals. A recent visioning exercise at Royal Roads University, for example, (completed in the summer of 2019) denoted institutions pillars as being entrepreneurship and innovation and sought to use those as a differentiator.

Put differently, while efforts at using technology in BC institutions are ongoing and recognized to be necessary, digitization is sought as a means to various ends, and not as an end in and of itself. While this makes it difficult to discover internal documents pertaining to digitization efforts, it is prudent to assume that institutions are not only implementing new systems for teaching and learning (e.g., Royal Roads University's adoption of Wordpress as a complementary system to its Moodle LMS; UBC's partnership with edX), but that they are also evaluating and upgrading existing systems to pursue further efficiencies.

Changes in Digitization in Ontario and British Columbia

The Canadian university sector is facing multiple pressures which vary by province. As post-secondary direction and governance is tied to funded which is a provincial jurisdiction, universities and college undergo change as dictated by politics. Alberta, for example, is undergoing severe budget cuts at the time of writing. Ontario faced similar cuts last year, with the election of a new conservative government. Mandates resulting from political change are demanding new performance outcomes and measures to try to ensure this. Digitization is not mentioned in post-secondary documents as a vehicle for achieving these performance measures, which leads us to believe that the rate and type of change within institutions will largely continue to be one-off, localized initiatives. However, some organizations are initiating collaborative mechanisms that should encourage change.

In his recent reports examining the digital learning landscape in Canada, Bates (2019) notes that the majority of institutions have an online learning strategy and most of them see online learning as a strategic priority. This is certainly true in both Ontario and British Columbia (and the rest of the country). To support such efforts, faculty are often provided opportunities for professional development through centers of teaching and learning. Professional learning also frequently occurs on an ad hoc basis as well, with faculty seeking professional development as needed and on-demand, either through institutional resources or through resources outside the institution (e.g., Twitter chats, offerings through eCampus Ontario, etc).

However, the circumstances noted above speak to the issue of determining change at institutional level. Change is not institution-mandated; it is not large-scale or policy-driven. When it occurs in the area of digitization, it is individually initiated or, at best, program-initiated, usually led by an onboard faculty member. One exception is in the library sector, as has been mentioned.

The OER Toolkit has been developed by Colleges Libraries Ontario (CLO) and the Ontario Colleges Library Service (OCLS) in collaboration with the Institute for the Study of Knowledge Management in Education (ISKME). Hosted by Ontario TechLibrary, this resource allows searching various pages for OER.

Previously, in 2017, the Ontario Council of University Libraries (OCUL) released a White Paper that called for change and innovation not only for libraries but for institutions, listing collaboration and research among its goals. However, the

document focused mainly on libraries' role with OER and in moving that agenda forward.

More institutionally-focused, however, and province-wide, a 2019 report, alluded to above, calls for an environment scan to determine the efficacy of created institutional policy for OER. "Such a scan not only allows an institution to assess where it is, where it wants to go, and how it's going to get there, it also gives the institution the opportunity to reflect on its goals for OER/P generally" (Skidmore, 2019).

Following on this initiative, as part of eCampusOntario's "Open at Scale" project, a preliminary environmental scan of Trades and Apprenticeship OER was conducted. The first stage of the project included an environmental scan of existing OER repositories and programs. Next steps were outlined to continue this work.

Similarly, while in BC a variety of macro agents engage in efforts at promoting change, much of the activity is happening at the institutional level. Most notably, BCcampus is engaging in a variety of changemaking initiatives. For instance, this organizations engages in open education changemaking efforts that involve the Open Homework Systems project and the Open Textbooks project; and Learning and Teaching changemaking efforts which involve a set of courses designed to help instructors facilitate powerful learning experiences.

These efforts are also supported by a variety of events that BCCampus hosts, such as an annual Festival of Learning and Teaching (which supports community-building and sharing), as well as open education fellowships (e.g., 2017-2018) and research and practice grants (e.g., CFP removing barriers to online learning).

At the institutional level, changemaking is often guided by institution's strategic plans, which lay out priorities for a set period of years. These plans have a variety of foci as well as signaling goals but are often highlighting priorities that are instructive. For instance, at the University of the Fraser Valley, the strategic plan clearly indicates a local focus, aiming to foster the socioeconomic and sociocultural development of the region, while at the University of British Columbia, the institution aims to be a global leader in research and teaching.

Beyond this diversity though, institutional changemaking efforts tend to focus on a variety of measures which predominantly include:

- Professional development delivered through workshops, talks, newsletters, and in some cases through a variety of media such as podcasts. Professional development is most often offered through Centers that support teaching, learning, and innovation (e.g., at Thompson Rivers University and at the University of Victoria)
- Awards for a variety of changemaking activities. In relation to our interests, such awards often highlight teaching and learning excellence (e.g., Royal Roads university) or focus on OER grants (e.g., University of Victoria). In BC, the former are more typical than the latter. Recently, a generous OER fund was established at the University of British Columbia to support OER efforts. This is significant because UBC is a large research-focused institution, and its support of OER signals to others the value and worth of OER.
- Finally, a variety of bottom-up initiatives invariably exist across BC institutions, driven by faculty members, individual programs, and students. These are difficult to capture in any systematic fashion. However, Contact North/ Contact Nord features a Pockets of Innovation project which aims to highlight innovative projects in the country. The organization highlights projects across Ontario and across the country (e.g., a project at the Justice Institute of British Columbia).

3.3 The Quality of OER in Ontario and British Columbia

Canada's prime researcher on digital issues in higher education, Tony Bates, makes three points about quality assurance in the transition to digitization: 1) there is indeed a body of literature on the topic; 2) outlining procedures and processes is not the same as implementation of same; and 3) measuring the success of implementation of quality assurance strategies is yet another issue. The quality of OER is discussed here as it pertains to the provinces of Ontario and British Columbia. But we begin with a discussion, below, "what is quality?"

What is quality?

To define quality. Bates (2010) cites Jean-Louis's discussion of quality, presenting several ways in which to define the elusive term:

- Quality as "excellence"– a definition that sets abstract goals for institutions and academic communities to always striving to be the best, mainly taken as having elitist undertones. In post-secondary education this could mean winning Nobel prizes, attraction of research dollars or the "best" faculty as measured by research output and teaching evaluations.
- Quality as "meeting a pre-determined standard"– a definition that requires only a given standard to be met, e.g. a minimum grade, basic competency, the ability to read, write, use a computer, etc. The drawback of this is that setting and measuring this "standard" is difficult at best and idealistic at worst.
- Quality as "fitness for purpose" – in this construction of quality, we have to decide the extent to which the service or product meets the goals set – does this course or program do what it says it was going to do? Such a construction of quality allows institutions/sectors to define goals themselves according to their mandate and concentrates on meeting the needs of their customers (whether this be upgrading learners, graduate researchers, industry, etc.).

The ambiguity in definition is important in that it prevents a uniform acceptance of what quality is and therefore of how to go about accomplishing it. As Bates (2010) points out, "most institutions … [depend] heavily on conventional formal degree quality assurance processes (both internally and at a state or provincial level) to ensure that teaching with technology met the necessary standards: adding that "Fully online programs often received particular scrutiny."

The novelty (in many institutions) of online learning has created both pushback and resistance among academics. For this reason, levels of scrutiny are often high but trend to focus on administration and process rather than on in-course pedagogy. Additionally worrisome is the tendency of adopters and adapters to mistakenly measure online quality against what has existed in traditional face-to-face situations.

Quality Concerns in Ontario

Working toward the issue of quality assurance in Ontario, Maxim Jean-Louis, Director of Contact North and appointed as Special Advisor to Ministry of Training, Colleges and Universities, issued a report in 2011 that called for the creation of an Ontario Online Institute OOI) with the following principles:

- The OOI will be a not-for-profit corporation whose members will be publicly assisted universities, colleges of applied arts and technology and other Ontario online learning networks.
- The Board of Directors and Board Chair would be selected by the members of the corporation in accordance with normal corporate legal requirements. The board would select and employ a Chief Executive Officer.
- The OOI will not be a degree-granting institution that would compete with the existing institutions.
- The OOI will not directly deliver courses, assess students, grant credentials nor provide instructional guidance on course content for students.

As far as can be ascertained, OOI was never implemented. Given the conditions described earlier regarding the provincial mandate for education and government change, this is not surprising.

However, in 2011-2012, OntarioLearn was implemented by seven Ontario colleges seeking to provide high quality online learning. Today, OntarioLearn has grown to include all 24 of Ontario's publicly-funded colleges with almost 1,200 shared online courses, over 550 online programs and more than 73,000 student registrations each year.

OntarioLearn named Quality Matters™ as their indication of providing internationally recognized quality assurance tools and processes to evaluate design of online courses. Quality Matters is popular in Canada and the U.S., providing quality assurance processes.

Also in Ontario, the Postsecondary Education Quality Assessment Board (PEQAB) provides oversight to postsecondary institutions' digitization and has developed standards to assess institutional capacity to offer blended and online courses. PEQAB is governed by an appointed ministerial board that consists of a Chair, a Vice-Chair, and up to nine members of the public, also appointed by ministerial decree. The appointees are high-profile members of the public with extensive experience in various fields, for example, law, health, and education.

An interview with the Executive Director of PEQAB indicates that the board does not distinguish between OER and other course materials/resources as concerns quality. That is to say, they review both rigorously according to their standards to assess "fit" and use. These standards indicate a quality process at a high-level. Closer to the product (and subsequent use), colleges and the universities each have their own individual quality services.

"Quality is fundamentally about design and intention with respect to achieving learner outcomes: quality is designed into programs and courses; not inspected in once they are available to the public" (PEQAB). Key quality issues include program and curriculum design; the delivery system (including the learning management system); related pedagogy preparation; and skills of faculty member assessment and authentication; student engagement; and the use of Open Education Resources.

Ontario's Quality Council

More broadly, The Ontario Universities Council on Quality Assurance (in short, the Quality Council), was established in July 2010 and is responsible for oversight of the Quality Assurance Framework processes for Ontario universities. This council operates independently and at arm's length from Ontario's universities and colleges, each of which have an internal quality process and administration. While the Quality Council does not directly oversee OER, OER – as well as all other processes involved in the creation and granting of credentials – falls into its jurisdiction. The Quality Council conducts regular audits and reviews of all university processes.

The Importance of Metadata in Quality

Peter Király, in undertaking a European 2015 study of the status of existing OER metadata, explained the importance of precise and correct metadata, and concluded that a lack of study scope prevented the investigation of relevant metrics such that the quality of metadata and their contributing factors could be determined (2015). He suggested a framework that would permit this study to be continued: set up a framework to test incoming and existing records, check them against quality requirements, and "give the European community a dashboard about metrics, showing the historical changes of those metrics, and provid[ing] tips and suggestions to data creators, aggregator institutions and different European teams" (2015).

Desktop research did not uncover any similar metadata research taking place in Ontario, although a December 2018 job posting for a "Digital Access and OER Lead" specified these responsibilities:

- Coordinate and maintain the Open Library through the optimized use of the various technologies involved (DSpace, Pressbooks, Wordpress, LimeSurvey, etc.).
- Develop and maintain an active research program focused on the role, impact, dynamics and trends of OER and digital resources in higher education and academic libraries in Ontario.
- Provide OER content advocacy, outreach, and education across all eCampusOntario programs and service areas.
- Determine and implement metadata schemas, crosswalks, and workflows for ingesting and maintaining data in DSpace, using Dublin Core and eCO OER subsets, as well as making interface recommendations for related systems.
- Develop data strategies facilitating the exchange of information within the Open Library and beyond.
- Build relationships with Librarians at Ontario colleges and universities to ensure success of the Open Library and other OER initiatives.
- Guide faculty in the creation, dissemination, identification, adoption, and assessment of OER.
- Create OER training resources and deliver educational workshops.
- Document OER use through the consortium, calculate student savings, and communicate benefits and impact to the broader community.
- Contribute to the overall scholarly communications program of eCampusOntario which includes open access, open scholarship and CC licensing.
- Keep abreast of, research, and report out on, current and emerging developments in OER.
- Identify opportunities to highlight OER initiatives and work with eCampusOntario communications team to showcase those initiatives and institutions.
- Establish and maintain effective working relationships with clients, colleagues, institutional administrators and Ministry staff.
- Contribute to a positive, supportive and strong team culture at eCampusOntario.
- Continually expand and update professional knowledge.

Meta-data data from a University Library Director

The insight below, shared in an interview with a university director, is indicative of the type of governance (or lack of) that exists through much of Canada's higher education system. In other words, individual institutions – and within them, individual projects, perhaps – create resources in their own fashion, often governed by funding or convenience.

Unfortunately, there is not a single metadata standard that is actually the standard. There are many different metadata schema in existence, and I suspect that for all the formal schema there is even more informal schema that are used. Library catalogues tend to use standard schema, such as the Library of Congress Subject Headings, and while some institutional repositories might use a variation on that, the headings aren't necessarily consistent from one institutional repository to another. The person who creates the metadata for a given repository might vary quite a bit from a librarian who is trained in cataloguing (and therefore presumably familiar with the importance of consistency for findability) to a person with considerably less background in that. In addition to there being differences in the terms that are assigned to a particular item, you may also find that some repositories take indexing seriously and assign multiple metadata terms to describe each item, whereas others will only have one or two terms assigned to each entry. This difference can impact the findability of resources. (E. Fabbro, personal conversation, 2020)

Commonwealth of Learning (CoL)

The CoL is not unique to Ontario (or British Columbia) but it is an umbrella organization that embraces all of Canada as well as other Commonwealth countries. Its mission is to

"promote the development and sharing of open learning and distance education knowledge, resources and technologies." As a part of its promotion of all aspects of distance education, CoL is also heavily invested in OER.

In CoL's 2014 document Quality Assurance Guidelines for Open Educational Resources: TIPS Framework, author Paul Kawachi presented this meta-data information, explaining that current data (at the time of writing) report on only two

levels of quality perceived: the level of OER experts (level 1) and of teachers (level 2). Level 3 data (students) had not yet been gathered.

In our earlier version 1.0 of this TIPS Framework, there were three levels of localisation each with their own specific quality criteria: (i) the upper-most level-1 of the repository containing the internationalised OER that have been standardised by OER experts and like a textbook are almost context-free, (ii) the intermediate level-2 of readily adaptable OER, and then (iii) the ground level-3 of the fully localised OER used by actual students. There has been feedback to version 1.0 that suggests our combined criteria covering these three levels should be disentangled and presented separately. Briefly, the upper-most level-1 is the most restrictive interpretation of quality by OER experts and institutions, the intermediate level-2 is complex involving ease of adapting through re-contextualising OER by teachers, and the ground level-3 is quality in the hearts and minds of the students learning with the fully localised OER version. (Kawachi, 2014)

Quality assurance at the provincial level for post-secondary institutions falls under the responsibility of the Ministry of Advanced Education. Internal academic program reviews are conducted annually by institutions, and quality assurance activities are reported to the ministry. External reviews of university quality assurance processes are also conducted by an independent body appointed by the Minister of Advanced Education. Accreditation at the program level is conducted by various provincial, national, and international accreditation agencies.

There does not appear to be a specific body or process to evaluate the quality of institutional open or digital efforts at the meso level. At the institutional level, there are likely processes and instruments used for evaluating quality. These include internal checklists, but also checklists provided by external organizations like Quality Course Teaching and Instructional Practice from the OLC Quality Scorecard Suite.

One area of digitization and collaboration that is new to eCampus Ontario is its micro-credentialing efforts. eCampus Ontario hopes to develop a shared infrastructure and ecosystem for micro-credentials in the province and has involved a number of universities and industry partners in this effort.

4. The State of Digital Transformation at the Micro Level

The Canadian report on digital adaptation in Canada at the micro level focuses on two provinces, given the Canadian decentralized education structure where education falls under provincial jurisdiction. For these data, we have reported on British Columbia and Ontario which as the most populated English-speaking provinces in Canada, Ontario with over 14 million residents and BC with over four million.

4.1 Micro level adaptation to digital resources in Ontario 2020

There is abundant information available in Ontario at the meso level with several organizations promoting OER through their online presence. Guidelines have been issued and repositories created. These initiatives have been reported on previously.

Determining micro level use is more challenging; however, the experiences that many OER users related to me in personal interviews resonated and reflected with the broader and more theoretical issues that emerged from meso level examination of OER use in Ontario. The following section will present these users' – all post-secondary professionals at both college and university level – responses to some or all of questions pertaining to personal use – creation or curation; types of materials preferred and used; the integration of materials into their own materials; challenges to adoption and adaptation; potential supports and assistance; and the cultures of sharing materials and ideas.

Their individual responses are followed by an analysis and by supports from the literature.

Respondent A

Respondent is an OER leader at her institution. She has a deep and intelligent commitment to the OER cause. Although she searches various repositories for the "right stuff," she is often frustrated that the material she wants lacks the appropriate licencing or that it is just not the right fit for a niche course. That said, she does use OER material and especially likes to avoid textbooks for her students due to their high cost.

A has been a pioneer at her institution. She championed OER's foothold there and organized an "Open Day" in 2018 which served as a catalyst for raising interest among her colleagues. Now, two years later, there are 12 courses offered with open texts. Some instructors are using OER in an ad hoc fashion per course or module, as needed. One day, each semester there is an OER information session at the institution's teaching and learning centre.

A part of the challenge, A explained, is that at her institution, created material belongs to the institution, thus inhibiting some instructors from creating their own OER. Their contracts prevent them from seeking a CC licence for their products. While frustrating, A and her colleagues are trying to make changes to their administration's position on this issue.

Respondent B

Respondent B echoes many of A's concerns. She can't find what she wants; either the material doesn't meet her standards or the "fit" to her course is not right. However, she tried to incorporate OER whenever she can. She has been unable to find a textbook for her courses. She, too, is an OER pioneer in Ontario and in Canada. About her institution and colleagues, she says: "We're not there yet." However, she has found eCampus Ontario a fairly good source of resources.

She has found faculty at her institution to be resistant to OER and feels that policy changes must occur so that teachers have easy access to free material. Management has so far resisted, citing their bottom line. A recent management change has swayed to pro-open somewhat but the contractual issue is still there: the institution owns instructors' products and OER use is determined by administration.

B creates some of her own OER, "little stuff," as she calls it – some slides, some rubrics, when it is possible to openly licence them. However, she doesn't have the time to focus on creating materials and there are currently staff shortages at her institution, which increases her workload. Additionally, there is no compensation for her "extra" work and she must complete it as volunteer labour.

She finds it difficult to be innovative in her environment, but she watches social media for evidence of new and relevant materials. She laments that the older, traditional models of education still hold; and that publishers have their feet firmly in the educational door. She notes that even research and researchers have conflicting interests dependent on funding sources and that licencing restricts the use of some resources. All of us who are researchers know this is true.

B mentioned that some OER resistors use accreditation as an excuse not to adopt newer approaches. In disciplines where there are regulatory bodies governing professional licences, curriculum developers are always wary of stepping out of/over the line set by the governing body. B suggests, however, that a process ensuring quality, a process of review and assessment, could and should nullify these concerns and restrictions. "They're just not there yet."

Respondent C

Respondent C has been an avid OER creator for several years, including during her several years spent at the K-12 level. With her students, she has co-created a textbook with eCampus Ontario, then published via PressBooks. Working with students, she collects their blog entries for public viewing. Initially, she reports, students were reluctant to go public. They needed information and clarity on aspects of OER – why, how, where, etc. Once reassured and with some CC info, they were much happier to participate. She understands that it's important to help students understand that they own their own work.

As did Respondents A and B, C has difficulty finding what she needs. While there is a lot available in some fields, there is not a lot available in her field. It's a lot of work, and time-intensive, for C to find what she needs. However, she would

rather invest the time in adapting materials to her own needs than re-invent the wheel.

C receives no consideration for creating or searching for OER. There is no funding. With a supportive team, she is able to adapt relevant materials from American-centricism. She also experienced technical issues in making adaptations from various platforms and suggesting that some standardization of platforms would make the process much easier.

She and her colleagues share relevant material, "the good stuff," in its original format, often by email. So far, their networking is casual and unofficial, led by "unofficial" figureheads. C hopes that a new strategic plan at her institution will include a designated person to head up the OER initiative.

Respondent D

Respondent D, a university teacher, initially didn't think that she had much connection to OER. She doesn't know anyone who uses OER but knows that some of her colleagues balk at the idea and are suspicious of open resources. Meanwhile, her department is negotiating with a publisher to create open, digital texts.

D does use open materials, however, in the form of presentation slides and videos. She just hadn't identified them as such. She has searched for materials on SlideShare but only found about one-third of materials useful. She feels her need is too "particular" to use OER. This is a common theme, heard in the words of most of the people I spoke to.

She has also used a video that she retrieved once. She told an interesting story: several years ago, while working as a teaching assistance in a university setting, she tried to share a downloaded cartoon with her class. The supervising professor, however, emphatically stated that he would not permit any materials from the Internet to be used with his student!

Respondent E

Respondent E is a university librarian who is considered the point person for OER at her institution. She is very involved in her institution's OER process. She "curates," assisting in search processes so that other faculty can review the OER materials.

E advises on copyright and licencing issues and has built a guide to OER repositories. She is involved with her institution's teaching and learning hub which offers professional development.

As with several other respondents, E belongs to a provincial working group on OER. She pushes her institution for change and for policy development. She laments that there is currently no policy in place nor any institutional direction.

Faculty at her institution are looking for open materials to replace textbooks so they can build a course around the open resource. While initially not keep on adapting OER for their own use, faculty become more comfortable with this idea as they get used to it. A lack of technical skills impedes some.

Especially in the trades, open content must match exactly the need at hand, given faculty's lack of skills. They are hesitant, as others have been, to create their because they don't own it. It appears that the notion of "open" applies to them as receivers but not as givers!

E reports the same wariness about OER as did others. The old ideas maintain, and OER supporters must challenge the "myths" about their use and quality. And of course they don't want to release their intellectual property, although they will share within limited parameters – within their own department, for example, or with close colleagues. Their "openness" is limited. They are reluctant to use or trust repositories.

Another issue involves precarious employment situations. Faculty don't want to lose what they see as "leverage" as regards their own materials. A sense of possessiveness and insecurity exists.

E feels that strong champions are needed to push OER acceptance forward.

Respondent F

Respondent F is a strong believer in OER and an advocate within her large university. In response to student demand, she has developed online programs in her field and various OER resources that respect the diversity in voice. She is committed to keeping available resources up to date.

She has created mobile OER resources that are currently being widely used in her field. These resources have been revised, adapted, and translated for international use as both an app and in web-based format. F is committed to providing easy-to-access resources, recognizing that many corners of her field are marginalized and work as non-profits.

Her institution is set up for cross-collaboration among areas. Quality assurance experts, technical experts, and the teaching and learning centre all unite to create OER and encourage its development. As always, there are enthusiastic champions in this group that push to "get things done."

Policy and guidelines are coming. In their absence, meanwhile, practice is not consistent. Integration is not consistent. F would like to see CC licensing used as a guide and is aware of copyright issues. As such, she feels the library should be involved in OER work.

At her institution, she has support from the teaching and learning centre and from their librarians. The province-wide eCampusOntario (discussed in the meso report) has been useful and has provided funding. However, more infrastructure is needed and, as always, more champions.

Respondent G

Respondent G was a very avid OER practitioners. He "gets it," and is aware of the scope of the issues involved. He strongly supports the move away from textbooks and looks to media for good resources. Several years ago, he started to pay attention to how he could curate materials to fulfil his teaching needs.

G became involved in eCampusOntario's OER programs that involved other interested professionals from all walks of educational life. He was excited and energetic but found that while institutional policy could be both a challenge and a solution, it did not contribute to increased OER use.

G creates some of his own materials for use within his courses and would like to adapt them to Pressbooks as textbooks. Lately, though, he was done more curating than creating and more wraparound to existing resources. He is hoping to develop an open textbook.

G is an experienced educator in his field and that helps him to "know where stuff is." Being able to find resources aids him in his pursuit of OER: it's so much more difficult for new faculty who are not as familiar with what's "out there."

His experience at his institution has shown him that younger graduate students who assist him in teaching are more receptive to creating and sharing materials, although they could be shared more widely. Older professors, he finds, are not as open to sharing. (This has been a theme.)

Respondent H

As with so many others, H advocates for open resources, but finds them difficult to access. He has developed ways to "slip around" paywalls in his pursuit of resources. In his scientific field, the cost for researchers to publish can be high; and he is opposed to that.

H uses search engines when looking for fast access to resources. Libraries are thorough but often the search takes too long. He revises material to suit his needs, looking for ways to effectively present the "found" resources. He also creates his own repositories of found resources for future use. He uses audio and video resources and curates them based on their technical quality and also length. Shorter is better!

H finds that sharing resources is dependent on personalities and collegiality. There is, at present, no guiding policy at his institution.

His challenge, as with so many others, is time…time to locate the right resources. He is sensitive to legality and copyright, and wants to "stay within the rules," but wishes the rules featured more openness and access.

Commonality among responses

A communications professor at an Ontario institution has been written up as a creative creator of OER. She could not find an appropriate textbook for her learners and wanted to engage them in forming community: "textbooks simply don't facilitate the kind of meaningful experience" (#OERThankU). As a long-time online teacher who does not use textbooks, I concur with her statement. She is also concerned with the cost to students of textbooks.

As did most of my respondents, above, she credits librarians with being "rockstars" in the OER world. She attended workshops that were hosted by librarians. That said, she admitted that creating OER was labour-intensive. She already knew how to use Wordpress and admits that that skill was a great help in the creation of OER.

Another professor in a different faculty at the same institution (worth noting that this institution is technology-focused) has moved away from "licensed, subscription-based homework/assessment" (#OERThankU, n.d.) systems to open source. His reasons are many: the cost of resources, frustration with online cheating via readily available online platforms; the understanding that there was a "better way" to engage students in their learning; and government pressure to keep student costs down.

This professor was an early adopter, again, a quality that many of my respondents shared. He believed in what he was doing. His field was also receptive to openness as a base concept.

This university, however, strongly encourages the OER movement and has in place designated OER website as well as a "steward" program. In 2019-2020, the steward program had 19 members. Championing is necessary in the movement toward acceptance, as my respondents indicated.

Data from a relevant doctoral dissertation

A 2018 doctoral dissertation was a good source of information on Ontario post secondary teachers' adoption and awareness of OER. The author considered OER advocates as "change agents" and used Rogers' diffusion of innovation theory as a research framework. She found that OER adoption followed on educators' belief system as regards pedagogy: "Advanced OER practitioners (who are often OER advocates) have embraced the use of OER in their teaching and have moved on to explore the ways they can leverage the pedagogic advantages of OER" (Hayman, 2018a). She also found that her study participants were willing to take risks, were excellent curators of open content and happy to share their intellectual property, including via social media.

The writer's study used pre- and post-surveys to examine the shift in attitude toward OER after workshop and resource attendance. However,

An important finding in the quantitative analysis for Attitude Toward OER (and an indicator that not everything was positive for participants) was that there was almost no improvement in means from pre- to post-intervention related to supply and search options for OER. Both cohorts of participants … were persistent in their attitudes that there was an insufficient supply of OER for their disciplines and that OER were difficult to find. These findings were indicators that better professional development was needed around these issues, and that there needed to be better repository designs and an increased supply of high-quality OER developed. These findings were consistent with concerns described in the global literature on OER. (Clements & Pawlowski, 2012; Lund Goodwin, 2011; Mtebe & Raisamo, 2014, as cited in Hayman, 2018a).

Given that, participants sought and valued professional development for OER use. Copyright issues – notably, a clear understanding of them – were also important.

Interestingly but perhaps not surprisingly, the study, which included both face-to-face teachers and online teachers, found that f2f teachers had less time to devote to learning how to use OER.

The discussion of OER and open education often/usually contains material on defining what open education really is. This dissertation also contained such a definitional section, and the word cloud that was generated as a part of this research is reproduced here:

(Hayman, 2018a, p. 139. CC-by-NC 4.0 International License.)

Other important themes included the importance of costly textbooks as a driver for OER; the necessity for quality assurance for OER; the need for educators to be better educated in OER-related skills, such as finding appropriate materials.

Hayman's research revealed disagreement about the quality of OER and about the lack of standards for OER. Combined with teachers' inability to locate appropriate materials, the lack of support resources (staff) to help them, and a lack of time to use them (revise, adapt), her study indicated a general confusion about OER in potential users. Given the issues just mentioned here, it's not surprising that summary questions from the study included: How can we ensure quality for OER? How can we learn more about the skills needed to find and use OER? How might educators collaborate with peers and learners to adapt and create OER? (p. 145)

Hayman offered some observations from her study that fell outside the parameters of her research questions. One of these involved a difference between college educators and university educators. (In Canada, colleges typically offer two or three-year diploma programs; universities offer three and four-year undergraduate degrees, and several graduate degrees.) Her conclusion was that college educators has less autonomy with respect to course decisions.

Hayman began her concluding chapter in her dissertation with a reiteration the problem statement: "The use of open educational resources (OER) is not widespread among Ontario college and university educators" (p. 150). Having explored the reasons for this – reasons which complement the responses from this report's data, above, she concludes

that this is, in part, a result of centralized leadership – a fact also corroborated by the data presented above, gathered from both college and university teachers.

Included here are recommendations derived from Hayman's study findings. We present them all as they are relevant to this chapter:

- Use of OER is best framed as an invitation for educators to explore and not as a requirement of practice.
- Effective advocacy for use of OER requires advocates to have technical competence. Some examples of this competence include the following:
- experience of multi-modal learning theory and pedagogic practice, knowledge for finding and use OER repositories and understanding of technical content file formats,
- familiarity with the adaptation tools that are needed to adapt and share content, and a good grasp of the issues of copyright and open licensing. This competence requires compensated time for ongoing professional development.
- Advocates and interested educators may benefit from social (rather than isolated) professional development experiences where they can communicate and support each other.
- Institutional support and professional development are critical factors in expanding the use of OER among educators. Educators in this study expressed the desire for additional professional development and exploration of OER, and indicated their OER practice would benefit from access to knowledgeable supporters.
- When OER advocates and educators from a variety of institutional roles are given encouragement and opportunities to share their knowledge, use of OER increases. (Hayman, 2018a, pp. 152-53)

An eCampus Ontario Study*

A large college and university study was conducted in 2018 on OER at Ontario's PSEs. Of 17 000 university educators and 12 000 college educators, the response rate was low, only 1.9% or 383 responses. Although the report states that the responses covered a diverse population with respect to experience, mode of delivery, and balance between types of institutions, our interpretation of the low response rate is that the level of interest or knowledge of the OER topic is correspondingly low. We have uncovered no data in this research, including the f2f interviews, to indicate otherwise.

The study's findings are summarized here. In most cases, data indicated distinct differences between college teachers' situations and university teachers' situations, with university teachers having more control over their choices.

- Journals, textbooks, and internet resources were most highly used as resources
- College instructors were more likely to use educator-originated resources
- Only 14% of participants were very familiar with OER; 28% familiar; 15% somewhat familiar
- Only 11% were very familiar with open textbook; 39% familiar or somewhat familiar
- Most OER used: YouTube 79%, Web links 83%, OER articles 55%
- Opinions of OER: reduced cost to learner and quality. (Hayman, 2018b)

The implications derived from the study are these:

- Support adaptation and creation of open textbooks through funding and professional development opportunities in partnership with Ontario institutions.
- Ensure programming and support activities include all modes of teaching (face-to face, blended, and fully online).
- Consult about differences in decision-making power about the resources used in courses when determining how to design professional development sessions.
- Ensure that conversations about OER with interested stakeholders include how to use them as supplemental resources.
- Determine steps needed to increase awareness among post-secondary administrators (in addition to individual educators) about the benefits and the challenges of using OER.
- Emphasize the key criteria for course resource selection: quality (trust), accessibility, and comprehensiveness (alignment with a spectrum of learner needs) when discussing OER.
- Include definitions of OER and explanations of licensing types in presentations and conversations.
- Address the need for professional development around OER repositories (where to find OER), and discipline specific lists of curated resources to increase overall use of OER. (Hayman, 2018b)

4.2 Micro level adaptation of digital resources in British Columbia 2020

As is the case for Ontario, numerous organizations support OER through numerous efforts. Guidelines, repositories, communities of practice, and so on, all exist to support such efforts, and such initiatives were already described in the meso and macro reports for BC. To investigate micro level use in BC, we focused on desk research and supplemented this with informal interviews/emails with colleagues focused on digital and open education. In this analysis, we include a qualitative exploration of pan-Canadian data generated by the Canadian Canadian Digital Learning Research Association / Association Canadienne de Recherche sur la Formation en Ligne (CDLRA). This organisation studies issues pertaining to digital education in Canadian post-secondary education and has produced three reports informed by an annual survey (Bates et al., 2017; Donovan et al., 2018; Johnson, 2019).

While the reports include the quantitative results, as part of a set of research papers, George's research team has been analyzing the qualitative data from 2017 to 2019. Below, we include analyses that related to micro issues of digital and open education adoption arising from that original data. The biggest takeaway from this is that a deeper, more granular, and more systematic investigation is necessary to fully understand micro adoption issues. Nonetheless, there are some important lessons and issues here – many of which are also captured in the Ontario section of this report – that should be helpful. Importantly, the categorization created above – creation or curation; types of materials preferred and used; the integration of materials into their own materials; challenges to adoption and adaptation; potential supports and assistance; and the cultures of sharing materials and ideas – may be helpful in future work.

In an effort to expand upon Dianne's work – everything that she writes above is applicable to BC, and the broader Canadian environment – George sought to highlight areas in which he could make a strong contribution by grouping them into themes as presented below:

Theme 1: As Canadian institutions offer an extensive menu of professional development options, individuals learn about and learn OER/digital through various means.

The 2017-2019 CDLRA survey data show that institutions offer an extensive variety of practices to provide instructors with professional development and support. These include training that can be undertaken independently by faculty members, one-to-one interactions with others such as instructional design professionals or peers, and group PD opportunities. Many faculty prefer and ask for flexible designs of such training such that it can fit into their busy lives. In the table below, we present a synopsis of practices that George's research team identified in the CDLRA data.

Table 1

Digital Education Professional Development and Training Practices Employed by Canadian Post-Secondary Institutions

Practice	Description
Educational workshops & meetings	Workshops in a variety of formats such as train the trainer, brown bag lunches, hands-on workshops in re-conceptualizing course design, external/internal teaching showcases, symposia, etc. with training targeted for specific digital modalities (online /blended /hybrid /hyflex) or highlighting different pedagogical strategies for digital education.
Personalized individual 1-to-1 training & support	Individual PD focused on instructional design/ technical training accompanied by just in time support throughout implementation.
Exploratory practice	Opportunities for faculty to experiment and practice with unfamiliar technology tools or teaching strategies that best address the type of learning experience they are trying to create prior to implementation in classes.
Participation in exemplar online courses	Provide online courses for faculty to experience digital education from the viewpoint of a student; model courses for faculty to explore before teaching in online settings.
Intensive course redesign	Redesign of course activities with wrap around instructional design and technologist supports.
Champions & mentors	Experienced faculty champions with digital education knowledge and skills who provide support and mentorship to colleagues and promote various digital education initiatives on campus.
Community of practice	Small groups of faculty which form together as a community of practice to learn as a group, facilitate peer-to-peer networking, or raise the profile of digital education; may include faculty peers, staff from teaching and learning centre, and a facilitator.
Reflective practice	Encouraging faculty to think about what went well/ not so well with digital learning activities and what/where they could improve. Could be an individual practice, a component of the activities for a community of practice or discussion within a mentoring partnership.
Incentives (e.g., financial, recognition, release time)	Various incentives available to faculty to attend training or develop digital learning activities include release time, financial incentives, compensation for attending training, recognition of excellence in digital education through tenure and promotion processes, awards.
Investment in scholarship of teaching & learning initiatives & research	Systematic study of teaching and learning in digital education with public sharing and review of such work to share innovations in curriculum development and content delivery strategies.

Theme 2: Individual support for OER seems necessary.

The pandemic – in addition to causing a rapid shift to digital education – has led to increased calls for the use of OER in Canada. To give a sense of the magnitude and interest in OER, consider the following three initiatives:

Initiative #1

CAUL to lead cost-saving textbook initiative

July 21, 2020

The Council of Atlantic University Libraries (CAUL) is leading a new pilot project that will put student resources, such as textbooks and teaching materials, online for free, accessible use. Executive Director of Students Nova Scotia Clancy McDaniel states that with students in the province spending between $800-$1,000 on textbooks each year, there is hope that the project will expand in coming years. “If we’re able to save folks some money by making this widely available, that’s a top priority for us,” said McDaniel. The article states that a similar initiative was introduced in British Columbia in 2012 and has since saved students almost $19M. *Halifax Today* (National)

URL

Initiative #2

A pan-Canadian effort to advance digital education (and use OER).

Initiative #3

In exploring what the future of higher education in Canada looks like, recommendations for policymakers highlight the value of openness, and suggest “open” becoming a requirement.

In conversations with colleagues, and in our analysis of the CDLRA data, it seems that for OER use to be more effective, it may be worthwhile investing in individual supports, such as one-on-one professional development and similar education efforts for individuals to understand OER as a value/license and not just as a free resource. While institutions can OER use through a variety of means instructional design support, library services, funding, policy-making, training and workshops, and work-release from duties to free up time for adoption and creation of OER, individual supports are necessary. Interestingly, despite some institutions having OER policies and offering faculty support, OER use often appears to come out of individual efforts and from a ground-up approach. In other words, the micro level appears to be a significant propeller and factor in adoption, even when meso and macro supports exists, but we would argue that activity at the micro level is insufficient for large-scale transformation to occur. Institutions should consider more supports to foster and encourage the activity at the micro level.

What does the process of adoption and diffusion look like?

In a recent publication focusing on the ways faculty adopt pen textbooks in BC, we identified eight methods of open textbook adoption: stealth adoption, adoption by infection, committee adoption, sanctioned exceptional adoption, course developer adoption, infection by inter-institutional carrier, creation and adoption, and lone adoption (Barker, Jeffery, Jhangiani, & Veletsianos, 2018). What this paper reveals is the many ways that individuals come to adopt open textbooks. At times, they might be introduced to them by instructional designers; other times, they may be engaging in

open practice without necessarily knowing that a community of open educators exists; and, at other times, it may be that a local champion convinces others to adopt and expand use of such OER. This analysis suggests that pathways to OER can be multiple and that it may be worthwhile exploring what the local context looks like in in order to inform local strategies for broad OER adoptions.

5. Concluding Remarks on Digitization in Two Canadian Provinces

In Canada, at the micro level, as described above, the adoption of digital resources follows the pattern that has been demonstrated at both the macro and meso levels. The tone is set, at a foundational level, by the Canadian tradition of decentralization as regards education policy and practice. Each of Canada's 10 provinces and two territories manages its own educational process. With no overarching or unifying direction, each contingency has approached digitalization and OER in its own way and at its own pace.

In reality, this has meant, in the provinces of Ontario and British Columbia, the two largest in English-speaking population, a fragmented and often individualized adoption of progressive measures. While some province-wide agencies and organizations have been formed to "group" adopters and provide a type of umbrella-home for their activities, these have been often dependent on one-time funding or by the political persuasion at the time, keeping in mind that educational policies in Canada may (and do) change with government changes every four years.

Overall, the major initiatives and thrust for OER have emanated from library organizations. They and their members – both individual and organizational – have been at the forefront of digitalization. Some universities, often led by their libraries, have created repositories of artifacts and maintain useful websites. Colleges and universities differ as to their take-up of OER, based on the fact that college teachers have less authority over their content and less academic "heft" than do their university colleagues.

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End Note

*Report was prepared by J. Hayman, perhaps as research for her doctoral thesis, already cited.

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3

China's Approach to Digital Transformation of Higher Education

Digital Infrastructure and (Open) Educational Resources

Junhong Xiao & Jingjing Zhang

1. Introduction

China is a huge country both in terms of geography and population with a territory of 9.6 million km2 and a population of over 1.4 billion. It is divided into 23 provinces, 5 autonomous regions, 4 municipalities directly under the Central Government, and 2 special administrative regions. Ever since the founding of the People's Republic of China in 1949, education has always been top on the priorities of governments at all levels with no efforts spared to enhance the educational level of the whole population. Currently, China implements the policy of nine-year compulsory education (six years of primary school education and three years of junior middle school education) free of cost. Public education is the norm although private education, from K-12 to higher education, is encouraged and has made significant progress in the past few decades.

Due to historical and geographic reasons, social and economic development varies from one province to another, and even within a province, which results in disparities in educational development including educational opportunities, resources and quality. In light of this reality, addressing educational inequalities and providing equitable access to quality education for all have become a primary concern of the Central Government. Numerous measures and incentives have been taken and adopted in the continuing attempt to deliver this goal and the latest initiative which started in the turn of the century is the use of modern technology for the purpose. Digital transformation is now regarded as a national strategy for education in the 21stcentury by the Chinese Government. The emphasis that the Central Government has laid on the role of digitalization in achieving balanced development of education countrywide is echoed by the formulation and implementation of corresponding national policies, initiatives, action plans, and schemes in the past two decades. With tremendous inputs in terms of public funds and human resources as well as effective orchestration, the digitalization drive has borne fruits, especially in infrastructure and digital educational resources, and the concept of digital transformation is now ingrained in the discourse of education in general and gradually accepted by educators and other educational stakeholders.

Overall, the higher education sector is in the vanguard of this digitalization drive which has been integrated into the institutional (both long- and short-term) strategy of all colleges and universities, in particular public higher education institutions (HEIs). The most recent embodiments of the digitalization drive are the application of artificial intelligence and the emergence of 5G university campuses. As far as HEIs are concerned, digital transformation is to serve the dual purpose of responding to the national strategy and their own institutional strategy. For the former purpose, contributing

to the national strategy of digital transformation of education is their social responsibility, especially for those publicly-funded HEIs. For the latter purpose, HEIs are intrinsically motivated to embark on the digitalization drive in order to improve learning, teaching, and research which can give them an advantage over other HEIs in the fierce competition both at home and abroad. A recent pertinent example is that digitally-prepared universities have managed to cope with the COVID-19 pandemic far more efficiently and effectively and to the greater satisfaction of their students than their less-digitally-prepared counterparts. In a sense, the pandemic has reinforced the embedding of digital technologies in (higher) education, an impact which will probably shape the landscape of (higher) education in the years to come.

Digitalization has positive connotations in the discourse of Chinese (higher) education, in particular the discourse in and around its education policies, although it should be admitted that there may be a gap between rhetoric (policy) and reality (practice), just as is the case in other parts of the world. It is also worth pointing out that China implements a highly centralized higher education system. Therefore, the Chinese model of digitalization may be different from those in other socio-political contexts. For example, the macro-level factors tend to play a bigger role in the digitalization drive in China, which may be very conducive to pooling limited resources and mobilizing all stakeholders for the pursuit of a common goal. This is particularly significant when China was less developed and could not provide an adequate budget for education and when it remains divided across the country in terms of educational access, quality and resources. On the other hand, the centralized mechanism may have its downsides. It is hoped that these contextual factors need to be borne in mind when reading, interpreting and even learning from this chapter.

In line with the specific research questions of EduArc, and also given the nature of chapter, the most dominant method used in this chapter is the secondary research method with the methods of case study and interview adopted mainly for the micro-level part. Data for the secondary research are government documents and institutional documents as well as materials found on official websites, including government, government department or agency, university and college, and association/partnership websites. Content analysis is made of these materials, expert opinions are sought, and discussion occurs among the project team. The researchers are insiders, hence probably with advantages and disadvantages. To avoid possible research bias, findings are often triangulated to ensure their accuracy.

This chapter aims to give an overview of digital transformation in China's higher education sector at macro-, meso- and micro levels. The macro-level part will review national policies, standards, infrastructure construction as well as the main driving forces behind the digitalization drive. The meso-level part will cover regional and/or alliance partnerships, institutional digitalization strategies, development of (digital) (open) educational resources, and institutional infrastructure construction. The micro-level part will focus on staff and student perspectives regarding application of digital technologies in teaching, learning and administration. It is hoped that lessons learnt from China are of relevance to other parts of the world. Furthermore, comparison of different country reports may also carry rich implications for policy-makers, administrators, managers, academic staff and students, yielding fascinating new insights into digitalization of higher education.

2. Digital Transformation in the Chinese Context

Throughout the world, higher education has been undergoing digital transformation and China is no exception. The importance that the Chinese government attaches to digital transformation of (higher) education has always been consistent, as can be seen in the rest of this chapter. For example, it is stipulated in the Education Law of the People's Republic of China (hereafter simply, The Education Law) that

> *The people's government at the county level or above shall develop education via satellite television and other modern means for teaching and learning, and the administrative departments concerned shall give such development priority and support.*
>
> *The State encourages the wide use of modern means in teaching and learning by schools and other institutions of education' (Chapter VII, Article 66) (The National People's Congress of the People's Republic of China, 1995).*

In 2015, the Education Law was amended and new content is now added to Article 66 to the effect that the State shall promote the use of information technology (IT) in education, speed up construction of digital infrastructure and take advantage of IT to facilitate access to and sharing of high quality teaching resources and improve teaching and administration (The National People's Congress of the People's Republic of China, 2015). The Higher Education Law of the People's Republic of China (hereafter simply, The Higher Education Law), which was passed in 1998 and amended in 2015, also makes it clear in Chapter II Article 15 that 'The State supports higher education conducted through radio, television, correspondence and other long-distance means' (The National People's Congress of the People's Republic of China, 1998).

Sharing of educational resources is also encouraged in the Higher Education Law:

> *The State encourages collaboration between higher education institutions and their collaboration with research institutes, enterprises and institutions in order that they all can draw on each other's strengths and increase the efficiency of educational resources (Chapter 1, Article 12) (The National People's Congress of the People's Republic of China, 1998).*

Before we move on to other sections, it would be desirable to clarify terminology used in this chapter. First, in the Chinese context, informatization is the 'standard' term for the use of IT while digitalization is more often used to refer to the use of a specific technology, i.e. digital technology, rather than as an umbrella term. But given the background of the audience of this report, we will use digitalization rather than informatization as an umbrella term. Second, there is no official definition of Open Educational Resources (OER) in China. Judging from our knowledge of this field, it seems that Chinese policy makers, researchers, and practitioners follow 'by default' the definition of United Nations Educational, Scientific, and Cultural Organization (UNESCO), according to which OERs are

> *teaching, learning and research materials in any medium, digital or otherwise, that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions (UNESCO, 2012).*

3. Digital Transformation of the Chinese Higher Education System

3.1 Facts and figures

According to the Higher Education Law,

> *The State Council shall provide unified guidance and administration for higher education throughout the country.*
>
> *The people's governments of provinces, autonomous regions and municipalities directly under the Central Government shall undertake overall coordination of higher education in their own administrative regions and administer the higher education institutions that mainly train local people and the higher education institutions that they are authorized by the State Council to administer (Chapter 1, Article 13) (The National People's Congress of the People's Republic of China, 1998).*

The establishment of undergraduate or post-graduate HEIs is subject to review and approval by the Ministry of Education (MOE) under the State Council and the establishment of junior colleges whose graduates are not degree holders is subject to review and approval by the people's governments of provinces, autonomous regions and municipalities directly under the Central Government but needs to be reported to the State Council.

The Higher Education Law also ensures funding for public HEIs and encourages non-State sectors to be involved in the provision of higher education (see Chapter VII 'Input to Higher Education and Guarantee of Conditions' for details):

> *The State institutes a system wherein government appropriations constitute the bulk of the funds for higher education, to be supplemented by funds raised through various avenues, so as to ensure that the development of higher education is suited to the level of economic and social development.*
>
> *The State Council and the people's governments of provinces, autonomous regions and municipalities directly under the Central Government shall, in accordance with the provisions in Article 55 of the Education Law, ensure that funds for State-run higher education institutions gradually increase.*
>
> *The State encourages enterprises, institutions, public organizations or groups and individuals to invest in higher education (Article 60) (The National People's Congress of the People's Republic of China, 1998).*

Implied in Article 60 of the Higher Education Law are two messages. One is that there are both public and private colleges and universities in China and the other is that public HEIs are the most dominant force in China's higher education sector. With the rapid growth of economy in the past four decades, the Chinese Government's investment in education has been on the rise all the time, including higher education. Therefore, unlike their foreign counterparts, Chinese HEIs, especially public colleges and universities are financially more secure and stable, even in recent years of global economic austerity which has had a significant impact on colleges and universities around the world (Qayyum & Zawacki-Richter, 2018; Zawacki-Richter & Qayyum, 2019).

Up to May 31st, 2017, there were 2914 HEIs in China [1], including 2631 conventional campus-based HEIs and 283 adult HEIs (see the list of Chinese colleges and universities for details) (MOE, 2017a). Of all these HEIs, 75 are affiliated to the Chinese Ministry of Education, about 30 to other ministries and the rest of them to the provincial governments or their education authorities where they are located, hence often referred to as 'local colleges and universities'. It should also be noted that there are 747 private HEIs with an enrolment of 6,284,600, representing about 17% of the total higher education student population in China. The latest statistics show that China has a higher education student population of 37,790,000, reaching a gross enrolment ratio of 45.7% in higher education (MOE, 2018a).

3.2 Current state of overall digital transformation

In 1998, MOE announced its Action Plan for Invigorating Education towards the 21st Century (hereafter simply, the Action Plan), which called for the implementation of Modern Distance Education Initiative to build an open education network and establish a lifelong learning system in China (MOE, 1999a). It was argued that Modern Distance Education Initiative should make good use of a variety of educational resources and contribute effectively to equal access to educational resources, which was of significant relevance to China where there was still a shortage and uneven distribution of educational resources (MOE, 1999a). Measures to build or improve technology infrastructure for the implementation of this initiative were outlined in this official document (MOE, 1999a). In 1999, the State Council published its Decision to Deepen Educational Reform and Fully Promote Quality-oriented Education (hereafter simply, the Decision), Article 15 of which clearly voices the Chinese government's strong support to the enhancement of the use of educational technology and digitalization of education in addition to the establishment of a modern distance education network (State Council, 1999). As pointed out above, digital transformation can trace its root to the Education Law. Nevertheless, we may be justified in arguing that what started digital transformation materializing were MOE's Action Plan and the State Council's Decision.

In 2003, as one of the measures to implement strategies and decisions from the Central Government and its education authorities to modernize education in China, MOE launched an initiative to develop 'Top-quality Courses', encouraging HEIs around the country to be actively engaged in this project by developing and submitting their courses for review with the aims to effectively promote innovation in education, deepen teaching reform, facilitate the use of modern IT in teaching, and share high quality teaching resources. MOE pledged to subsidize the project and organize reviews of these courses. Courses which received high ratings by a panel would be awarded the title of 'State-benchmarking Course' and be curated on a website exclusively for the purpose of sharing these courses (http://www.jingpinke.com) (MOE, 2003) [2]. From 2003-2010, nearly 4,000 courses were recognized as 'State-benchmarking Course' (Hu, Yang, Wei & Yang, 2014; Wang & Håklev, 2012).

In the same year, China Open Resources for Education (CORE) was established following the MIT OpenCourseWare conference in Beijing. CORE was a non-profit organization,

> *a consortium of universities that began with 26 IET Educational Foundation member universities and 44 China Radio and TV Universities, with a total enrollment of 5 million students. It aimed to provide Chinese universities with free and easy access to global open educational resources and provides the framework for Chinese-speaking universities to participate in the shared, global network of advanced courseware with MIT and other leading universities (China Open Resources for Education, n. d.).*

Ever since these early initiatives, digitalization has been gaining increasing momentum with more and more national policies made and introduced with the aim to encourage and speed up digital transformation in China's (higher) education sector, as is evident in the following sections of this report. Governments at all levels have invested heavily in digitalization infrastructure and capacity building for this purpose. In 2016, Chinese Premier Li Keqiang advocated the integration of the idea of Internet Plus into every sector of the society, including education, in his report to the National People's Congress of the People's Republic of China on behalf of the Central Government, which can be regarded as the culmination of the Government's emphasis on digitalization in the past decades and has ever since sparked greater enthusiasm for digital transformation in the whole society.

To provide a snapshot of the current state of digital transformation within higher education in China, a preliminary analysis was conducted of the 13th Five-Year (2016-2020) Development Plans of 75 universities which are directly under MOE[3] (MOE, n. d.). Of the 75 universities, 56 mention their achievements in terms of digitalization in the 12th Five-Year period (2011-2015); 48 outline their digitalization strategies for the 13th Five-Year period; and all of them delineate specific digitalization transformation measures in terms of instruction, learner support, administration and management as well as the university's for-profit businesses (see Section 5.2 for details). It may be unrealistic to predict how well the goals and objectives set in these five-year development plans will be delivered at the end of the 13th Five-Year period. Nevertheless, what these development plans display is really a promising vision for digital transformation in the Chinese higher education sector in the foreseeable future.

4. Digital Transformation at the Macro Level

4.1 OER Policy-making

As mentioned earlier, MOE's Action Plan (MOE, 1999a) and the State Council's Decision (State Council, 1999) initiated the digital transformation movement in the (higher) education sector. But it was not until in the last decade that policies were formulated and introduced one after another in an attempt to boost the digital transformation process and maximize the benefits that it has brought forth.

In 2010, Outline of China's National Plan for Medium and Long-term Education Reform and Development (2010-2020) (hereafter simply, the Outline) was published (Central Committee of the Communist Party of China & State Council, 2010), Chapter 19 of which is dedicated to acceleration of digital transformation, including speeding up infrastructure construction, developing and using high quality educational resources on a greater scale, and building a national education information management system.

In order to implement the Outline, MOE formulated its Ten-Year Development Plan for Educational Digitalization (2011-2020) (hereafter simply, the Ten-Year Development Plan) (MOE, 2012a), which delineates the overall strategy (including current state and challenges, principles and guidelines, and development goals), development targets (including narrowing digital divide, sharing high quality educational resources, accelerating digitalization in vocational education, promoting integration of IT and higher education, improving the lifelong learning system, enhancing education management efficiency, upgrading public service capacity, strengthening professional development, and ensuring sustainability), action plans, and guarantee measures.

In 2015, the State Council issued its guidelines on promoting the idea of Internet Plus in all walks of like (State Council, 2015), which advocates the establishment of an innovative mode of education provision. Internet enterprises and educational institutions are encouraged to collaborate in developing digital educational resources and providing online education to meet market demands; schools are urged to make full use of digital educational resources and online education platforms, experimenting with new models of online education, widening access to high quality educational resources and contributing to educational justice. The guidelines also recommend sharing of online course materials in the provision of degree/diploma programs, offering more Massive Open Online Courses (MOOCs), exploring mechanisms for recognition and transfer of online learning credits, and accelerating transformation of higher education business models (State Council, 2015). In the same year, MOE called for HEIs to develop and use MOOCs more extensively and effectively (MOE, 2015a) and issued its guidelines on comprehensively promoting digital transformation in education in the 13th Five-Year period, for example, adopting and localizing MOOCs and Clipped Classroom practice as well as innovating instructional management in HEIs (MOE, 2015b).

In 2016, MOE issued its 13th Five-Year Plan for Educational Digitalization (hereafter simply, MOE's 13th Five-Year Plan) (MOE, 2016), the main goal of which was to better implement the Outline published by the Central Committee of the Communist Party of China and the State Council (2010) and the Ten-Year Development Plan (MOE, 2012a), with the overarching aim to advocate such development ideas as innovation, coordination, green, open and sharing in order to establish an online, digital, personalized and lifelong education system and build a learning society where anyone can learn anywhere and anytime. When it comes to HEIs, it urges colleges and universities to continue to develop and open up their online courses to the general public and encourages HEIs affiliated to MOE and other ministries to help HEIs in West China to carry out blended instruction reforms by taking advantage of open online courses. The Central Government promises to support and push forward HEIs' ongoing efforts to share digital educational resources, encouraging them to establish online education alliances and university-enterprise alliances for continuing education in order that HEIs' high quality educational resources can be put to better use (MOE, 2016).

In January, 2017, the State Council published The 13th Five-Year Plan for National Educational Development (hereafter simply, the National 13th Five-Year Plan) (State Council, 2017), which outlines China's major objectives and targets for the education sector at the national level over the period 2016-2020. There are 38 mentions of the term 'educational resources' in this document which has a length of about 42,000 Chinese characters. There is a subsection on developing 'Internet Plus' education which covers four areas: accelerating the development of a sound system of rules and regulations, further improving infrastructure conditions, committedly pushing forward in-depth integration of IT and education, and continuing to promote co-construction and sharing of high quality educational resources. In terms of rule-and-regulation setting, it highlights the need to formulate standards for the quality of online education and digital educational resources, develop approval and monitoring mechanisms for digital educational resources, protect authors' intellectual property rights and encourage the business sector and other non-government sectors to develop digital educational resources, contributing to the emergence of a market conducive to the growth of digital educational resources. In terms of infrastructure, it aims to achieve full coverage of broadband networks and popularization of online instruction environments. Another focal point of infrastructure construction is to continue the construction of a national public platform for educational resources as well as a platform for educational administration and management. In terms of integration of IT and education, teachers are encouraged to make use of IT to enhance their instruction, innovate new instructional methods, and benefit from high quality educational resources by practicing new methods such as Flipped Classroom and blended instruction. Finally, this official document also calls for HEIs to develop open online courses that are in line with their respective expertise, set down instructional quality evaluation criteria and credit recognition rules for open online courses, as well as incorporate online courses into the curriculum and syllabus. Co-construction of educational resources and platforms for OER is also encouraged.

In 2018, MOE issued its Action Plan for Educational Digitalization 2.0 (hereafter simply, Educational Digitalization 2.0) (MOE, 2018b). Educational Digitalization 2.0 sits under the Outline (Central Committee of the Communist Party of China & State Council, 2010), MOE's Ten-Year Development Plan (MOE, 2012a), its 13th Five-Year Plan (MOE, 2016) and the National 13th Five-Year Plan (State Council, 2017). The 19th National Congress of the Communist Party of China (CPC), which was held between 18 and 24 October, 2017, set new goals for all sectors of China, including (higher) education.

Educational Digitalization 2.0 can be regarded as an updated version of previous digitalization plans in order to better respond to the spirit of the 19th CPC National Congress.

The fundamental intention of Educational Digitalization 2.0 is that by 2022 all teachers will teach via digital means; all students will learn via digital means; all schools will have digital campuses; digitalization application and digital literacy of teachers and students will reach a higher level; and an 'Internet Plus' education platform will be built (MOE, 2018b). Of particular relevance to HEIs are the improvement of MOOC provision and the collaboration of HEIs and other social sectors in providing top quality MOOCs. 3,000 State-benchmarking Open Online Courses, 7,000 national-level and 10,000 provincial-level higher education top quality courses, both online and offline, will be developed as 'model courses' setting examples of how IT can be integrated into education. Guidelines on digital campus construction for schools at all levels, including HEIs, will be formulated and put into use. Capacity building for teachers, including HEI teachers, is also placed on the agenda. Compared with earlier digitalization plans, Educational Digitalization 2.0 is characterized by application of cutting-edge technologies such as AI, big data, blockchain technology, and smart devices. Digital transformation is one of the 10 strategic priorities of China's Education Modernization 2035 Initiative and one of the 10 key development tasks of the corresponding Five-year Implementation Plan for Speeding up Education Modernization (2018-2022), both recently issued by the Central Committee of the Communist Party of China and the State Council (2019 a, 2019 b).

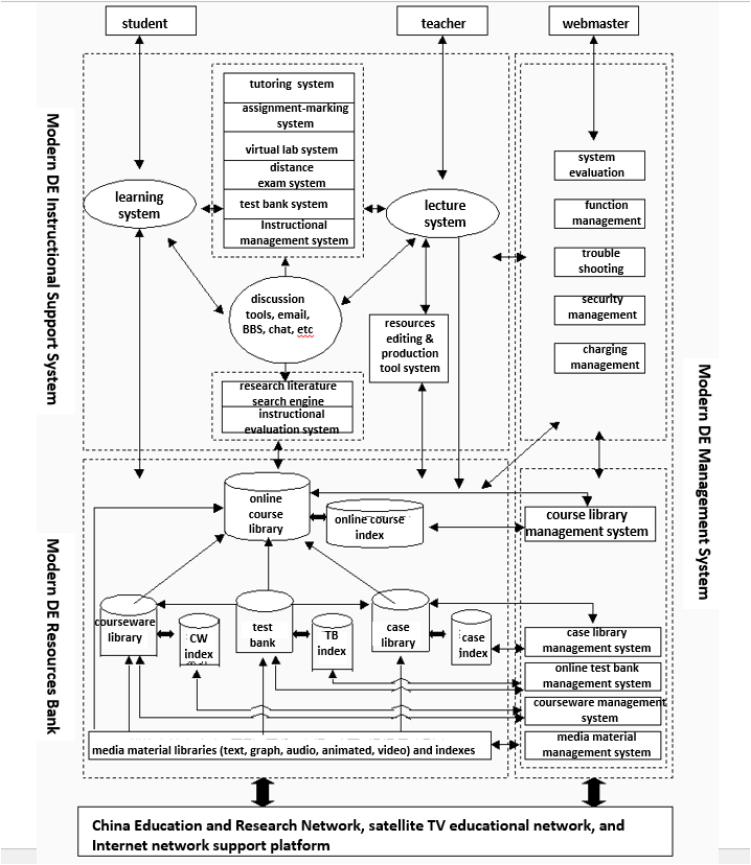
Higher education in China is a highly centralized system although according to the Education Law (The National People's Congress of the People's Republic of China, 2015) and the Higher Education Law (The National People's Congress of the People's Republic of China, 1998) the Central Government delegates some administration and management responsibilities of HEIs to provincial governments. Given the Chinese social system and this centralized feature of (higher) education, the broader policy environment plays a key role in influencing the digital transformation of the country's higher education. An in-depth analysis of the above favorable government policies show that digital transformation in the (higher) education sector has always been considered as some kind of national strategy. Hence, funding and human resources can be guaranteed and relevant barriers can be cleared away more effectively. For example, the last section of MOE's Educational Digitalization 2.0 describes five measures to ensure the successful implementation of this plan (MOE, 2018). The first measure is to strengthen leadership and coordination. China is a geographically vast country with radical differences in different regions, hence the urgent need for strong leadership and coordination. Educational digitalization is listed as an evaluation index of local educational development. The second measure is to innovate new ways of investment in educational digitalization, diversifying sources of financial input. The third measure is to pilot educational digitalization on a small scale and use lessons learnt from these pilot projects to train teachers, managers and administrators. MOE also urges local authorities to create a favorable atmosphere for this transformation and change educators' traditional mindset using both traditional and new media. The fourth measure is to continue cooperation with international organizations and institutions such as UNESCO and to be actively involved in international initiatives of educational digitalization, exchanging experience with international counterparts and learning from each other. The last measure is to assume accountability for the security of cyber space. Chief administrators of educational institutions are held accountable for cyber security and appropriate mechanisms are to be put in place. It is of paramount importance that the Central Government pledges its support to digital transformation. Otherwise, educational institutions would have to struggle to move on with a less promising vision ahead.

4.2 Association and national standards

In 1999, MOE decided to establish the Modern Distance Education Resources Committee (MDERC) and its Expert Panel with the aim to drive the construction of modern distance education resources and assure their quality (MOE, 1999b). The tasks set for this committee included formulating principles and policies for developing modern distance education resources, making resource development plans, coordinating the construction of all kinds of educational resources at all levels, and formulating technological standards.

Figure 1

Modern Distance Education Resources Construction Architecture (MDERC, 2000).



In May, 2000, MDERC issued Technical Specifications for Modern Distance Education Resources Construction (TSMDERC) (trial version) (MDERC, 2000). As is clearly stated in the Preface, this standard focuses on the guidelines for resource developers, production requirements, and functions of the management system, rather than on the data structure of the software system. Parts of the specifications draw on Learning Object Metadata (LOM) model by IEEE LTSC (Learning Technology Standards Committee). Educational resources as referred to in this document include media material library, test bank, case library, courseware library and online courses. Its educational resources development architecture covers an instructional support system and a management system (see Figure 1).

But TSMDERC is not mandatory. Nor is it a national standard in the proper sense of the term. Rather, it is an association standard. MOE's Educational Digitalization Technology Standard Committee (EDTSC) came up with a draft version of Technical Specifications for Educational Resource Construction Information Model CELTS-41.1 CD1.0 in December, 2002, which drew on TSMDERC as well as LOM by IEEE LTSC but never went official (EDTSC, 2002; Q. Li, personal communication, January 3, 2019).

Similar to TSMDERC is Technical Specifications for State-benchmarking Shared Courses Construction (TSSSCC) issued by MOE (2012b). Educational resources as referred to in TSSSCC include basic resources (course profile, syllabus, calendar, lesson plan or presentation slide, key content, assignment, reading list and video lecture) and extended resources (for example, case library, assorted lecture library, multiple-media resources library, discipline-specific knowledge retrieval system, demonstration/virtual/simulation training system, test bank system, assignment system, online self-testing or online examination system, tools for learning, teaching and discussion, as well as online courses based on multiple media). In terms of basic resources, TSSSCC covers the structure, format and technical specifications, and metadata specifications of a basic resource. For example, the metadata of a resource should include Title, Author, AuthorOrg, Copyright, Level, Readers, Subject01, Subject02, ResourceType, MediaType, Keywords, Abstract, CourseTitle, Language and Note (MOE, 2012b). As for extended resources, TSSSCC also creates some

technical requirements. The relationship between these association standards and international e-learning standards and specifications is demonstrated in Figure 2 (Lu & Wei, 2005).

Figure 2

Cross-references of educational resource standards between China and other countries

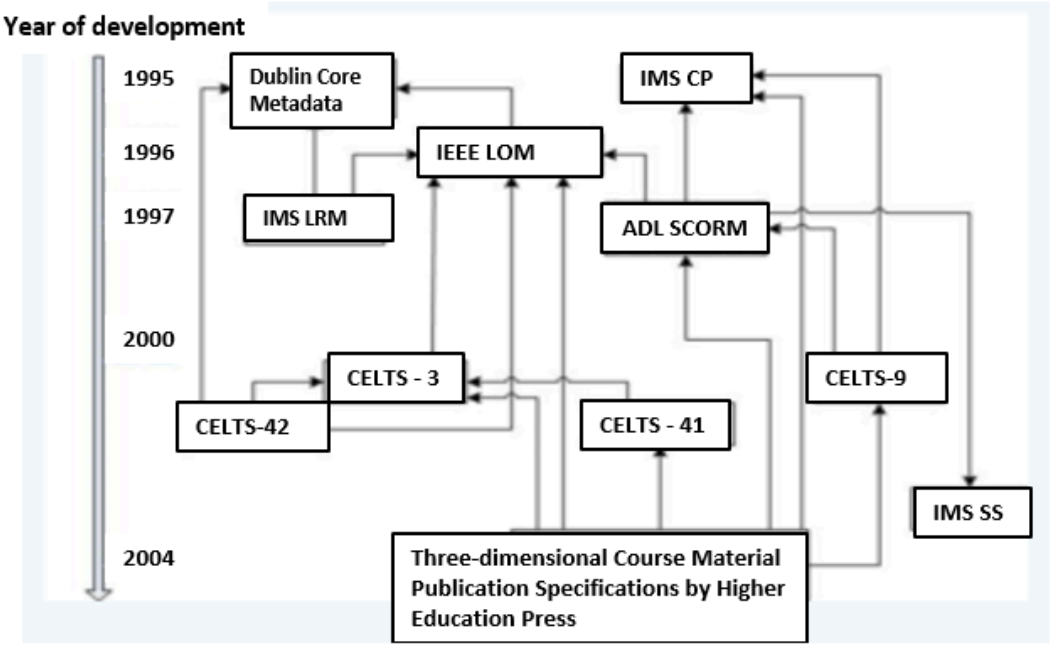


Figure 2: Cross-references of educational resource standards between China and other countries

(Note: CELTS-3 Learning Object Metadata (LOM) Specifications; CELTS-9 Content Packing Specifications; CELTS-41 Technical Specifications for Educational Resource Construction; CELTS-41 Metadata Application Specifications for K-12 Educational Resource)

In addition to these association standards, there are also national standards in relation to educational digitalization in China. Chinese E-Learning Technology Standardization Committee (CELTSC) has developed dozens of national standards ranging from general guidelines to learning resource, learner, learning environment, education management information, multimedia instruction environment, virtual experiment, learning tool as well as e-textbook and e-schoolbag. [4] Standards concerning learning resources include

- GB/T 36347-2018 Information technology - Learning, education and training - Common cartridge profile for learning resources
- GB/T 36350-2018 Information technology - Learning, education and training - Semantic description of digital learning resources
- GB/T 28825-2012 Information technology - Learning, education and training - Classification and codes of learning resource
- GB/T 29807-2013 Information technology - Learning, education and training -XML binding specification for learning object metadata
- GB/T 29809-2013 Information technology - Learning, education and training -Content packaging XML binding
- GB/T 29802-2013 Information technology - Learning, education and training - An information model for test and question
- GB/T 30265-2013 Information technology - Learning, education and training -Learning design information model
- GB/T 29810-2013 Information technology - Learning, education and training - Test and question information model XML binding specification
- GB/T 26222-2010 Information technology - Learning, education and training -Content packaging
- GB/T 36437-2018 Information technology - Learning, education and training - Simple sequencing of courses
- GB/T 21365-2008 Information technology - Learning, education and training - Learning object metadata
- GB/T 36642-2018 Information technology - Learning, education and training -Online courses [5]

These national standards were developed by researchers from universities, research institutes and/or the corporate sector under the leadership and coordination of CELTSC. For example, GB/T 36642-2018 Information technology - Learning, education and training - Online courses was the result of joint efforts by 39 researchers from six universities (Tsinghua University, East Chia Normal University, Shanghai Jiao Tong University, Beijing Normal University, Capital Normal University and Shenzhen University), China Electronics Standardization Institute, and four enterprises. The leading researcher, Professor Li Zheng from Tsinghua University, explained the purpose of this standard in an interview which we believe is applicable to all the above standards (Xin, 2018). According to Professor Zheng, on the one hand, the implementation of GB/T 36642-2018 can break down technical barriers between different platforms and different educational institutions in terms of educational resource sharing; on the other hand, technical standardization is conducive to equal access to education. Moreover, this standard can also facilitate cross-platform comparison and evaluation of online courses and define the basic support functions of an online course platform. In other words, these standards are designed to facilitate development and sharing of digital educational resources so as to optimize their use, reducing repetitive investments and increasing cost-effectiveness.

Like the above mentioned association standards, these national standards are not mandatory either. Therefore, the development of standards can benefit from the involvement of the corporate sector which is a major driving force behind the application of standards in practice, according to Zheng (Xin, 2018). For example, Beijing Muhua Information Technology Co., LTD., which develops and operates the Tsinghua University-funded Xuetangx.com, 'the world's first Chinese MOOC platform, authorized to operate edX courses in the Chinese mainland' [6], is a partner institution of GB/T 36642-2018 Information technology - Learning, education and training - Online courses. The other corporate co-developers of this standard are MOE's Higher Education Press, IFLYTEK Co., LTD (iFLYTEK) (a software enterprise) and UOOC.ONLINE. Beijing Muhua Information Technology Co., LTD has committed to taking the lead in applying this standard to online courses offered at Xuetangx.com.

Up to December, 2018, CELTSC has developed 46 national standards and 12 association standards on educational digitalization (Xin, 2018).

4.3 Driving forces behind digital transformation

Digital transformation at the macro level is driven by the determination of the Central Government to modernize Chinese education, enhance (higher) educational quality, and achieve educational equality by investing in digital infrastructure construction, capacity building, technology-enhanced learning and teaching, and developing and sharing of high quality educational resources. It is a national strategic mission. The determination of the State to pursue educational

digitalization has remained steadfast in the past decades, as is evidenced by the Education Law (The National People's Congress of the People's Republic of China, 1995) and the Higher Education Law (The National People's Congress of the People's Republic of China, 1998) as well as numerous national strategic plans, including several which were dedicated to educational digitalization (see Current state of overall digital transformation under the Digital Transformation of the Chinese Higher Education System section and Policy-making under the Digital Transformation at the Macro Level section).

To deliver the goals of educational digitalization, measures were taken by the Central Government and MOE to ensure the successful implementation of relevant policies, including providing funding, incentive or subsidy, strengthening leadership and coordination, creating a favorable innovative atmosphere, and promoting international cooperation (see MOE, 1999a; MOE, 2012a; MOE, 2018). For example, in 2011, MOE issued a series of suggestions on the development of State-benchmarking Open Courses, which included awarding of honorable titles and provision of funding in the form of subsidy to courses which were well received after being made available online (MOE, 2011). A similar measure was taken by MOE in 2012 to encourage the construction of State-benchmarking Shared Courses (MOE, 2012c).

From 2012 to 2016, eight reviews were conducted of video open courses and altogether 922 resources were awarded the titled of Top-quality Video Open Course with financial support given to the providing universities.[7] From 2013 to 2016, MOE approved 2911 projects on development of State-benchmarking Shared Courses, each of which was granted a subsidy of RMB 100,000 yuan as development fee.[8] Of these courses, 2866 were awarded the title of State-benchmarking Shared Course in 2016[9] and 2017[10] respectively. In 2017 and 2018, MOE awarded 1291 online courses the title of State-benchmarking Open Online Course.[11]

MOE is pushing forward the recognition of MOOC credits, according to the head of the Higher Education Section of MOE (Wu, 2018). So far, over 6 million higher education students have obtained credits by learning MOOCs. MOOCs are believed to be able to break the boundary of traditional education and tear down the walls of brick-and-mortar educational institutions, hence disrupting campus-based classroom teaching and transforming education in a radical manner. Intensive integration of IT and education can afford Chinese HEIs great opportunities to overtake their counterparts in advanced countries (Wu, 2018). This is a very strong motivating force behind the State's strategy of educational digitalization. China has reiterated, again and again, the determination to carry out digital transformation in its (higher) education sector.

4.4 OER Infrastructure: National platforms

In 1994, funded by the Central Government and directly under the supervision of MOE, six elite universities in China 'set up the first education network using transmission control protocol/Internet protocol "China Education and Research Network" (CERNET)' (Zhao & Jiang, 2010, p. 574). CERNET is now accessible all over China with universities and colleges, primary and secondary schools and research institutes as its users, ensuring 'safe and high-speed information exchange among educational institutions both at home and abroad' and ushering in the era of e-campus to Chinese HEIs (Zhao & Jiang, 2010, p. 575). Given its role, CERNET may well be regarded as the meta-infrastructure of digital transformation for Chinese HEIs.

Openness and sharing have been advocated and practiced ever since the initial stage of educational digitalization in China. For example, when MOE initiated a project to develop high quality course resources in 2003 (MOE, 2003), courses which had been awarded the title of 'State-benchmarking Course' were curated on a website exclusively for the purpose (http://www.jingpinke.com), freely available to the general public for five years (Wang & Håklev, 2012). This platform, operated by Higher Education Electronic Audio-Video Press affiliated to MOE, has been restructured and becomes a repository of educational resources both at the undergraduate and junior college/vocational higher education levels, storing a total of 1,299,268 resources in a variety of subjects, including history, management, education, science, engineering, medical science, bio-chemistry, pharmacy, civil engineering, electronic information, textile, food, health care, tourism, arts, design and media.[12] It also puts a comprehensive incentive scheme in place to encourage users to share resources.[13]

In 2011, MOE launched another initiative to develop top quality open courses, with more emphasis on the use of information and communication technology (ICT). Open courses are comprised of two types: top quality video open courses and top quality shared courses. Up to January 3rd, 2019, 992 video open courses and 2884 shared courses are curated on iCourse platform, operated by Higher Education Press affiliated to MOE, which is also home to MOOCs provided by Chinese universities and establishes a space called 'School Cloud' to offer customized service to partner HEIs in relation to the development, management and application of open online courses.

In 2012, the National E-learning Resources Center (NERC) was established and is operated by the Open University of China (OUC) (formerly known as China Central Radio and Television University [RTVU], China's only dedicated distance education institution at the national level governing a national network of RTVUs). Like its developer and operator OUC, NERC has established a national network. So far, NERC has set up 255 branches nationwide with 51,000 courses available. NERC was a deliverable of the HEI undergraduate teaching quality and teaching reform project (MOE & MOF, 2007). One of its sub-projects was the Construction of Online Education Digital Learning Resources Center, undertaken by OUC in 2008. It took OUC five years to construct NERC.

In 2014, NetEase, an Internet technology company and MOE's Higher Education Press started an online education platform - Chinese University MOOC (CUM), curating State-benchmarking Open Courses and providing MOOCs developed by Chinese universities. This is a very popular MOOC platform in China with relatively more information available online. Therefore, the rest of this section will focus on describing CUM.

Like other large MOOC platforms in China, CUM is a centralized platform. Its course development guidelines cover course development specifications and requirements as well as instructions on operating the platform (iCourse Center, 2014). Part I Specifications and Requirements is subdivided into teaching content and course structure. Specifications are laid down on teaching content in terms of video lecture production (length, resolution, format and size, audio quality, image layout, subtitle, and interaction design), teaching materials (types and format), quiz (self-assessment and auto marking), discussion, unit test and assignment, and examination as well as on course structure in terms of duration, two levels of heading and corresponding content, and modes of content delivery. According to the latest statistics (National HEI Teaching Research Center & iCourse Center, 2018), up to December 31st, 2017, CUM provided nearly 2,000 MOOCs, including MOOCs labeled as Chinese University MOOCs (that is, using its own brand name), Chinese Advanced Placement (CAP) MOOCs, vocational education MOOCs, and general open online courses, with engineering, science, life science, economics and management, and computing topping the list of the most popular subjects. Over 10 million learners registered with CUM, with an average enrollment of four MOOCs per person (40,370,000 course enrolments by December 31st, 2017). MOE awarded 490 MOOCs as State-benchmarking Open Online Course for the first time in 2017 (MOE, 2017b) with 65.7% of them (322 MOOCs) from CUM. It is worth mentioning that CUM also offers space for Small Private Online Courses (SPOCs) for partner HEI students. Unfortunately, many OER platforms do not have in place specific evaluation mechanisms for educational resources uploaded, hence failing to assure their quality and compromising users' experience (Dong, Du, Xu, Zheng, & Hu, 2017).

Although CUM is a joint venture by NetEase from the corporate sector and MOE's Higher Education Press, it is non-profit in nature. As a centralized platform, providers of MOOCs need to design and develop their course resources in accordance with CUM's guidelines (iCourse Center, 2014) and upload all the resources to the platform. All the learning activities, assessments and learner support go on through the platform. Learners who have managed to complete and pass a course will be issued an electronic certificate of accomplishment free of charge but can pay to obtain a paper certificate if they so wish (Y. Han, personal communication, January 3, 2019; Hu, Yu & Chen, 2015).

5. Digital Transformation at the Meso Level

5.1 Alliance and subject-based partnerships

Legal and policy foundations

As mentioned above, China is a geographically vast country with blaring disparities in different parts in terms of economic and social developments, including distribution of educational resources. In the light of this reality, cooperation between HEIs and cooperation between HEIs and research institutes, the business sectors and/or other institutions are encouraged in the Higher Education Law so that parties concerned can give full play to their respective advantages and put educational resources to more effective use (The National People's Congress of the People's Republic of China, 1998). Chinese HEIs' awareness of the necessity and benefits of joint development and sharing of educational resources can be traced back to 2003 when they formed CORE to coordinate cooperation in developing open educational resources between HEIs, both at home and abroad.

Given that an effective mechanism to boost co-development and sharing of high quality digital educational resources has yet be to established, as pointed out in the Ten-Year Development Plan (MOE, 2012a), one of the principles and guidelines proposed by MOE in this document is application-driven joint development and sharing of high quality digital educational resources. To achieve this objective, MOE stresses the need to establish an open cooperation mechanism to facilitate government-led, multi-party-involved joint development and sharing (MOE, 2012a). Cooperation in developing sharable digital educational resources is a recurrent theme in this plan. For example, it highlights the importance of joint development and sharing of high quality digital educational resources, comprehensive in-depth integration of IT and education, and promotion of innovations in instruction and administration to ensure educational justice, enhance educational quality and build a learning society. To this end, MOE aims to push forward the formulation of technical specifications and application guidelines for digital educational resources and to develop corresponding review and evaluation index systems (MOE, 2012a). Of particular relevance to the higher education sector are (1) to establish a mechanism for co-developing and sharing higher education resources in order that HEIs can benefit from each other's high quality courses and library resources as well as digital laboratory platforms in instructional practice; (2) to encourage the co-development and sharing of high quality instructional and research resources between East China and West China HEIs; and (3) to support students' inter-institutional selection of online courses and the joint development of these courses (MOE, 2012a).

Cooperation in developing and sharing digital educational resources is also emphasized in MOE's 13th Five-Year Plan (MOE, 2016a), which calls for the establishment of online education alliances and university-enterprise alliances for this purpose. In the same year (2016), MOE announced its Action Scheme for Joint Development of Education in the One Belt and One Road Countries (MOE, 2016b). Cooperation in educational resource development and sharing is one of the recurrent themes in this scheme.

Co-construction of educational resources and platforms for OER is also encouraged in the National 13th Five-Year Plan (State Council, 2017), which points out that co-development and sharing of high quality educational resources can accelerate transformation in educational provision models and learning styles.

In 2018, MOE announced its Educational Digitalization 2.0 (MOE, 2018b), with the establishment of an integrated 'Internet Plus Education' mega-platform as one of its key goals. This mega-platform is intended to integrate public educational resource platforms and support systems of various sorts and at various levels with the aim of building a public system of national digital educational resources. One of the proposed actions is cooperation between HEIs and other social sectors in developing top quality MOOCs (MOE, 2018b).

A preliminary analysis of the 13th Five-Year (2016-2020) Development Plans of 75 universities which are directly under MOE (MOE, n. d.) also shows that some HEIs realize the value-added benefits of cooperation with their counterparts in developing and sharing (digital) educational resources, especially MOOCs and other online course materials.

Given such steadfast policy support in the broader social and political context, it is no surprise that the number of partnerships in this field has mushroomed, in particular in the most recent years. Nevertheless, despite consistent support from the Central Government, cooperation in this field needs strengthening. HEIs, professional associations, and the business sector should be more actively involved in joint development of educational resources and corresponding resource-sharing platforms (Dong, et al., 2017). In other words, a more effective mechanism is needed to ensure the sustainability of these joint efforts, according to Dong et al. (2017). Cooperation in educational resource development and sharing is also influenced by relevant factors. For example, in terms of policy support, recognition and transfer of credits acquired from learning open or sharable educational resources, appraisal of the quality of these educational resources, accreditation of the operation of their platforms, and protection of copyrights, among other things, should be institutionalized (Hu, et al., 2015).

Examples of regional and/or alliance partnerships

CNMOOC [14]

CNMOOC is the official website of Top Chinese University MOOCs Alliance , launched by Shanghai Jiao Tong University in April, 2014, originally aiming to promote mutual recognition of MOOC credits among the 19 HEIs in southwest district of Shanghai and to enable students to study a second degree in the partner universities (Wu, 2015). CNMOOC is an open, non-profit, cooperative educational platform, serving not only the partner institutions but also the general public. [15] It now has 101 partner institutions, including 92 universities and nine other institutions (CNMOOC, n. d.). Up to January 13, 2019, in addition to a micro specialization, it has 957 courses offered on the platform, taught in Chinese (842 courses) and English (115 courses), in the subject areas of philosophy, economics, law, education, literature, history, natural science, engineering, agriculture, medicine, military science, management science, and arts. [16]

University Open Online Courses (UOOC)

UOOC, launched by Shenzhen University in South China, is the website of the UOOC Alliance of Local Universities. As mentioned earlier, of the nearly 3,000 colleges and universities in China, except the 75 universities affiliated to MOE and about 30 others affiliated to other ministries of the Central Government, the rest of these HEIs are often referred to as 'local universities'. UOOC is the first alliance of local universities in China, guided by the principles of joint creation, joint construction, and joint use. It started with 56 member institutions and now this number has doubled, reaching 125 with a student population of three million. About half of the member institutions have provided 309 MOOCs to the platform with an enrollment of half a million students. UOOC has also established relevant rules and regulations to ensure its successful and effective operation, including Charter of UOOC Alliance, Regulations on UOOC Alliance Construction and Operation, and Regulations on Quality Assurance and Mutual Recognition of Credits from UOOC MOOCs. [17] Training sessions both for academics and platform administrators are also held regularly (UOOC, n. d.). But it should be noted that only students from partner universities can register for course study (Wu, 2015). In this sense, it may not be as open as 'open' is commonly interpreted.

Course Sharing Alliance of West and East China HEIs (WEMOOC)

WEMOOC was started by Chongqing University in West China in April, 2013 with 28 top Chinese universities as its first members. [18] Later that year, Peking University was elected as the chair of WEMOOC [19]. WEMOOC now has 132 member institutions [20], aiming to cooperate in developing high quality video online courses, constructing a connected platform for these courses, sharing these resources, and recognizing video online course credits (WEMOOC, 2013a). It also has its Regulations on Course Quality Assurance, which covers course development (types of course content, recommendation procedure, and review of technical specifications and instructional design), management of instructional quality, quality evaluation, and relevant research (WEMOOC, 2013).

In addition to CNMOOC, UOOC and WEMOOC, there are several regional/alliance platforms which are hosted by the CNMOOC provider:

- East China Five-University Courses Sharing Consortium (https://edtechbooks.org/-NiGE) – comprised of five top universities in East China, namely Shanghai Jiao Tong University, Fudan University, Zhejiang University, Nanjing University and University of Science and Technology of China.
- Fujian Open Online Courses Education Alliance (http://www.fooc.org.cn/) – with support from the Department of Education (DOE) of Fujian Province, 42 colleges and universities in the province created this alliance in 2016. Currently, there are 69 courses available online. It now also has 20 member institutions from the corporate sector. [21]
- Jiangsu Alliance of CNMOOC – comprised of 11 top universities in Jiangsu Province with only seven courses provided by Nanjing University. [22]
- Open Quality Courses Shared Learning Center of Heilongjiang Colleges & Universities (CNMOOC)– including 39 colleges and universities in Heilongjiang Province and 16 HEIs outside the province. This is a deliverable of a project led by the provincial government to promote joint development and sharing of open online courses. [23]

Some are hosted on the website of MOE's Higher Education Press:

- Jiangsu HEI Online Course Center – an online instruction platform jointly operated by DOE of Jiangsu Province and iCourse to serve HEIs in the province. Currently, there are 346 undergraduate courses and 133 vocational higher education courses available online. 101 colleges and universities in the province are its members. [24]
- Hebei HEI Courses Online – with 23 member institutions and 112 online courses offered, including MOOCs, open onine courses and SPOCs. [25]
- Shanghai Online Course Center – currently including six top universities located in Shanghai, namely Fudan University, Tongji University, East China Normal University, East China University of Science and Technology, Donghua University, and Shanghai University of Finance & Economics, with 22 MOOCs and six SPOCs available from its member institutions. [26]
- Hubei Online Course Center – offering 156 online courses from 12 HEIs in Hubei Province, including both MOOCs and SPOCs. [27]
- Henan Online Course Center – with 803 online courses, MOOCs, SPOCs, and video open courses available from 26 HEIs in Henan Province. [28]
- Sichuan Online Course Center – having ten HEIs in Sichuan Province as its members, with 189 MOOCs and SPOCs available. [29]
- Guangxi Online Course Center – currently only involving four universities in Guangxi Province which provide nine courses. [30]
- University Open Online Course Alliance of Guangdong-Hong Kong-Macau Bay Area – started by eleven universities from Guangdong Province and established on November 24, 2018. Its members include 52 HEIs, 13 of which are from Hong Kong and Macau. There are now 398 online courses offered. DOE of Guangdong Province promises to provide special funds every year to support the development of online courses (Department of Education of Guangdong Province, 2018). Unfortunately, an Internet search for its website returns zero result.

And some others are hosted by a digital technology company on its course platform – Zhihuishu (Wisdom Tree):

- Open Quality Courses Shared Learning Center of Heilongjiang Colleges & Universities (Zhihuishu – in addition to 93 courses provided by its members - 38 HEIs in Heilongjiang Province, it also introduces 389 courses from HEIs outside the province to the students of its member institutions. [31]
- Shanghai Course Center – started by the Commission of Education of Shanghai, it comprises 30 HEIs from this municipality directly under the Central Government, currently providing 28 courses. [32]
- Open Online Course Alliance of Guangdong Undergraduate Universities – with 66 HEIs from Guangdong Province joining the alliance. 357 courses are available but only 10 are provided by its alliance members. [33]
- The Platform of Higher Learning Online Open Courses in Shandong – led by DOE of Shandong Province, 61 HEIs from Shandong Province form an online course alliance to share high quality educational resources. So far, 39 HEIs have shared 91 open online courses and 379 courses from HEIs outside the alliance are introduced to the platform. [34]
- Hainan HEI Course Sharing Alliance – led by DOE of Hainan Province, 18 colleges and universities in Hainan Province formed this alliance in 2016. [35] Currently, there are 35 online courses shared online. [36]
- Jilin HEI Course Sharing Alliance – comprised of 53 HEIs from Jilin Province, the alliance has 84 courses on offer. [37]

Examples of subject-based partnerships

CNMOOC, iCourse and Zhihuishu (Wisdom Tree) also host some subject-based platforms.

China HEI Computer Education MOOC Alliance (http://www.cmooc.cn/#jgsz)

In December, 2014, the Alliance was created with coordination and organization from MOE Instruction Steering Committee of HEI Computer Science Programs, MOE Instruction Steering Committee of HEI Software Engineering Programs, and MOE HEI Computer Curriculum Steering Committee. [38] It is a MOOC-based computer education community with 214 colleges and universities from 31 provincial-level administrative divisions (including three member institutions from the Army). [39] Currently, it offers 37 MOOCs and 23 SPOCs. [40]

The Pilot Software Engineering Schools Association

The Association was established in November, 2014 with approval from MOE's Department of Higher Education, joined by software engineering schools from 37 colleges and universities around the country. [41] 38 courses are on offer. [42]

Library and Library Science Online Course Alliance

Created by MOE Steering Committee of HEI Library and Information Science, MOE Instruction Steering Committee of HEI Library Science, and iCourse in January, 2017 [43], the Alliance has 32 university libraries and 33 schools of management, of information management, and of computer science and IT as well as departments of library information and archive sciences from HEIs around the country. [44]

China HEI Mathematical Modeling Course Center

Jointly constructed by the organizing committee of Contemporary Undergraduate Mathematical Contest in Modeling (CUMCM) and Higher Education Press, the Center provides video open courses, resource sharing courses, MOOCs and SPOCs on mathematical modeling.

Huaxia Yuefu Music Online Course Union

Formed by the National Research Center of HEI Instruction, Music Education Society under the Chinese Musicians Association, and iCourse, the Union aims to engage Chinese HEIs and other institutions in developing open online music courses. 10 music courses are available online now. [45]

Foreign Trade Vocational Education MOOC Alliance

Established in May, 2016 by a dozen of vocational secondary and higher education institutions in this sector, [46] it now has 15 member institutions but only two courses are available which are developed by its members. [47]

Traditional Chinese Medicine HEI Course Sharing Alliance

Started by Shanghai University of Traditional Chinese Medicine together with 16 other HEIs in the sector in May 2015, [48] it is dedicated to developing and sharing high quality online courses on traditional Chinese medicine. It now has 19 traditional Chinese medicine universities as its members. [49]

People's Medical Publishing House MOOCs

This is the platform of Chinese Medical Education MOOC Alliance started by People's Medical Publishing House together with 53 medical universities as well as Chinese Medical Association and Chinese Medical Doctor Association in 2014. Nearly all medical colleges and universities in China (about 200 HEIs) have now joined the Alliance. [50] Currently, the platform offers 50 MOOCs with another 68 in production and 1866 open courses. It is worth mentioning that some MOOCs and open courses target secondary medical education and medical professional development. [51] 30 universities use their cloud service for SPOC delivery.

China MOOCs for Foreign Studies (CMFS)

As stated on its website,

> *Initiated by Beijing Foreign Studies University, China MOOCs for Foreign Studies (hereafter referred to as CMFS) was founded on December 23, 2017 in Beijing, China. It is a nationwide nonprofit organization formed by foreign studies universities and colleges endeavoring to promote MOOCs of foreign languages and cultures in China. At present, CMFS has 136 member universities and colleges.*

UMOOCs is the official website of the CMFS' open courses. As an online course platform for universities and colleges, it offers high-quality foreign studies courses online from universities both at home and abroad, and provides course certificates from these universities. The platform enables CMFS members to share their courses and promote the innovative language teaching methodologies and models in China. On UMOOCs, universities can build their own courses, share courses with other universities, and achieve credit recognition. [52]

Quality assurance of regional/alliance and subject-based partnerships

As is obvious from the above examples, whether regional, alliance-affiliated or subject-based, partnerships in constructing and sharing digital educational resources develop at different rates. Some are well developed while others are almost in name only without substantial input and significant engagement from its member institutions.

All alliances/platforms have their quality assurance mechanisms. For example, UOOC members have to follow UOOC Rules for MOOC Production, which covers identification of courses to be developed as MOOCs, course production, course uploading, organization of instruction, and quality assurance mechanism with an attachment detailing technical specifications for creating a video lecture (UOOC Alliance of Local Universities, n. d.). As mentioned earlier, it also puts in place Regulations on UOOC Alliance Construction and Operation, and Regulations on Quality Assurance and Mutual Recognition of Credits from UOOC MOOCs. WEMOOC also puts Regulations on Course Quality Assurance in place to guide course development, management of instructional quality, quality evaluation, and research (WEMOOC, 2013).

The platform of the Shandong alliance - Platform of Higher Learning Online Open Courses in Shandong has to follow rules set down by DOE of Shandong Province (2017) which stipulate in detail measures to ensure the quality of open online course development and sharing. China HEI Computer Education MOOC Alliance (2015) issued its Guidelines on Course Development, including the approval procedure of a course, basic requirements of course production, and support from the alliance. It has three committees in relation to quality assurance, namely Training Committee, Quality Specification Committee and Course Development Committee, each of which has to obey their respective rules and regulations. [53] Shanghai Course Center formulated a series of standards to be followed by its course providers. For example, its Standards for Live-broadcast, Interactive, and Recording Lecture Halls includes very specific processes and technical specifications for the construction of such a lecture hall and its use. [54] It is the same case with its Standards for Sharable Course Video Lecture [55] and How to Watch Live-broadcast Lectures in the Lecture Hall. [56] Moreover, its Instructor Manual provides detailed information about how to prepare instructional materials, how to carry out

instructional activities, and how to acquire IT support, among other things. [57] Jilin HEI Course Sharing Alliance has a dedicated section on quality assurance in terms of course development, course delivery and platform operation in its Charter, [58] although relevant rules, regulations, and specifications are not openly available. This is also exactly the case with the Charter of Traditional Chinese Medicine HEI Course Sharing Alliance. [59]

Hainan HEI Course Sharing Alliance (2018) issued its Quality Standards for and Regulations on Sharable Course Development. In addition to requirements for course components, its quality standards section also lays down rules for the design both of online course (instruction) and face-to-face activities (if a course is designed to be delivered in a blended mode) as well as the design for course assessment and course evaluation. Procedures of application for sharable course development and selection of courses to be shared among alliance members are formulated in this document which also specifies types of teacher professional development opportunities to be offered.

5.2 HEI digitalization strategies

As mentioned earlier, there are nearly 3,000 colleges and universities in China where Higher education is a highly centralized sector. Given that educational digitalization is a national strategy, we may as well assume that all HEIs have their own digitalization plans or measures accordingly to be in line with the national digitalization strategy. Nevertheless, it would be impossible to look at the digitalization strategies of all these HEIs. Therefore, we will focus on the 75 universities which are directly under MOE. To be specific, we will examine their 13th Five-Year (2016-2020) Development Plans, all of which are available on the MOE website (MOE, n. d.), to see what role digitalization is intended to play in the overall development of these universities.

As pointed out earlier, of the 75 universities, 57 mention their achievements in terms of digitalization in the 12th Five-Year period (2011-2015); 48 outline their digitalization strategies for the 13th Five-Year period in an explicit manner, whether in a section or in a subsection, or even in an independent paragraph with a corresponding title; and the remaining 27 HEIs delineate their specific digitalization transformation targets in statements about instruction, learner support, administration and management as well as the university's for-profit businesses. In this subsection, we will review and discuss the institutional digitalization strategies in more detail.

Institutional digitalization strategies

All the 48 universities whose 13th Five-Year (2016-2020) Development Plans include institutional digitalization strategies focus on the enhancement of efficiency and effectiveness in administration, management and support as the goal of digitalization transformation. For example, all of them mention strengthening the construction of digital infrastructure, including online platforms, cyber security, resource-sharing environment, data-sharing facilities, mobility, and so on. 35 of them plan to make the most of digital technology to improve decision-making, routine management and student services. 20 of them mention the goal of constructing or upgrading their digital libraries to better support research as well as learning and teaching. Staff capacity building, inter-university collaboration in resource sharing and instruction, as well as credit recognition and transfer are also specifically mentioned in the digitalization strategies of some universities.

In sharp contrast to the overwhelming importance attached to administration, management and support services, innovation in instructional models and in modes of learning are specifically mentioned in the institutional digitalization strategies of 18 universities although as many as 74 universities specify their targets for instructional innovation elsewhere in their development plans.

Specific intended digitalization targets

Take Renmin University of China (RUC) for example. RUC's digitalization strategy is comprised of three parts (RUC, 2016, pp.70-72). The first aspect is IT-driven transformation of and innovation in instructional and research models. When it comes to instructional models, the targets include: (1) transforming the existing digital environment into a smart one; (2) enriching and improving high quality digital educational resources and software tools; (3) adopting a variety of instructional methods, for example, heuristic, inquiry-based, discussion, and participatory, and encouraging development assessment to establish a new instructional model embodying learner-centeredness; (4) encouraging

students to carry out active learning, autonomous learning and cooperative learning using IT such as Cloud Classroom; (5) enabling students to cultivate the habits of taking advantage of IT in their learning so that they can develop personal interests and enhance learning quality; and (6) strengthening student's abilities to raise, analyze and solve problems in an online environment. As for innovation in the way research is conducted, the targets include: (1) establishing a scholarship resources center; (2) constructing an IT-based platform for research collaboration and communication; and (3) developing a high performance computing platform to support cutting-edge research.

The second aspect is the construction of three integrated platforms for students, faculty and administrators/managers respectively on the foundation of the university's OA system. The student platform is to support students from enrollment, registration, orientation, course study, graduation, employment guidance to alumni membership. The faculty platform is to have multi-functions, namely, as an online course platform for teachers to prepare their lectures, carry out instructional activities, mark assignments, and organize examinations and enter their scores; as a research platform to provide research resources and support; as a management platform for faculty recruitment, appointment and promotion, remuneration and reimbursement, among other things; and as an administrative platform to improve administrative efficiency by optimizing digitalized management in such areas as finance, university assets and logistics with the aim of shifting from a traditional, hierarchical approach to a flatter management structure.

The third aspect is the establishment of an agile, smart, open, and sharable digital environment, including user center, data center, application center, developer center, high-speed campus network and multi-media facilities. It is of significant relevance to this chapter that this environment is also intended to (1) explore IT-based approaches to inter-university cooperation; (2) develop an inter-university, joint accreditation system with the aim of integrated management of inter-university users; and (3) increasingly share library resources, courseware, and online courses among universities, innovate inter-university online instruction models, and explore mechanisms for credit accreditation, recognition and transfer among universities.

Elsewhere in RUC's 13th Five-Year (2016-2020) Development Plan, in its Goals and Actions section, RUC commits to significantly speeding up the development of digital courses by allocating more money for the purpose and innovating their development and business mechanisms, which is considered as one of the actions to achieve the goal of optimizing undergraduate curriculums (RUC, 2016, p. 23).

In reporting their achievements during the 12th Five-Year period (2011-2015), 33 of the 75 MOE-affiliated universities mention the development of digital educational resources, including MOOCs, SPOCs, video open lectures, state-benchmarking online courses and so on. The number has increased to 55 when it comes to digital educational resource development as intended digitalization targets during the 13th Five-Year period. Many universities even specify the number of digital educational resources to be developed over this period. For example, Table 1 is the development targets of Beijing Normal University (BNU) for digitalization set in its 13th Five-Year (2016-2020) Development Plan (BNU, 2016a, p.13).

Table 1

BNU's intended targets for digitalization over the 13th Five-Year period

Item	Intended number/percentage
Smart classroom (%)	15
Undergraduate MOOCs	75
Postgraduate MOOCs	25
High quality online undergraduate course resources (%)	10
High quality online postgraduate course resources (%)	10
Undergraduate student studying for-credit MOOCs	1 MOOC per person

Both 'joint development' and 'sharing' are high-frequency words in these 13th Five-Year (2016-2020) Development Plans, which are set in accordance with a path of innovative, coordinated, green, open and shared development which was proposed at the Fifth Plenary Session of the 18th CPC Central Committee in October, 2015. Therefore, it is nothing unusual that the ideas of joint development and sharing are reflected in the 13th Five-Year (2016-2020) Development Plans of Chinese public universities. Of the 75 MOE-affiliated universities, 66 describe their 'joint development' measures and targets, and 73 set forth their 'sharing' measures and targets. Nevertheless, a content analysis show that only seven universities' joint development efforts are concerning inter-institutional development of digital educational resources and that 26 universities mention inter-institutional sharing of digital educational resources in their 13th Five-Year (2016-2020) Development Plans. The idea of joint development in these documents is more often referred to as cooperation in other aspects such as joint development of Confucius Institutes with universities in other countries, co-construction of laboratories and research centers with foreign or domestic universities or the business sector, joint implementation of practicum and/or internship programs with other social sectors, and so on. As for sharing, as mentioned above, slightly over one-third of the universities have plans to promote inter-institutional sharing of digital educational resources. In the remaining two-thirds of the cases (47 universities) where sharing is not concerning digital educational resources, sharing is more often intra-institutional, rather than inter-institutional.

Institutional governance and support structures

All universities have an office of digitalization management, aka Office of Informatization if translated literally from Chinese, and/or computing/IT/network/educational technology center, by whatever name it is called, in charge of digital transformation affairs. In some universities, these two departments are assigned different responsibilities while in others they are actually two in one. Take Peking University (PKU) for example. PKU has an Office of Informatization to manage institution-wide digitalization processes, including (1) implementing national laws, rules, regulations and policies and formulating the university's policies, regulations and standards in relation to digitalization, (2) making and carrying out institutional plans for digitalization processes, (3) coordinating and managing institutional funds for digital construction, (4) overseeing the construction of digital projects; (5) coordinating related departments and dealing with major issues in relation to the construction, operation and management of digital infrastructure, (6) managing and monitoring the university's website as well as coordinating and ensuring cyber security, (7) monitoring and evaluating the development and situation of the university's digitalization, and collecting relevant statistics, and (8) organizing capacity building of the university's IT professionals as well as cooperation and exchange both with domestic and international digital community.[60] By contrast, PKU's Computing Center 'is a large-scale university-wide comprehensive laboratory…responsible for the construction, development and operation of the university's information infrastructure'.[61] In some universities, their computing/IT centers may play a role in the development of educational resources. Tsinghua University is a case in point.[62]

When it comes to development of digital educational resources, it tends to be a multi-department endeavor. For example, PKU establishes its Instruction Steering Committee for Online Education whose responsibilities include organizing and developing open online courses as well as coordinating the sharing of these resources both intra-institutionally and inter-institutionally. Its Center for Excellence in Teaching and Learning, which is a unit of the Department of Educational Affairs, is to provide professional training and technical support such as video production and editing to their open online course teams, as well as cooperate both intra-institutionally and inter-institutionally in supporting faculty to develop digital educational resources (PKU, 2018). Any individual or team interested in developing digital educational resources will submit an application to the faculty/school/department that they are affiliated to. After a preliminary review and approval from head of the faculty/school/department, their application will be submitted to the Department of Educational Affairs and will be included in the university's overall scheme for educational resource development after another round of review, as stipulated in its Regulations on Implementing MOOCs (PKU, 2014). This document sets down the university's regulations on governance; training, review and approval; implementation and monitoring (from course development to course delivery); guarantee and support (including workload recognition, funding and rewards, and technical support); and intellectual property and related issues.

Individual universities may vary, to some extent, in governance and support structures for digitalization transformation, including educational resource development. Nevertheless, the big picture should be rather similar among public

colleges and universities.

Institutional quality assurance

As mentioned above, there are association and national standards in place for digital educational resource development despite the fact that they are not mandatory unless specifically designated to be applied to a particular project. In addition to these standards, MOE also issued evaluation indicators as criteria for reviewing and awarding honorable titles to high quality educational resources. For example, MOE's (2005) Evaluation Indicators for HEI State-benchmarking Courses include evaluation criteria for six areas: course team, course design and organization, readiness (course material, practical teaching and online teaching environment), means and methods of instruction, instructional effectiveness, and uniqueness and institutional policy support.

Take another example. In addition to Technical Specifications for State-benchmarking Shared Courses Construction (MOE, 2012b), MOE (2013) issued Evaluation Indicators for State-benchmarking Shared Courses (Undergraduate Level), which is used to evaluate the course team, progress made in relation to State-benchmarking Courses and upgrading, course design and development, required course materials (components), extended course materials, intellectual property right protection, and course features and intended outcomes. Despite the fact that rubrics of this kind are for the purpose of evaluation and prize-awarding, individual institutions tend to stick to these criteria in their development of digital educational resources. In this sense, these rubrics are conducive to quality assurance. Also, as pointed out earlier, some platforms, for example, CUM, require that courses to be uploaded should meet their criteria. This can also contribute to quality assurance at the institutional level.

Moreover, as expounded above, university alliances of (digital) educational resources also establish their own quality assurance mechanisms that their member institutions should follow. If individual institutions want to share or co-develop educational resources with other partner institutions, they will have to follow the relevant guidelines and ensure that educational resources to be shared or developed meet the requirements.

Institutionally speaking, many colleges and universities develop and implement their own specifications, standards, guidelines or regulations in their digitalization process. For example, South China University of Technology (SCUT) introduced a series of standards in relation to digital course resources and subject-specific platform construction. SCUT started to implement its subject-based platform development scheme in 2005 (SCUT, 2005). The first phase of the project aimed to develop five subject-based series of online courses, including mechanics foundation courses, mechanical engineering courses, chemistry and chemical engineering courses, electric and electronic engineering courses, and computer science courses. It divides each series into several modules and stipulates what courses are included in each module, how many learning hours are required for each course, and who the target students of each module are. In addition, it also specifies the deliverables of each series of courses. The scheme also sets forth the procedure for course development. SCUT issued another document - Specifications for Online Course Development, which provides detailed guidelines and (technical) requirements for online course development, syllabus preparation and learning outcome setting, course content selection, overall course design and its implementation (including instructional design, content organization, content presentation, and content navigation), script writing, material preparation (for example, audio, video, animation, case study, and so on), courseware development, learning activity design, as well as instructional environment design (SCUT, n. d.). Two appendixes are attached to this document. One is a list of required materials of an online course to be uploaded to the platform and the other is a sample format for preparing the syllabus and learning outcomes. Later, SCUT (2010) implemented its specific regulations on online course development which, among other things, deal with technical specifications by reiterating that course development should be in line with the university's Specifications for Online Course Development (SCUT, n.d.). The other contents of this document are also intended to contribute to the quality assurance of online courses, including the overall goals of online course development; stakeholders, intellectual property rights and division of dividends; production cost provision; application, review and approval procedures; course development management; maintenance and updating; and marketing (SCUT, 2010).

Other examples of institutional quality assurance mechanisms include PKU's (2014) Regulations on Implementing MOOCs, and PKU's (2018) Opinions on Strengthening the Development and Application of Open Online Courses, as mentioned above. As for RUC, its quality criteria for online courses (RUC, 2015) draw on MOE's (2005) Evaluation Indicators for HEI State-benchmarking Courses. BNU (2016) issued its Instructional Digitalization Acceleration Program, according to which its Teaching Affairs Office [63] , Graduate School, Human Resources Office, and Center of Information and Network Technology are assigned to work out the university's regulations on high quality courses and digital resources construction and management. Other measures proposed in this document can also impact positively on the quality of its digital educational resources, either directly or indirectly. Overall, the quality assurance measures of individual institutions may have nuances, varying slightly one way or another, but the core is basically the same (for example, Jilin University, 2015; Tonghua Normal University, 2016; Yanbian University, 2017).

5.3 (O)ER and digital educational resources

The Chinese government views higher education as an integrated part of the nation as a whole, and sees it as a way of achieving the aim of increasing China's competitive strength in the world. Although there appear to be particular multi-layered power relations and ideological precepts that operate in Chinese society and culture, China's top-down approach to developing digital educational resources has to a large extent pushed universities to take actions forcefully and swiftly. As a result, many online courses, databases, platforms, repositories and sophisticated digital infrastructure that connect administrators, professors and students have been developed and successfully demonstrated.

As stated earlier, OER was first defined at the UNESCO conference in 2012, and later introduced in China. In the process of creating more world-class universities, China did not redefine the term, but rather used it as an international and umbrella term to refer to the country's existing domestic practices (e.g. courses and resources). Unlike many Western countries, the Chinese government is continuing to invest heavily in its elite institutions, which aim to obtain a permanent leading position in global rankings. As part of this process, China is employing OER as leverage to improve the quality of learning and teaching throughout the higher education sector, and to augment the reputation of Chinese institutions worldwide.

The existing OER practices are discussed below, with regard to the way they are developed, (re)used, provided and integrated.

'Top-quality Courses'

In 2003, China launched a large-scale project, the 'Top-quality Courses' project, for sharing educational resources using digital means. Adhering to the core OER values of openness and being cost-free, the 'Top-quality Courses' Project focused on improving the quality of higher education teaching (MOE, 2003). This understanding towards 'Top-quality Courses' positioned China to take a unique approach to implementing the 'Top-quality Courses' Plan, in terms of scale, financing and quality assurance.

The 'Top-quality Courses' Project went through two stages: 2003–2007 and 2007–2010. The first stage, called the 'Top-quality Courses' Plan, focused on selecting exemplary undergraduate courses for national-level designation, while the second stage created 3,000 national-level 'Top-quality Courses' (referred to above as 'State-benchmarking Courses'), including not only undergraduate courses but also distance education courses and others (Wang & Håklev, 2012). By 2010, more than 12,000 courses had been developed by 700 universities and institutions. Between 2003 and 2010, 3,790 course were selected for national-level designation, including 2,528 undergraduate courses, 1,037 vocational course, and 209 distance education courses (Wang & Håklev, 2012). These courses mostly included lesson plans, teaching materials, courseware, and audio or video recordings, but the actual development of these digital resources across universities remained variable.

The development of 'Top-quality Courses' (2003–2007)

How 'Top-quality Courses' were developed at macro and micro level has been detailed in the work of Wang and Håklev (2012), and this section provides some examples to illustrate how 'Top-quality Courses' were developed by professors at the institutional/meso level.

The case of Tsinghua University

As the implementation of 'Top-quality Courses' involves both lesson plans and teaching materials, as well as a technical platform, faculty members have to spend time both on course desgn, and website development, courseware and video recordings. Since the workload for technical development is heavy, the effort that is put into developing lesson plans and teaching materials has to be proportionally reduced.

To make sure that professors put maximum effort into course design, the project management for implementing the 'Top-quality Courses' Project at Tsinghua University took place under a system of unified planning, carried out by the university's Office of Academic Affairs, focusing on designing instructor-led courses, as supported by professional and technical staff at the university (Yang & Duan, 2008). The Office of Academic Affairs was responsible for the selection of 'Top-quality Courses' and the organization and management of the courses, and the instructors were in charge of the actual design of the courses. The e-Learning Center provided technical support for the entire process. The sustainable implementation of 'Top-quality Courses' was ensured through a division of labor between, and cooperation among, multiple departments of the university. As a technical support department, the e-Learning Center provided professional technical services throughout the entire process. For different courses across the disciplines, the same approach and method was adopted in the production of courseware, and audio and video materials, which ensured the design of all of these 'Top-quality Courses' was consistent and professional. During the implementation period, a professional R&D team was also created, which included researchers from the Department of Educational Technology, as well as those specializing in the area of media art design and media production, and program designers, etc. Tsinghua relied on scientific management, world-class equipment, technology and professional teams to ensure the quality of these technology-mediated courses (Yang & Duan, 2008).

An example of a Top-quality Course: Chinese Geography

In 2005, the Chinese Geography course offered by BNU was certified as a national top-quality course. In addition to the Chinese Geography course being used in teaching on the BNU campus, it was also designed to provide quality teaching materials for use in similar courses offered at other Chinese universities. In addition, the Chinese Geography course aimed to provide demonstrations on how the course should be taught, and thus the course materials were openly shared, mainly for in-service teacher training. Bearing these goals in mind, the Chinese Geography course was designed to cover who was to do the teaching (the teaching team), what was to be taught (the course syllabus), how it was to be taught (online classroom), how content would be learned (student practice), an assessment of the teaching (teaching evaluation), and a list of teaching resources, etc. (Wang, Su & Yu, 2013).

Logistical issues associated with the first-stage development of 'Top-quality Courses'

In 2004, during a re-examination of 151 national 'Top-quality Courses' that were designated as 'Top-quality Courses' in 2003, 33 course websites could not be visited (Sheng, 2009). A review by the National 'Top-quality Courses' Working Group of Higher Education Institutions in June 2005 also reported that about 12.78% of the national 'Top-quality Courses' websites were unavailable, and other accessible websites suffered from low access speeds (as cited in Liu & Wu, 2008). A 2007 investigation also found that up to 38.02% of the national 'Top-quality Courses' were unavailable, and 15.7% of those courses that could be accessed did not have either lesson plans, courseware or videos (Huang & Xiang, 2007). A 2008 investigation of 22 national-level 'Top-quality Courses' offered by five universities identified problems such as the fact that some of the course webpages could not be browsed (40%), that the access to course websites was too slow and the response and waiting times were too long (30%), and that there was no access to the course websites (20%). Also, only a few courses had been implemented in actual teaching activity (18.2%) and in e-book form (36.4%) (as cited in Zhou & Zhang, 2010). In total, of the 3,582 national 'Top-quality Courses' surveyed (Hu, Yang, Wei & Yang, 2014), whether for undergraduate or vocational college teaching, less than 60% could be accessed. In some cases, due to the lack of specialized technical maintenance, the 'Top-quality Courses' websites of some universities or individual professors did not function, which undermined their supposed role of setting a positive example for the public and also affected the reputation and authority of the 'Top-quality Courses' Plan.

Intellectual property

A survey of 185 professors whose courses had been given the national-level designation as a 'Top-quality Courses' found that 31.5% of professors preferred for their 'Top-quality Courses' to be available for browsing but not for downloading, and 45.1% preferred that they be downloaded but not revised; only 18.5% preferred that their courses be browsed, downloaded and revised (Zeng, Fang & Huang, 2010). The research team of "the sharing mechanism of national 'Top-quality Courses'" conducted a survey of 212 faculty members from BNU and Beijing Jiaotong University. Their unpublished pilot-study (as cited in Zhou & Zhang, 2010) also revealed that although the majority of professors whose courses had received the national 'Top-quality Courses' designation held positive views on the extent to which their courses could be shared – e.g. 100% were in favor of sharing their courses within their own universities or with collaborative universities (100%) and 86% were in favor of sharing them with the public within China (86%), nevertheless, they favored setting the conditions for sharing – especially explicitly declaring the copyright to the publishers. It is worth noting that many professors did not think that the funding provided by the state met the cost associated with the intellectual property rights underlying the courses. As they had worked for years with their teaching team to produce these courses, even before the 'Top-quality Courses' Plan, they believed their intellectual property needed to be protected, to avoid plagiarism.

The use of 'Top-quality Courses' (2003–2007)

The technical standards of the 'Top-quality Courses' websites adopted by different universities were diverse, which meant that the 'Top-quality Courses' websites were inconsistent in style, and highly varied in performance. Consequently, it was difficult to identify or navigate national 'Top-quality Courses'. Students whose own university offered a particular designed course were more aware of how to access that course. For example, the research team of "the sharing mechanism of national 'Top-quality Courses'" conducted a survey of 212 faculty members from BNU and Beijing Jiaotong University. Their unpublished pilot study looking into teachers' interest in using national 'Top-quality Courses' found that 71.7% respondents used 'Top-quality Courses' to acquire teaching resources, 54.7% used them to learn about different teaching methods and approaches, 52.8% were interested in teaching principles and design, and 50.5% were keen to re-use the 'Top-quality Courses' (as cited in Zhou & Zhang, 2010). Those who declared themselves to be not interested in using 'Top-quality Courses' cited reasons such as 'the resources are not suitable for their own needs' (33.0%) and 'there are limited access rights' (23.1%). Of those who had completed campus version of 'Top-quality Courses', 70% were keen to download the lecture notes or PowerPoint sides, and 50% were interested in exercises (such as homework, test papers, etc.). There was also a demand for the 'Top-quality Courses' syllabus (48%) and teaching videos (43%), while the demand for simulation experiments was relatively low (19%).

Thirty students from Peking University were interviwed, and the extent to which students used these resources also varied. About 50.8% of students visited the 'Top-quality Courses' website on average one to three times or less per month; only 26.5% of students visited them one to three times on average per month. About 70% of students believed that 'course resources need to be updated frequently' and that 'more resources need to be put up online, such as classroom videos, courseware, test questions, etc.' (as cited in Zhou & Zhang, 2010). Another survey of 350 science students also found that only 9.1% of the students frequently browsed the websites, while 51.4% occasionally browsed the websites (Ding, Wang, Feng, Shen, Tian & Jin, 2006).

Quality assurance

To achieve the goal of improving the overall quality of higher education teaching, MOE has particularly highlighted the importance of using information technology to open up access to these 'Top-quality Courses'. All the courses were required to be shared through the internet, and the percentage of annual updates (or new additions) was required to be not be less than 10%.

The principal investigators of 'Top-quality Courses' Project were asked to submit an 'annual self-review form' to report improvements in each course within five years. The MOE organized the committee to review the annual self-review forms with regard to the course proposals. For those courses that did not pass the annual evaluation, the designation of 'Top-quality Courses' was to be cancelled and all professors in that university were to be banned from applying for

national-level designations for one year (MOE, 2005). A continuous process of development and quality improvement was required by the 'Top-quality Courses' Plan (Wang & Håklev, 2012). This can be regarded as a top-down approach to ensuring quality assurance.

The 2005 review of Beijing municipal's 'Top-quality Courses' investigation showed that 10% of the courses had made great progress in terms of updating their resources, 20% were just about meeting the basic criteria, 33% did not meet the basic requirements, and 37% had not been updated at all (as cited in Liu & Wu, 2008). One of the reasons for these results was professors' motivation and the awarding mechanism. Professors who applied for 'Top-quality Courses' status made an effort to pass a pre-assessment in order to receive the designation for their courses, but they then put less effort into subsequent resource updates and website maintenance. This was also partly due to the funding mechanism. The original plan of the 'Top-quality Courses' Project was to develop 1,500 courses, but the actual number of designated courses greatly exceeded this, reaching 2,439 in 2008, and increasing year by year. Thus, more universities and disciplines were constantly required to enter the competition to have their courses awarded 'Top-quality Courses' status. This increasing number required the state to either invest more funds or see the quality of the courses being threatened.

The continuous increase in the number of designated courses and the unstable funding sources had a negative impact on the 'Top-quality Courses' policy, showing that the system was not sufficiently flexible and adaptable (Zhou & Zhang, 2010). In fact, in 2004, the support provided to each 'Top-quality Courses' was reduced from 80,000 yuan to 30,000 yuan. Zeng and her colleagues (2010) found that in their investigation that 80.6% of 184 faculty members from 15 universities stated that the problems associated with updating their courses were due to a lack of funding. Thus, due to insufficient funding, the actual implementation of these courses after they had been given the national-level designation of 'Top-quality Courses' was unfortunately flawed.

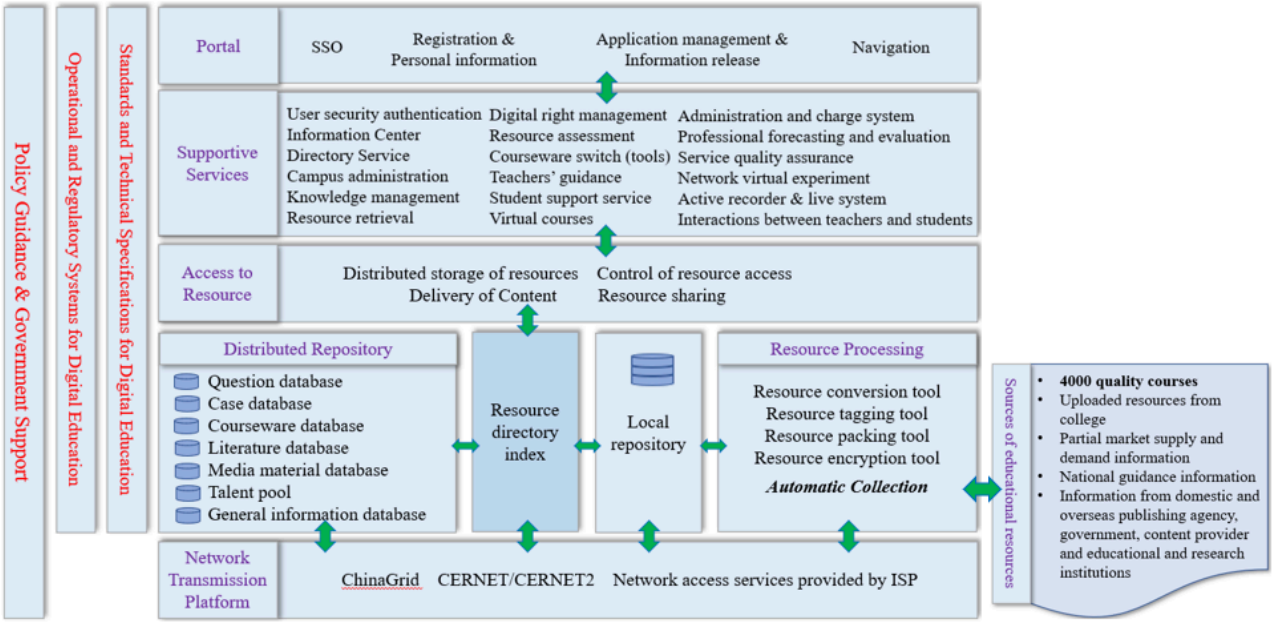
The development of 'Top-quality Courses' (2007–2010)

Due to the problems identified earlier in regard to the development of 'Top-quality Courses' in the first stage, a different approach was taken between 2007 and 2010. During this period, the integration of 'Top-quality Courses' Project was led by Tsinghua University, in collaboration with Huazhong University of Science and Technology, Higher Education Press, etc (MOE, 2007). The goal was to formulate information technology standards and specifications to create a supporting online platform for the storage, retrieval and operation of 4,000 integrated national 'Top-quality Courses'. The emphasis was on creating a mechanism for sharing and re-using national high-quality courses, in order to enable teachers and students to use these freely available 'Top-quality Courses' more conveniently and quickly.

The integration of national 'Top-quality Courses' project (MOE, 2007) required that the strategic focus remain centered on developing and contextualizing the fundamental infrastructure that supported the development and use of 'Top-quality Courses' (see Figure 1).

Figure 1

Infrastructure of 'Top-quality Courses' (2007–2010)



The main work between 2007 and 2010 included four overarching dimensions of action and support for digitalization:

1. Establishing national standards and norms for sharing courses online, including carrying out R&D in respect of standards, including curriculum description standards, curriculum structure specifications, resource processing and technology standards, data storage standards, resource packaging standards, structured definitions of materials, construction specifications for shared open service systems, and specifications for shared monitoring and evaluation.
2. Constructing an information service platform for sharing 'Top-quality Courses'. Six subsystems were created, including a 'Top-quality Courses' shared portal, a directory retrieval subsystem, a personalized active service, shared multimedia service, a shared grid service grid, and an evaluation subsystem.
3. Building a national portal for 'Top-quality Courses' (http://www.jingpinke.com), involving cooperating with the construction of national 'Top-quality Courses' and digitizing the course resources in order to establish a core course resource portal that supported the storage of 4,000 national 'Top-quality Courses', which could be freely shared to the public.
4. Building a National 'Top-quality Courses' Resource Center, operated by Higher Education Press, and building a Regional Resource Sub-center for National 'Top-quality Courses' (created within Huazhong University of Science and Technology).

By April 2011, the National 'Top-quality Courses' Resource Center had published a total of 20,283 'Top-quality Courses' at all levels, including 3,835 at national level, 8,279 at provincial level, and 8,169 at university level. Among them were 14,233 undergraduate courses, 209 distance education courses, and 5,837 vocational courses. A total of 125,659 resources and 44,832 textbooks were included in the online database. 10,460,025 visitors had accessed the 'Top-quality Courses', and the total number of page views was 57,030,860. 54,861 resources had been uploaded, which had been downloaded 178,762 times. There were 327,373 interactive Q&As (National 'Top-quality Courses' Resource Center, 2011).

'Top-quality Open Courses'

In 2011, MOE launched another project to develop 'Top-quality Open Courses', with the aim of producing 1,000 top-quality video open courses and 5,000 top-quality shared courses. The iCourse platform was created to host all the courses, and some universities were also expected to create an aggregator linking to their own course (e.g. Peking university . Up to January 3, 2019, 992 video open courses and 2,884 shared courses were publicly available on the iCourse platform.

The purpose of creating national ‘Top-quality Open Courses’ was to effectively strengthen the development and popularization of high-quality educational resources, to further improve the quality of higher education, and to build a learning society. ‘Top-quality Open Shared Courses’ were normally undergraduate courses or professtional courses that had been prepared for use by college teachers and students, while ‘Top-quality Video Open Courses’ generally covered popular science and cultural and socially-oriented subjects, and were designed for the public. As an initiative that followed the ‘Top-quality Courses’ Plan (2003–2010), the ‘Top-quality Open Courses’ Plan took a similar approach to course planning, development and evaluation.

Examples of ‘Top-quality Open Shared Courses’

In 2012 and 2013, the focus was on the transformation and upgrading of the former national ‘Top-quality Courses’ to top-quality shared courses. Previously, ‘Top-quality Courses’ focused on developing a syllabus setting out how to teach the course, but top-quality shared courses also set an exemplary course structure, making clear how learning should take place (Wang, Su & Yu, 2013). For example, Chinese Geography, after receiving the national-level ‘Top-quality Courses’ designation, was awarded the title of ‘Top-quality Open Shared Courses’ later. Building on their previous teaching material, the teaching team aimed to strengthen the course design in terms of its breath, depth and accuracy, and in terms of the extent to which teaching resources were shared. Therefore, the core of curriculum construction was around the integration and sharing of teaching resources, the visualization of teaching processes, and the transmission and sharing of regional multimedia geographic information to better meet the needs of learners. With the core value being ‘quality and sharing’, the key to developing open courses is to improve the actual use of these courses. In 2014, the previously existing course Physiology of PE, awarded as the national-level ‘Top-quality Courses’, was also transformed and upgraded to one of the national-level ‘Top-quality Open Shared Courses’. The new updates and improvements made to this course included providing support for students' autonomous inquiry and collaborative learning, supporting research activities in collaboration with k-12 teachers, proving different teaching strategies, improving the quality of talent training, and serving the construction of a learning society.

Figure 2

Top-quality open shared course, Chinese Geography, on the iCourse platform

An example of a ‘Top-quality Video Open Courses’

In 2013, Beijing Forestry University's ‘Chinese Plantation Cultivation’ was selected as one of the national-level ‘Top-quality Video Open Courses’. The course was officially offered on the iCourse platform at the end of 2013. As a video open course, this course brought together a large number of ancient and contemporary cases to illustrate the following subjects: how trees were planted in ancient times; what the current state of tree planting is in modern China; what technologies are needed for tree planting; what are the expected future developments in tree planting; and what problems need to be solved in the area of tree planting. The course had six lectures in total, each lasting less than 50 minutes, with 60–80 slides per lesson. The videos were recorded at Beijing Forestry University, which is equipped with three high-definition cameras and two sets of professional recording and broadcasting software, and which strictly follows the recording requirements of the Technical Standards for the Production of Top-quality Video Open Courses (2013 Edition) issued by MOE.

In contrast to the production of ‘Top-quality Courses’ (2003–2010), the video recordings used by ‘Top-quality Video Open Courses’ were greatly improved. For example, the ‘Top-quality Video Open Courses’ produced by universities such as Beijing Institute of Technology, the University of Science and Technology of China and Jilin University were filmed in large auditoriums, while Northeastern University, Nanchang University, and Qinghai Virtual studios were used for producing ‘top-quality Video Open Courses’ (Hu, Yang, Wei & Yang, 2014).

Figure 3

Top-quality video open course, Chinese Plantation Cultivation

MOOCs

Since Peking University and Tsinghua University joined forces to offer Chinese MOOCs in 2013, China has seen a steady growth MOOCs. Following the 'Top-quality Courses' Plan (2003–2010) and quality open courses (2011–), the development of MOOCs is also regarded as a key strategic choice for improving the quality of higher education in China. Although different policies, plans, initiatives and practices have been issued and carried out continuously over the past 20 years, the key aim of MOE's strategies to improve the quality of teaching and learning in higher education has not changed.

Since 2015, following MOE's policy entitled 'Guidelines on Strengthening the Construction, Use and Management of MOOCs in HEIs' (MOE, 2015), individual universities have issued internal/external calls for MOOC proposals, offering funding to support the development of MOOCs by individual professors. In the process of developing MOOCs, many different actors, including university administrators, academics, educational technologists, instructional designers etc., knowingly and unknowingly played a role in shaping policy and designing MOOCs (Zhang, Sziegat, Perris & Zhou, 2019).

Calls for MOOC proposals

We collected calls for MOOC proposals from universities' official websites in order to understand in what ways universities recruit or encourage their faculty members to offer MOOCs for free. As different universities seem to have

very similar regulations, the majority of these documents are to some extent similar, with only minor variations (e.g. removing some constraints on course types or increasing the number of courses that members are allowed to offer), except in the case of Peking University (see below). Two typical approaches were taken in the calls for proposals. The majority of universities followed a typical, routine procedure: the Office of Educational Affairs acted under the authority of the university leadership office and disseminated calls for MOOCs via emails and through internal/external websites. The university called for MOOC proposals in a way that compelled attentiveness from potential course-creators, underlined the importance of the activity, and imposed restrictions on the process. The call for proposals set out the prerequisite qualifications, the obligatory format of the course, and compulsory pre-defined requirements. For example, in terms of which course to offer, one call required that the proposed courses 'should be combined with the curriculum offered on campus', and that 'teaching resources must include videos that contain key points of knowledge that are taught on campus'. Anyone who applied to offer a MOOC 'need[ed] to select those courses that are suitable for the form of MOOC, which can attract a wide range of audiences and spread influence', which also implied that instructors 'need[ed] to reform the current on-campus course design'. According to the call, proposed courses 'should be selected by college/department before reporting to university registrar', and the approved course design and implementation 'should follow the specified timelines', as the 'university will arrange inspections accordingly'. As can be seen, while universities gave freedom to instructors to decide when to offer MOOCs, which course to apply for, and in what ways to prepare, the modal verbs used here, such as 'should,' 'must,' and 'need, reflect demands to make sure that the proposed MOOCs were selected, designed, and implemented in such a manner as to ensure a high quality and a high impact worldwide. This perhaps reflects quality assurance by universities in respect of MOOCs, but it is interesting to notice that most universities also required that the MOOCs offered be aligned with on-campus courses. This to some extent shows that the authorities considered on-campus courses as having qualified teaching resources, and that, by setting this prerequisite, they assumed that the offered MOOCs would be able to achieve the same quality standard as on-campus courses.

In contrast, Peking University took a different strategy to encouraging its faculty members to offer MOOCs. The call for MOOCs released by Peking University reads: 'if [teachers] decide to offer MOOCs in Spring 2015, please fill out the Peking University MOOCs Application Form'. The university also emphasized that 'during this period, professional technical support will be provided by the Educational Technology Center'. Few prerequisite qualifications were required; instead, the university 'welcome[d] all teachers to participate in the development of MOOCs', and stated that 'currently there is no restriction on teachers' qualification or course type.' The word 'if' suggests a subjunctive mood, and 'will' is the future tense – both soften the tone in the modal expression. Nevertheless, this is not to say that Peking University did not intend to review the proposed MOOC offerings. Similarly to other universities, it stated: 'the registrar is responsible for the overall planning of MOOCs development', 'the courses will be approved by the registrar or graduate school', and 'the MOOCs committee will review the teachers' preparation and understanding of MOOCs teaching' (Peking University, 2014, Official Document [64]).

Furthermore, quality assurance formed a part of the process of implementing MOOCs, e.g. offering technical support, and recruiting active and experienced instructors to provide tutorials. For example, at Peking University, the Office of Personnel and the Office of Educational Affairs jointly established a MOOC training program. Starting from 2014, for a period of five years, 100 teachers were trained each year, with the aim being to improve the professors' ability to use ICT in teaching. On March 22, 2019, the 22nd workshop for MOOC training was held – more than 20 professors and student assistants from different departments of Peking University participated.

The role of professors and universities in the process of developing MOOCs

We collected about 500 documents related to MOOCs released by 49 universities that offer MOOCs. By analyzing these documents we learned that universities typically assign multiple roles to instructors: being responsible for online lecturing, participating in the development and implementation of MOOCs, and being 'challengers' who are willing to try new things and are seeking change. In the view of those who offer MOOCs, they participate in MOOCs as a result of their own personal interest, rather than simply being influenced by their university. For example, when asked about why they are willing to offer MOOCs, most faculty members claim that they 'are interested in this new technology' (Peking University, 2015, interview [65]), they 'like the feeling of lecturing' (Peking University, 2015, interview [66]), or they '[like to]

try new things' (Tsinghua University, 2016, interview [67]). In addition, in interviews, many faculty members emphasize their roles as 'educators', and state that they are proud to 'have improved teaching skills' and 'successfully kept learners engaged' (Peking University, 2015, interview [68] [69] [70]).

Universities 'provide' funding/technological support (Lanzhou University, 2015, official documents [71]; Lanzhou University, 2016, official documents [72]; Henan University, 2018 [73], official documents), 'encourage/guide' teachers to participate in the development of MOOCs (Peking University, 2014, official documents [74]; East China Normal University, 2015, official documents [75]; Lanzhou University, 2015, official documents [76]), and 'implement/launch' the registration of MOOCs (Lanzhou University, 2015, official documents [77]; East China Normal University, 2016, official documents [78]). By doing this, the universities' central offices play an important role in regard to initiating MOOC activities, supporting the process and deciding who will provide an MOOC and what to offer.

Micro-courses

In 2010, the Foshan Education Bureau took the lead in organizing a micro-course for primary and secondary school teachers (Zheng, 2011). Since 2012, China has held numerous 'micro-teaching' competitions among universities (MOE, 2012). A national university micro-teaching competition platform was created to curate all of the micro-course resources (https://edtechbooks.org/-gUm). As shown in Figure 4 (see the links to the bottom-left), the platform embeds the icons of social sites/platforms that can be used to share courseware. As shown in Figure 4, the micro-course provided by Jinlin University was shared 139 times, used 1,027 times, played 69,384 times, and commented on 93 times. The users of these resources can also rate them on the platform, from one star to five stars. Also, different universities have created their own micro-courses platform to host courses (e.g. Central South University, http://netclass.csu.edu.cn/weike2016/). In practice, the nature of micro-courses has changed, moving from being 'micro-resources' to being 'micro-teaching activities' and to being 'micro-web courses', with the belief that micro-courses are an important component of online learning and teaching online video courses, with micro-video as the core (Hu, Huang & Li, 2013).

Figure 4

National university micro-teaching competition platform

作品标题：哲学的自我追问
所属课程：哲学通论
课程性质：公共基础课（必修）
所属省份：吉林省
所属学校：吉林大学
参赛项目：全国高校微课教学比赛
评比结果：初赛推荐、复赛推荐、决赛（特等奖）
第一作者：孙正聿　　参赛方式：学校选拔
团队成员：无团队成员
学校类别：本科　　播放次数：69384
参赛类别：文史　　评论次数：93
作者职称：教授　　分享次数：139
作者学历：博士　　投票指数：4.6
作品介绍：

“哲学通论”课程创建于1994年，于1995年在吉林大学开设此门课程，授课对象包括哲学专业本科生和非哲学专业本科生两部分，年平均授课人数为500人左右，共约8000人左右。近年来，全国普通高校哲学专业大多已开设此..[查看全部]

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1027
我采用

Taking Jianghan University as an example, in order to strengthen the course design, promote the sharing of course resources and innovate teaching methods, the leading MOOC working group decided to call for micro-course proposals in March 2014. Clearly stated in the call for micro-course proposals was the fact that there must be clear teaching goals, learning designs, study guides, practical tests and other learning resources. The call emphasized that it was important to choose the most difficult and error-prone points of knowledge as the subject of micro-courses, which should last 15 minutes or less. According to the call, topics that students can learn about by reading are not suitable for micro-courses. A detailed evaluation was provided by Jianghan University, including nine categories (e.g. the topic, the design, structure, technical specifications, and format). The leading MOOC working group also required that each college/department must apply to develop three to four micro-courses, and must implement these micro-lectures. Making the design and implementation of micro-courses compulsory was a way to push professors to get involved in this process (Jianghan University, 2014a).

In April 2014, the implementation plan for micro-classes (trials) was released by Jianghan University (Jianghan University, 2014b). A detailed schedule was planned (March to May – design; May to July – recording; July to October – revise and assess; November to December – go online), and it was pointed out that each course would receive seed funding of 5,000 yuan, and more funding might be invested according to the quality and quantity of implemented micro-courses.

The implementation of micro-courses follows a strategy of organizing micro-class competitions. There are national and provincial competitions, and universities and some colleges also actively organize their own micro-class competitions. For example, Beijing University of Science and Technology, Southeast University School of Medicine, Central South University School of Basic Medicine and Guangdong University of Foreign Studies successfully held their first micro-class competitions in January 2013, May 2014, January 2015 and April 2015, respectively. Some colleges and universities require faculty members to participate. For example, Guangdong University of Foreign Studies (Guangdong University of Foreign Studies, 2015) proposed that ‘each college recommends at least two faculty members to participate, and colleges with less than 50 faculty members recommend at least one faculty member participate.’ Also, universities encourage faculty member to participate by providing training for participations and recognizing 18 hours of training credits for annual evaluation. Those who win the first prize are awarded ‘Outstanding’ in the annual teaching

quality assessment, and have the opportunity to be recommended to represent the university in national micro-class competitions. However, some universities limit the number of faculty members who can participate in micro-class competitions. For example, the University of Science and Technology Beijing stated that 'the recommended quota for each college is limited to no more than five for first-level subjects and no more than three for second-level subjects'.

5.4 Institutional infrastructure and integration

The changing/extended responsibilities of the informatization office

As discussed earlier, all universities have an office/offices that is/are in charge of the management of digitalization, with different names used for these offices. The roles and responsibilities of these offices have changed over time. Take Central China Normal University for example. In 2005/6, the Modern Educational Technology Center was renamed the Center for Network and Educational Technology, having responsibility for the development of the digital campus, in addition to its previous roles of maintaining network devices and facilitating teaching mediated by technology. In 2011, the Center for School Card Management was created within this Center, to further take charge of the management of school card development. In the same year, the university created its Digital Educational Resource Center at the division-head level, in charge of developing all the digital educational resources across the campus. In 2012, the Digital Educational Resource Center and the Center for Network and Educational Technology were combined, and renamed the Center of Network and Informatization Service. It was not just the names that changed over time: the responsibilities of the center were greatly extended. The center's responsibilities were extended to being in charge of: (1) developing and maintaining basic infrastructure; (2) developing and maintaining the application system; (3) developing and managing campus cards; (4) creating and maintaining multimedia classrooms; (5) maintaining the campus TV network; and (6) creating and operating digital educational resources. In 2013, this center was closed and the Office of Informatization was created, integrating all the work relating to digitalization or informatization, which further includes: (1) development planning; (2) overall coordination; (3) formulating standards and specifications; (4) supervision and evaluation; (5) procurement of all informatization equipment and facilities; (6) innovating and operating the management information system; (6) creating a smart learning space; and (7) developing digital learning resources. Currently, all of these activities are under the responsibility of the Office of Informatization. In 2018, the university further assigned confidentiality management to the office. In the meantime, a subordinate unit, the School Service Center, was created. The Center of Informatization School Service Center is an administrative unit within the university, with roles and responsibilities that are explicitly defined and extended.

Integrated infrastructure

Technical barriers to digital transformation, coupled with challenges in coordinating with different administrative units, as well as academic departments, have been a major obstacle to digitalization. At the same time, informatization offices, with their specific roles, capabilities and duties, have become the gateway to the implementation of a digitalized higher education system. ICT officers working in these offices need support and resources to understand the requirements of individuals working in different departments and offices, as they have varied educational and administrational needs.

The solution to digitalization lies in an integrated system, with systematic coordination of general administration and learning and teaching support. In the current higher education system the best outcomes are produced by integrating administration, digitalization office, and smart learning classrooms, together with learning and teaching support; this is the most effective approach to accommodating administrators, instructors and students with multiple educational needs.

Figure 5

Digital Jingshi portal at Beijing Normal University

The Digital Jingshi portal at BNU provides an example of integrated infrastructure. To fully implement the Twelfth Five-Year Plan for Informatilization Development (Action) at BNU, the Digital Jingshi portal was created in 2015 to resolve previous problems, such as piecemeal implementation of technology, poor use of educational resources, data interoperability, etc. The portal aims to build more effective organizational support systems and innovative and

sustainable operating mechanisms to further promote the exploration and development of education reforms, teaching methods, and evaluation and service models (China Education Network, 2015). The Digital Jingshi portal includes five components: campus information, office hall, data center, resource center and campus community. It provides unified access to all online information and resources, such as school information, system applications, online services, digital resources, etc. This integrated infrastructure provides a single gate for releasing and sharing university information; processing necessary office work online across departments and units; obtaining all sorts of teaching and learning information and data; aggregating all the implemented digital resources; engaging in group communication and collaboration; and providing personalized services for administrators, professors and students (Beijing Normal University, 2015).

Building on BNU's previous systems, such as IPv6 and digital libraries, a unified Service Center for Educational Resources (shown in Figure 5) has been established within the Digital Jingshi portal, in order to provide different groups of users with high-quality learning resources, including online courses, teaching courseware, and scientific and technical literature. The Service Center for Educational Resources supports massive retrieval, storage, publishing, uploading and downloading of various types of digital files, thus effectively promoting the co-construction and sharing of high-quality educational resources.

5.5 Specific intended digitalization targets

Digitalization practices and processes are contextual and likely to be influenced by their specific institutional contexts. Taking Beijing Foreign Studies University, in the Tenth Five-Year Plan period the university focused on the R&D of educational resources for foreign languages, attaching great importance to the use of educational technology to assist foreign language teaching. It built an educational database of foreign language resources and 23 online teaching apps (Beijing Foreign Studies University, 2017). During the Eleventh Five-Year Plan period, the university focused on the R&D of information technology, and organized in-depth discussions on digital campuses, networked educational environments, construction of educational resource banks and educational application platforms, and development and utilization of foreign language educational resources (Beijing Foreign Studies University, 2017).

Since the beginning of the Twelfth Five-Year Plan, the university has moved its focus to the digitalization of educational resources, and has established advanced, efficient and practical information infrastructure systems, information management systems with big data, and high-quality university-based resource systems. At the same time, it has completed a batch of high-level multimedia teaching courseware that are closely integrated with the on-campus teaching, such as 'Into Russia', 'Negotiation', 'Character and Cultural Characteristics of Russian Literature', 'Italian Humanism' and 'the Renaissance' (Beijing Foreign Studies University, 2017).

Figure 6

Cloud Service for Digital Resources at Beijing Foreign Studies University

As shown in Figure 6, the Cloud Service for Digital Resources platform contains massive multimedia resources. At present, the platform has a capacity of 50TB, including 7TB of educational resources, covering a total of 64 languages (Beijing Foreign Studies University, 2020). The topics covered by these resources include general education, Beijing Foreign Studies University lecture series, videos of on-campus teaching, academic lectures, classic foreign language films, foreign language recordings and texts, etc. At the same time, the platform also has a resource production functionality, which provides editing and synthesizing tools for teachers. The platform is embedded with an IPTV satellite TV live broadcast system, which allow students to watch real-time TV programs in 20 languages and across 48 channels in Chinese and foreign languages. The platform also includes four apps: an on-demand system for audio and video resources, network satellite TV, a materials production system and private repositories (Beijing Foreign Studies University, 2020).

5.6 Learning management system

Commercialized products

The majority of Chinese universities use Blackboard as the official learning management system (LMS), but different LMSs have also been adopted by individual professors.

Figure 7

LMS at Zhejiang University

Taking Zhejiang University for example, 'Learning in Zhejiang' (https://c.zju.edu.cn) is an international LMS that was developed based on Blackboard. Officially launched in August 2016, Learning in Zhejiang (see Figure 7) was set up to provide online learning and teaching for all the campuses of Zhejiang University. Professors and students can log in using the school's unified identity authentication system, and learning and teaching data is transferred and shared with the university's educational administration system. The system supports various learning and teaching activities, including syllabuses, learning sessions, assignments, examinations, interactive Q&As, teaching management, information and resources, video on demand, etc. (Zhejiang University, 2017).

The system supports multiple approaches to online learning and teaching, such as online teaching, blended learning, MOOCs, SPOC, flipped classrooms, explorative learning, mobile learning, etc. The system also supports co-teaching online across different universities/departments, in 18 different languages. It also provides an interface for exporting

and importing curriculums, developing teaching tools, and engaging in secondary system development using international standards (Zhejiang University, 2017).

Cloud classrooms and smart classrooms

In recent years, Central China Normal University has progressed with research into, and the construction and use of, smart classrooms to promote the modernization of educational resources and teaching methods, for which it won the 2018 National Higher Education Teaching Award Special Prize (Huang, 2018). Relying on the National Digital Learning Engineering Technology Research Center and the Educational Big Data Application Technology National Engineering Laboratory, Central China Normal University has developed its own cloud classroom platform, which aggregates 6,587 teaching courses for 80,000 professors and students (China Education Daily, 2019).

In order to realize a seamless connection to the cloud classroom platform (as shown in Figure 8), the all-in-one card system and the student affairs system, the university developed an in-house starC teaching system, which integrates tools for teaching preparation, classroom interaction and third-party applications.

Figure 8

Cloud classroom platform

Central China Normal University holds teacher training on smart classroom teaching every year. Since February 2017, 11 training workshops have been held. Professors at China Normal University must train for more than 360 hours every five years, and this training counts toward their credits.

Learning Cell Knowledge Community

BNU has independently developed the learning system 'Learning Cell Knowledge Community' (LCKC) (PI: Shengquan Yu), which includes six modules: learning cell, knowledge group, knowledge cloud, learning tool, learning community, and personal space (Yang, Yu & Zhang, 2013). In 2010, the LCKC was officially released, including the modules, e.g. learning cell, knowledge group, curriculum, resource center, learning community, and personal learning space. In

contrast to the existing learning management system, the core functions of the LCKC include the creation of learning cells, collaborative editing, interpersonal network construction and sharing, a collaborative creation of knowledge ontology, community learning and interaction, personal knowledge maps, intelligent recommendations, and personalized learning (Beijing Normal University, 2020). These functions provide learners with an open environment in which to access, and to create, resources. Up to 2020, 26,948 students and teachers had created 91,807 learning cells, and there were 7,098 knowledge groups of resources, 629 learning resources and 4,479 active learning communities.

Using the learning object model, the concept of a learning cell implies that a learning resource is open, generative, evolvable, connected, cohesive, intelligent, adaptive and social (Yu, Yang & Cheng, 2009). Learning cells are the smallest resource organizational units and a group of these learning cells creates an LCKC. To enable the learning resource to evolve like a cell, the property of time and an interpersonal cognition network are introduced to the learning resources. As the cells evolve over time, generative information and revisions are recorded and the interpersonal network helps to form a knowledge network, which allows students to construct knowledge (Yu, Yang & Cheng, 2015).

Figure 9

The cloud storage model for ubiquitous learning resources

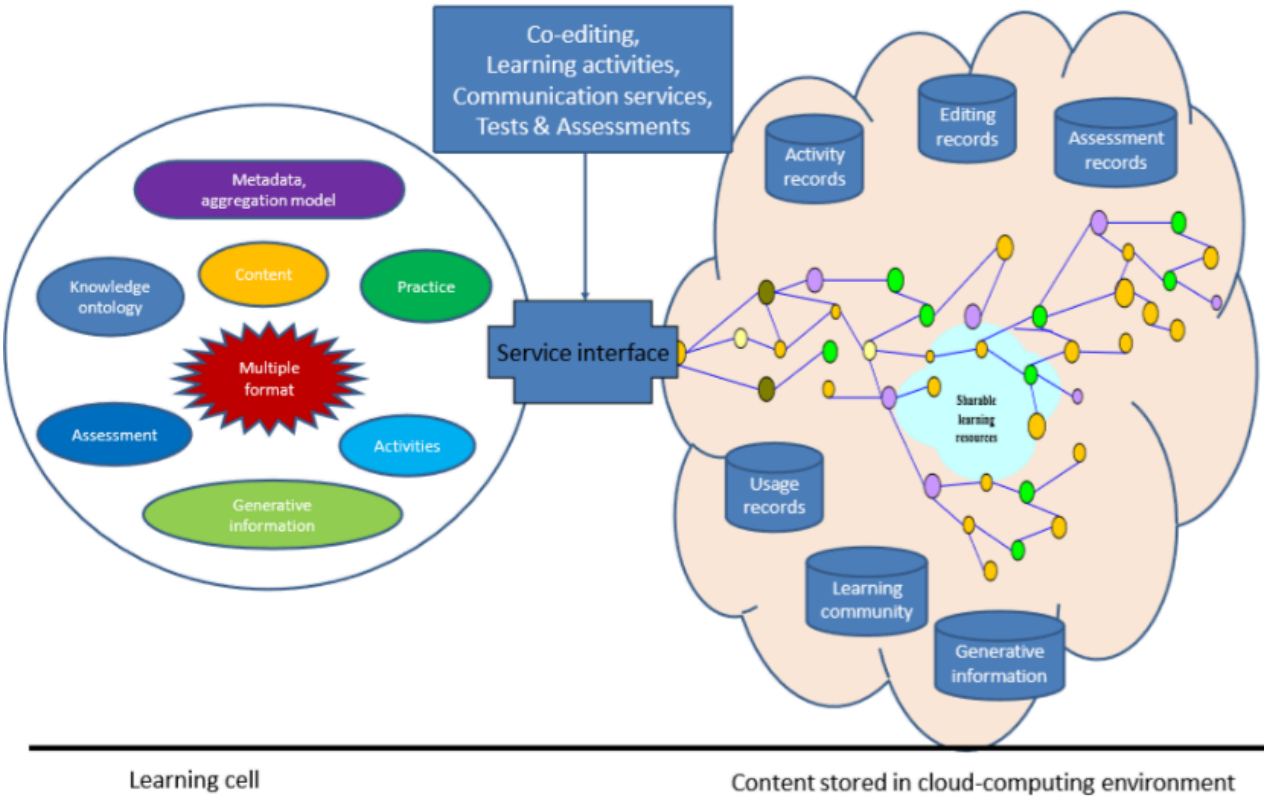


Figure 4. The Cloud Storage Model for ubiquitous learning resources

On the LCKC platform, a learning resource can be created independently or co-developed by connecting to a personalized knowledge network, which contains metadata, aggregation models, knowledge ontology, learning content, learning assessments, learning activities, generative information, learning service interfaces and other resources(see Figure 9). Metadata is used to describe the attributes of learning cells, so that they can be easily categorized, indexed and shared (Yu, Yang & Cheng, 2015).

Figure 10

Collaborative content editing

As shown in Figure 10, users grant permission to edit and revise the resources. To ensure the security of data revision a content version management function is implemented in the LCKC (Yu, Duan & Cui, 2019). A correlational study (Zhang, Zheng, Chen & Xu, 2014) using clickstream data stored on the LCKC has identified that the number of versions has a significant impact on learners' behavior as regards viewing and editing content, and that the number of knowledge groups is the most important factor influencing behavior in respect of sharing and bookmarking; additionally, the type of learning activity also significantly affects whether users make comments.

6. Micro Level

6.1 Policy-related issues and concerns

Faculty's engagement with (O)ER: A policy perspective

As mentioned earlier, in addition to the policies formulated by the MOE, municipal governments and higher education institutions have also released a number of policy documents that set the local guidelines and principles for constructing and maintaining online courses, addressing their use and evaluation, including the application of online courses, curriculum operations, evaluation of faculty members' workloads, student credit certification, and evaluation of teaching quality. Examples include: UOOC Rules for MOOC Production and Guidelines on Course Development issued by China HEI Computer Education MOOC Alliance in 2015 [79]. The Construction Standards of Top-quality Online Open Courses for Colleges and Universities in Henan Province (trial) [80], the Construction Standards of Municipal High-quality Online Open Courses for Colleges and Universities in Chongqing (Trial) [81], and the Construction Standards of Xiamen University (Trial) [82]. To understand how these policies are interpreted at the faculty level, we sought to conduct semi-structured interviews at different universities. However, only three participants could be interviewed before the COVID-19 outbreak. Thus, we used these interview data only as a supplementary account to shed light on staff involvement in the practices of (O)ER in line with their universities' policies. For example, a key person who works at the Information Resource Centre at BNU stated that BNU has a free network tariff policy in place to enable students to use educational resources on platforms including XuetangX, China University MOOC, and Rain Classroom, which are provided by third-party organizations. This policy also indicates that BNU's information portal should provide links to these educational

resources (see screenshot in Report 3). The participant pointed out that the central portal regularly releases updated educational resources that can be accessed by BNU's students who have credentials to log on to the internal portal.

An interview participant who previously held a managerial role at Beijing Open University (BOU) stated that BOU has policies to award 'high-quality courses' and 'teaching excellence' to faculty members who prove themselves able to create high-quality educational resources or who demonstrate excellent instructional designs in their courses every year. In addition, all the faculty members are required to curate one course online which will be integrated into their university learning portal. These online courses are reviewed by a university management group. Moreover, this interviewee mentioned that BOU offers educational resources that are either for academic qualifications or non-academic qualifications, with the purpose of enabling lifelong education for adult learners.

Faculty members' and students' awareness of (O)ER policies

Few studies have examined faculty members' involvement in the policy-making process. According to a field study at a university in Nanjing, faculty members were invited to attend seminars to give feedback on the policy for calculating their workloads related to using online courses to develop flipped classes, with face-to-face tutorials. The university administrators took their advice and feedback into consideration in policy formulation (Meng, 2018). Beyond participation in policy-making through seminars in the higher education sector, awareness of these policies is rather low.

Xu's study (2018) reports on faculty members' and students' awareness of (O)ER policies. In 2018, Xu undertook a survey study at a number of representative universities in different regions of eastern, central and western China. The selected sample included Peking University, Renmin University of China and East China Normal University in the eastern region; Huazhong University of Science and Technology in the central region; and Southwest University, Shaanxi Normal University, Western University of Electronic Science and Technology and Sichuan University in the western region. In total, 450 students and 172 faculty members participated in this survey research.

For more than half of the students and nearly one-third of the faculty members, their understanding of the policy documents related to online courses was limited mostly to specific aspects, and they lacked overall knowledge. Students were found to have low awareness of relevant policies: 55.7% of students replied "Unclear" to the question "Does your university have a policy document on the construction of online courses?", whereas only 22.4% answered "Yes". Of the faculty members, only 33% were aware of relevant national policies, and 37.2% knew about relevant university policies. The degree to which faculty members were familiar with policies was ranked by participants from high to low, with the following results for different policies (from high to low rankings, from most to least familiarity): (1) course management; (2) changes in teaching methods; (3) course content; (4) course resources; (5) course structure; (6) the training system; (7) the training system for technical personnel; and (8) support for relevant resources. Policies regarding (O)ER outline different orientations for developing and using educational resources, and faculty members had different levels of awareness and understanding of certain aspects of (O)ER. This indicates that faculty members had a low level of understanding of relevant policies, and mainly lacked an understanding of training programmes and policies regarding evaluation that might act as incentives for them to develop more resources. The study by Zhang and colleagues (2015) also pointed out that faculty members' lack of understanding about the standards of (O)ER and open courses is problematic, because their perceptions of the universities' policies and standards of (O)ER can influence their (O) ER practices. Wang and Wu (2013) conducted a survey (153 questionnaires) in over 20 departments at Peking University, and faculty members argued that policies and mechanisms for motivating faculties to develop (O)ER by protecting their intellectual properties are key to promoting (O)ER, and more policies are needed in these aspects. The extent to which faculty members and students understand the (O)ER policies has implications for how these policies can be disseminated, circulated and received by them. Additionally, academic and administrative staff members' awareness of these policies is also a factor influencing how effectively these policies can be carried out.

Policies on how to manage online resources

On 21 July, 2017, the General Office of the Ministry of Education issued the "Notice of the 2017 National Excellent Online Open Course Accreditation Work", which set out constructive suggestions about application procedures,

requirements, evaluation approaches, standards, and management at the macro level, but no detailed evaluation indexes were developed subsequently, resulting in unsuccessful evaluation work within individual institutions. In addition, higher education institutions need to demonstrate innovative approaches to evaluating (O)ER, for example, the lack a third-party evaluation (Yang, 2018).

Taking Xu's (2018) study as a case, we found that only 13.4% responded with "completely agree" to the statement that "the university conducts regular inspections and evaluations" and 50% responded with "disagree" or "completely disagree" to the statement that "the university frequently revises policies with regard to the problems that occur in practice". Only a few faculty members responded with "strongly agree" to the statement that their universities had established a credit transfer system (6.4%), whereas 38.3% completely disagreed that there was an inspection process and 28.6% completely disagreed that a credit transfer system existed. Xu (2018) argued that this problem was related closely to the absence of specialized online course management offices in universities. In addition, 13.4% and 16.8% of the faculty members responded respectively with "completely agree" and "agree" to the statement that "the university has a teaching team for developing online educational resources", whereas 25% responded with "completely disagree". Regarding the mechanism in place for providing support and incentives, the survey results showed that the majority of faculty members either responded with "disagree" or "completely disagree", and only 14.5% responded with "completely agree" to the statement that the university had operated well.

Xu's (2018) survey found that faculty members from the eight universities generally considered the courses well developed, but that there was a lack of understanding about how to manage these resources. Of 172 faculty members, 30.2% responded with "completely agree", and 28.5% responded with "agree" to the statement that "their university provides a complete curriculum plan and teaching schedule", and more than 50% responded "completely agree" and "agree" to the statement that "their university provides reasonable requirements for developing and implementing course content", suggesting that the current online course or educational system was relatively complete.

Follow-up interviews with these participants found that, although the university seemed to have established principles and regulations on curricula and schedules, in reality, problems, such as the misalignment between teaching plans and course objectives and integration of online teaching with face-to-face courses were not resolved in further policy-making (Xu, 2018).

Regarding faculty members' awareness of how courses or educational resources were managed, Xu's (2018) survey found that only 10.6% knew that their university had an office that specialized in online courses, and 45.9% reported that that they were not aware of such an office, whereas 43.5% stated that there was no such office in their university. This shows that most faculty members were not aware that policies regarding online courses and educational resources were managed from a central and specialized office.

In addition, these faculty members stated that they had yet to be given the type of administrative and technical support that should be provided by professional teaching teams. In addition, they said there was a lack of teaching quality supervision to ensure that faculty members implemented online teaching of a high quality.

Regarding information technology (IT) training, only 14% of faculty members responded "completely agree" and 16.9% responded "agree" to the statement that "the university conducts special training and assessment for faculty members", indicating that IT support for faculty members to develop online resources and courses was not sufficient.

The survey also investigated why the above issues occurred; 69.8% of the participants considered online educational resource or courses incompatible with traditional instruction. In online resources and courses, the methods of organizing content, scheduling time and making the course plan are different from those required for face-to-face teaching, and ineffective coordination significantly impacts the effectiveness of online teaching. Additionally, the lack of a scientific approach to resolving the tension between fragmented learning and integrated disciplinary knowledge is an important factor that accounts for the current problems in developing (O)ER online. This was also echoed in the interviews, which will be detailed later in this report.

The impact of university administrator and managers' ICT literacy on (O)ER policy implementation

An interviewee from the BNU Centre of Information & Network Technology believed that the country and the universities had issued relevant policies and action plans to promote the digitalization of educational resources but that the implementation depends on the actions that ICT offices take in individual universities. The most important factor that impacts on the implementation is IT literacy among leaders and administrative staff who are involved directly in digitalization work at the institutional level. The interviewee explained as follows:

"The problem in the digitalization of educational resources in colleges and universities lies not in the quality of learning platforms and the learning system, but more importantly in the IT literacy of personnel. If the IT literacy of the personnel involved in the informatization process does not reach a certain level and the university wants to promote the reform, there is no way for the university to effect such a change".

This interviewee indicated a belief that if university leaders have proficient IT literacy, the digitalization transformation of educational resources will be accelerated.

"In a very small number of universities, whose leaders also served as the director of the centre of ICT, the university's digitalization transformation has been promoted relatively quickly."

An example pointed out by one interviewee was the great work done by Professor Yang Zongkai, the president of East China Normal University, on the digitalization transformation of educational resources at the learning and teaching level, whereas other universities have only managed the digitalization of routine office work.

Without a leader who can coordinate resources from different university offices, problems occur. One interviewee pointed out that the ICT office and the office of academic affairs need to work together to promote the use of (O)ER at the learning and teaching level:

'[Work on both sides is] separate. Our team built a lot of things, however, if faculty members want to use our system, what I said doesn't count. For example, I wanted to provide faculty members with information services; when the job was done, those people [who were in charge of academic affairs] said: "Forget it, we're here, don't mess with us". Most universities need someone to coordinate these things.'

The interviewee also said: 'I don't know what the current high-level management is.'

Incentive policies and implementation of open courses: A case study of X University in Nanjing

In recent years, colleges and universities have continuously improved the system for identifying the workloads of faculty members who are involved in online courses. Faculty members who participate in developing online open courses receive a certain workload subsidy; their involvement is also related directly to their professional career development. Meng (2018) conducted a survey of faculty members at X University in Nanjing and the results showed that an incentive policy to encourage (O)ER development was aimed mainly at two kinds of faculty members: those who chaired online educational projects and those who directly used online courses or used them for offline tutoring. Specific policies were divided into four aspects (Meng, 2018).

First, the university provided financial support for the project, which included all course-related expenses. Faculty members received funds as soon as the online class started. The funding was provided either by the university or by the college. The amount of funding differed, according to different disciplines: ¥ 30,000, ¥ 50,000 and ¥ 100,000. According to the faculty members interviewed:

'Students were recruited as teaching assistants to produce the video of the course "Network Technology and Application" in X University and thus the production cost was relatively low, about 60,000 yuan. As for the course "Basic

Circuit Analysis", the videos were recorded by lecturers in front of the computer, so the budget was also very low, about 50,000 yuan, which consisted of fees to buy recording devices and hand-written boards for producing the videos.'

However, some videos for arts courses were made by companies because of the special effects needed. These videos were expensive. However, no matter how expensive the online course was, the universities provided sufficient financial support and encouraged the development of more such quality materials

Second, in order to encourage faculty members to participate actively in producing online open courses, X University provided additional subsidies for faculty members' additional workloads. According to the faculty member:

'There is a huge amount of work for faculty members to do during the process of making an online course. So, the university defined the workload of a faculty member in making an online course as equivalent to the time needed for teaching in a traditional face-to-face course.'

Third, faculty members were entitled to three times the workload of traditional face-to-face teaching in the first round of the flipped class, 2.5 times in the second round, and twice in the third round and beyond. This was due to the extra workload when faculty members developed a flipped class.

Fourth, funding was provided to faculty members who ran online courses. The director of academic affairs stated:

'Faculty members will receive ￥15,000 per round for the first online class, and ￥8000 for the second round and beyond. Besides, the specific funding process is as follows: iCourse allocates the national funds to universities. And then the university distributes it to the relevant faculty members after deduction of taxes. That is to say, the university is the intermediate link in the state funding process.'

6.2 Quality-related issues and concerns

The quality of (O)ER from the perspective of faculty members

In the Chinese literature, a great number of studies have proposed quality assurance systems from a variety of perspectives. For example, Chen (2008) proposed the development of a control system, process monitor system, tracking evaluation system, and quality feedback system. Wang and colleagues (2011) used prior, during, and post control mechanisms to establish a quality assurance system including planning, management, and evaluation. Wan and Zhao (2013) proposed a quality assurance system from the user perspective, including quality monitoring, quality evaluation, quality feedback and resources update systems. Wu (2015) argued that it is difficult to evaluate educational videos from educational, scientific, technical, artistic and usability perspectives. In the light of this, he proposed evaluating video teaching resources by using expert peer evaluation and student evaluation. In terms of expert peer evaluation, the focus should be on instructional design, instructional content, instructional scenarios, instructional strategy and instructional art evaluation (Wu, 2015). Although Chinese scholars have actively proposed different approaches and ways to evaluate the quality of OER, few documents address how the quality of educational resources is evaluated at the learning and teaching level in practice.

Another survey investigated staff working in MOOC offices, information centres, educational resource offices, and multimedia offices from 50 universities in China (Liu, 2016). The majority of participants (96.15%) believed their offices played a role in overall regulation and planning, and only 23.08% considered that their offices managed or examined formative evaluations of the quality of (O)ER.

In addition, interviewees from BOU mentioned that its development of educational resources had been in accordance with national policies, and therefore the focus of quality evaluation had changed accordingly.

According to this interviewee, at the time of the interview the online course quality depended mainly on the evaluation carried out before it was implemented, and the feedback received after it was developed:

'Before developing the online courses, at the departmental level, several faculty members give collective lectures and send several selected courses to the university. The university then invites experts to evaluate these courses, and the

experts will also select the qualified courses. After the selection of the courses by the experts based on the required criteria, our team started to develop the courses. Additionally, after the development of the courses, only those which are confirmed to be qualified can be run online. There will be teaching supervision during the learning process, which will supervise the compliance of faculty members' educational resources and activities. But the tools we have now can only ensure quality compliance and there is no particularly effective way to distinguish good lessons from bad lessons.'

'After the class, questionnaires are arranged to ask participants for their feedback on the course. However, from the responses students give, our team has realized that the feedback and suggestions do not actually reflect students' true experiences with the course. They only answer the questionnaires, with the only aim being to help them to get their degrees faster.'

As we can see, quality assurance at the learning and teaching level is rather difficult to implement. This requires further investigation.

The National Top-Quality Course project's contribution to educational resource quality: An interview study

Hou and Wang (2012) conducted an interview study in a research-oriented national key university (University A), and a provincial normal university (University B). Seven faculty members were interviewed: an academic staff member at University A, who was in charge of coordinating the construction of the National Top-quality Courses; faculty members at University A; the Director of the Academic Affairs Office at University B; and faculty members at University B (one of them also participated in the evaluation of the provincial-level high-quality courses).

According to the Director of the Academic Affairs Office, the National Top-quality Courses program has improved the quality of the faculty members' offline courses and deepened their understanding of instructional methods and standards. Some interviewees also mentioned that all teaching staff know the national standards for each course, and these standardized instructional methods set guidelines for faculty members, to improve the quality of their teaching.

In addition, a member of the National Top-quality Courses Review Committee explained that standardization did not mean a lack of innovation. This was confirmed by one of the interviewees. He mentioned that, in the past, some faculty applied more traditional teaching methods, with little discussion and interaction embedded in the classroom, but that the attempts to redesign their courses in order to apply for the National Top-quality Courses had changed their teaching philosophies and instructional design.

'Faculty members used to just go to their own classes and rarely attended other faculty members' classes to learn from peers. However, it is not just the members of course teaching teams who are sharing and reflecting internally around the course materials (i.e. the National Top-quality Courses) – all the course resources published online can be watched by a wider range of people. Also, due to the requirement to maintain the high quality, faculty members are also getting more familiar with information technology and making more use of educational technology in the classroom. Meanwhile, those students who couldn't keep up with the lesson can review the videos after the class.'

Most interviewees thought that top-quality courses were used mainly by peer colleagues from the same university or other universities. One faculty member from University A, whose course was a National Top-Quality course, mentioned that many universities used the course materials they produced, and that this was very helpful in order to broaden the influence of their course in the country. Faculty members from other universities had contacted them about how they produced their resources and some faculty members even visited their university in person to learn more about the course. In addition, another interviewee's course was very influential. He believed that his National Top-quality course had played an important role in improving the standards of instructional design and had had an impact on similar courses in many domestic universities. His course had an extremely high usage frequency, because it was also offered by other universities, and many faculty members browsed his course resources or contacted him when developing their own courses (Hou & Wang, 2012).

6.3 Educational resources and technologies in use

Use of (O)ER and technologies among faculty members

In 2011, a survey study of 246 faculty members was conducted in Chongqing, Hebei, Beijing, Jiangsu and other cities. The study showed that faculty members had a high demand for digital resources, and that the top three frequently used digital resources were multimedia, e-learning materials and instructional resources (Xu, 2011). Regarding their access to digital educational resources, most faculty members mentioned that they obtained these resources through the Internet, using various network platforms for high-quality courses. Very few faculty members obtained resources through the campus network.

A 2013 survey of early-career faculty members under the age of 40 from three universities in Xi'an found that 59% of 202 faculty members had developed courseware by themselves. However, in-depth interviews showed that most faculty members chose to use PowerPoint as the digital courseware. In addition, 38% mentioned that they downloaded resources from the Internet to help them develop courseware. By contrast, only 3% used educational resources developed by their universities and paid recourses (Li & Ma, 2013). Similar findings were reported in a 2011 survey, and 64.6% of participants chose to use PowerPoint resources. The challenges for faculty members to use OER were reported to be lack of awareness (41.5%), lack of skills (24.6%), and lack of time (9.2%) (Li & Li, 2012).

Moreover, in 2015, an interview study of 87 faculty members at Northwest Normal University found that 75% chose to design courseware either by themselves or by integrating teaching materials by themselves, whereas the others adopted multimedia resources either from CDs, websites, QQ sharing or WeChat (similar to WhatsApp). Most interviewees used text, images, audio, animations and videos in their daily teaching. Image processing technology was used by 92%, 69% used audio processing technology, and only a few faculty members used video or animation technology. In addition, 75% of interviewees added interactions in class.

Nevertheless, 70% of the participants still stated that they could not make full use of multimedia equipment (Li, 2015). As in previous studies, 71% mainly used PowerPoint in teaching, whereas only a few faculty members used advanced technologies, such as Authorware or Flash (Li, 2015).

Zheng and colleagues analysed 603 courses from 14 Chinese MOOC platforms, of which 266 (44.11%) were recorded lectures given in classrooms. Animation, Khan's style, discussion and interviews were rarely used in MOOCs, accounting for less than 4% across 603 courses (Zheng, Li, & Chen, 2015).

Use of open courses among students

Students tend to use different types of education resources. In 2012, a survey of 319 university students was conducted in the area of Xiuzhou (including China Mining University, Jiangsu Normal University, Jiangsu Vocational Institute of Architectural Technology and Jinzhou Polytechnic) and another 185 university students from universities all over the country, with a total of 504. The results showed that the most popular learning resources among students were open courses offered by NetEase Open Class (56.75%), open courses from overseas universities (36.90%), video open courses (36.11%), online courses in domestic universities (34.33%), and National Top-quality Courses (33.13%) (Dong, 2013).

In relation to the Top-quality Courses, many problems have been reported. Wang (2010) conducted a survey of 483 students studying at higher education institutions, and found that they rarely used top-quality courses. The results showed that 76.92% of students logged into the platform for less than one hour per week or per day. In Wang's survey (2010), students commonly highlighted that there were problems with using Top-quality Courses. For example, 63.14% thought that the hyperlinks led to the wrong (O)ER, 61.35% stated that it took too long to load (O)ER, 55.25% indicated that the internet speed was slow, 50.37% mentioned that they were inaccessible, and the majority were not satisfied with (O)ER that was provided to them. In a survey by Wang and colleagues (2012), only 27.2% of students thought the Top-quality Courses were user-oriented, whereas 56.2% considered the sharing and reusing of these sources to be relatively low. In Wei's (2019) investigation, only 20.4% of students considered open instructional resources good

enough to facilitate their learning, and 38.6% thought that these resources rarely helped them to improve their learning performances.

According to a study of frequency of use in the area of Suzhou (near to Shanghai) (Dong, 2013), 33.93% of students rarely visited online classes over the whole semester, 22.22% visited fewer than three times per semester, 22.42% visited one to three times per month, 17.06% visited once or twice per week, and only 4.37% of students visited more than three times per week. This indicates that the utilization rate of open courses is relatively low for university students (Dong, 2013). Another study (Wang, Liu & Zhu, 2013) investigated students from 11 provinces from the east, west, and north of China. Of 1125 students, 23.9% indicated that they did not used top-quality courses.

In terms of preferences, 66.67% of participants preferred to use teaching video/audio, 40.08% preferred to use downloadable lecture notes, 37.3% chose references, 18.06% tended to use course assignments, 16.87% preferred to use interaction and communication, and 15.28% tended to use online tests for learning. This implies that university students preferred to follow a course in video/audio format that could be downloaded for later use. In addition, it seems that they were also interested in references provided by open courses, to deepen their understanding of the course content.

In addition, the university students' participation in interaction and discussions was found to be relatively low. According to the survey, less than 20% of the students participated in interactions frequently, with a non-participation rate of approximately 40%. This is a clear indication that participation in open course interactive discussions is generally not high. Nevertheless, the survey showed that students thought that the communication and interaction module was important (Dong, 2013).

A successful story of (O)ER adoption by students

Ten universities are located in Guangzhou University Town, including Sun Yat-sen University, South China University of Technology, Guangzhou University of Traditional Chinese Medicine, South China Normal University, Guangdong University of Technology, Guangdong University of Foreign Studies, Guangdong Pharmaceutical College, Xinghai Conservatory of Music, Guangzhou Academy of Fine Arts and Guangzhou University (see Figure 11). These universities allow students to learn from other online sources through several approaches, such as offering online courses in their specialized disciplines for other universities, offering minor degrees for other universities, and providing flipped classes using online courses offered at CNMOOCs.

Figure 11

Map of Guangzhou University Town (adapted from 'Speculative urbanism and the making of university towns in China: A case of Guangzhou University Town')

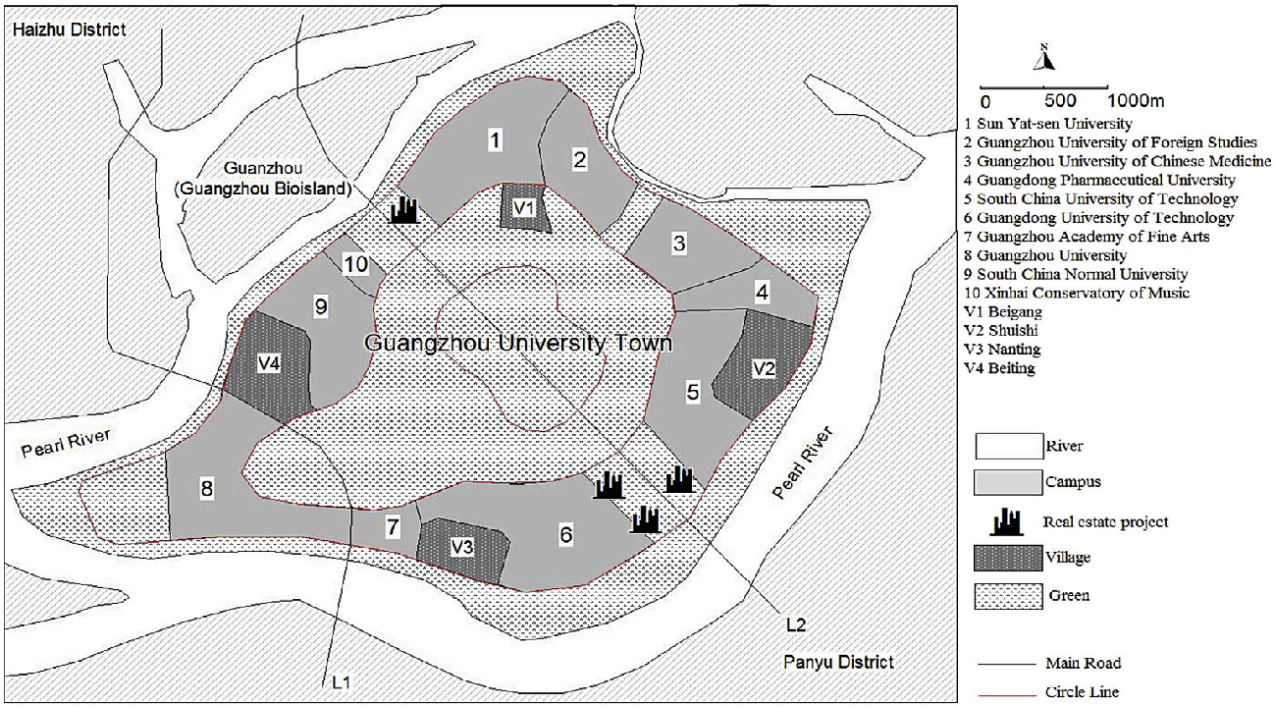


Fig. 3. The map of Guangzhou University Town.

In 2006, the Department of Education of Guangdong Province issued documents designed to encourage cross-registered courses and credit recognition among colleges and universities in Guangzhou University Town. However, the article 'Guangdong University Town: Mutual Recognition of Credits, No one Applauding', which was published by People's Daily on July 18, 2011, reported a dilemma regarding the policy in Guangdong University Town. According to this article, only 2% of the total number of students in the town chose to learn through cross-registered courses in the first semester of the 2011/2012 academic year. Interviews showed that students generally believed that most cross-university courses were not practical and that the extra tuition was not cost-effective.

However, since 2008, South China Normal University has launched two online elective courses, Pedagogy and Psychology, both of which have achieved good reviews and have been improved continuously to this day. These two online public courses each has one lecturer, assisted by two tutors, and the number of registered students is approximately 300 per semester. Both courses are taught by a teaching team led by associate professors, involving lectures. According to a 2013 survey, 172 students of Pedagogy and 143 students of Psychology rated the quality of the resources of these two online courses highly, and preferred to learn online to avoid high tuition fees and travel (Wu & Zhang, 2013).

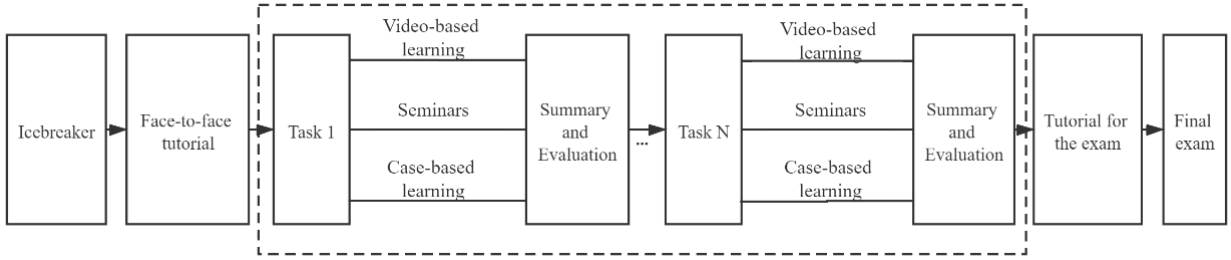
The success of these two courses is also attributable to the fact that a new teaching method support system was adopted.

Innovation in instructional mode – Facilitation rather than lecturing

At the beginning of these two courses, the lecturer organizes a first face-to-face session, introducing the course content, characteristics, learning methods and assessment, in order to familiarize students with online learning, in preparation for later online sessions. During the face-to-face session, lecturers provide students with feedback on how to progress step by step, and give them tasks, including learning materials, discussion topics and cases to solve. After one session, focusing on one topic, the lecturers summarize the topic and provide scaffolding for students to develop knowledge construction. In this way, this course is no longer a conventional online one, including 'video + forum'; it has more interactions. Before the final exam, lecturers offer tutorials on difficult knowledge through face-to-face sessions or online sessions, with the aim of helping the students to prepare for the final exam (see Figure 12).

Figure 12

The teaching process of intercollegiate network public elective course (adapted from 'On Curriculum Elect and Learning Credit Recognition in Guangzhou University Town: From the Perspective of Interscholastic Online Teaching')

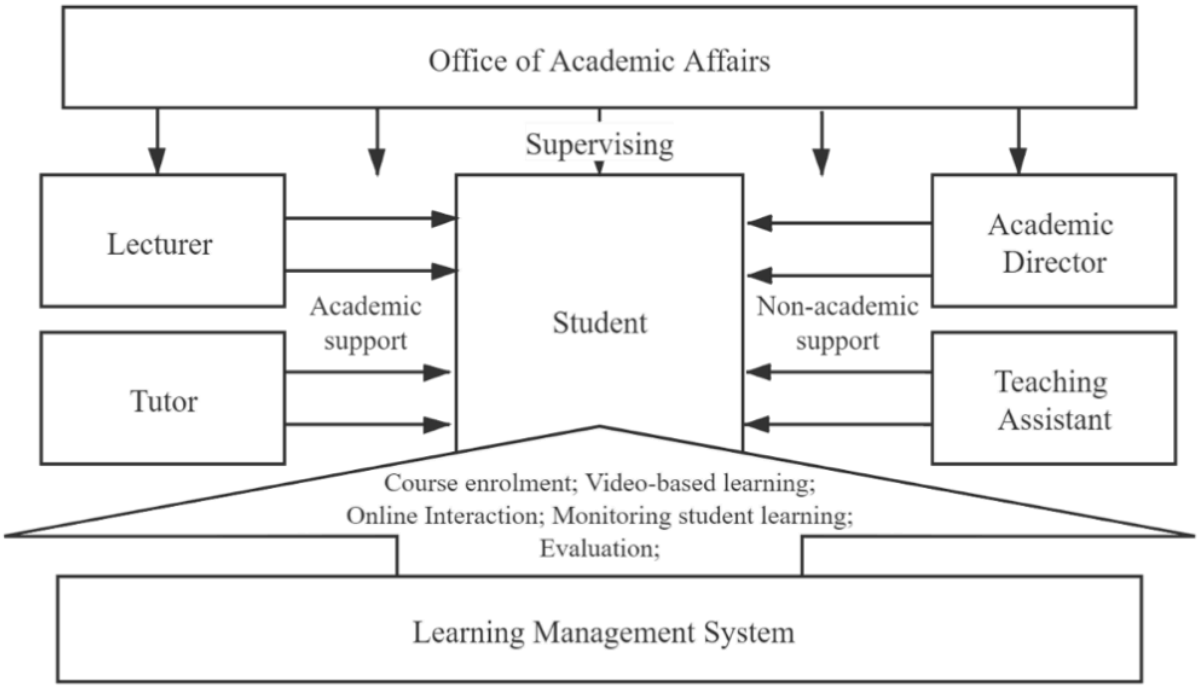


Innovation in the support system

Approximately 300 students take Pedagogy and Psychology each semester; they come from different universities (see Figure. 11). After a long exploration period, South China Normal University has developed a comprehensive learning support service system to provide better support to students who learn online, as shown in Figure 13 (Wu & Zhang, 2013). This ensures low dropout rates. Feedback from students is generally good.

Figure 13

Support system for sharing online courses (adapted from 'On Curriculum Elect and Learning Credit Recognition in Guangzhou University Town: From the Perspective of Interscholastic Online Teaching')



Online education resources construction during COVID-19

Coronavirus-19 broke out in China during the Spring Festival 2020. In February, the Ministry of Education issued a Guideline Regarding Online Teaching and Management of Colleges and Universities during the Epidemic Prevention, requiring that teaching and learning should continue uninterrupted while all colleges and universities were closed down.

At present, little research has been conducted on the infrastructure used by faculty members at Chinese colleges and universities during this epidemic. A few studies have provided descriptive accounts of how universities pivoted quickly to online learning. For example, Professor Gong from Peking University introduced the use of platforms and tools. On February 17, 2020, Peking University started the new semester, with 2,836 faculty members and 218,853 students taking online courses.

First, in terms of course formats, undergraduate courses mostly adopted live streaming, accounting for 50% of the total number of courses, whereas most of the graduate courses were more diverse, including seminars and live streaming and other formats. About 25% of these graduate courses adopted two or more instructional forms to improve the teaching quality (Gong, 2020).

As for platform selection, Peking University encouraged faculty members to use multiple platforms simultaneously to reduce pressure on the university's ICT infrastructure. Faculty members used diverse platforms, such as the Peking University teaching platform (Blackboard), ClassIn, and Canvas, and Zoom. Most faculty members chose ClassIn. In addition, faculty members who needed to organize seminars and record course videos primarily chose the Peking University teaching platform (Blackboard). For students, the most popular website for MOOC learning was China University MOOC. However, there are advantages and disadvantages of having a great number of platforms to support online learning: it, on the one hand, provides great convenience for faculty members and, on the other, also requires students to switch to different learning platforms frequently (Gong, 2020).

Although different platforms had been adopted within universities, there were still some problems rooted in the IT infrastructure for online teaching across the country (especially earlier in the term). During the peak time, the learning platforms and software are likely to encounter network congestion because too many students were using them at the same time (Han, 2020). For example, when using some platforms such as China University MOOC and XuetangX, there were lags and delays because too many students were watching videos and taking online classes, and sometimes they even failed to log in during certain peak hours. In addition, a small number of students could not attend classes due to the poor Internet access in rural areas.

Regarding quality assurance, different college and universities acted in their own ways. For example, Peking University organized a teaching research group, composed of experienced professors, to investigate online courses to ensure their quality. In the first two weeks of the teaching research group, this group attended more than 60 classes. They found some problems, such as the incorrect angle of the faculty member's camera and light problems. These problems were reported back to the faculty members in a timely fashion, and then the faculty members quickly made adjustments. Additionally, the group gave some suggestions about the instructional design of online classes.

In addition, many colleges and universities, such as Shandong Normal University and Inner Mongolia Normal University, surveyed undergraduate students and faculty members about teaching quality and published reports on this. The surveys also covered the attitudes of students and faculty members towards online teaching, as well as the expectations for future teaching modes, as seen in the report from Shandong Normal University.

During this epidemic, many faculty members were nervous about teaching online; for many of them this was the first time they had used the online mode to teach. For these faculty members, urgent technical support was needed.

As Peking University, the Centre for Excellent Teaching and Learning held a training programme for faculty members very quickly. Specifically, the programme was carried out in two stages with the idea that the first priority was to solve technical problems to ensure the development of online teaching and then to increase the instructional design and strategy gradually to improve the quality of courses (Gong, 2020).

The first stage of the programme, which started before the beginning of the semester, focused on using software tools, lasted five days and involved 15 lectures (over seven hours). This trained 2,062 faculty members at Peking University. The content included using resources such as ClassIn, and the Peking University teaching platform (Blackboard).

The second stage of the programme, which was held during the second week of the term, focused on instructional design strategy. At that time, faculty members had gradually adapted to online teaching and had begun to focus on how to promote teacher–student interaction. Training sessions included instructional methods and online teaching skills.

In addition to these, regular training for young faculty members and teaching assistants is still continuing, also focusing on online learning and teaching. To promptly solve the faculty members' problems in online teaching, the centre opened a hotline, a consultation mailbox and a WeChat group to provide 24/7 support.

7. Conclusion

Given that educational digitalization is a national strategy in China, it is hardly surprising that the Central Government is the key driving force behind educational digitalization and that macro-level policies and measures guide and in some cases define the direction and the growth of the digitalization drive, resulting in a concentric phenomenon, with all efforts at macro-, meso- and micro-levels directed towards the national digitalization objectives. Nevertheless, with increasing awareness of the resulting benefits, more and more HEIs have shifted from responding, somewhat passively, to the national strategy to intrinsically-motivated engagement with digital technologies in their attempt to have more competitive advantages over their counterparts. Another point worth noting is that following the guidelines imposed at a higher level does not mean the sacrifice of initiative, ingenuity, creativity and innovation at a lower level, as evidenced by the ways in which digital technologies are utilized in practice. A key lesson concerning the top-down approach is that great care should be taken to ensure that there is no flaw in the higher-level policies and/or initiatives. The damage caused by higher-level flaws can be very expensive and even disastrous. Luckily, no such costly mistake has ever occurred in China.

From the perspective of the Central Government, the overarching goal of digitalization is to modernize the country's education, enhance (higher) educational quality, and achieve educational equity by investing in digital infrastructure construction, staff capacity building, technology-enhanced learning and teaching, and developing and sharing of high quality educational resources. Measures taken to ensure the successful implementation of these policies include providing funding, incentive or subsidy; strengthening leadership and coordination; creating a favorable innovative atmosphere; and promoting international cooperation. Compared with the Central Government, HEIs are not an impressive force in terms of pushing the digitalization drive. However, this situation is changing as a result of the COVID-19 pandemic. Having learned cruel lessons from the COVID-19 crisis, more and more HEIs now realize the imperative of digitalization in the future. Therefore, we have reasons to believe that efforts from the macro-, meso- and micro-levels will result in a better synergy in the days ahead.

Amazing achievements have been made in such areas as digital infrastructure construction and high quality digital educational resource development and sharing. For example, China has a well-developed network composed of digital platforms at national, regional or provincial and institutional levels, which greatly facilitate dissemination, sharing and using of digital educational resources such as MOOCS as well as course delivery. As a matter of fact, infrastructure construction and resources development are top on the agenda at the macro-, meso- and micro-levels. In contrast, more attention should be given to staff capacity building so that they can make the best use of digital technologies in their teaching, research and administration. Lack of adequate skills in using digital technologies may explain in part the gap between construction and application. With well-developed digital infrastructure and rich digital educational resources, it is time to shift the focus to practice, supporting innovation in micro-level practice to realize the overarching goal mentioned earlier. Unless the infrastructure and resources already available are put to effective and productive use, we have yet to reach this goal.

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[1] All statistics are applicable to mainland China only; statistics from Hong Kong Special Administrative Region, Macau Special Administrative Region and Taiwan Province are not included in this report.

[2] It should be pointed out that this website has been restructured and re-purposed and is no longer used exclusively for this purpose.

[3] For a list of these 75 universities, visit http://www.moe.gov.cn/jyb_zzjg/moe_347/201708/t20170828_312562.html

[4] For a list of national standards (updated on September 10, 2016), visit http://www.celtsc.org/channel/bzlist.html

[5] All the national standards are available from the national standardization information system of Standardization Administration of the People’s Republic of China.

[6] Retrieved January 2, 2019 from http://www.xuetangx.com/global

[7] For results of the first review, visit https://edtechbooks.org/-MRbW

For results of the second review, visit
http://old.moe.gov.cn/publicfiles/business/htmlfiles/moe/s5972/201212/146264.html

For results of the third review, visit
http://old.moe.gov.cn/publicfiles/business/htmlfiles/moe/s6871/201306/153010.html

For results of the fourth review, visit
http://www.moe.gov.cn/srcsite/A08/s5664/s7209/s6871/201311/t20131111_159561.html

For results of the five review, visit
http://old.moe.gov.cn/publicfiles/business/htmlfiles/moe/s5972/201404/167525.html

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http://www.moe.gov.cn/srcsite/A08/s5664/s7209/s6871/201410/t20141027_177363.html

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http://old.moe.gov.cn/publicfiles/business/htmlfiles/moe/s5972/201504/186380.html

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http://www.moe.gov.cn/srcsite/A08/s5664/s7209/s6871/201602/t20160223_230198.html
[8] See https://edtechbooks.org/-LLIC. Also see
http://www.moe.gov.cn/srcsite/A08/s5664/s7209/s6872/201607/t20160715_271959.html

[9] http://www.moe.gov.cn/srcsite/A08/s5664/s7209/s6872/201607/t20160715_271959.html

[10] http://www.moe.gov.cn/srcsite/A10/s7011/201702/t20170216_296448.html

[11] https://edtechbooks.org/-hNjW and
http://www.moe.edu.cn/s78/A08/A08_gggs/s8468/201812/t20181217_363767.html

[12] Retrieved January 3, 2019 from http://resource.jingpinke.com/

[13] http://www.jingpinke.com/my/point/introduction

[14] We keep the English names of all the alliances/platforms as provided on the websites; otherwise, we will use our own translations.

[15] See 'About us'

[16] Retrieved January 13, 2019 from https://www.cnmooc.org/portal/frontCourseIndex/course.mooc

[17] Retrieved January 16, 2019 from http://www.uooc.net.cn/league/union/intro#contact

[18] Retrieved January 16, 2019 from http://wemooc.zhihuishu.com/union/pages/notice/notice02.jsp

[19] Retrieved January 16, 2019 from http://wemooc.zhihuishu.com/union/pages/notice/joinnew.jsp

[20] Retrieved January 16, 2019 from http://wemooc.zhihuishu.com/union/pages/Member/member.jsp

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[22] Retrieved January 16, 2019 from https://jslm.cnmooc.org/portal/frontCourseIndex/course.mooc

[23] Retrieved January 16, 2019 from https://hlj.cnmooc.org/school/alliance-402.mooc

[24] Retrieved January 14, 2019 from https://edtechbooks.org/-GPUX and http://jiangsu.icourses.cn/jiangsu/school.jsp

[25] Retrieved January 14, 2019 from http://hebei.icourses.cn/

[26] Retrieved January 16, 2019 from http://shanghai.icourses.cn/

[27] Retrieved January 14, 2019 from http://hubei.icourses.cn/

[28] Retrieved January 14, 2019 from http://henan.icourses.cn/

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[30] Retrieved January 14, 2019 from http://guangxi.icourses.cn/

[31] Retrieved January 14, 2019 from http://hljmooc.zhihuishu.com/home/index

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[38] Retrieved January 15, 2019 from http://www.cmooc.cn/pages/lmjj.html

[39] The People's Republic of China is composed of 34 provincial-level administrative divisions, namely 23 provinces, 5 autonomous regions, 4 municipalities directly under the Central Government, and 2 special administrative regions. Retrieved January 15, 2019 from http://www.gov.cn/guoqing/2005-09/13/content_5043917.htm

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[43] Retrieved January 15, 2019 from http://www.moe.gov.cn/s78/A08/moe_745/201703/t20170302_297912.html

[44] Retrieved January 15, 2019 from http://lis.icourses.cn/

[45] Retrieved January 15, 2019 from http://music.icourses.cn/#zxkc

[46] Retrieved January 15, 2019 from http://fet.zhihuishu.com/static/pages/notice01.jsp

[47] Retrieved January 15, 2019 from http://fet.zhihuishu.com/static/pages/course.jsp

[48] Retrieved January 15, 2019 from http://zyymooc.zhihuishu.com/static/pages/newsList.jsp

[49] Retrieved January 15, 2019 from http://zyymooc.zhihuishu.com/static/pages/school.jsp

[50] Retrieved January 15, 2019 from http://www.pmphmooc.com/web/about?type=1

[51] Retrieved January 15, 2019 from https://edtechbooks.org/-eMTT and from http://www.pmphmooc.com/web/open?type=1

[52] Retrieved January 16, 2019 from http://moocs.unipus.cn/union/introduction

[53] Retrieved January 17, 2019 from http://www.cmooc.cn/index.html

[54] Retrieved January 17, 2019 from http://ucc.sh.zhihuishu.com/statics/pages/Announcement/interactionPage.jsp

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[58] Retrieved January 17, 2019 from http://jlmooc.zhihuishu.com/static/pages/newsPages/unionConstitution.jsp

[59] Retrieved January 17, 2019 from http://zyymooc.zhihuishu.com/static/pages/unionrules.jsp

[60] Retrieved January 20, 2019 from http://oi.pku.edu.cn/

[61] Retrieved January 20, 2019 from http://english.pku.edu.cn/intro_organization_admindetail.shtml?id=045

[62] Retrieved January 20, 2019 from http://www.tsinghua.edu.cn/publish/thuitc/10719/index.html

[63] Teaching Affairs Office is the name used on the BNU website (English). The English equivalent of the same department is the Department of Educational Affairs on the PKU website (English). It may be called differently elsewhere, for example, Office of Undergraduate Education on the website of Jilin University (http://global.jlu.edu.cn/User/Index/newsDetail?id=39).

[64] http://mooc.pku.edu.cn/mooc/news.php?id=7

[65] http://mooc.pku.edu.cn/mooc/news.php?id=37

[66] http://mooc.pku.edu.cn/mooc/news.php?id=35

[67] https://www.tsinghua.edu.cn/publish/newthu/10249/2016/20160113081920309193611/20160113081920309193611_

[68] http://mooc.pku.edu.cn/mooc/news.php?id=31

[69] http://mooc.pku.edu.cn/mooc/news.php?id=35

[70] http://mooc.pku.edu.cn/mooc/news.php?id=29

[71] http://jwc.lzu.edu.cn/lzupage/2015/06/04/N20150604102458.html

[72] http://www.lzush.com.cn/Item/20101.aspx

[73] http://zgy.henu.edu.cn/info/1107/2407.htm

[74] http://mooc.pku.edu.cn/mooc/news.php?id=7

[75] https://www.ecnu.edu.cn/_s294/ec/82/c10614a126082/page.psp

[76] http://jwc.lzu.edu.cn/lzupage/2015/06/04/N20150604102458.html

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[78] https://www.ecnu.edu.cn/_s294/ec/fb/c10614a126203/page.psp

[79] Retrieved January 17, 2019 from http://www.cmooc.cn/index.html

[80] http://www.haedu.gov.cn/2016/09/01/1472703477251.html, 2016-08-31.

[81] http://jwc.swu.edu.cn/s/jwc/download2qtcl/20171114/2116030.html, 2017-11-14.

[82] http://jwc.xmu.edu.cn/cb/60/c2194a314208/page.htm, 2017-10-25.

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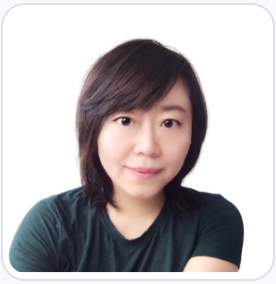

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4

Open Educational Resources within the Digital Transformation of German Higher Education

Svenja Bedenlier & Victoria I. Marín

1. Introduction

This chapter is sourced from three separate reports revolving around the macro, meso and micro level of Open Educational Resources (OER) as they are presently addressed in the larger context of digital transformation within German higher education. The three reports were collated during a period of three years, mirroring the state at the respective points in time. Whereas the macro and meso level are organized in the form of a desk research, the section on the micro level is constituted by a small-scale survey on instructors' OER practices within their teaching.

As the topic OER is - in practice - still rather located at the margins than in the mainstream of higher education, it is embedded within the larger discussion of digital transformation. Furthermore, and in comparison to other countries, the German higher education system is characterized through its federal structure, leading to the differentiation of the macro level to be understood as the national level, the meso level to encompass the 16 different federal states and the mirco level to revolve around the individual institutional and instructor practices.

The German Higher Education System

The higher education system in Germany is comprised of a total of 396 higher education institutions, 121 of which are universities, 218 universities of applied sciences and another 57 art and music conservatories (Hochschulrektorenkonferenz, 2018). With 240 institutions, their majority is public (ibd.). As of 2018, the higher education system had a total enrolment of 2.8 million students, of which 1.46 million are male and 1.38 are female and a total staff number of 691,363 within which academic and artistic staff amounted to 386,752. Education at all levels is regulated on the state level, in the case of higher education through the state-specific Hochschulgesetze—herewith accounting for a variety of state-specific regulations, ranging from student admission criteria to pay scales for staff. Germany became a signatory to the Bologna process in 1999, entailing the major organizational change process of converting to the three-cycle system of bachelor, master and doctorate as well as agreeing to join the European Higher Education Area (EHEA).

At the core of the German higher education systems remains—since the early 19th century—Humboldt's conceptualization of higher education institutions that revolves for example around the unity of research and teaching, freedom from immediate societal and political application and usability of research and self-governance within the institutions (Kehm, 2015). However, institutional and system changes, e.g. increased competition between institutions, budget allocation and career trajectories, also affect these principles (ibid.).

Digitalization has emerged to be a strong force on higher education and presumably continues to be so; influencing institutional structures within higher education institutions and including, rather prominently, the process of teaching

and learning. The public and scientific discussion has been centrally shaped and influenced by the Hochschulforum Digitalisierung, considered as a "think tank, network and knowledge hub" [1] (Janoschka & Horndasch, 2018, p. 8) and that has published a large number of working papers, covering different aspects of digitalization, albeit less concerned with its informational and computational aspects.

Digital transformation and/or digitalization

A taskforce set up within EDUCAUSE (2018) defines digital transformation within higher education to be

> *Digital transformation is a cultural, technological, and workforce shift. In its cultural dimension, it requires a new approach to how campus leaders interact with each other as well as an emphasis on change management and a movement toward institutional agility and flexibility to meet quickly changing needs. For IT, this means adopting a role of strategic and transforming partner in alignment with institutional mission. IT leaders and their organizations must model digital transformation by adopting innovative practices and creating new digital architectures that provide unprecedented agility and flexibility to enable the institution to rapidly and efficiently achieve its strategic aims. Digital transformation also has broad implications for the institutional workforce, requiring dramatic shifts in workplace skills at all levels and professional development that enables the workforce to keep pace with the rapid tempo of change.*
> *Digital transformation is being driven by technology trends and changes that include advances in analytics, artificial intelligence, the cloud, mobile, consumerization, social networks, and storage capacities. Those drivers are enabling a new approach to everything from digital architectures to how campus leaders interact with the IT organization, all with the expected outcomes of new business models, improved student outcomes, different teaching and learning methods, and new research capabilities (p. 6).*

Although this definition is primarily concerned with leadership (and coined for the US American context), it provides a rough orientation towards the all-encompassing character that digital transformation has on higher education campuses. Nambisan, Lyytinen, Majchrzak and Song (2017) introduce a special issue of MIS Quarterly on IT and Innovation, by advancing a definition of digital innovation, which is to a certain extent also applicable to the higher education context and its present transformation. They state that "in digital innovation, digital technologies and associated digitizing processes form an innate part of the new idea and/or its development, diffusion, or assimilation" (p. 224). Herewith, digital technologies are positioned at the core of all process stages of revolving around change - much as it is occurring right now when digitalization within higher education is concerned.

Another, very recent study on digitalization needs to be mentioned as it pertains to the German higher education context. In this extensive and comprehensive overview study on the status quo of digitalization within German higher education, Gilch, Beise, Krempkow, Müller, Stratmann & Wannemacher (2019) advance an understanding of digitalization for their study that follows the three dimensions of research, teaching and service that are typically applied to structure the responsibilities of universities. They then state:

- In this study, digitalization of research means the comprehensive application of computer-supported approaches and the systematic use of digital resources in research.
- The digitalization of teaching and learning is understood as the integration of digital tools and components into the teaching and learning processes.
- The digitalization of services encompasses the networked realization of administration processes through use of shared digital tools (p. 12, translation by the authors)

For further consideration of the aspects that are being raised in the remainder of the report, it is helpful to keep in mind Gilch et al. (2019) clearly documenting that German higher education institutions view digitalization as a highly important topic, whilst also conceding that most often their current status with regard to digitalization is not yet evaluated as sufficient (p. 41).

2. Macro level

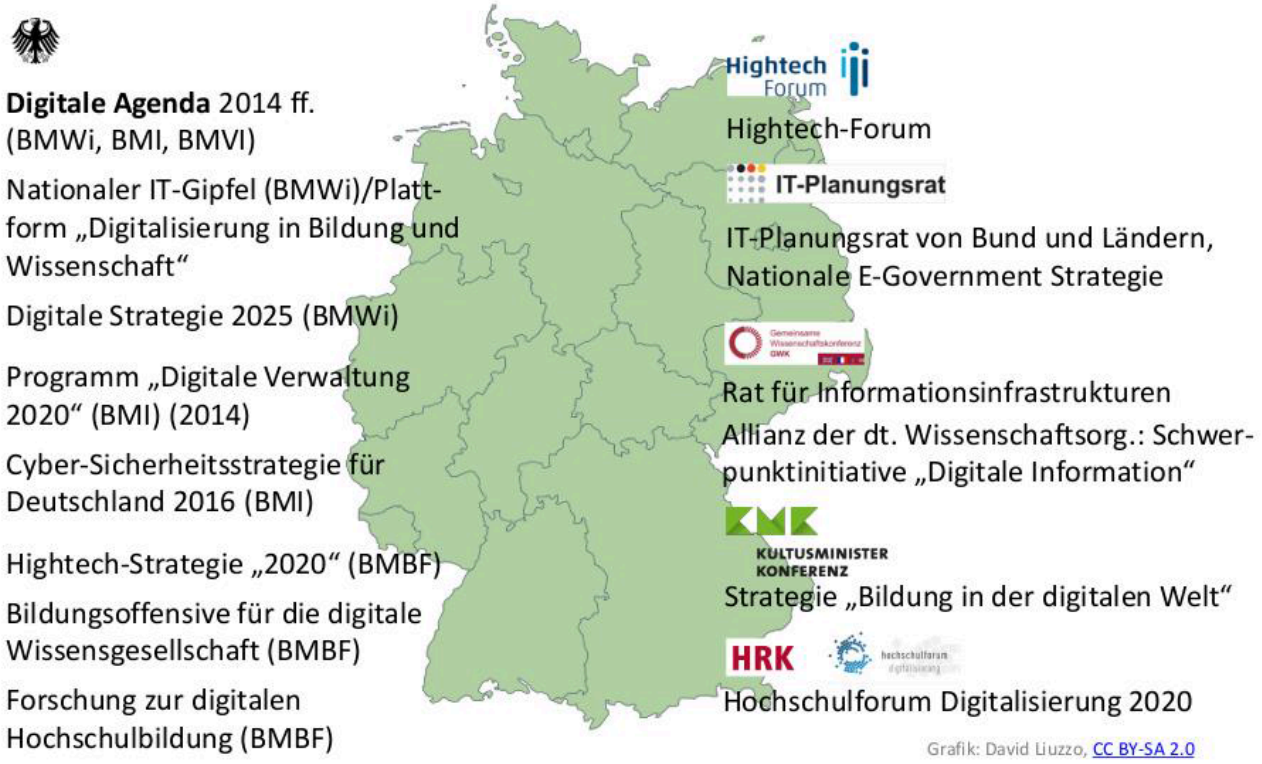
2.1 Policy

2.1.1 Policy trends

As will be seen throughout this report, policy – in the form of strategies, initiatives or programs – is weaved into all other fields pertaining to digitalization and the specific field of OER and metadata. From the comprehensive report by Gilch et al. (2019) the following figure was extracted, which provides an overview of initiatives in the field of digitalization on the federal level, some of which will be elaborated on below and throughout the report. Taken into consideration all initiatives depicted here would exceed the space of the document, however, they can be turned to for further reference.

Figure 1

Digitalization initiatives and strategies on the federal level (copied from Gilch et al., 2019, p. 148)



2.1.2 National policies

Due to the fact that the German education system is federally structured, legislation and execution of education is regulated on the state level—as a consequence, developing and implementing one national policy is not feasible. This holds true for the topic of digitalization as well, thus delegating it to the individual states and their responsible bodies. Subsequently, this also results in the fact that discussion on digital infrastructure, exchange of data and information within higher education institutions occurs on the state level. However, a Digital Agenda for 2025 (“Digitale Strategie 2025”) was put into place in 2016, as well as concrete measurements (“Digitalisierung gestalten”–Umsetzungsstrategie der Bundesregierung) in 2018. Both documents also encompass distinct passages on higher education as regards both its shape as well as challenges that are to be met. Whilst these strategies can only address more general elements, it is useful to include them in this analysis as they provide the large and national context and intention associated with digitalization.

In the 2016 document (BMWi, 2016, p. 52), noteworthy points related to digitalization within higher education include the

- Establishment of more professorships in the STEM fields and computer science
- Integration of informational and digital knowledge across the disciplinary curricula
- Foster entrepreneurial engagement
- Extend face to face instruction through online learning via MOOCs and other forms of e-learning

Concrete areas to be tackled in the field of higher education, as outlined in the 2018 document (Bundesregierung, 2018, p. 40, translation by the authors), include:

- Digitalization of the higher education system: Research on digital higher education, competition for digital innovative higher education institutions or consortia—in order to strengthen the German HE system, enable HE institutions to develop and implement digitalization strategies and to generate sound knowledge on HE digitalization, its potentials and barriers.
- Digitalization of the scientific research system, national research data infrastructure - in order to strengthen the German science and innovation system and support the development of a sustainable, interoperable research data management system and implement a standardized research processing scheme across scientific disciplines.

Whilst these documents are drafted with the national perspective in mind, the Standing Conference of the Ministers of Education and Cultural Affairs (KMK) (2016) published a position paper “Education in the digital world” (”Bildung in der digitalen Welt”) in which the states promulgate, from their perspective, a joint understanding on the role, challenges and measures to be taken in order to ensure appropriate education on all levels in the context of digital transformation. For the higher education context, the KMK defines ten central areas of action and development, including for example:

- Open Educational Resources – whilst a range of OERs exists already, uncertainties revolving around legal issues continue as well as challenges regarding their financing. Hence, it is necessary to clarify legislation and provide basic financial means (p. 50-51).
- Quality assurance – quality is of utmost importance, including content, technology and pedagogical setting of digitally enhanced HE learning and should be measured across institutions and in the context of accreditation (p. 51).
- Strategy development – HE institutions are called upon to develop agendas and strategies to shape and refine an individual profile (p. 53).
- Inter-institutional cooperation - the digital transformation is a national endeavor, in the course of which HE institutions are being financially supported to cooperate and share infrastructures, also across other educational sectors (p. 54).
- Infrastructure and technical requirements – with partially digitalized processes and units, HE institutions use learning management systems for intra-institutional processes predominantly related to teaching. In order to also use research data for teaching purposes, the different institutional software solutions should take interoperability into account. Scientific libraries assume a prominent role in supporting digitally enhanced teaching and learning (p. 52-53) (translation by the authors).

However, due to the federal structure, declarations and voiced commitments only have recommendation character and are not legally binding.

2.1.3 State level policies

Currently [2], thirteen of the sixteen federal German states have digital agendas, digital master plans or digitalization strategies in place, all of which mention different levels of the education system, and including higher education, as part of their respective digital futures. Screening the respective agendas, it is also evident that education constitutes only one dimension among the many that digitalization influences—next to economy, e-governance, culture and participation, the technical and informational foundations, health and welfare as well as cyber security. Two states, Bavaria and Saxony, also have distinct strategies for the field of (higher) education alongside the general state-level strategies.

Before endeavoring into the more concrete topics that these agendas discuss in regards to higher education in the context of digitalization, it is helpful to look at how the states understand and define digitalization.

Defining digitalization

Out of the thirteen strategies, only seven elaborate a definition of digitalization or at least remark on some traits that characterize this process—the other strategies employ the term digitalization but lack further information on how they conceptualize and understand this term. Definitions also vary in scope and detail.

For example, in the digital strategy of the state of Baden-Wurttemberg (2017, p. 8), digitalization is being referred to as

> *Originally, the term „digitalization" merely meant the transformation of storage media such as books, records or photographs into data files consisting of 0 and 1 numericals. Over time, the term has gained an additional, more comprehensive meaning. The transformation of all kinds of information into a digital format, the storage and processing of data on a massive scale and the worldwide connectedness has become the symbol of a new era. Since then, „digitalization" is understood to encompass the whole of all economic, societal and political reform and alteration on the basis of information and communication technology (translation by the authors).*

This understanding of digitalization is similar to the definition of digital transformation advanced by EDUCAUSE (2018) in the sense that it is referred to as a massive and comprehensive change that is brought about through ICT and that fundamentally changes existing structures and beliefs in all dimensions of individual and societal life. The comprehensive changes that the digital transformation brings are reflected in all seven strategies, making most often reference to changes occurring in all areas of life ("Lebensbereiche"). Thus locating digital transformation within education contexts can only be fully understood when viewed within this larger societal context.

In the course of their definitions, the policy documents tend to argue along the line that digitalization is induced predominantly through technological developments but that it can be shaped by humans, more concretely by "us" as the pronoun "we" reveals, which makes the experience of digital transformation a shared one between state governments and citizens alike ("We are convinced that digitalization holds great opportunities for growth and new prosperity, if we actively shape it", North Rhine Westphalia). Digitalization is labeled as, for example, "the fourth industrial revolution" (North Rhine Westphalia) or as "a mega trend" (Thuringia), and considered to be "next to globalization the greatest chance and equally the greatest challenge of the 21. century" (Rhineland Palatinate). Furthermore, the strategies also touch upon perceived risks and challenges brought about through digital transformation (data security, substitution of professional fields) as well as benefits it potentially brings (improved medical services, economic growth).

Higher education and digitalization

In line with the federated structure of the German education system, a cursory screening and coding of these digital agendas reveals that numerous concerted activities either exist or shall be implemented on the respective state level. References to joint actions between higher education institutions on the state level can be found for eleven states. These initiatives can be broadly differentiated into the three areas

- Research: Inter-institutional exchange of (research) data, cloud services
- Teaching: Joint production and sharing of digital learning materials, a state-wide learning platform, provision of courses across institutions, open digital learning, Repositories for OER and other digital learning resources, inter-institutionally compatible learning management systems
- Administration (i.e. Libraries): Provision of infrastructures, shared licenses (software and literature) across the state, library consortia on the state level

Five states also touch upon OER and their intention to foster creation and use of OER across their institutions – against the background that these, of course, are statewide initiatives, this is also an interesting approach, as OER are per se not bound by geographical or institutional boundaries. Furthermore, it is evident that these state-level platforms and

infrastructures create parallel structures and potentially lack interoperability between the individual repository and platform solutions.

2.1.4 Opinion pieces and Working Papers

Beyond the policy papers drafted for the national and state-levels, a number of working papers and opinion pieces have been published that also address aspects of digitalization in higher education, which are relevant to the EduArc project.

- Hochschulforum Digitalisierung: Beginning in 2014, a think tank composed of higher education, policy and entrepreneurial actors has formed as the Hochschulforum Digitalisierung (financially supported through the German Federal Ministry of Education and Research and cooperatively carried out by Stifterverband für die Deutsche Wissenschaft, the CHE Centrum für Hochschulentwicklung and the Hochschulrektorenkonferenz) with the intention to foster the implementation of digitalization strategies at higher education institutions, enhance instructors' competencies for using digital tools in their teaching and to generate innovative ideas for future scenarios in digital higher education (HFD, n.d., „Das Hochschulforum") [3] . The HFD has produced a large number of working papers on a range of topics and which are publicly available on the HFD website, with working paper no. 33 addressing the feasibility of a national platform for teaching in higher education.

- OER Feasibility Study: The BMBF commissioned the Deutsches Institut für Internationale Pädagogische Forschung (DIPF) (jointly with the Learning Lab at the University Duisburg-Essen) to provide an investigation into the feasibility of implementing and operating OER infrastructures in education. Results of the study indicate that a national repository that stores OER across all educational levels does not seem to be possible but rather advocate for a disseminated system that exchanges OER information (Blees, Hirschmann, Kühnlenz, Rittberger, Schulte, Heinen, Kerres & Scharnberg, 2016, „Zusammenfassung").

- White paper on OER in German higher education institutions: In this white paper, the three authors provide a summary of the state of the art of OER in German higher education and also include a foresight on expected or possible developments in this field, also touching upon technical and informational infrastructures (Deimann, Neumann, Muuß-Merholz, 2015, pp. 55).

Actors and bodies

Actors within the field of digital transformation within higher education largely correspond to the institutions and bodies mentioned before. It is the government for the national level as well as the respective state governments for the 16 states. As an intermediary between different sectors, the Hochschulforum Digitalisierung assumes a very prominent and influential role through both their topic-focused working groups as well as their peer to peer counseling for higher education institutions wishing to develop and implement digitalization strategies.

From within (higher) education, the Standing Conference of the Ministers of Education and Cultural Affairs has positioned itself towards the topic as have rather regionally or statewide oriented networks as well. These will be treated in more detail in the sections on the meso level as they are confined to a number of institutions or the respective state they are located in.

Against the background of European initiatives in the wider field—and also including infrastructures to make research data digitally available—the European Open Science Cloud (EOSC) is one major development that Germany has signaled commitment to through provision of supporting office, jointly offered with the Netherlands and France (BMBF, 2017). Although this endeavor relates to research, the idea of providing access to information free of charge, open and in a standardized manner through metadata to ensure interoperability is also at the core of the intended structure for (O)ER.

2.2 Infrastructure

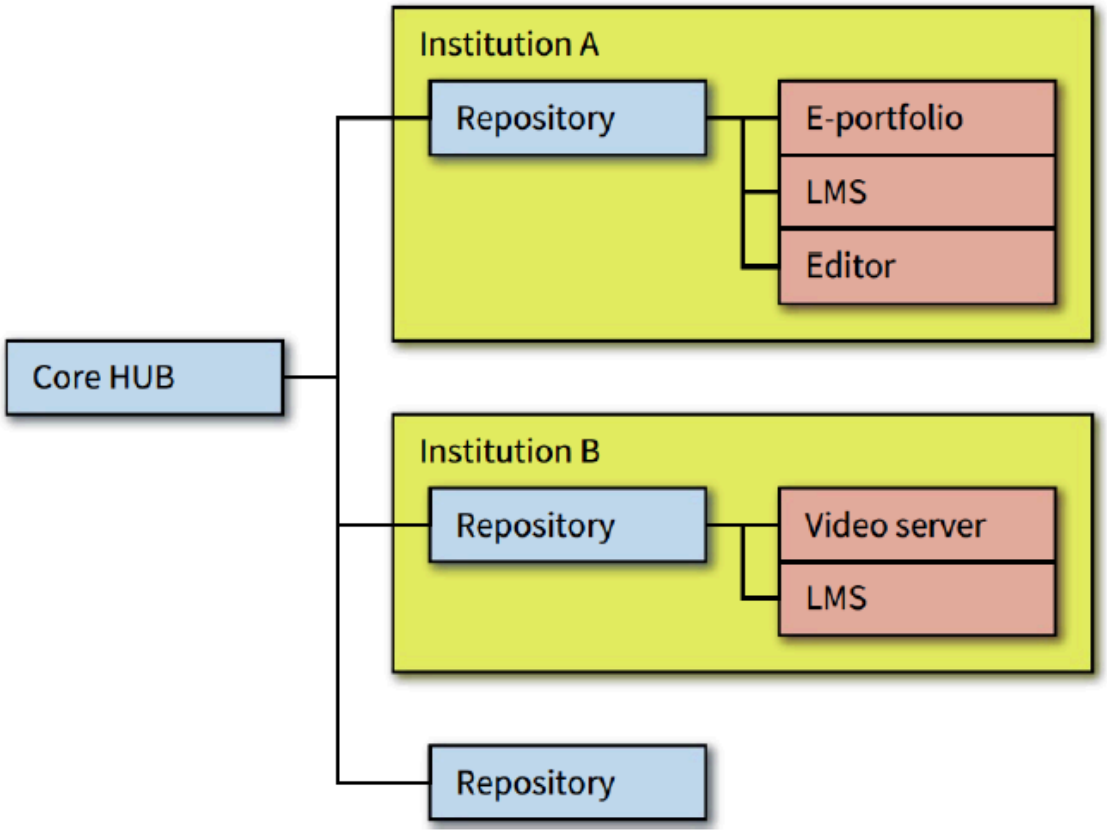
2.2.1 Current state

As of January 2019, no national infrastructure exists for the storage and dissemination of (O)ER. In the context of the EduArc project, a first sketch of how its structure could potentially look like was drafted by Hölterhof and Kerres (2018)

and is provided below.

Figure 1

Possible Infrastructure for storage and dissemination of (O)ER (Hölterhof & Kerres, 2018)



Given the federal structure of the country and the information on the digitalization strategies of the respective states, a nationally implemented repository that is being adhered to across the states, is rather unlikely to happen. Schmid, Zimmermann, Baeßler and Freitag (2018) in their feasibility study of realizing an (inter)national platform for higher education teaching devise two possible set ups for such a platform but then advocate for a merger of these, stating that "realizing an open, networked education platform with a nation-wide portal and integrated theme channels for study and life long learning offerings" (p. 11, translation by the authors) would in their opinion be the way forward.

Whilst teaching is in the focus of the above-mentioned platform, it is interesting to see how the idea of establishing infrastructures either centralized or decentralized in order to provide access to information permeates research as well (e.g. the project Generic Research Data Infrastructure, GeRDI), teaching as indicated in this passage as well as educational resources as in EduArc.

The report by Schmid et al. (2018) also makes reference to the fact that, so far, individual states such as Bavaria, Hamburg and Schleswig-Holstein have set up their statewide educational resource and shared teaching platforms (p. 55). Whilst this follows the logic of the state sovereignty over education, it also means parallel structures and partially works against the idea of providing resources and access to education offerings that are open in the understanding of open (Weller, 2014). Providing open access might not even be in the interest of the states (considering e.g. competition for students, anxiety of giving away investments without return or investing into their respective institutions to be well-prepared to compete for nationally awarded grants (Getto & Kerres, 2017, p. 133), but it still is an interesting and peculiarity of the German higher education system. A publication from the BMBF-funded project "OpERA – OER in

academic continuing education" also states that a number of repositories that were established within individual universities were closed down after some time (Schmid, 2018, p. 8).

2.2.2 Current discussion

As early as 2007, a desktop research on the international distribution of OER at universities revealed that creation and dissemination of OER follows individualized and non-standardized patterns (Goertz & Johanning, 2007). The authors state that out of the 36 international OER projects that they identified in their search, the meager number of four provided information on metadata and formats that were used for their OERs (p. 11). Whilst the quantity of OER and the discourse surrounding them has proliferated over the past decade, metadata and interoperability still constitute challenges, as it seems. In 2015, the Standing Conference of the Ministers of Education and Cultural Affairs and the Federal Ministry of Education and Research include a passage on the "technical level" (p. 5-6). Within this passage, the need to locate and being able to retrieve OER is cited as crucial to seize their full potential. This is to be realized through metadata, with the concrete examples of LOM and Dublin Core being cited and an official coordination post ensuring this through an appropriate referatory.

The need for adequate infrastructure in general is reiterated in the strategy paper of the Standing Conference of the Ministers of Education and Cultural Affairs (2016). In view of technical and informational infrastructures, it is stated that, "An important field of action in the further development is the creation of Campus-Connect-Solutions which allow for an inter-institutional exchange. It is thus necessary to develop standards for the exchange of information between the common systems at the higher education institutions and to foster their technical implementation" (2017, p. 52-53, translation by the authors). It is also stated that is to be negotiated if and how commercial messaging services can be integrated into the HE institutions' services. The latter aspect is strongly criticized by Deimann (2017) who, in view of data protection and security, argues that caution is necessary when endeavoring into these kinds of partnerships (p. 87).

Thus, while for the time being, technical infrastructures for the storage and dissemination of (O)ER are not being discussed in policy papers with the intention to involve commercial partners per se, no concerted effort is made to jointly develop infrastructures either.

Yet in another paper, the impact of improved networks and infrastructure is being referred to. Deimann, Neumann and Muuß-Merholz (2015, p. 56-59, translation by the authors) in their white paper on OER in German higher education delineate several concrete areas that could help or hinder further dissemination and use of OER. Included are

- A (government supported) OER infrastructure is not being established: American and German publishers develop high-quality infrastructures that also include OER and provide metadata for their materials (which are not provided openly). Higher education institutions will choose these systems due to their quality, which finally favors a proprietary system over an open one. The authors find high likelihood and high impact of this scenario.
- LMS that are being used in higher education institutions will have interfaces with OER repository: Applying to both open source and proprietary LMS, interfaces to repositories will be added and license models will be adapted. In this way, OER will be more visible within LMS. The authors assume a medium-term likelihood and high impact of this scenario.
- A joint platform for materials / state or national level OER platforms: Supported through policy actors and funding, a nationwide platform or state wide platform will be established that is being hosted by libraries or education-related servers in order to provide a first anchor for OER users and providers; the platform effects will increase with interfaces to LMS at higher education institutions. The authors assume high likelihood and high impact of this scenario.
- Agreement and timely implementation of OER metadata standards: Finding and locating them hinders the large-scale use and distribution of OER. To overcome this problem, an agreement on a metadata standard for OER in Germany, willingness of scientific libraries to document OER and implementation of an OER search engine are needed. In the medium-term, this will increase use of OER by students and teachers, which then leads to increased OER production. The authors find low likelihood but high impact of this scenario.

Still, action has not yet followed rhetoric in this field as stated in the first line of this part of the report, despite several mentions in various statement and strategy papers, no standardized technical set up or use of metadata can be identified so far.

2.3. Quality

2.3.1 National quality standards

In the field of (higher) education, discussion on quality as a multidimensional construct has increased in scope since the seminal article by Harvey and Green (1993) who state that, "Quality can be viewed as exceptional, as perfection (or consistency), as fitness for purpose, as value for money and as transformative" (p. 11, highlighted i. t. orig.). These dimensions are intertwined with one another and also illustrate the different perspectives one can assume in regard to this topic. Thus, before entering any discussion on what constitutes quality in the field of e-learning (Ehlers, 2011), or OERs (e.g. Clements & Pawlowski, 2011), it seems necessary to discuss the field of quality assurance within German higher education more broadly.

As of 2018, the decision on what constitutes high enough quality in higher education to be accredited, is fully given to the Accreditation Council, forming the executive part of the Foundation for the Accreditation of Study Programmes in Germany. This foundation is a shared endeavor between the German states with the intention to ensure the quality of higher education study in Germany, as stated on the webpage of the foundation (Stiftung Akkreditierungsrat, n. d.). The foundation further states on its webpage:

> *The Foundation for the Accreditation of Study Programmes in Germany ensures its overall responsibility for the accreditation system through ensuring the consistency and coherence of its accreditation decisions, through supporting the German states in their further development of the German quality management system, through fostering the international cooperation in the field of accreditation and quality assurance and in doing so supporting the realization of a shared European higher education area (translation by the authors).*

Whilst the decision on accreditation is made through the Council, the evidence base for making this decision is accumulated through external, accreditation agencies, that are responsible for providing an evaluation report (resulting from expert visits to the respective institutions and programs and intensive scrutiny of the program in question). Whilst program accreditation refers to either bachelor or master level study programs, system accreditation is more comprehensive and involves the accreditation of the institution-internal quality assurance system to be of such a rigor that the institution is authorized to accredit its own programs. Both accreditations are granted for a limited time period. Thus, despite the general responsibility for education affairs residing with the individual states, the Accreditation Council is an overarching unit and indeed sets the national quality standards for higher education study.

Quality of OER

The situation for e-learning and OER deviates quite strikingly. Despite the discussion about quality in and of OER, in Germany no coherent national standard exists on the basis of which quality could or would be measured. This applies both to the content of OER as well as their indexing based on metadata. To the best knowledge of the authors, one document directed at librarians in German higher education institutions exists by Ziedorn, Derr und Neumann (2013), in which a summary of metadata schemes is compiled (Dublin Core, IEEE LOM, LRMI, XCITR and ELAN Application Profile). As even this small number of standards varies in their complexity, establish a nationwide system seems like an enormous challenge. Furthermore, these metadata schemes are developed along the lines of associations and special interest groups rather than countries, thus incorporating different interests and intentions.

Zawacki-Richter and Mayrberger (2017, 2018) made a first attempt for the German case to first outline existing approaches to quality of OER and to then develop tentative projections on how an institution-specific quality assurance approach could potentially look like[4]. With eight different quality assurance models derived from international literature and discussed in their merits and shortcomings, the authors reiterated that a) quality is a contested field and b) there is a lack of accurate and validated measurements scales for quality of OER. Whereas the specific approach

developed for the HOOU will be discussed later in the report, the authors also contend that this institutional endeavor most likely does not or cannot result in a German quality model of OER.

Ehlers (2013) assumes that, in the context of evolving learning contexts, quality will be primarily judged by learners and peers (n. p.) and thus turn away from prevailing forms of expert judgment. This can be understood as a precursor to Brückner's (2018) critical discussion of the general idea of quality assurance according to pre-specified standards – and their implied mechanisms of control, legitimization and marketing (p. 61) – for the field of OER. She advances the argument that with OER, when understand as a collectively created and used resource, also the assurance of quality needs to be occur based on collective practice and consent in order fully live up to the principles of open (p. 59). Especially in the realm of education, using teachers in secondary education as example, she emphasizes their professional capacity to evaluate quality of materials and educational performance and develop them further based on this specific knowledge and capability. Also furthering this line of argumentation, Clements and Pawlowski (2011) elaborate on trust (e.g. in established organizations, individuals) as a proxy for quality of a resource. It is 82% of instructors in their study saying that recommendation of trusted individuals is their quality approach on OER. This resonates with a somewhat historical development, meaning that in the very first beginnings, OER were provided by highly reputed higher education institutions. This in turn was presumed to account for at least minimal quality standards. Following this initial phase, several approaches were then also launched in the field to combine top-down with bottom-up metadata initiatives (Klemke, Ternier, Kalz & Specht, 2010).

2.3.2 Actors in national quality assurance

As stated in the previous section, the Stiftung Akkreditierungsrat is the main body responsible for overall quality assurance in the field of higher education, albeit for the program level and not for quality assurance of OER. Again, given the legislation of the country when it comes to education, national actors in and for quality assurance are not easily identified and empowered. In the following part of the report that focuses on the meso level, that is understood here to encompass the state level and its relation to the respective higher education institutions of that state, the example of the Hamburg Open Online University (HOOU) will serve as an illustration of how first attempts are being made towards developing quality standards as a first step towards action.

Thus, whilst discussion has been going on about the quality of OER – as also illustrated in some references throughout this chapter – it seems that this has not yet translated into a concerted practice of quality assurance or distribution of responsibilities to this end.

2.3.3 Relation and adherence to international standards

The observation that no nationally agreed upon quality assurance mechanisms are in place can also be extrapolated to the international level, despite several larger initiatives working towards this end. Camilleri et al. (2011) report on the OPAL project, in which a large number of case studies was conducted, which lead to the identification of a range of models of quality assurance practiced at different higher education institutions. Camilleri et al. (2011, p. 33) name the following factors to be of influence for the quality assurance model practiced:

- „The type of institution and their learning and teaching culture.
- The balance of importance of the 'value' of teaching (in comparison to research activities in the institution).
- The degree to which OER activities were seen as research activities in their own right.
- The level of e-learning maturity of the institution.
- The extent to which they had engaged with OER work previously."

In their discussion on quality of OER, Camilleri, Ehlers and Pawlowski (2011) explicitly include adherence to agreed metadata standards (e.g. LOM, SCORM) to be closely intertwined with quality (pp. 19-20)—while simultaneously pointing out that this has not yet been practiced consistently. Partially confirming this, in a survey study by Clements and Pawlowski (2011), 146 instructors from a range of European countries were asked about their perception of quality of OER, with a special focus on their (re)use practices of OER. Interestingly, whilst across the sample, 68% of teachers stated that quality also meant "interoperability between the LOR and their LMSs" (p. 11). They also stated that their

reluctance to share OER in an international repository mainly stemmed from curriculum compatibility problems (74%), from copyright difficulties (52%) and variations of subjects between countries (48%) (p. 10). Furthermore, they greatest barrier to re-using international OERs is cited to be a preference for materials developed in one's own country (35%), the long time it takes (31%) – concerns about the quality of the OER follows on the fifth rank with 24%. Thus, speaking for the international context, quality of OER (e.g. based on shared metadata), is one aspect to consider – however, the actual fitting of the material into the respective national learning context might constitute an equally important inhibitor for the uptake of OER internationally.

International standards for OER—or rather attempts to define them—have occurred through a variety of institutions and individuals (see the above examples of Dublin Core, IEEE LOM or SCORM). As stated above, both awareness of and then adherence to one of the chosen standards is a challenge, as was also documented in Davis et al. (2010) who found that

> *it was clear that a significant barrier to teachers using a repository was the complexity of the deposit process, and in particular, the need to specify a large number of metadata fields before a deposit could be made. […] It was clear that while professional LO developers were prepared to take the time to understand and complete the schema, everyday sharers would not be (p. 99).*

In addition, for the repository under analysis in Davis et al. (2010), the number of metadata to be entered amounted to 25 obligatory fields and another 27 that were optional. It can tentatively be concluded that this situation constitutes a considerable barrier for content providers to OER repositories and it can easily be assumed that this in turn results then into OER not sufficiently indexed or not shared at all. Neumann and Muuß-Merholz (2017, p. 13) state, that in their view one of the measures to increase usage of OER, is to make them searchable and findable through meta date used by both search engines and OER providers, as well as increasing interoperability between platforms to share OERs.

Hence, whilst the problem of developing and implementing one system of metadata across multiple countries (and even within one country) is but one challenge, the actual achievement would then be to involve and encourage creators and users of OER to actually make use of these metadata.

2.4. Change

2.4.1 Promotion of change

Given that Germany has long relied on its close network of brick and mortar higher education institutions and the face-to-face teaching of a largely traditional student body, the uptake of digital technologies had been slow in international comparison. Over the past years, however, the large topic digitalization, including OER, has received increased interest on the national policy level.

Interest and ensuing discourse have most strongly been fostered through the aforementioned platform and think tank "Hochschulforum Digitalisierung" in the course of which both dissemination of opinion papers, working papers and policy statements as well as peer to peer coaching between higher education institutions (to foster development and implementation of institutional digitalization plans) has occurred and continues to do so. For the specific field of OER, further initiatives and web presences were established that serve as platforms for communication and dissemination of information and activities revolving around OER. Examples of such platforms are

- OERinfo – “A topic-specific online platform that provides comprehensive information on OER directed at the public and specific target groups. It has the intention to foster broader visibility of OER as well as reaching out to new target groups. State of the art insights are to be adapted for practitioners, information on best practices are to be summarized and the range of existing initiatives are to be displayed” (freely translated by the authors). The web site partners with four education institutions, each of which provides additional information on the specific fields of schools, higher, vocational and continuing education. The platform is sponsored by the BMBF and the DIPF.
- OER World Map – is another, albeit internationally oriented, platform, jointly established by North-Rhine-Westphalia Library Service Centre (hbz) and graphthinking GmbH (cooperation partner: Open University, UK) and financially supported by the Flora Hewlett foundation. It claims to „provide the most complete and comprehensible picture of the global Open Educational Resource movement“ („Currently on the map“) and offers information on a diverse range of OER activities, institutions and events.

  As part of this map, OERinfo links to a map on Germany, which displays a range of Germany-based OER events, institutions and activities.

Change is, as a topic, very closely related to policy development in education that was outlined in the first chapter of the report. With the growing importance that is attached to digitalization and OER on the policy level and that is followed by attempts to disseminate information on the topic and to generate further interest and involvement, it is the provision of financial means to actually realize both research and practice within this field. Since 2016, several large scale tenders have been enacted through the Federal Ministry for Education and Research that have focused on different aspects of digitalization in higher education. For the specific field of OER, a tender was publicized in 2016 through the BMBF, which called for OER topics across different education sectors under the umbrella of OERinfo, resulting in over 20 projects that were featured in a special issue of “Synergie” in 2018.

However, to the knowledge of the authors, no major concerted effort has yet been made to foster intense discussion on the technical infrastructures underlying especially OER and their retrieval and dissemination. The only attempt that the authors know of originates from the initiative JOINTLY.

2.4.2 Change agents

For the field of OER, Neumann and Muuß-Merholz (2017, p. 17) attest Germany a rather slow progress when compared internationally. However, the authors also emphasize the influence that bottom up initiatives (which they consider as “communities”) have in advocating for OER, especially in school and higher education. They also note that higher education practitioners reach out and share their expertise with actors in other education areas and also voice the expectation of increasing support through policy actors in the future. As of 2017, Neumann and Muuß-Merholz state that based on the OER World Map, there are 166 organizations in Germany that are involved in OER-related activities.

There is a mixture of bottom up activities and top down policies and agendas whose interests meet in, for example, platforms of information and dissemination that operate on the national level (Neumann & Muuß-Merholz, 2017). However, it can be tentatively assumed that no concerted effort for OER and digitalization infrastructures on the federal level will be made in the near future that is binding for the states – education being in the realm of the states strongly impedes this.

Against the background of the structure of German (higher) education, it so far predominantly governmental or state bodies that are involved with driving and developing change in the field of digitalization and OER. With individuals and institutions that are at the forefront of these developments, the impression prevails that there are a number of initiatives, associations and slowly but surely growing policy aspirations that join to form a multilayered mosaic around the topics of OER.

The above-mentioned 20+ initiatives, which were funded by the BMBF between 2016 and 2018, can be considered among the community of OER practitioners and advance practical approaches to the topic. However, being funded in the context of policy interests, they also closely aligned with an overall political aim of fostering development and use of OER. The initiative JOINTLY assumes a special role as it has established a special interest group on software and

infrastructure, in the context of which also metadata play an important part. To this end, a first draft for harmonizing OER metadata was set up and is continuously worked on.

3. Meso level

Against the background of Germany being separated into sixteen states that have their respective government and legislation for the education system within each state, this part of the chapter uses specific states examples to illustrate key points or identify best practice examples. The legislative and executive authority that the States hold over education is a defining characteristic of the German situation and constitutes an intermediary between national and institutional levels.

In the following, likewise separated along the lines of policy, infrastructure, quality and change, this meso level will be addressed in its specific States approach to digital transformation, as well as making reference to the institutional level of selected institutions.

3.1 Policy

The Kultusminister Konferenz (2019, p. 5) remarks that it is the task of the States and the State to put at disposal the required conditions for the implementation of the goals related to the digitalisation of HE, which is object of the strategic development of the HE German sector. Therefore, it recommends a seamless exchange between States and the diverse responsibilities that the states have when it comes to digitalisation are effective. On the other hand, the same institution states that one of the problems in higher education teaching and learning with digital media is the project-based work being done, which does not support a sustainable implementation in the long term, leading to people leaving with the expertise and no structures in place (Kultusminister Konferenz, 2019, p. 8).

As mentioned previously for the macro level, almost all the States have their own agendas for their strategies for digitalisation in the general level, which also includes (higher) education and, in addition, four states (Bavaria, Baden-Wurttemberg, Thuringia and Saxony) have their own strategy for (higher) education. Others are currently developing their own strategies for digitalisation for the (higher) education level.

For instance, the strategy of digitalisation for higher education in Saxony has as goals (Staatsministerium für Wissenschaft und Kunst Freistaat Sachsen, p. 4, translation by the authors):

- Unlocking potential for improvement of the quality of teaching,
- Improvement of the study success,
- Strengthening competitiveness the Saxon universities,
- Increase of international visibility.

Therefore the action fields proposed by this strategy are the following (p. 10):

- Imparting digital competence to teaching staff,
- Increase in acceptance for digital teaching by the teaching staff,
- Anchoring in teaching,
- Learning with digital media,
- Sustainability of the use of digital media.

As another example, the strategy of digitalisation for schools, higher education and culture in Bavaria points out for higher education that

> *The universities should become a "digital campus", where all actors in science use and profit from the opportunities and possibilities of digitization. It is about improving both the performance and equity of the higher education system as a whole. This applies in a similar way to our cultural institutions, which have to*

tailor their offers and contents accordingly (Bayerisches Staatsministerium für Bildung und Kultus, Wissenschaft und Kunst, p. 40, translation by the authors).

On the institutional level, according to Gilch et al. (2019, p. 66), 13.6% of the German higher education institutions in the study (n = 110) have already designed a strategy or a concept for the digitalisation in their institution during the three last years (2016, 2017 and 2018) and 40.9% are working on it. The authors also recognised a difference between West and East Germany, with higher education institutions in West Germany having more often strategies in place than their East German counterparts (57.3% versus 47.1%). The goals mentioned in those strategies are the following (Gilch et al., 2019, p. 68, translation by the authors):

- Improvement of the quality of teaching (91.7%)
- Increase in the quality of services provided by higher education administration and services (90%)
- Increase the efficiency of higher education administration and services (90%)
- Skills training for a digital world (86.7%)
- Increasing the university's ability to control itself through digitised support for governance (73.3%)
- Profile building at the university (66.7%)
- Intensifying research for the digital society (50%)
- Acquisition of new target groups for study and further training offers (48.3%)
- Internationalisation of the university (45%)
- Increase in research quality (45%)
- Intensification of transfer activities (research and technology transfer) (45.0%)
- Increase in research performance (43.3%)
- Increase in diversity and heterogeneity of the student body (38.3%)

Concerning the OER projects at the federal level, a broad range of initiatives can be identified through the OER World Map. In order to provide a more detailed picture, in the following several examples are provided for how digitalization and OER practices occur on the meso level of the States.

3.1.1 Lower Saxony

Lower Saxony is located in the North of Germany with 28 higher education institutions (public and private, universities, art and music conservatories, theological institutions and universities of applied sciences) and 211.229 students enrolled in the winter term 2018/19 [5].

Strategies of digitalization

The strategy of Lower Saxony for the digital transformation (Niedersächsisches Ministerium für Wirtschaft, Arbeit, Verkehr und Digitalisierung, 2018) is the document that guides digitalisation within Lower Saxony, by covering the different areas of the society, among others: economy, transport, work, education, health, energy, environment, culture, administration.

In the context of education, the relevance of the development of media/digital competence is remarked. Two other documents are mentioned with this regard: the implementation of the federal state concept in “Medienkompetenz in Niedersachsen - Ziellinie 2020” (Niedersächsische Staatskanzlei, 2016) and the “Strategie zur Bildung in der digitalen Welt” (KMK, 2016).

The goals of Lower Saxony with this respect are as follows: supply of strong Internet connection and infrastructure in all schools and educational institutions; comprehensive introduction of personal digital mobile devices in more schools and its recognition as educational means; implementation of media education in all the study plans of the schools; comprehensive introduction of digital platforms and work environments and school or federal state’s cloud; qualification and counseling of teachers and administrators; development of innovations, introduction of new formats for staff training; and strengthening of the administration of the IT school infrastructure. The measures proposed to achieve those goals focus on the introduction of mobile technology in education, the introduction of 3D-printers and robots in the schools, the use of videoconference systems for professional training, monitoring the digitalisation

process through IT data collection in schools and adult education, the advancement of teacher training (pre- and in-service), support of innovations and the anchorage of media education in the schools' study plans (Niedersächsisches Ministerium für Wirtschaft, Arbeit, Verkehr und Digitalisierung, 2018, pp. 78-81).

The report "Media competence in Lower Saxony - Target lines 2020" focus on a series of educational contexts, within also higher education is to be found (Niedersächsische Staatskanzlei, 2016). The reference to higher education comes especially within the measure "improve pre- and in-service teacher training in media pedagogy", when it is mentioned that since 2015 media education is part of the educational competences and standards in the Master of Education (teacher training) in Lower Saxony. Further mention related to the integration of the information competence as element (key competence) of the curriculum through the methods and e-Learning and blended learning formats, which also involves the development of regulations regarding the implementation of e-Learning modules. This integration depends on each study program. A specific section is devoted to the measure of promotion of the use of high-quality OER in educational institutions and adds that the acquisition of digital learning materials with costs generally depends on the financial strength of the educational institution in question. The network between universities in terms of Know-how-transfer should continue to be built, which is maintained largely through the ELAN eV. cooperation and counseling; libraries and research centres are also to cooperate in order to support integrating the information competence in the universities.

Regulatory frameworks within HEIs

Most of the regulations regarding digitalisation in higher education are proposed by and for the universities, being no higher education general regulation in Lower Saxony.

For example, at the University of Oldenburg,

> *the institution-wide implementation of digital media to enhance on-campus learning is seen by the university management as a strategic issue and an area in need of further development. Thus, a task force has been established, involving various stakeholders from university management and strategic planning, as well as the faculties and departments for continuing education and teacher training, in a top-down/bottom-up approach. (Bond, Marín, Dolch, Bedenlier & Zawacki-Richter, 2018, p. 6)*

The current Development Plan of the University of Oldenburg (HEP, 2016) proposes digitalisation in the context of three thematic areas: research-based learning (through the support of individual and collaboration tools), teacher training (media competence, media education as cross topic and development of digital materials) and open university, further education and equal opportunities (flexibility of learning offer, development and use of OER and promotion of digital supported recognition processes).

However, most of the higher education institutions have not yet developed a specific strategy for digitalisation at their universities. Some of them include digitalisation as part of the guiding themes of their university.

Projects and initiatives

The OER World Map show 6 projects in the state of Lower Saxony. Some of the most relevant for the context of higher education are as follows.

eCULT+ (eCompetence and Utilities for Learners and Teachers, 2011-2020) is a project in which 13 Lower Saxony universities [6] and two associations (Stud.IP e.V. and ELAN e.V.) take part to improve the quality of teaching with the aim of an intensive and broader, didactically meaningful, implementation of digital technologies. Teachers and students are to be provided with digital tools for the didactic fields of action of teaching/learning organisation, eAssessment and video-based teaching and learning across locations and are to be taught competences in dealing with them.

The project MOIN - Multiplicators for OER in Lower Saxony (Technische Universität Braunschweig, Hochschule Hannover, Kreisvolkshochschule Ammerland, Universität Osnabrück and ELAN e.V.) (2017-2018) focused on developing together concepts and further training offers for schools, universities and adult education regarding the topic OER and handling with open licenses, with the support of the Servicestelle Offene Hochschule Niedersachsen gGmbH.

The project OpERA (OER in the academic further education) (2017-2018) had as aim to strenghten the use of OER in the further education context within the network of open universities (School of Advanced Professional Studies, und Universitäten Weimar, Ulm and Oldenburg) through an offer of qualification, counseling and connection.

Teach4TU is a project that forms part of the Group Teaching and Media Education of the Technische Universität Braunschweig that works on the advancement of the quality of teaching at the university and includes a university qualification and counseling offer for teachers to implement innovative teaching and learning concepts. Related to (O)ER, and apart from workshops and seminars (including OER training), the project puts at disposal of university teachers a learning space to discuss and try out different technologies and ideas for its implementation in the classroom, digital tools for the university, new rooms for teaching and learning and an Augmented Reality app developed by the group.

Actors and bodies

Many universities in Lower Saxony work together as members [7] of the ELAN e.V. [8], which is considered a change actor and infrastructure provider for the improvement of the quality of technology-enhanced teaching, and also a platform for exchange and cooperation for the distribution and facilitation of information. Stud.IP e.V. is an association composed of developers of the Stud.IP open source learning management system that form part of the eCULT+ participating universities and its aim is work together to improve towards an always more user-friendly system. University libraries and research centres are also considered important actors to cooperate with universities in terms of integrating information competence in the study plans.

3.1.2 North Rhine-Westphalia (NRW)

NRW is Germany's most densely populated state, and within its 70 higher education institutions (public and private, universities, art and music conservatories, theological institutions and universities of applied sciences) 763.000 students were enrolled in the winter term 2018/19 [9]. NRW is also the state of Germany hosting the only state-funded distance teaching university in Germany, the FernUniversität in Hagen.

Digitalization strategies

The digitalization strategy of NRW can be considered among the ones attempting to provide an understanding of digitalization and to delineate this complex concept: In the previous and also the current 2019 version [10], digitalization is described as a complex phenomenon that needs to be considered from four major perspectives:

- ethical and legal dimension - negotiation of the role A.I., human and machine interaction, targeting questions of data protection and data use
- social and cultural dimension - reflection of digitalization's role within society through acknowledgement of its benefits and challenges
- economic dimension - emergence of new economic models and job profiles and positioning of digitalization as a way to meet major challenges of our times
- scientific-technical dimension - acknowledgment of importance of a strong technical infrastructure and emphasis on the role of research and its application in these fields (Digitalisierungsstrategie NRW, 2019, p. 5, translation by the authors).

In the parts of the strategy that focus explicitly on education and research (in higher education), the education of pre-service teachers in regard to their preparation of employing educational technology in the classroom emerges to be a crucial target (p. 25). Higher education is also depicted as the place where "tomorrow's digital professionals" (p. 26) are being made and in support of this claim, a number of large-budget development and network initiatives are to be introduced (see 1.2.3) across NRW higher education. OER are explicitly mentioned as an area of special interest, as are Open Access and Open Science.

Alongside these initiatives within education, the strategy also promulgates six areas of research that will be in focus and prioritized in research funding: Big Data, A.I. and Human Machine Interaction, Data security and data protection,

Digital society, Digital infrastructures as well as Transfer (p. 45).

Regulatory frameworks within HEIs

Reinforcing the greater impetus to establish digitalization strategies, higher education institutions in NRW have started to develop and implement institutional digitalization strategies according to their specific profile and institutional mission and vision. The extent to which they have made progress in so doing varies greatly: Universities such as the Universität Duisburg-Essen (UDE) has done so as early as 2014 with its E-Learning Strategy that was developed further into a "Strategy for Digitisation in Teaching and Learning" (Universität Duisburg Essen, 2017). Some goals of the UDE' strategy for digitisation are related to assuring teachers with high-quality support in expanding their e-learning activities, enabling regular feedbacks, further improving quality of learning or promoting networking. The UDE emerges to be an interesting case for digitalization insofar that it combines a very strong research profile in the field of educational technology across all segments of the education systems, numerous applications of digitally mediated teaching and learning as well as hosting the executive office of elearning.nrw as part of the research center "Learning Lab". With elearning.nrw, the state of NRW has, as early as 2008, established structures to foster the use of educational technology and digitally mediated learning across its higher education institutions. The NRW Ministry for Research has commissioned elearning.nrw to conduct workshops and dissemination of information on this topic, including an annual conference.

Furthermore, UDE has developed an OER platform as a repository for the university, and which is part of the UDE' strategy for digitisation in studies and teaching, in collaboration for the design and implementation with the Digital Library Department of the University Library (UB) and the Learning Technologies Division of the Centre for Media and Information Services (ZIM).

Projects and initiatives

As outlined in the digitalization strategy for NRW[11], the field of higher education in the state is targeted by policy efforts on the state level mainly through four major projects and initiatives, which will be presented in the following sections. The first initiative finds its place as part of the policy development, whilst the remaining three will be allocated more strongly to change processes on the meso level.

Out of the 70 existing higher education institutions, 42 have joined forces via the network Digitale Hochschule NRW (DH-NRW) and work towards the aim of fostering digitalization among the institutions across the state and also to permeate institutional structures, including teaching and learning, and higher education management. The DH NRW (established 2016) not only operates as a consortium that is singular in the country, but also claims ground as a platform addressing political and strategic questions and issues (DH NRW, n.d.). Under the umbrella of DH NRW a range of projects is being operated, these being partially funded with money from the "Digitalisierungsoffensive" described below.

As stated in the NRW digitalization strategy, two ideas/projects stand out - the above-mentioned focus on OER as well as the state-wide study portal, which are of elevated interest in the discussion of infrastructures and the idea of inter-institutional repositories. Being coordinated by UDE and labelled as "Content Marketplace NRW", this one year-long project serves as a pilot endeavor into the technical set up of a state-wide platform that integrates institutional learning management systems and different repositories. Special attention is paid to the integration of OERs as well as barriers and challenges to such an undertaking. This project is an interesting case as it seems somewhat contradictory to the intention of EduArc to investigate and pilot the structures needed for a national platform. Both projects could also be read as an exemplary challenge of the German education system being torn between having a national perspective in mind and state solutions at hand. However, in the case of the "Content Marketplace NRW", it is important to note that linkages have been established with projects in the states of Ruhr-Universität Bochum (consortium-leading), Rheinisch-Westfälische Technische Hochschule (RWTH) Aachen, Fachhochschule Aachen and Hochschule Bochum.

Similarly following the idea of exchange of practices and accumulating individual e-learning projects across the state in one place and increase their visibility, the second project in this line is "Online-Landesportal für Studium und Lehre" that is also set up as a pre-project and with the perspective to merge with "Content Marketplace NRW". These two projects

clearly show that the state has the overarching interest to assemble disparate projects and initiatives into larger networks and connected endeavours. This is being encouraged through state-level policy and specific funds allocated to this end.

Under the title “OER-CONTENT.NRW” a call is open to work towards this state-wide platform, indicating that the pilot projects mentioned above have been successful in collecting the needs and demands of higher education institutions in this specific field [12]. Similarly targeting a platform and reusable, open contents is the project “DIGI-KOMP.NRW”. Within this project, a consortium of various NRW higher education institutions aims to provide study materials for beginning and first year students in oder to close gaps in knowledge between school and higher education [13].

Two other interesting projects regarding (O)ER and its integration are firstly Digital University Bridge Western Ruhr Area I Niederrhein (2012-2019) (University of Applied Sciences Niederrhein, Rhein-Waal and Ruhr West, and the UDE), which aims at the cooperative design of digitalisation for teaching and learning, including many activities related to instructional design and OERs. Within the second project Studiport, openly accessible online offerings were created with the intention to support first year students in their transition to higher education, for example including online self-assessments or introductory courses to mathematics and academic language use. This project was launched by Ruhr Universität-Bochum and the Standing State Rector’s Conference.

The creation of the UDE above-mentioned repository (1.2.2) was conceptually framed in the project "OER-UDE: Open Educational Resources at the UDE" (2016-2018) at the Learning Lab of UDE and as part of its e-Learning strategy. In this project, information workshops on the topic of OER were conducted and it was examined how OER materials could be more strongly integrated into teaching at the UDE. It was also developed a concept for how materials from the university can be made available as "open educational resources" with corresponding licenses (OER) on university platforms in the future and how available OER materials can be increasingly used in teaching. The technical implementation was carried out jointly with the Learning Technologies Division of the Centre for Information and Media Services (ZIM) and the University Library (UB) of the UDE.

Another project related to OER in the UDE was “Mainstreaming OER” (2016-2018). It aimed at sensitising and qualitifying multipliers from schools, universities and adult education for the potential of digitised OER. Cooperation partners were the Ministry for Schools and Continuing Education in North Rhine-Westphalia within the framework of cooperation with the Media Consultancy NRW and the Ministry for Science and Innovation NRW within the framework of the elearning NRW network. In a first round, short workshops sensitised multipliers from all areas of education to the advantages of working with open educational materials. After the first round the concept was adapted to the needs of the respective target groups (university, school and adult education).

As one of the most recent developments, the state has launched a portal, ORCA.nrw that is intended to serve as a meeting point of different initiatives and offering online learning and teaching materials to students and instructors.

Actors and bodies

On the state level, the North Rhine Westfalian Ministry of Culture and Science is a central and influential actor not least because of its simultaneous function as policy and funding instance. Within the ministerial unit Higher Education and Research “Digitalization in higher education and research” is firmly entrenched, making primarily reference to the four above mentioned projects and initiatives.

The Scientific library center of the state of North Rhine-Westfalia (Hochschulbibliothekszentrum des Landes Nordrhein-Westfalen (hbz)) assumes a prominent role in regard to provision and further development of digital infrastructures. The OER Worldmap project, referenced earlier in this report, was also carried out by the hbz.

With the DH NRW constituting an umbrella for both a range of projects as well as forming a platform for exchange and networking, this consortium sends a strong signal: for once re-emphasizing the state-level sovereignty over education and strengthening the state’s position within the national context. And second, the benefits of exchanging perspectives and ideas come as a clear advantage when piloting and implementing new approaches to (digital) learning.

Last but not least, the individual higher education institutions in the state emerge as actors and bodies for the actual implementation and day-to-day application of any digital tools and digital pedagogies.

3.1.3 Hamburg

In contrast to Lower Saxony and North Rhine-Westfalia, Hamburg is one of the so-called “city states” in Germany, referring to cities (Berlin, Bremen and Hamburg) which gained state-sovereignity and are treated like the remaining 13 states, including independency in educational matters. Hamburg is home to 20 higher education institutions, both public and private and including universities, universities of applied sciences and institutions with a very focussed study offer, and which have roughly 109,000 [14] students enrolled.

Digitalization strategies

Compared to the other three examplary states chosen for this report that have developed extensive documents that capture a number of aspects in a very detailed manner, Hamburg has drafted a strategic document in 2015, targeting digitalization of the metropolitan city. This document deviates both in extent as well as layout from the other strategies considered in the report. (Higher) education receives attention through the inclusion of the Hamburg Open Online University (HOOU) as the central project to be developed from 2015 on. It focuses on the creation of OERs by all the Hamburger Higher Education institutions and on their quality (Stadt Hamburg, 2015, p. 4). In August 2019, looking back at the developed of the HOOU, it si interesting to note that this endeavor received extensive funding, was marketed with enormous effort - and nevertheless lost a major force and the largest of the participating universities with the University of Hamburg leaving the alliance in early 2019.

Regulatory frameworks within HEIs

Some of the universities in Hamburg have developed their own institutional digitalisation strategy. For example, the Technical University of Hamburg (TUHH), proposes the following aims: improving teaching through digitalisation, education for a digitalised working and living environment, and its contribution to the expansion of the knowledge society (p. 3). These measures include hiring a specialist speaker for media-supported teaching and learning, and developing digital teaching and learning formats through a Digital learning Lab.

Another case with a strategy for digitalisation is HAW Hamburg, which establishes four goals: digitisation in teaching, learning and continuing education; digitisation in research and transfer; internal processes and IT infrastructure/services; and dialogue, discourse and networking in digital change. [15] Concerning digitisation in teaching, learning and continuing education, the focus is on the development and promotion of competences for a digitised world of work and society. It concretely addresses open education, specifically: “HAW Hamburg also promotes the education of its students for a global digitized world of life and work in the spirit of Open Education” (translation by the authors). Evaluative quality assurance measures are also mentioned.

Projects and initiatives

Hamburg has developed many initiatives and projects regarding OERs in higher education institutions. Here some of the most representative are mentioned (Universität Hamburg, 2019a; 2019b):

- “Synergies for teaching and learning through OER” (2017-2018) (SynLLOER). Teachers at Hamburg schools and universities were sensitized to OER through information materials, information events, workshops and an open range of workshops, and actively encouraged to engage in further joint and productive exchange across subjects and institutional boundaries. One of the initiatives of this project is the magazine “Synergie” for providing information on digitalisation in teaching. Other initiatives included counseling and workshops regarding OERs, media support, and the evaluation of OERs.
- HOOU@UHH (2017-2018) focused on the creation of OERs for different disciplines of the Hamburger universities.
- openLab at the Digital University College (UK Digital), which offers comprehensive technical equipment and advice for interested teachers and support to OER projects.
- ApptogoHH-App (2018-2019). As part of this project, an app has been developed that enables students, employees, schoolchildren and other interested parties to learn about the contents of the courses in a practical context. In addition, this app supports learning on the direct object and the direct application of theoretical knowledge. Teachers can use this app to create a wide variety of learning content as an analog walk-through tour - similar to a scavenger hunt - without any further programming knowledge.
- eManual Ancient History (2017-2019). It is an introduction to ancient history and contains mostly OERs. Users can learn ancient history through podcasts, translated ancient sources (with comments), secondary literature and additional materials (e.g. ruler lists).
- Mapping Democracy - 100 years of (educational) democracy in Hamburg (2017-2019). The project produced the first OERs on the development of democracy in Hamburg between 1919 and 2019. An interactive city map embedded in a weblog links virtual and real learning locations and contents and makes them visible together.
- Study compass in the teaching profession: fields of action and perspectives of future teachers (2017-2019). At www.lehrerinhamburg.de, the project provides information on the requirements of the teaching profession in various fields of action and shows the development lines of teacher training. The Learning Scenarios (OER) can be used for self-study without a seminar link.

More projects can be found at
https://edtechbooks.org/-GDqh

Actors and bodies

The University College (Universitätskolleg) is one of the main actors within OER in higher education in Hamburg. It was founded in 2012 as central organisational unit of the University of Hamburg. As an educational institution, development and experimental laboratory, communication, coordination and cooperation platform and think tank, it is intended to contribute to the improvement of teaching. In 2017 the UK Digital was created through the reorganization of the University College into three areas, which are to equip the overall idea of the UK as a development and experimental laboratory, communication, coordination and cooperation platform and think tank with a different focus in the future. The UK DIGITAL brings together several projects on new developments for digitisation in teaching. The projects at UK DIGITAL mainly cooperate with individual lecturers and are simultaneously integrated in several inter-university overall projects at the Hamburg location or nationwide (Universität Hamburg, 2019b).

The HOOU is a key actor in the development and implementation of OER in Hamburg. At the beginning of 2015, the Hamburg Senate adopted a "Digital City Strategy" to bundle the digitization processes of the Hanseatic city and create structures for them. The Hamburg Open Online University (HOOU) is responsible for education. This inter-university project is supported by the network of the six state universities* in Hamburg with the Ministry of Science, Research and Equality, the Senate Chancellery and the Multimedia Kontor Hamburg (see Figure 9). The special feature of the HOOU concept lies in the desire to create a digital space in which students, teachers and the interested public can meet in order to collaborate on interdisciplinary, cross-university projects with academic demands. Four aspects serve as their guiding principles [16]: learner orientation and collaboration; being scientific; opening up to new target groups and civil society relevance; and openness/OER. The HOOU is oriented towards the idea of Open Education. It aims to make learning materials available as OERs and pursues technological openness through the use of open source software, legal openness through the use of open licenses, social openness as well as the opening up of action and learning opportunities.

3.2. Change

3.2.1 Promotion of change

Change within the states is effected mainly through two measures, following a top-down approach:

- The strategies for digitalisation developed in each federal state and increasingly across each higher education institutions are a top-down approach to impulse change at the university level and other areas of society.
- Within the field of higher education, further change and concrete measures are fostered through funding schemes that allow for project-based initiatives and structural implementation at the institutional level of higher education institutions.

It needs to be noted, however, that these changes can include infrastructures for storing and disseminating (O)ER but most often they primarily involve teaching-based projects and initiatives that have the focus on broadening knowledge and competencies to use and implement educational technology into teaching and learning processes.

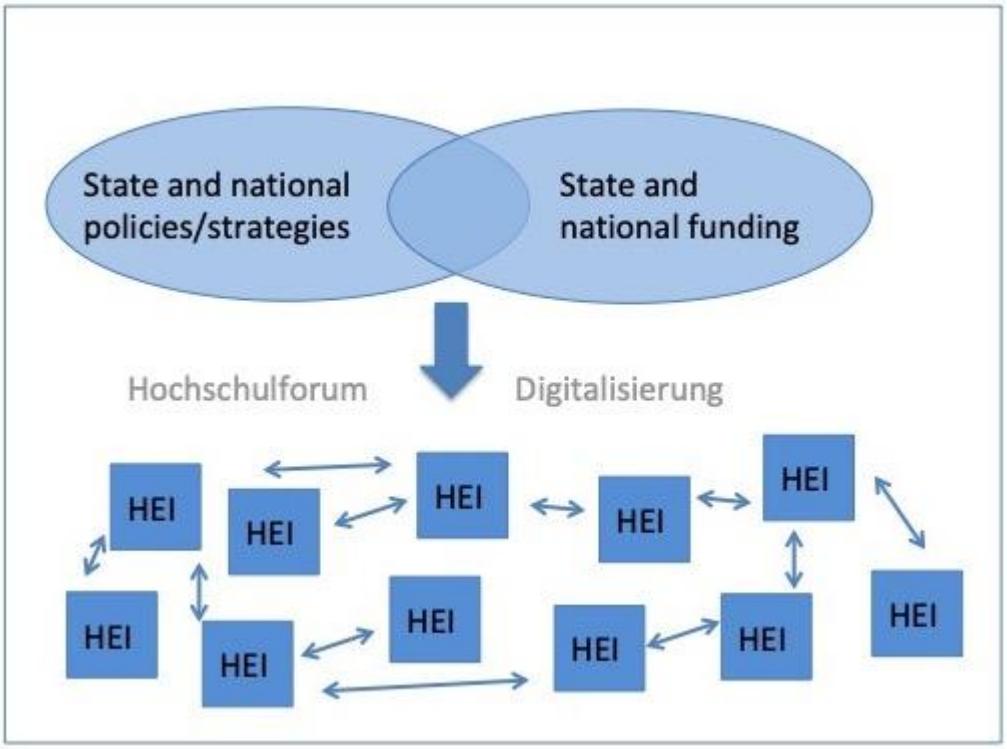
In their study, Gilch et al. (2019, pp. 240) list state-based digital teaching networks, the ones within NRW and BW serving as advanced examples, and herewith show that networking at least within the individual states has increased in scope and also in institutional structures. In this context, the Virtual University Bavaria (Virtuelle Hochschule Bayern) is worth mentioning. The VHB is a cooperation between a number of universities in the state of Bavaria, that offer their students the opportunity to interchange classes that are being offered online. The VHB also has an Open section, containing classes that are open to the public, are free of charge and are directed at people interested to broaden and further their knowledge. This reiterates the observation that there are solid networks within the states that serve to connect institutions and their stakeholders in teaching and learning - however, the topic of metadata or the underlying and necessary infrastructures remain issues that are not prominently addressed or that laymen's attention is directed to.

As the report by Gilch et al. (2019) shows, higher education institutions have picked up the impetus to digitalize - especially in the area of teaching with 18.8% of institutions having a digital teaching strategy in place and 50.9% working on it (n=112). In regard to developing and drafting digitalization strategies, this push is most likely affected by a great extent through institutions participating in the peer to peer coaching for strategy development in the context of the Hochschulforum Digitalisierung. It can be assumed that the visibility of this forum and the spotlight that has then been on digitalization activities of all sorts has had its share in this topic. Hence, this is an example in which a national initiative has somewhat "skipped" the state level and has directly infused individual institutions.

Following from the recapitulation of the four example states as well as the report by Gilch and colleagues, we tentatively put forward the assumption that most institutions have rather reacted to the increased presence and discourse of digitalization on the national and state level - and a certain pressure to adapt that comes along with it and that is both created through comparison and competition with other institutions, as well as the blend of high-level policy and funding programs (see also Fig. 11). This also shows in the fact that most institutional digitalization strategies were developed over the past three years. Only a few fore runners had strategies prior to that.

Fig. 2

Assumed change processes across higher education institutions (HEIs), own representation



Lower Saxony

In the case of Lower Saxony, the funding of the Lower Saxony Ministry of Science and Culture for Teachers focuses on financing projects that propose innovative teaching and learning concepts. These innovative teaching-learning projects are to be promoted by working groups or teachers who support students in the learning process and whose results are to be made available as materials or experience reports in an OER portal. One of the possible contributions of the project could be directed at digital teaching/learning methods and sustainability of the project idea beyond the funding period should be taken into account. Another measure in Lower Saxony, which is being replicated in other federal states, is the establishment of digitalisation professorships at universities that receive additional support from the Volkswagen Foundation. It is interesting to note that the subjects for these digitalization professorships stem from a range of fields related to digitalization, also emphasizing its technological and informatics side - and herewith going beyond the mere focus of digitally enhance teaching and learning.

North Rhine Westfalia

As stated in the digitalization strategy of NRW, aiming at equipping both students and instructors in higher education with the actual competencies to navigate in digitalized teaching and learning environments, the program “Data Literacy Education.NRW“ will be launched for students and instructors will be encouraged to participate in workshops on digital teaching.

Alongside this program, the so-called “Digitalisierungsinitiative” is also one of the four key elements of the state’s strategy, supplementing the DH NRW and its broader activities with an extension of the

> *existing budget by an additional 50 million Euro from 2019 and 35 million Euro from 2022 with the intention to foster integration and implementation of digitalization into the main functions of higher education institutions, including technical infrastructure. As detailed above, OER and the establishment of a state-wide e-learning portal are in the focus here.* [17]

And finally, providing incentives for developing new and innovative teaching practices, “120 Fellowships for digital teaching” will be awarded between 2019 and 2021, continuing an existing funding scheme. Instructors will receive

funds and the space necessary to develop digitalized teaching approaches and are invited into forming networks with other fellows to exchange experiences.

Hamburg

It can assumed that in the case of Hamburg, the HOOU serves different aims and intentions and is policy and change at the same time. As Gilch et al. (2019, p. 151) reveal, the budget for HOOU is to amount to an annually 5 Mio € for each year from 2019 to 2022 and this consortium is perceived to be one of two central pillars of the city's digitalization strategy. The HOOU has also been prominently featured in a specially designed outlet "Synergie" publishing theory and practice-based works related to the idea of open and being itself, not surprisingly, an open access publication.

3.2.2 Institutional strategic planning

Institutional strategic planning occurs mostly - at least publicly visible - through digitalization strategies that take different scopes and shapes. With these strategies being political and strategic documents, they only hold limited information on the actual technical and technological details and necessary steps to be undertaken when it comes to actually implementing infrastructures.

Whilst change, in the sense of providing a policy frame and funding, is primarily effected in a top-down manner on the state-level, the extent to which this translates into practice is thoroughly dependent on the individual higher education institutions. Some of them, such as the UDE, have managed to align research, consulting and teaching practice for their institutional purposes, whilst others have been rather slow in the uptake of digital teaching practices. Even within universities, variations exist between schools and disciplines that are either keen to adopt digital media or rather demonstrate resistance (Hetzner & Schmidt, 2017).

Finally, what needs to be noted on the side is that for most projects involving the development and implementation of digital formats in teaching and learning (as well as administration and research), it becomes increasingly difficult to attract software programmers and informatics specialists. This is due to the fact that universities, as part of the public service structure, cannot always compete with the salary level of private companies (Gilch et al., 2019, p. 116). Furthermore, against the background of the increasing number of digitalization projects that are being demanded for and within higher education, there is a shortage of qualified workforce who could meet that demand. This shows both in the appointment of CIOs as well as IT-staff.

3.3. Infrastructure

On a general level, IT infrastructures within higher education broadly exist but are not yet – for the most part – integrated and interconnected (Gilch et al., 2019). As the report by Gilch and colleagues shows, both universities and universities of applied sciences indicate with a vast majority that they have a number of IT systems in place and that users are being supported in regards to the fulfillment of their core activities within the institutions. However, respondents also stated that the systems are not thoroughly connected with one another and only about 10% of institutions confirmed that a full digital workflow actually is possible for their users.

3.3.1. Consortia

Again, the report by Gilch and colleagues (2019) provides the helpful and general insight that higher education institutions also enter cooperations with other institutions to foster, for example, the digitalization within teaching and learning (72.1%) and the digitalization of the infrastructure (67.3%) (p. 128).

An interesting development here is Edu-sharing which stands out as an open source e-learning integration solution for a repository for the co-operative creation, management and usage of learning objects, which is not only used in HE, but it is extended in some HE institutions in Germany. It was developed as a product of the DFG-project Campus Project initiated in the University of Hagen (2004-2009) with the target on academic education. The exchange between learning repositories is the main objective of the platform. It is based on the Alfresco document management system and supports arbitrary metadata sets such as LOM and Dublin Core and offers interfaces to systems such as Moodle, ILIAS,

OLAT and MediaWiki, as well as content items as SCORM-courses, QTI-compliant tests and drills, and H5P-objects, being each repository is still an independent content-pool.

Since the end of the Campus Project in 2010, edu-sharing is currently coordinated by the edu-sharing association as a consortium based in Weimar to allow the creation of edu-sharing communities that could negociate and define their needs and priorities for further development. According to the project team (Klebl, Krämer & Zobel, 2010), there are four networked installations at Bauhaus Universität Weimar, FernUniversität, Universität Leipzig and the Communal Computing Centre Lower Rhine (schools), and two unconnected edu-sharing installarions in Schmalkalden and Stuttgart and two new membership applications from regional computing centres in NRW. Non-commercial and commercial institutions are invited to apply for a fee-based membership in the edu-sharing association. The authors acknowledged that

> *the main difficulty in acquiring users lies in the fact that our main target group are not individuals but educational institutions that recognise the benefits of cross-institutional sharing of educational experience and cooperative development of scholarly content. Attracting such partners, negotiating individual (adaptation) needs, formulating corresponding legal contracts, and waiting for final decisions just requires a lot of endurance and time. [...] We have also good chances that edu-sharing be adopted as part of the e-learning infrastructure for the universities in Thuringia, Germany, and we are optimistic that ongoing negotiations with several other German universities will end positively (Klebl, Krämer & Zobel, 2010, p. 949-950).*

Another consortium is the Virtuelle Hochschule Bayern which was constituted of a network of 9 universities, 17 universities of applied sciences and 4 other HE institutions in Bayern in 2000. Within the platform, online courses are developed and shared among the universities. Three different modalities to participate in those courses are offered: classic modus (students in those HE institutions can obtain ECTS for their studies, for free), open modus (everyone interested in the courses can have a look at them and use them for themselves) and smart modus (those are blended-learning units with the possibility to integrate them in a flexible way in the traditional face-to-face courses). Companies and other educational institutions can use the “open” courses freely, but the “classic” ones as well, with a fee.

A third consortium is HOOU and it is a good example of a regional consortia where shared OER are offered. As researcher leader of a project among the network partners full rights to create and edit own OER in the platform are granted. As metadata specifications, the Learning Resource Metadata Intiative (LRMI) is cited and described as important in learning offers (courses) to be able to use the OER in other contexts. It is also mentioned in the case of educational materials, as smaller units of contents than learning offers.

Lower Saxony

The Merlin-Portal is the OER portal in Lower Saxony for schools that is hosted centralised in the Niedersächsischer Bildungsserver. Recently, the project OER-Portal Niedersachsen (2019-2023), funded by the Lower Saxony Ministry of Science and Culture, has developed a portal for OER in HE in Lower Saxony based on the edu-sharing platform (TIB Hannover) [18], [19]. Along the creation of this portal, the connection of the new portal to other ones (search function) is expected. In this development, there are different institutions that are cooperating: TIB Hannover, ELAN e.V., HIS Institut für Hochschulentwicklung e.V., Hochschule Emden / Leer, Universität Osnabrück (vitUOS) und Stud.IP e.V.

Another initiative that was funded as a project from December 2013 until December 2015 by the Ministry of Science and Culture of Hannover and carried out by ELAN e.V. was the OHN-KursPortal. This portal was thought as a platform to host online courses addressing the target group of the Offenen Hochschule Niedersachsen, apart from offering information and counseling as part of the Servicestelle Offene Hochschule Niedersachen). Within this platform, ELAN e.V. put at disposal different mathematics online courses. However it is no longer active.

North Rhine Westfalia

NRW has developed many OER infrastructures, some of them representing consortia among universities. In some other cases, there are OER repositories of individual institutions. The report in Heureka.NRW informs about some of those

initiatives and describes them. A summary is included as follows.

Some institutional consortia are the following:

- NRW Digitale Hochschule. It is a cooperation association of 42 HE institutions and the NRW Ministry of Culture and Science that aims at establishing a shared infrastructure in NRW for digital transformation. Within these networks the development of a Landesportal DH.NRW is planned and some of the current projects and funding lines are involved with the HE digital infrastructure for OER, e.g. OER-Content.NRW.
- Bridge. This was a cooperation project between the Universities of Applied Sciences Niederrhein, Rhein-Waal, Ruhr West and the University Duisburg-Essen. The aim was to promote the cooperative design of digitalisation in teaching and learning. A specific OER product was made in the area of Business Administration.
- digiLL. This was a cooperation project for pre-service teacher training initiated by the University of Bochum, TU Dortmund, Uni Duisburg-Essen, Universität zu Köln and Universität Münster (2016), currently transformed into a university cooperation. Recent incorporation as members include the Universität Trier and Universität Koblenz-Landau (2019). The initial aim of the project was to collaboratively develop university learning modules related to the topic of media competence and didactics of the media and digital and subject-area competences. However, in perspective, it is expected that new members will bring their different thematic and methodic areas. The learning modules are created in the infrastructure of each university (each LMS), then reviewed and received feedback before being shared in the digiLL repository.
- OERlabs. It is a cooperation project between the Institut für Allgemeine Didaktik und Schulforschung of the Universität zu Köln and the Fachgebiet Pädagogik of the TU Kaiserslautern since 2017. The aim is to bring OER strongly to the teacher education studies.

Institutional OER repositories in NRW are:

- OpenRUB (University of Bochum). It includes Moodle courses, course concepts, videos, websites and stand-alone educational materials of all the disciplines.
- OER an der Universität Duisburg-Essen. The OER are part of the general repository of the university (DuEPublico), which is managed by the university library and is based on the Repository-Framework MyCoRe and other open source components. It is possible publish OER in the repository and search for them. OAI-PMH interoperability is mentioned.
- Youtube Kanal Civil Engineering RWTH Aachen University. The focus is on the many facets of bacis and current research in the area of Civil Engineering , by building up a set of standard features in Civil Engineering as OER to be used by any student or university. The initiative was founded as part of the Blended Learning and Exploratory Teaching Space (2014-2017) campaign of the RWTH Aachen University.
- WeBWork (Universität Siegen). This is an institutional project aimed at translating English OER in the area of mathematics into German OER and sharing them in the WeBWork portal.
- Offenen FernUni Hagen. Since 2017, this is the open learning platform of the FernUni Hagen to offer online courses (e.g.MOOCs) or OER to any person, even if they are not registered as students at the university. There is also the possibility of developing cooperations with other universities in Germany and abroad.

Although not an institutional initiative, but promoted from the association ILIAS e.V. and company lernmodule.net gGmbH for schools and universities, the openUP project can be highlighted (2016-2018). The aim was to engage teachers in schools and universities to use and publish OER. The offer included workshops, a network service and OER materials and information.

Hamburg

Being a small state with a diverse and heterogeneous higher education institution landscape nevertheless, Hamburg has also prominently launched the Hamburg Open Online University, which is a prime example for a consortium of institutions. Whilst not a consortium that is solely focused on higher education, the digital learning lab is a platform that provides teachers in K-12 with openly licensed material for school teaching and allows individuals to also create and disseminate materials. It is a joined endeavor that also includes the city municipality as well as the Technical University

Hamburg. Additionally, the Multimedia Kontor Hamburg needs to be mentioned, which is not exactly focusing on OER per se, but rather on the range of topics revolving around the digital transformation of higher education. It is organized as a joint initiative by the six public higher education institutions in Hamburg and offers counselling and support services.

3.3.2 Communication and exchange between repositories

So far, the picture remains disparate and incoherent, with the idea of the state and their respective educational governance being influential. As the digitalization strategies on the state level reveal, the states are primarily concerned with infrastructures within their state and the linkage between institutions within the state.

Not for higher education, but for the school sector the platform MUNDO that serves open educational materials under the self-label of a "Bildungsmediathek der States" to teachers in K-12 is to be mentioned. It is a joint initiative of the 16 states and aims to provide an overview of existing digital materials, to check them for quality and licences so that they can be safely implemented into the classroom [20]. Quality assurance is included in MUNDO through an expert group, as is also the use of LTI as an interface for integration into schools' individual Learning Management Systems. Against the background of the German federalism, the entire project is rather noteworthy.

3.3.3 Public and commercial entities involved

Against the background of the predominantly public German education system, commercial entities do not assume a prominent place, however, associations do, e.g. JOINTLY (to some extent) and the Bündnis Freie Bildung. Whilst there is increasing critique directed against the (potential) influence that (educational) technology companies and its advocates exert on and within education (e.g. Förschler, 2018; Niesyto, 2021), OER is a topic that is mostly driven by active participants in respective communities, rather than industry.

3.4 Quality

3.4.1 Institutional quality assurance mechanisms

Quality of OER remains a contested topic, with the Hamburg Open Online University being closely affiliated with quality assurance due to the publication on OER and quality by Mayrberger and Zawacki-Richter (2017, 2018).

As there is no overall benchmark for quality of OER, initiatives have taken to individual solutions and approaches. In the case of the recently established OER repository TWILLO in Lower Saxony, quality is addressed via seven indicators that were developed by researchers at the University of Oldenburg in the context of EduArc:

- Discipline-specific content knowledge
- Reusability
- Application and Transfer
- Support
- Motivation
- Structure, navigation and orientation
- Design, intelligibility, accessibility

Other consortia, such as the Virtuelle Hochschule Bayern, also state that their e-learning courses undergo quality assurance mechanisms, e.g. student evaluations, pedagogical and content-related external evaluations, financial support in order to rework courses upon evaluation in order to maintain and raise their quality. For the open section within VHB, an extensive criteria catalogue is published and available online that external assessors can use in order to carry out the evaluation.

The state-wide OER repository in NRW – ORCA.nrw – states likewise that, under the guidance of one university, a quality assurance concept is being devised that takes into consideration e.g. the content, usability and pedagogy of the resource.

However, the quality assurance mechanisms are still in development as this quotation indicates.

Yet another initiative, the Universitätsverbund digiLL that is directed at teachers and sources its expertise from ten teacher education institutions, also highlights the aspects of openness and quality assurance in their description. digiLL makes use of a quality assurance process before, during and after production of materials and their publication. The quality standards include, among others, accessibility, user friendliness, content correctness and target group specific degrees of complexity.

3.4.2 Actors and standards

As can be inferred from the examples listed above, quality assurance remains a scattered topic that revolves around similar aspects, e.g. design, pedagogy, accessibility… - but that is "reinvented" for individual endeavors as it seems. Despite the fact that several portals and repositories follow a similar aim and interest, they do not join forces but rather seemingly resort to expertise present at the universities within the specific state and follow a quality assurance model developed there. Finally, the above presented projects do predominantly hint at content and pedagogy related aspects rather than interoperability or adherence to international standards in the realm.

3.5 Summary and preliminary conclusions

In this second part, we zoomed in on the meso level by means of comparing four German states and complementing those with insights from the comprehensive report by Gilch et al. (2019). Instead of providing conclusions for the meso level of digital transformation in Germany, we want to develop a number of statements that could be subject of further investigation or could be analysed comparatively with the situation in other countries:

Publicly available strategy documents in the realm of policy (national, state and institutional level) revolve around digitalization as a major force that needs to be used to the advantage of e.g. education. However, the technological, infrastructural and informatics-related aspects of it are less prominently featured in these documents, although they constitute the second - and necessary - pillar of digitalization within education alongside the pedagogical implications and settings.

Attributable to the German political system, it is obvious that change in the sense of matching policy with funding occurs to a great extent on the level of the states - with the large funding schemes by the BMBF constituting an exception, of course. However, the example of NRW shows a network has begun to form that results from a state policy, whose implementation is then driven by large fundings. States have their respective actors - in the form of more of less established and institutionalized networks and interest groups - and have created a diverse landscape of structures and institutions. This, however, means that a nationally concerted effort for e.g. a shared platform for OER seems like a very unlikely possibility against the background of these existing but scattered efforts.

Platforms and repositories for OER have been created for and by individual institutions (UDE in NRW) and state-wide networks (TWILLO in Lower Saxony; HOOU in Hamburg), which reiterates the states' individual identity and wish to position themselves as separate entities. This, when assuming a broader perspective on the notion of open, makes one wonder about how many opens there are in Germany and that establishing links between existing repositories seems a reasonable and timely approach.

Within each state, the individual institutions show different stages of development and adoption when it comes to both establishing digitalization strategies and the topic of OER as one part of this broad process. With some, naturally, being at the forefront, others take their time and have only recently increased their digital activities - with teaching assuming a prominent role - as part of their institutional development focus. And even within institutions, the pace varies.

With the following section looking at the micro level of individual institutions and the instructors therein, we also suggest that digitalization or, more specifically, the use of OER for teaching purposes is perceived mainly as a pedagogical endeavor, the fact that their dissemination and availability mainly relies on metadata and repositories (institutional or inter-institutional) is overlooked.

4. Micro level

4.1 Introduction

With policies and infrastructures for the creation and dissemination of Open Educational Resources (OER) in place on the national and state level in the German higher education context, OER have assumed their place in education policy and recent funding schemes of various kinds. Zooming in on the micro level of individual institutions and instructors provides additional information on OER developments and complements the multi-level view established across the diverse country reports within the project EduArc. Against the lack of empirical studies for the actual uptake, use and creation of OER, this section draws on a small scale empirical investigation in one German state (N = 76); focusing on topics related to OER alongside the topics of policy, infrastructure, quality and change. Descriptive statistics from this survey-based research are reported and conclusions are drawn – these require more extensive empirical scrutiny in order to deepen and delineate results more comprehensively. Limitations are addressed and an overarching conclusion is proposed that brings together finding from the macro, meso and micro level as previously reported as part of the EduArc country reports for Germany.

So far, very little empirical studies for the German higher education context exists that go beyond theoretical discussion and conceptualization of (O)ER in higher education – notable exceptions are recent studies by Otto (2019) and Lechtenbörger (2019). Both authors make first attempts to trace either the impact of the funded projects on OER in 2017 and 2018, making use of a meta-analytic approach (Otto, 2019) or show in an introspective report the different steps taken to create an OER for one's teaching (Lechtenbörger, 2019). Furthermore, Otto (2020) provides an empirical analysis of instructors' attitudes towards and perceptions of OER and relates them to actual uptake and use within schools, higher education and adult education.

Whereas a number of individual instructors are prolific in the creation, dissemination and uptake of OER, this has not yet translated into broad awareness and uptake. To this end a questionnaire was translated into German and adapted for use in the German higher education setting; questionnaires with a similar focus being used in Spain and Australia as part of the comparative country studies. This will not only allow to establish a small empirical base within Germany but rather allow for comparison between the three countries. As will be explained in the method section, the study sample is sourced from within higher education institutions in Lower Saxony.

In its structure, this micro level report follows the same thematic foci that were already established in the previous sections, that is infrastructure, quality, policy and change. As stated above, the structure is not directly visible in the chapter headings but expressed in the scope of the chapter.

4.2 Method

4.2.1 Procedure

For the purpose of this study, the questionnaire was set up in the online questionnaire tool Limesurvey at Carl von Ossietzky University Oldenburg. In close consultation with the data protection officer at said university, data protection measures were taken, participant information drafted and approved, and the accordant documents filed.

The scientific project leader approached the association ELAN e.V., asking for support in disseminating the questionnaire amongst the association's institutional members; these being 10 universities and universities of applied sciences in Lower Saxony [21]. It was deemed appropriate to focus on institutions located in own state, both for measures of proximity and connection via ELAN e.V. as well as similar institutional conditions within one state. Between 30 of September and 31 of October 2020, the questionnaire was online [22] and accessible for participation. No reminder for participation was sent (or could be sent) due to the fact that ELAN e.V. could only forward the invitation to the member institutions (e.g. vice presidents for education, deans, colleagues in the administrative position to disseminate the survey within their institutions) without knowing if these would actually be forwarded.

In order to ensure as much privacy and protection of personal data as possible, we did not ask participants to indicate the name of the institution they are affiliated with. Whilst this serves the purpose of data protection, it also means that we do not have any possibility to know which institutions are represented in the questionnaire. This constitutes a limitation to the study as it might only be one, two or three institutions present in the sample; therefore generalization is not possible. Generalization is further hampered by the fact that we only received 76 complete questionnaires. “Complete” was indicated via LimeSurvey and was then chosen as the criterion to use when selecting completed and uncompleted surveys.

4.2.3 Data collection instrument

The questionnaire that was used in this study is a translated version from the Spanish original version which was also developed within the context of the EduArc project. It was slightly modified, for example when defining the academic positions or the names of institutional units and services. A question on the use and creation of digital educational resources in the context of Covid-19 was added. The questionnaire is structured into three parts (A. basic information, use and creation of (O)ER, B. infrastructure for (O)ER, C. quality and infrastructure for (O)ER, D. (O)ER and infrastructure policy and regulations). All questions were voluntary and the opportunity was given to indicate no comment (keine Angabe) as well. The survey (in German language) can be provided upon request.

4.3 Results

4.3.1 Sample description

Out of 125 received questionnaires, only 76 were complete as per automated information in LimeSurvey. For the present study, the remaining 49 were discarded for consistency reasons – it might be of interest at a later stage to go back to these answers and check for patterns and topic at which participants decided to withdraw from participating. Out of the 76 participants, 35 (46%) are female, 39 (35%) are male and two (3%) do not report their gender. With 27 (36%) research associates are most frequently present in the sample, followed by 19 professors (25%). Full-time lecturers (Lehrbeauftragte für besondere Aufgaben) are the positions following (11, that is 14% with regular contract; 10, that is 13% with term contracts). One assistant professor (1%) and 5 others (7%) and two persons without indication (3%) follow. One person did not provide information on his or her position.

As indicated in Table 1, teaching experience is reported for the entire spectrum from one to over 20 years of teaching experience; with the groups of 4 to 7 years, 12 to 15 years and more than 20 years being most dominantly within the sample.

Table 1

Participants' Teaching Experience (In Years) (N = 76)

Teaching experience	Absolute	Relative
1-3 years	7	9.21%
4-7 years	17	22.37%
8-11 years	6	7.89%
12-15 years	17	22.37%
16-19 years	6	7.89%
+ 20 years	21	27.63%
No information	2	2.63%

Participants were also asked about the field of study that they conduct their teaching in; as Table 2 displays, it is the two fields Humanities (34.21%) and Mathematics & Natural Science (26.32%) that participants most often teach in. With 15.79%, Social Sciences are also relatively often represented, the other fields of study only limitedly.

Table 2

Participants' teaching across fields of study (N = 76)

Field of study	Absolute	Relative
Humanities	26	34.21%
Sports	2	2.63%
Law, Economics and Social Sciences	12	15.79%
Mathematics, Natural Sciences	20	26.32%
Medicine /Health Sciences	7	9.21%
Engineering	2	2.63%
Art, Arts	4	5.26%
Other	3	3.95%

Sixty participants (78.95%) report that they can decide on the creation and reuse of digital educational resources in the classes they teach, whereas 11 participants (14.47%) indicate that they decide jointly with other colleagues on the creation of digital educational resources. Three respondents (3.95%) can make use of resources provided to them and do not have to create them themselves and two (2.63%) indicate other.

4.3.2 Use of (open) digital resources

As a precursor to the further results, the (open) digital resources are described that instructors reported to use in their teaching.

Table 3

(Open) digital resources used for teaching purposes (N = 76)

Resource	Never	Seldom	Sometimes	Often	Always	No comment	No answer
Text-based material (e.g. Notes, Instructions)	3 (3.95%)	6 (7.89%)	14 (18.42%)	32 (42.11%)	17 (22.37%)	1 (1.32%)	3 (3.95%)
Tests and Quizzes (e.g. online surveys)	25 (32.89%)	18 (23.68%)	14 (18.42%)	7 (9.21%)	7 (9.21%)	1 (1.32%)	4 (5.26%)
Presentations (e.g. slides)	3 (3.95%)	2 (2.63%)	5 (6.58%)	25 (32.89%)	39 (51.32%)	0 (0.0%)	2 (2.63%)
Videos (e.g. Tutorials, screencasts)	10 (13.16%)	11 (14.47%)	18 (23.89%)	25 (32.89%)	8 (10.53%)	1 (1.32%)	3 (3.95%)
Podcasts	49 (64.47%)	8 (10.53%)	8 (10.53%)	4 (5.26%9	3 (3.95%)	0 (0.0%)	4 (5.26%)
Images	6 (7.89%)	3 (3.95%9	9 (11.84%)	34 (44.74%)	21 (27.63%)	0 (0.0%)	3 (3.95%)
Infographics	11 (14.47%)	5 (6.58%)	18 (23.68%)	27 (35.53%)	12 (15.79%)	0 (0.0%)	3 (3.95%)
Games	47 (61.84%)	14 (18.42%)	8 (10.53%)	4 (5.26%)	0 (0.0%)	0 (0.0%)	3 (3.95%)

Resource	Never	Seldom	Sometimes	Often	Always	No comment	No answer
Simulations	46 (60.53%)	14 (18.42%)	8 (10.53%)	5 (6.58%)	0 (0.0%)	0 (0.0%)	3 (3.95%)
Courses/Modules	33 (43.42%)	12 (15.79%)	8 (10.53%)	6 (7.89%)	7 (9.21%)	6 (7.89%)	4 (5.26%)
MOOCs	59 (77.63%)	2 (2.63%)	1 (1.32%)	0 (0.0%)	0 (0.0%)	8 (10.53%)	6 (7.89%)
Blogs	48 (63.16%)	8 (10.53%)	14 (18.42%)	0 (0.0%)	2 (2.63%)	1 (1.32%)	3 (3.95%)
Other	28 (36.84%)	3 (3.95%)	8 (10.53%)	6 (7.89%)	2 (2.63%)	12 (15.79%)	17 (22.37%)

As can be seen in this table, resources based on text, presentation slides, images and infographics are most strongly reported to be used often and always, followed by videos. This is an inversed trend when compared to blogs, modules, simulations games, MOOCs, podcasts and also tests and quizzes, which are most often never employed or only seldom. Whilst it can only be speculated to the reasons, it is quite evident that slides and digital texts are now omnipresent in higher education teaching and require little preparation and technical/pedagogical knowledge compared to other tools in their set up and generation.

4.3.3 Infrastructure

In the case of the micro level, infrastructure relates to the institutional structures that are in place (or not) to allow for use and provision of digital educational resources. With an open question, it was attempted to discern pattern, in which instructors use their respective institutional repository. This yielded six statements, with one participants stating that he/she used own lecture recording on the university video platform, one using it for researching information and another saying the use applies to storing lecture materials and software projects. However, the low numbers of open answers also speak for themselves as the vast majority did not feel able or willing to respond to this question. The reasons can only be speculated on. As depicted below, participants commented on the institutional infrastructures mostly affirmative on their existence (51.32%) and also stated with 42.11% that the said repositories are important for the reputation and image of their institution. However, and this relates not only to infrastructures but rather touches upon the usage and publishing patterns of the instructors, instructors state in a great majority that they do not publish their self-created resources neither on other public platforms (86.84%) nor on their respective institutions' ones (53.95%). Roughly half of the respondents state that the digital educational resources they use do not come from the institutional repository (53.95%) that they do not use their institutional repositories, collections or portals to search for digital educational resources (55.26%).

Table 4

Repositories for OER and their use (N = 75)

Item	Yes	No	Do not know	No comment
My HEI has one or more repositories for digital educational resources (or integrates them).	39 (51.32%)	6 (7.89%)	28 (36.84%)	3 (3.95%)
The digital educational resources that I use come from those repositories.*	18 (23.68%)	41 (53.95%)	10 (13.16%)	6 (7.89%)
I normally publish my digital educational resources in HE repositories.	27	33	7 (9.21%)	9 (11.84%)

Item	Yes	No	Do not know	No comment
	(35.53%)	(43.42%)		
I normally publish my digital educational resources on public platforms (e.g. youtube, slideshare)	5 (6.58%)	66 (86.84%)	0 (0%)	5 (6.58%)
I normally publish my digital educational resources under Creative Commons licenses*.	23 (30.26%)	38 (50%)	6 (7.89%)	8 (10.53%
I use repositories, collections, portals of my HEI to find digital educational resources*.	20 (26.32%)	42 (55.26%)	4 (5.26%)	9 (11.84%)
Repositories for digital educational resources are connected to other institutional systems (e.g. Intranet, virtual platform)*.	24 (31.58%)	21 (27.63%)	19 (25.00%)	11 (14.47%)
Digital repositories for educational resources are important for my HEI's image, reputation or visibility.	32 (42.11%)	11 (14.47%)	23 (30.26%)	10 (13.16%)
Other external entities (e.g. companies) are involved with the support or maintenance of the resource repositories.	4 (5.26%)	19 (25.00%)	44 (57.89%)	9 (11.84%)

Following a filter question, participants who responded predominantly negative to the usage of the institutional repository replied to barriers to them using the repository. Amongst the various potential reasons provided to the participants in a multiple choice format, it is the intellectual property rights that keep participants from using the repositories, followed by not wanting to publish resources and not being able to find the appropriate resources – although these replies are low in number overall.

Table 5

Reasons for not using institutional repositories (multiple choice)

Item	Absolute	Relative
I do not know how it works.	2	2.63%
I cannot find any digital educational resources that are useful for my courses.	6	7.89%
I find it difficult to use the institutional repositories.	3	3.95%
My colleagues do not use institutional repositories.	2	2.63%
There is no support system for the use of institutional repositories.	2	2.63%
There are no incentives for the use of institutional repositories.	5	6.58%
I do not want to use other instructors' digital educational resources.	4	5.26%
I do not want to publish my digital educational resources.	6	7.89%
I am concerned about the intellectual property rights related administration of resources.	7	9.21%
My HEI does not have a repository for digital educational resources.	2	2.63%
My HEI does not have a repository for the kind of digital educational resources that I would need.	4	5.26%
Other	2	2.63%

It is interesting to note that concern over intellectual property rights is the reason most often indicated for not using the institution's repository.

4.3.4 Quality

As depicted below, instructors apply quality consciousness when it comes to (open) digital resources and perceive quality via a number of characteristics. Interestingly enough, the resource type is perceived as an indicator of quality by 65.79% of participants, which is only surpassed by the reusability of the resource in one's course (72.37%). However, the inclusion of metadata and the opportunity of a rating or evaluation system for the resource lacks agreement and is only referred to as a quality indicator by 11.84% or 9.21% of participants respectively.

Table 6

Quality indicators of (open) digital resources (N =76, multiple choice)

Item	Absolute	Relative
Availability in the institutional repository	36	47.37%
Reputation of the authors of the resource	32	42.11%
Reusability of the resource in my course	55	72.37%
Use of the Creative Commons license	26	34.21%
Accessibility	19	25.00%
Resource type (Text, Video, Audio etc.)	50	65.79%
Inclusion of metadata (Information about the resource, e.g. subject)	7	9.21%
Multi culturality of the metadata (Possibility to cover multiple educational realities)	10	13.16%
Adherence to international standards (e.g. SCORM, Dublin Core)	11	14.47%
Availability of a sort of evaluation or a comment on the quality of the resource	9	11.84%
Other	5	6.58%

As part of the section on quality, participants were also asked about a short description on how the institutional quality mechanisms operate in this realm. Focusing only on answers that explicitly sating that they do not know how quality assurance works, it is 26 participants answering with a "I do not know" type of statement; out of 45 participants who provided an answer to this question.

This perceived uncertainty concerning quality and quality assurance is also mirrored in the question on the influence that certain stakeholders exert on quality – with no comment being the most frequently given answers across all stakeholder groups. Interestingly – although not surprising – quality is then also seemingly anchored as a topic addressed by the (general) IT services and instructors themselves, the latter being the group accorded very high influence on quality matters (23.68%), and the general IT departments (11.84%) and the IT of the institutional LMS (19.74%) respectively.

Table 7

Influential units on the definition of quality of digital educational resources, their metadata and repositories (N = 76)

Stakeholder and/or unit	Very little	little	medium	High	Very high	No comment	No answer
General IT support	8 (10.53%)	5 (6.58%)	14 (18.42%)	12 (15.79%)	9 (11.84%)	23 (30.26%)	5 (6.58%)
Library services	8 (10.53%)	12 (15.79%)	8 (10.53%)	13 (17.11%)	4 (5.26%)	25 (32.89%)	6 (7.89%)

Stakeholder and/or unit	Very little	little	medium	High	Very high	No comment	No answer
Faculties / Institutes	8 (10.53%)	10 (13.16%)	7 (9.21%)	18 (23.68%)	3 (3.95%)	24 (31.58%)	6 (7.89%)
Units for teacher development	10 (13.16%)	9 (11.84%)	11 (14.47%)	8 (10.53%)	4 (5.26%)	28 (36.84%)	6 (7.89%)
HE leadership	16 (21.05%)	10 (13.16%)	8 (10.53%)	5 (6.58%)	3 (3.95%)	28 (36.84%)	6 (7.89%)
Quality management	13 (17.11%)	9 (11.84%)	12 (15.79%)	2 (2.63%)	2 (2.63%)	32 (42.11%)	6 (7.89%)
IT services of the institutional LMS	5 (6.58%)	6 (7.89%)	10 (13.16%)	16 (21.05%)	15 (19.74%)	19 (25.00%)	5 (6.58%)
Media services and production	10 (13.16%)	5 (6.58%)	10 (13.16%)	16 (21.05%)	3 (3.95%)	26 (34.21%)	6 (7.89%)
Instructors	4 (5.26%)	3 (3.95%	13 (17.11%)	14 (18.42%)	18 (23.68%)	19 (25.00%)	5 (6.58%)

4.3.5 Policy

When asked about policy guidelines for (open) digital resources at their specific institutions, a striking majority of participants replied that they do not know or decided for the “no comment” option. Compared to the answer option that would have confirmed knowledge about the existence or non-existence of policies (explicit and implied ones), this is an interesting result in different way: Whilst first and foremost, there does not seem to be much knowledge as such, this might be explained by either not much communication flowing within the institutions but also could be read as a sign that there exists a relatively small – but in itself very active and connected - (O)ER community that is also informed about institutional matters and the stand that their institution takes. A larger group not knowing about these topics does then emerge at the other side of the spectrum.

Table 8

Policy guidelines for (open) digital resources (N = 76)

Item	Yes	No	Do not know	No comment
At my HEI, there an explicit regulation or policy that regulates the use and/or creation of digital educational resources*	19 (25.00%)	9 (11.84%)	41 (53.95%)	3 (3.95%)
At my HEI, there is an implicit policy concerning the use and/or creation of digital educational resources*	17 (22.37%)	7 (9.21%)	44 (57.89%)	4 (5.26%)
At my HEI, there are institutional guidelines that are linked to a study program, institute or faculty**.	13 (17.11%	12 (15.79%)	43 (56.58%)	3 (3.95%)
Instructors are involved in the preparation or these (explicit) institutional guidelines or regulations*.	7 (9.21%)	15 (19.74%)	44 (57.89%)	6 (7.89%)
Instructors can influence these (explicit) institutional guidelines or regulation to a certain extent**.	10 (13.16%)	7 (9.21%)	49 (64.47%)	5 (6.58%)

*N = 72, **N = 71

4.3.6 Change

When replying to the statement of the used digital educational resources being licensed under Creative Commons, 34 participants (44.74%) stated yes, 22 (28.95%) stated no and 14 (18.42%) indicated that they do not know. Another six (7.89%) indicated the no information reply.

Against the backdrop of the ongoing Covid-19 pandemic, 23 instructors (30.26%) stated that they use more OER, and 28 (36.84%) reported to create more OER. However, 11 (14.47%) also indicated not to use more OER and 7 (9.21%) mentioned not to create more OER. Two participants indicated to not know it and five opted for no comment.

Table 9

Measures at the HEI to support instructors in the creation of digital educational resources and their metadata (multiple choice) (N = 76)

Item	Absolute	Relative
Financial incentives (e.g. tenders, calls)	3	3.95%
Non-monetary incentives (e.g. recognition)	7	9.21%
Technical support	40	52.63%
Support for professional development	30	39.47%
Recognition for teaching (e.g. Teaching awards)	16	21.05%
I do not know any	33	43.42%
Other	1	1.32%

Out of 41 participants replying with a statement to the open question of how the support mechanisms for creating and publishing of (open) digital resources work, 23 replied that they do not know about how support systems work at their respective institution. However, technical support (52.63%) and support for professional development (39.47%) are frequently noted measures.

In 2020, Lower Saxony launched a funding scheme for developing OER, targeting higher education cooperation between institutions within Lower Saxony. Grants are provided to collaborations in a number of subjects and disciplines, the uniting factor being that the will all be published on the state's new established OER portal "OER-Portal Niedersachsen". With this scheme incentivizing OER production and creation it will be interesting to see how many resources will be made available and how much this permeates into higher education institutions as such. It is at this junction of financial support, policy action on the meso level and personal involvement of instructors on the level of department and faculty, that change can also be effected. Therefore, it seems necessary to be aware of this interface and mutual influence and interdependence.

4.4 Discussion

The results from this - albeit small and geographically limited – survey study can be read as a hint that (O)ER have not yet arrived on a broad scale on the micro level of the institution and the higher education classrooms and that knowledge about OER and related topics can be considered as limited. Whilst the study can provide a glimpse into current practices, there are some topics to be considered and evaluated more closely. This will be done, again following the different topics of infrastructure, quality, policy and change.

4.4.1 Infrastructure

Regarding institutional infrastructure to results stand out: About half of the participants indicate that their institution has at least one repository for digital educational resources. However, the actual use of these infrastructures is far behind, with participants not using the repositories outnumbering the ones using them by far. It is also interesting that

participants reported frequently not to know about infrastructure-related topics. Considering that infrastructures for OER, that is institutional and regional repositories, have increased over the past years and are actively encouraged via policies and initiatives at the state level (as reported in the macro and meso level sections), the lack of knowledge about the institutional infrastructures as identified here, is interesting. However, in his study on instructors' attitudes towards OER, Otto (2020) derives the following conclusion

When the results are brought together, they indicate that the beliefs about OER are partly independent from the knowledge about OER, but that knowledge constitutes a central pre-condition for the use of OER (Otto, 2020, p. 36, translation by the authors).

Therefore, the lack of knowledge about institutional infrastructure could potentially be a sound reason for instructors saying that they do not publish their resources on the institutional repository (43.42%) or that their resources do not come from these spaces (53.95%).

4.4.2 Quality

As can be inferred from the participants' replies, there exists a consciousness of quality-related issues when OER, digital educational resources respectively, are concerned. The Monitor Digitale Hochschulbildung (Schmid et al., 2017), confirms, however, that quality is a somewhat diffuse issue: of their respondents[23], 21% indicated that they fully agreed with having difficulty to judge the quality of an OER offering and 37% rather agreed. So despite the discussion on quality advancing through framework development (Zawacki-Richter & Mayrberger, 2017) and critical review (Brückner, 2019), this has not yet translated into self-confident practice amongst instructors. In light of Brückner's article (2019), who argues for exactly this self-confident practice when assessing an OER's quality, it is interesting to see that instructors in this study also perceive the influence of instructors as very high and that of faculties as high when quality overall, metadata and repositories are concerned. With 23.68% each, these two stakeholders are most often viewed as influential in this regard, closely followed by the LMS-related IT staff.

Regarding the idea put forward within the EduArc project, it is interesting to see that inclusion of metadata is only perceived as indicating quality by seven participants (9.21%). It can only be surmised that - if a person is not much involved with OER and their technical and information scientific side – this topic is not broadly considered. It would also be interesting to delve deeper into the question as to why the resource type in itself constitutes an indication of quality for 65.79% of the participants. In Schmid et al. (2017) it is reported that 58% of their respondents stated that they (rather) agreed with the statements that they found it hard to judge the quality of an OER. This finding is echoed to a certain extent in the present study.

With the newly established OER portal in Lower Saxony being operated on the state level, from November 2020 on, there is an optional quality check integrated that OER producers can use while creating their OER. Again, this shows the interrelatedness of different operational levels concerning the production and dissemination of OER.

4.4.3 Policy

Bridging the aspects of policy and change, Deimann, Neumann and Muuß-Mehrholz (2015) also argue that an institutional policy instrument to foster creation and dissemination of OER lies in the so-called Leistungszulage, an incentive mechanism to foster professors' overall performance in different domains, if this is applied to creating and distributing OER. However, the author assume only a low probability for this to happen – but a high impact if this was implemented. With the recognition for teaching, this is – albeit very small in comparison – a step to incentivize creation and publication of OER. The topics stated within the discussion on change are more or less directly related to policy as well for reasons of clarity, both topics are, however, treated separately.

4.4.4 Change

With Lower Saxony launching a state-wide initiative to foster OER production and dissemination in 2020, this corresponds to the aspect of "Funding lighthouse projects / OER competition" that is increased visibility and prominence, as stated by Deimann, Neumann and Muuß-Mehrholz (2015). With Deimann et al. assuming a high

likelihood of this happening and high impact resulting from this action, it will now be interesting to see how this plays out in practice. Within this funding scheme, policy and change – not surprisingly – are linked again as one of the requirements within this tender is the publication of the created OER on the state's newly established OER portal. In that sense, the project provides both a financial incentive (120,000€ worth of funding) as well as an ideal support and obligation to disseminate the OER broadly.

This concrete example shows how much state and institutional level are intertwined to foster OER production and dissemination. Implicitly, it can also be read as an acknowledgement that the final product OER is free of charge for its users – but does require financial means during the creation phase, if it is to exceed single endeavors and also be considered in a broader scheme. Therefore, change and policy apparently rely on more than just political and individual commitment in order to reach a larger audience and a potentially critical mass in the future.

Otto (2020) analyzing the affective, cognitive and action-related attitudes of instructors from different education sectors towards OER, concludes that attitudes towards the more abstract values such as sharing and openness are quite firmly rooted in the participants he could recruit for his study. He summarizes: „This potentially indicates that OER are positively connoted by the participants that is comparably independent from the knowledge about OE and indicates the rigidity of the beliefs " (Otto, 2020, p. 32, translation by the authors).

This is quite a relevant finding as it shows the strong normative stance that has emerged as characteristic of the OER movement. The 207 participants that he included for analysis were alerted to OER through a number of channels related to the already active OER community - while this also indicates that mostly instructors with first connections to that community answered the questionnaire, as the author states.

Finally, Otto (2020) also concludes that, not surprisingly, „Das erste Engagement in der Nutzung von OER scheint demnach weitere OER-Aktivitäten zu befördern" (Otto, 2020, p. 33). However, in turn, this hints at the need to implement more measures and provide opportunities for instructors to get acquainted with OER in diverse ways – in order to reach a critical mass eventually. And broadly effect change on the micro level.

With change being considered in one multiple choice question in the present investigation, the respondents provided their view on potential change drivers that exist within their institution. Based on the results of his qualitative meta-analysis of 22 nationally funded German OER projects, Otto (2019) derives the conclusion or suggestion that institutions could consider the following:

As a dominant and cross-educational recommendation, the analysis yielded the suggestion of establishing a central contact point or person at the institutional level. Experiences in the projects demonstrated that institutions encounter problems when they are faced with the task of creating a legal and quality framework to enable or support open work, and specifically the use of OER. However, to trigger change, individual or group efforts are mostly insufficient. At a structural level, too, support units must be created that can signal to teachers or groups that their initiatives concur with the overall strategic alignment of the institution (Otto, 2019, p. 133).

4.5 Detour I: (open) digital resources in class

Instructors in this study reported to always use slides and presentations in 51.32% of cases but never to use games (61.84%), simulations (60.53%) or MOOCs (77.63%). With the latter three being arguably more complex that slides, this opens yet another discussion as to what educational technology instructors integrate into their teaching and with what purpose. And, extrapolating this thought, how these can be created as an OER for broader application. Schmid et al.'s (2017) study as part of the Monitor Digitale Bildung reveals the following results: Instructors indicate to (rather) agree with lacking the time to search for OERs, judge their quality, and their field of teaching lacking adequate OER. However, they simultaneously (rather) agree that OER help them to prepare for their teaching and that OER enrich their courses. This indicates somewhat of a discrepancy between the perceived support that can be gained through OER and the perceived problems in locating OER that fit.

Otto (2020) also confirms positive beliefs - on the abstract level - to be associated with OER, whereas practical matters, such as copyright, are still perceived as challenging on the part of the educators. In Schmid et al.'s (2017) study, about two thirds of the instructors also reported to share their teaching materials with others – the author then point out that this sharing does occur primarily in confined spaces, such as exchange via e-mail or within the institutional LMS. Again, whereas Otto (2020) identifies the strong belief in sharing as part of education, the actual practice looks different. This also corresponds to the instructors in the present study not uploading their resources to the institutional repositories (43.42%) and even less so on public platforms (86.84%). Relating this to the topic of (institutional and individual) change, there is still some way to go as it seems – although presumably necessary if broad use and creation of OER is envisaged to occur.

4.6 Detour II: Individual activities

Albeit affiliated with either higher education institutions or working in adjacent contexts, it is often times individuals who push the topic of OER and related activities. To cite a few examples that stem from this individual (or concerted) engagement:

- Elmu Project
  A professor for music and his association established this OER project to share and develop resources on music education, musical listening development - also integrating OER into his teaching and publishing open textbooks within this field (Prof. Dr. Ulrich Kaiser).
- Materialsammlung Mathematik der PH Heidelberg
  One of the first – and prominent - HE instructors in Germany to put his lecture videos online on Youtube to practice a flipped classroom concept. Whilst this project is linked to a greater compound of resources and association, Prof. Dr. Christian Spannagel has so far contributed a bulk of the materials found on this OER wiki.
- Ebildungslabor
  In contrast to the above examples, this webpage collates the professional offerings of a free-lance OER (and digital learning) advocate, Nele Hirsch. Not affiliated with an institution and working across educational sectors, her portfolio shows the prominence and drive that individual actors unfold as part of the bottom-up OER community.
- Jöran und Konsorten. Agentur für Bildung
  A mixture of event management and curation of educational offerings in the realm of OER, this is an agency with its founder, Jöran Muuß-Mehrholz, being involved with different OER projects, also including OERinfo, which is based on his original initiative.

The individuals displayed above serve but to illustrate that OER (in higher education) are a field reliant on - quite frequently – the drive and perceived intention of individuals who have created a connected community. However, whilst this is conducive to practice and exchange (and most likely also one constituent pillar), this also comes close to what can be critically questioned as highly normative from a more neutral scientific and empirical point of view – or at least be viewed cautiously (Kerres, 2019). Nevertheless, these examples also show that a lot of personal involvement is one prerequisite for creating OER on a scale that e.g. Ulrich Kaiser is doing [24].

4.7 Limitations

The answers that were provided to the questionnaire are self-reported and therefore are based on the personal perception and estimation of the participating instructors. The framing of the questions is something to consider more closely, if a further iterations is intended. One participant turned to the project coordinator and provided that feedback that some of the survey questions were too specific and partly too confusing for him/her to follow. This needs to be acknowledged as an important limitation as other participants might have had the some impression and therefore either stopped the questionnaire (with 49 incomplete answers, this is plausible) or potentially answered questions as they understood them from a lay perspective. In further usage of this survey, putting questions in a broader accessible way needs to be considered.

On closer inspection, 31 participants stopped answering the survey at the first question that targeted the actual content question, following the basic information about the professional background. Furthermore, answers to the open

questions indicated that participants might have a limited understand about the topic as such (OER – repositories – related questions). Some answers seem to point in a direction that participants had the institutional LMS in mind when responding to the questions; rather than repositories. However, Marín (2022) derived similar conclusions in her study on the Spanish micro level context – also putting forward the argument that LMS can be considered as a repository; especially if it is the only centralized space of such a kind within an institution. Albeit being restricted to members of the institution, storing and retrieving material and resources is possible. This aspect will need to be explored further, also taking into consideration the framing and wording of questions as stated above. Further anecdotal replies point to the fact that there is an active but small group of instructors who is very much knowledgeable about the topic of OER and repositories, with their open answers using terminology correctly and conveying the impression of expertise on the topics in questions. However, in order to make qualified statements, this would require a closer analysis and would deviate from the topics considered here. Otto's (2020) statement, that he also put forward cautiously to frame his discussion of the impact of OER projects in Germany, reads as his results as „confirming the often times voiced, but so far not empirically confirmed suspicion of a limited dissemination and use of OER beyond an engaged circle as well as the existence of an engaged OER community " (p. 38, translation by the authors). This line of thought could be followed further.

5. Conclusion

5.1 Micro level

The small scale research that was presented as an exemplary glimpse into OER use on the institutional and individual level in Germany higher education revealed that, for the participants in this study, (open) digital resources are a topic that is characterized through a perceived lack of knowledge when it comes to the four prominent EduArc fields of (institutional) policy, infrastructure, quality and change.

This study can only provide one small view and does not attempt to draw generalization to other German states or even other institutions, as we can assume that instructors were - due to the process of approaching them and the inability to follow up because of the chosen way to ensure utmost privacy – recruited from potentially only one institution or very few at most. With the very few empirical studies from the German context that delve into the attitudes and usage patterns of instructors (Otto, 2020; Lechtenbörger, 2019) contributing to the attempted contextualization of the findings, it still is imperative to conduct more studies to establish a sound empirical basis.

The examples of instructors and independent actors within the OER community in combination with our findings show that, on the individual level, OER have still not arrived in the mainstream of teaching in higher education. Incentives, support and knowledge transfer (Otto, 2019) could potentially help to mitigate this perceived challenge – this does, however, require more funding programs that also take into account questions of sustainability and long-term impact if they are to lift OER out of a temporarily paid endeavor. OER are for free but demand resources in the development process.

Therefore, the answers that were not provided in this survey study can actually be perceived as an indicator that much is still to be done to build up knowledge and eventually trigger more active involvement with OER.

5.2 Macro, meso and micro level

The picture would remain incomplete without relating the micro, meso and macro level with one another. As part of a comprehensive report by Orr, Neumann and Muuß-Mehrholz (2017, p. 7), the authors stress the interrelatedness of top-down and bottom-up initiatives that are expressed through educational and digital agendas, and the lively community of OER practitioners. Both are mediated by (national) funding programs.

This is undisputed and certainly not unique to Germany – following from Orr et al (2017), it can, however, be derived that there is a OER community of practitioners, whilst higher education institutions (or other education institutions respectively) are not explicitly included. Against the backdrop of Otto's (2020) study and the present investigation, this

seems sensible enough. With Otto (2019) suggesting to implement institutional coordinators or responsible units to foster OER production and dissemination, this indicates the need to integrate the institutional perspective more strongly between the state and national policies and the individual instructors.

With the first report for Germany on the macro level paying much attention to policy and change – being able to rely on numerous recommendations, strategies and position papers – more concrete topics such as quality, infrastructure were already difficult to trace in detail. The 2016 OER feasibility study (Deutscher Bildungsserver, 2016) and some general observations on quality marked the extent of information that was to be gained. The digitalization of the individual states provided the grounds for educational policy grounding of OER and in that sense also constituted a bridge to the meso level.

As part of the meso level, exemplary higher education institutions from different states were selected to illustrate how they address the topic of OER - operating within the boundaries set by the individual states and serving as an example of how specific and tailored to institutional strategy OER are made use of an are integrated. The micro level was considered more closely through surveying instructors on the knowledge, use, creation and dissemination of OER, allowing the conclusion that there is still a perceived need to foster all these areas to broadly integrate OER within German higher education.

6. Future perspectives

6.1 Evolving practices

With the present and ongoing Covid-19 pandemic has already resulted in a radical and sudden shift in teaching and learning practices within German higher education, the role and application of OER seemingly has not yet received much attention. As it is not predictable for how long this health emergency is going to last, keeping an eye on national, state level and institutional practices seems worthwhile – not only from the research point of view but also for practitioners who now face the immediate need to provide their teaching online – not only pedagogical approaches but also every single teaching material and resource. From a practical and legal standpoint, OER are very well suited to fill this potential resource gap and also to accommodate instructors to save time when preparing their classes (agreement for which was found in Schmid et al., 2017). However, what still lingers is the gap between the practiced normative activism and the neutral observation of OER-related practices; thus research is needed on all levels that OER are affected by (Marín et al., 2020).

6.2 Research on OER

Education policy documents touching upon OER as one mechanism within the increasing digitalization within higher education support the ideas and rationale that OER relate to. However, it still remains to be seen how empirical research can substantiate (or not) how OER and digital educational resources as such are actually employed and created. In order to understand and trace the actual practice of using, re-using, creating and publishing OER on the side of the instructors, this is deemed more than necessary to be able to go beyond mere description and intentions to foster the idea of OER and related practices within higher education and beyond. With only very few studies – to the best of the author's knowledge - having been published so far that target these topics (Otto, 2019, 2020; Lechtenbörger, 2020), this is still a considerable gap to be filled. Investigation of actual usage and instructors' perception and knowledge about OER is a necessary step to also consolidate the research area as such. This would also help to go beyond a perceived normatively driven and increasingly closed discussion on OER and related fields (Kerres, 2019).

7. References

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[1] This chapter takes into account a number of German-language policy documents, reports or studies. In case of direct quotations, these were translated by the authors into English to the best of their abilities.

[2] December 3, 2018: Exceptions are Saarland (nothing found), Berlin (departmental strategies), Bremen (strategy for a digital administration).

[3] https://edtechbooks.org/-fnJp

[4] The authors make reference to the Hamburg Online Open University (HOOU) and use this example to delineate their approach to a quality assurance system: https://www.hoou.de/

[5] https://de.statista.com/statistik/daten/studie/281782/umfrage/studierende-an-hochschulen-in-niedersachsen/

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[8] E-Learning Academic Network: https://www.elan-ev.de/

[9] https://www.mkw.nrw/hochschule-und-forschung/studium-und-lehre/ueberblick-hochschulen-nrw (Last accessed: August 6, 2019)

[10] In this report, both versions of the strategy are being referred to.

[11] https://www.wirtschaft.nrw/sites/default/files/asset/document/digitalstrategie_nrw_endfassung_final.pdf see pp. 26

[12] https://www.dh.nrw/kooperationen/OER-Content.nrw-42

[13] https://www.dh.nrw/kooperationen/digi-komp.nrw-32

[14] https://de.statista.com/statistik/daten/studie/255207/umfrage/studierende-an-hochschulen-in-hamburg/

[15] https://www.haw-hamburg.de/digitalisierung/digitalisierungsstrategie/ziele-der-digitalisierungsstrategie.html

[16] https://www.hoou.de/footer-items/6f8c52c9-74e1-4303-aa35-1ea174995a8b

[17] https://www.mkw.nrw/foerderlinien-digitalisierungsoffensive

[18] https://www.tib.eu/de/forschung-entwicklung/projektuebersicht/projektsteckbrief/oer-portal-niedersachsen/

[19] https://www.oernds.de/oer/

[20] https://mundo.schule/#about, Retrieved Nov 29, 2021

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[22] At least at the University of Oldenburg – we can only assume that it was also online at the other universities within the ELAN e.V. network.

[23] In the study 662 instructors provided their answers to questions revolving around digitalization within higher education in Germany (Schmid et al., 2017, p. 11).

[24] See also https://edtechbooks.org/-Eejn

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5

The Case of Japan and Korea

Insung Jung

1. Introduction

1.1 Overview of Higher Education and Digital Transformation

Higher education institutions (HEIs), especially private universities and colleges which comprises around 80% of HEIs, in South Korea (Korea hereafter) and Japan have made significant contributions to the socio-economic development of each country.

With a population of 51.5 million, Korea has over 3 million university students enrolled in 359 HEIs which include 191 universities awarding bachelor's, master's, doctoral and professional degrees, and 137 colleges awarding associate degree (KERIS, 2018). It also has the Korea National Open University, 21 cyber universities offering bachelor's and master's degrees and lifelong education programs mostly online, and corporate universities and other types. Recent reforms in higher education in Korea emphasize: 1) diversifying roles and functions of different types of HEIs to meet changing needs of the society, 2) prioritizing knowledge creation rather than knowledge transfer, 3) addressing changing curricular and financial needs by adopting more flexible and efficient models for education, management and governance, and 4) promoting academic-industrial cooperation (MOE Korea, 2016; MOE Korea, 2017a; Leem et al., 2015; Ryu et al., 2011).

With a population of 127 million, Japan has over 2.8 million university students enrolled in 1,200 HEIs which include 778 universities awarding bachelor's, master's, doctoral and professional degrees, and 395 junior colleges awarding associate degrees (MEXT Japan 2018). In addition, it has the Open University of Japan, a distance teaching university offering university degree programs and lifelong education, the Cyber University, an online university established by SoftBank awarding bachelor's degree in IT related areas, and a few other types of institutions. Recent reforms in Japanese higher education focus on: 1) strengthening the functions of different types of HEIs by empowering individual universities (MEXT Central Education Council, 2018), 2) improving the quality of learning to respond to future changes and create new values, 3) proving quality higher education in each region/province considering demographic changes in the whole higher education system, and 4) addressing issues related to diversity, flexibility, and quality assurance.

When it comes to digital transformation, Korean universities have achieved a higher level of ICT access, utilization and skills compared with their counterparts in Japan. This could be accounted for by differences in the two governments' policies and specific action plans, funding schemes, and universities' enthusiasm, planning and operational management. This could also be due to the fact that Korea has a centrally supporting agency (the Korea Education and Research Information Service or KERIS) that promotes innovative initiatives, development projects and academic research related to ICT use in education ranging from primary to higher education, while Japan does not. In developing and sharing of (open) educational resources or (O)ER and MOOCs for higher education, the two government agencies,

KERIS and the National Institute for Lifelong Education (NILE), play a key supporting and coordinating role in Korea whereas no nation-wide system and government supports exist in Japan.

1.2 Purpose and method of macro-, meso- and micro-level studies

The main purpose of this report on the macro-, meso- and micro-level studies was to investigate four aspects (infrastructure, quality, policy, and change) in the development, utilization, and dissemination of (O)ER in HEIs in Korea and Japan at macro (national), meso (institutional) and micro (individual and course) levels.

The macro-level study aimed to examine national-level infrastructure, quality assurance system, policies and changes made with regard to (O)ER and their creation, utilization, dissemination and evaluation. To achieve this aim, the study employed a comprehensive document analysis as an appropriate method. Documents included recently published academic articles, government and other public documents, media news, and other sources from Korea and Japan.

The meso-level study aimed to explore institutional-level infrastructure, quality assurance system, policy and change aspects in the development, utilization, dissemination, and evaluation of (O)ER. For this purpose, in-depth analyses of relevant documents were conducted and interviews with key personnel who had been engaged in OCW or MOOC initiatives in five cases (two universities in Korea and three universities in Japan) were conducted. Across the cases, questions were asked regarding: regulatory frameworks existing within HEIs, actors involved in building and implementing such frameworks, joint efforts in creating infrastructure for the dissemination of (O)ER, existence of subject-based platforms, communication and exchange between repositories and servers, and partnership between public and commercial entities.

The micro-level study aimed to examine course- or individual instructor-level infrastructure, quality, policy, and change in the development, utilization, dissemination, and evaluation of (O)ER. To achieve this purpose, analyses of relevant documents, websites and previous research were conducted and interviews with two local experts who had been engaged in OER initiatives in both countries were conducted to validate the data collected from three case studies (two from Korea and one from Japan). Across the three cases, questions were asked regarding: faculty members' knowledge on the existing infrastructure, their preference for certain technologies and working conditions in creating and utilizing (O)ER, types of (O)ER frequently adopted in teaching and functionalities helpful for faculty members to edit (O)ER and collaborate with others.

2. Macro-Level Analysis

2.1 OER Infrastructure

Japan

The National Institute of Informatics (NII) provides information networks and services exclusively for academic institutions (NII Japan, n.d.). NII manages the Science Information NETwork (SINET) which was established in 1987 as a high-speed, nation-wide campus backbone network for Japanese universities. While SINET provides the universities with an Internet connection, each university needs to physically connect to the node national universities using a commercial network. NII also promotes the use of Eduroam JP, which allows the enrolled faculty members or students at Japanese universities to use the Wi-Fi network of visiting universities with their own username and password.

Furthermore, NII has developed and managed the Academic Information Circulation system (CiNii), which offers an open access database service for articles, books, dissertations, reports and other types of academic resources created and accumulated mainly by Japanese universities, research institutes, journals, books and other publicly funded projects. CiNii provides Web API (Application Program Interface) for system linkages, and it offers the OpenURL receiving and sending functions. NII has also operated the Academic Access Management Federation called GakuNin since 2009. GakuNin is a federation consisting of universities (main users of online academic resources) and publishers (main providers of such resources). Once the federated authentication is established, the users of a university can access online resources (i.e., e-journals and reports) of other universities and commercial publishers in Japan with a

single log-in on and off campus. NII also funds the creation and sharing of institutional repositories of university in-house journal articles, bulletins and dissertations. Institutional Repositories Database (IRDB) collects and disseminates metadata of the contents registered in those institutional repositories. JPCOAR schema is a new metadata standard developed by the Japan Consortium for Open Access Repository (JPCOAR) and has been applied to the content creation of the institutional repositories.

To promote resource sharing and collaborative research among universities, the Research Organization of Information and Systems (ROIS) has created the Inter-University Research Institute Corporation to promote sharing of research facilities, graduate courses, academic data and research materials produced by research institutes and departments of the Japanese universities and support collaborative research with other universities, research institutions and private sectors in Japan and other countries.

The purpose of the aforementioned nation-wide systems such as CiNii, GakuNin, IRDB, and ROIS is to develop, link and share the research products of Japanese universities and of other organizations. No nation-wide system exists for the development and sharing of (open) educational (teaching and learning) resources. It may be possible in the future that OER and other educational materials created by individual universities could be shared via ROIS or another existing system.

Japan OCW, which was established in 2005, promotes the open sharing of courses provided by its member universities and operates mostly based on membership fees (Total 19 universities, NGOs and companies as its members in 2019). Each member university offers their OCW on their website and thus no host server exists.

JMOOC, established in 2013, is also a membership-based organization with no government support. Members include both private companies and universities (Total 79 members and 140 courses in 2019). Courses are offered in four different providers: Fisdom, gacco, and OpenLearning Japan, each managed by a different company, and OUJ MOOC managed by the Open University Japan. Its steady growth has been reported in the website.

Korea

The Korea Education Network or KREN, a non-for-profit organization, has created and managed the Education Network since its creation in 1991. Until 2001, the Seoul National University and other national universities in eight different regions oversaw the Network. Since 2001, the Education Network has been using a commercial network service to accommodate the rapidly increasing communication needs of the universities and to stabilize the service for 24 hours/365 days, with the matching funds from the government and the university. So far 356 (out of 359) higher education institutions are using this network. The network fee is paid jointly by the individual universities and the government.

Eduroam or Educational Roaming is another type of infrastructure that offers a global wifi roaming service. With over 50 member universities and research institutions, it shares their wifi network service and their academic information services.

Since the development of the e-Campus Vision for Higher Education in 2002, the Korean government has supported the establishment and implementation of 1) e-Learning support centers in the universities across ten different regions of the country and funded collaborative content development among the universities located within the same region, 2) the Integrated Administration and Finance System for Universities, and 3) the Crowd-based Integrated Academic Affairs' System, which will be linked to the Universities' Resources Management System in 2020.

KERIS is at the center of developing, managing and evaluating various types of academic resources (both research products and open educational resources) for higher education with funds from MOE and member institutions.

- First, for academic research, KERIS obtained university licenses to access several overseas academic databases so that researchers of all universities in Korea can access them without individually subscribing to those databases. This overseas database service aims to bridge the information gap among the universities and promote competitiveness of Korean researchers.
- Second, RISS, founded in 1998 by KERIS, is a service to all university students and faculty members in Korea. As explained above, it aims to enhance Korea's research competitiveness by providing all academic research resources including national and foreign journals, e-learning courses, publicly funded project reports and other open resources. It has become the main source for academic research with over 4.5 million accumulated members and around 10 million monthly search clicks. It is now offering other public resources owned by private and other types of organizations and external portal services following the government 3.0 policies for disclosure and joint use of public data.
- Connected to RISS, the digital distribution system (dCollection), which was established in 2006, has been offering the latest version of full texts and other research outcomes created by individual universities and organizations along with all other academic resources served in RISS. This system allows all university libraries to access and manage academic research materials created by other universities through KERIS's RISS. As of 2017, over 240 universities (this number includes almost all universities in Korea which offer a graduate program) were using the dCollection service, and around 40 universities installed the system in their own server.

Unlike Japan where OCW and MOOCs are not supported by the government or public agency, KOCW and K-MOOC are supported by two Korean government agencies, KERIS and the National Institute for Lifelong Education (NILE), respectively.

For the dissemination of OCW and other open materials created by Korean universities, KERIS has developed and managed the KOCW (Korea Open CourseWare) system since 2007 (Leem et al., 2017). KOCW supports the dissemination and sharing of university course lectures and supporting materials, and other theme-based lecture videos (e.g., English conversation, preparation classes for vocational certifications, etc.) to meet various learning demands of the adult learners and students. KOCW provides around 13,000 courses created by the universities, and around 2,300 videos created by the Educational Broadcasting Service, the Vocational Broadcasting Service and other educational institutes. It also provides a global MOOC provider Coursera's meta data service for about 200 courses.

In the case of K-MOOC, NILE, an MOE-funded national institute for lifelong education, has managed the K-MOOC server centrally since 2015. As MOOCs are considered to be resources for lifelong education rather than materials for formal higher education, NILE, not KERIS, was chosen as the hub institute for K-MOOC. Course developers are the member universities (over 80 universities and 500 courses in 2018) and course users are the general public as well as university students. Currently K-MOOC is searching for a sustainable business model including introducing paid courses and collaborating with private sectors with an expected budget cut from the government in the near future.

Considering educational metadata schemes and components such as Dublin Core or DC Education and IEEE LTSC LOM, KERIS has introduced the Korea Education Metadata (KEM) standards with nine categories (general, life cycle, metadata, technical, educational, rights, relations, annotation, classification) since 2005 and applied them to the development of educational resources. KOCW applies all categories of KEM3.0 but one (annotation). The E-Learning Support Centers established throughout ten regions of the nation collect and manage e-learning courses and other digital materials following KEM3.0 (Ahn & Park, 2009).

A Shared University is a recent initiative funded by the MOE. One such example is developed by 24 universities out of 57 that are located in Seoul, aiming to share courses for credit transfer and joint degree, educational resources, research and educational facilities, job-related data and more, and co-develop and provide MOOCs for citizens in Seoul and beyond. Each member university operates a credit transfer system and MOOCs linked to other member universities.

2.2 Quality of OER

Japan

No standards, guidelines or checklists exist for the quality management of educational resources including OER and MOOCs in Japan at the national level. The JOCW consortium and JMOOC consortium do not offer any consortium-level guidelines to their members. Interviews with a few member universities reveal that the quality guidelines for the creation of materials are left to the hands of the individual universities. Often times, the guidelines prepared by the individual universities are step-by-step procedures to follow but are not necessarily for the purpose of quality assurance of the materials. Some researchers such as Katoet al. (2018) have developed a quality checklist for the development and management of OER at the personal level.

Korea

KERIS provides A Guidebook for Digital Content Development and Management (in Korean) to ensure the acceptable quality of online resources and OCW that are shared among the universities or open to the public (KERIS, 2017). The Guide specifies both minimum required criteria and optional suggestions. Required checklists include:

- Check types of educational materials (e.g., ppt, handouts, links etc.)
- Check if copyright issues of all the materials are cleared (e.g, open licensed? need permission? properly cited? etc.)
- Specify lecture style (e.g., using whiteboard and/or ppt? offering demonstration? etc.)
- Check if any supporting tools are needed (e.g., projector? LCD? other supporting tools?)
- Check lecture time

In addition to the use of this guidebook, KERIS continuously evaluates open digital content and online courses developed under the MOE-funded projects such as ACE (Advancement of College Education), CK (Creative Korea), and CORE (COllege of humanities' Research and Education) projects. In addition, it provides best practices in the use of KOCW and other open materials to the universities.

NILE provides Guidelines for K-MOOC Development and Management to K-MOOC providers. As K-MOOC uses edX platform, the guidelines offered in this booklet consider those of edX. K-MOOC Guidelines include a set of quality criteria (both required and optional quality criteria) and detailed suggestions across the design, development, testing and implementation stages. For example, two required quality criteria related to the learning content at the design stage include: accuracy of content (e.g., no grammatical and logical errors, no missing words, etc.) and sound ethical content (e.g., considering diversity and inclusivity, non-violent, respecting privacy, etc). The booklet is used by the MOOC developers as a tool to assure the development of quality online courses and was also adopted by NILE to assess if the submitted MOOCs follow the required quality criteria in the Checklist.

Moreover, NILE applies the following measures to assure the quality of MOOCs:

- NILE encourages each university to utilize the Guidelines and assign a MOOC project director who manages the whole MOOC development project and works closely with the faculty members/content experts and instructional designers.
- Those MOOCs that are not meeting the quality criteria are returned to the developers for revisions and improvements before resubmission.
- Once submitted, experts in MOOC quality management at NILE review the quality of the course and offer feedback and recommendations for further improvement.
- Finally, the best MOOCs and research and evaluation results are distributed to the K-MOOC members to share knowledge and experience.

2.3 OER Policy

Japan

The necessity to increase government funding for higher education and policy support for promoting donations and investment from the private sector has been emphasized in MEXT's most recent report in Japan (MEXT Central Education Council, 2018) although the specific plans have not been released. A policy change is expected in the area of information disclose. With the use of public assistance, the universities will be asked to disclose the quality of their education and students' performance information, as well as the costs of education and research to the public in more detail.

Korea

MOE Korea (2017b) identified several policy areas to be discussed and prepared for digital transformation and resource sharing in the future. Those include:

- Policies to maintain and manage copyrights of KOCW and other open content
- Policies related to personal information and privacy protection with the advancement of digital infrastructure and services
- Management and technical measures to protect online services from hacking attempts
- Measures to specify procedures to collect and manage minimum personal information
- Measures to minimize overlapping parts between KOCW and KMOOC operations by two different government agencies
- Measures to simplify application technologies and apply AI technologies
- Measures to promote active sharing and utilization of KOCW, KMOOC and other digital content
- Measures to share digital contents with developing countries and countries in conflict zones

MOE and other related ministries such as the Ministry of Culture, Sports and Tourism, KERIS and NILE are working together to discuss and solve copyright, privacy and safety issues involved in overall digital transformation and resource-sharing in the education sector. KERIS and NILE are clarifying their roles and collaborating in offering and promoting KOCW and KMOOC in a more cost-effective manner. MOE has begun to support and promote the universities to apply AI technologies through various initiatives.

2.4 OER Change

Japan

The e-Japan Strategy released in 2001 is still considered the foremost official policy concerning the national-level ICT strategies in various sectors including higher education. In the acceleration plan for the e-Japan Strategy (IT Strategic Headquarters, 2004, 2017), changes in the following areas have been promoted at the national level:

- Enhancement of ICT security measures in various sectors. In the education sector, cybersecurity human resource development, provision of professional training programs and publicity are emphasized.
- Promotion of digital content creation and distribution. Unfortunately, educational resources from higher education institutions are not included in the category of digital content in this plan.
- Deregulation of laws that have prevented the use ICT in public document storage, meetings and interviews, issuing certifications and other public activities. Changes have been made to save various information (e.g., medical information, tax information and more) in digital format, and conduct meetings and interviews via video/audio-conferencing in ministries and university exams, etc.
- Policy and financial support for the creation of faculties and graduation schools for training of high-level data scientists in pursuit of advancements in IoT, big data, AI and other intelligent technologies.
- Continuous financial support for university reform via University Reform Good Practice initiatives.

Korea

The 2019 MOE budget (MOE Korea, 2018a) includes special funds for:

- Globalization of higher education via increased global experiential learning opportunities for students to promote global leadership and the development of pre-service teachers' global and multicultural competency.
- Increase of graduate students' research capabilities and global competency through BK21Plus initiative.
- Venture entrepreneurship efforts by universities.
- Young researchers in medical and life science fields.
- Establishment of both face-to-face and ICT-based life-long education system of universities.

MOE are working on the following changes that are closely related to digital transformation and resource-sharing in higher education (MOE Korea, 2018b).

- Introduction of online nanodegrees in the areas with high social demand.
- Development and dissemination of vocational MOOCs in collaboration with community colleges.
- Development of AI and 4th industrial revolution related K-MOOC.
- Development of an integrated MOOC platform to distribute MOOCs from both public and commercial providers.

3. Meso Level

3.1 Cases of OER

Seoul National University (SNU)

SNU is a top national university located in Seoul, South Korea (Korea hereafter). It offers 13 MOOCs in English on edX including courses in international policies in the Korean peninsula, economics, and robot mechanics. In addition, as of September 2019, it is offering 20 courses in Korean language on K-MOOC and has uploaded 172 OCW on the KOCW server since 2011. SNU's Center for Teaching and Learning (CTL), established in 1975 as the Instructional Media Center and renamed as CTL in 2001, is responsible for the development, delivery and quality assurance (QA) of OER and other multimedia and online educational resources for SNU classes. CTL has 43 staff members working in six teams: Teaching and Learning Support, Writing Support, E-learning Content Development, Multimedia Production, PR, and Administration Teams.

C University (CU)

CU, a large private university in the southern part of Korea, is a member of both KOCW (offering two KOCW courses in the engineering field and K-MOOC (offering one MOOC in the field of history of literature). CU's Center for Teaching and Learning (CTL), founded in 2000, is responsible for the development, delivery and evaluation of CU's online courses, OCW, MOOCs and other educational resources, and teaching and learning support. It has eight staff members who work closely with CU faculty members. Like several other universities in Korea, CU collaborates with other campus-based and cyber universities and consortia such as Seoul Digital University, KCU Consortium, Yongnam University and more, and shares their online courses for credit transfer. It also shares MOOCs created by other universities for credit transfer.

University H (UH)

UH, a large-scale national university in Japan, is the member of both JOCW and JMOOC. At UH, the Center for Open Education (OEC) is responsible for UH's OCW, MOOC and other OER development and delivery, and training and support for UH's faculty and staff members regarding ICT use and OER development. OEC is responsible for 1) UH OCW (creating and sharing OCW with other Japanese HEIs), 2) OEC MOODLE (supporting MOODLE-based e-learning creation), 3) Academic Commons for Education or ACE (creating and managing open courses with seven universities located in Hokkaido prefecture), and 4) MOOCs on JMOOC and edX.

International Christian University (ICU)

ICU a small private liberal arts college, is a member of JOCW. The Center for Teaching and Learning (CTL) is responsible for the development and dissemination of ICU OCW and other educational resources (e.g., ICU-TV). Since 2009, it has developed over 50 OCW course, mostly in English, in various fields including English for Liberal Arts, general education, Japanese language program, and other academic major fields. Some OCW courses are prepared for high school students.

University of Tokyo (UTokyo)

Utokyo is a top national university in Japan with 2,484 professors, 3,937 other types of teaching staff members, 1,524 administrative staff members, 14,071 undergraduate and 14,239 graduate students. The Center for Research and Development of Higher Education (CRDHE) manages UTokyo's OCW and MOOCs. UTokyo was the first university in Japan which offered MOOCs with global MOOC providers. Since 2013 when it offered two courses on the Coursera platform, it has added five more to Coursera and eight to edX as of December 2010. At the beginning stage, UTokyo designed MOOCs as information for international students who wished to come to Japan (Fujimoto et al., 2017), but now it focuses more on reaching out to the world with their courses and fostering online learning communities.

3.2 OER Infrastructure

Korea

As noted in Keskin et al. (2018, pp. 198-199), Korea has assertively and publicly supported the partnerships with international organizations to promote OER and open education. Korea partners with the World Bank's Open Learning Campus where several Korean institutions including SNU, Seoul Metropolitan Government, and Korea Development Institute offer their online courses and video lectures. Korea's National Digital Library of Congress also works with Creative Commons Korea and provides open licensing to their content. All these national and institutional level efforts and partnerships discussed above and below evidence that Korea positions OER and open education as a key strategy for national competitiveness in both formal and lifelong education sectors.

KOCW and K-MOOC as OER are created, managed and disseminated mainly by two government-funded organizations: The Korea Education and Research Information Service (KERIS) overseeing KOCW and the National Institute for Lifelong Education (NILE) that is responsible for K-MOOC. Both organizations are under the auspices of Korea's Ministry of Education (MOE).

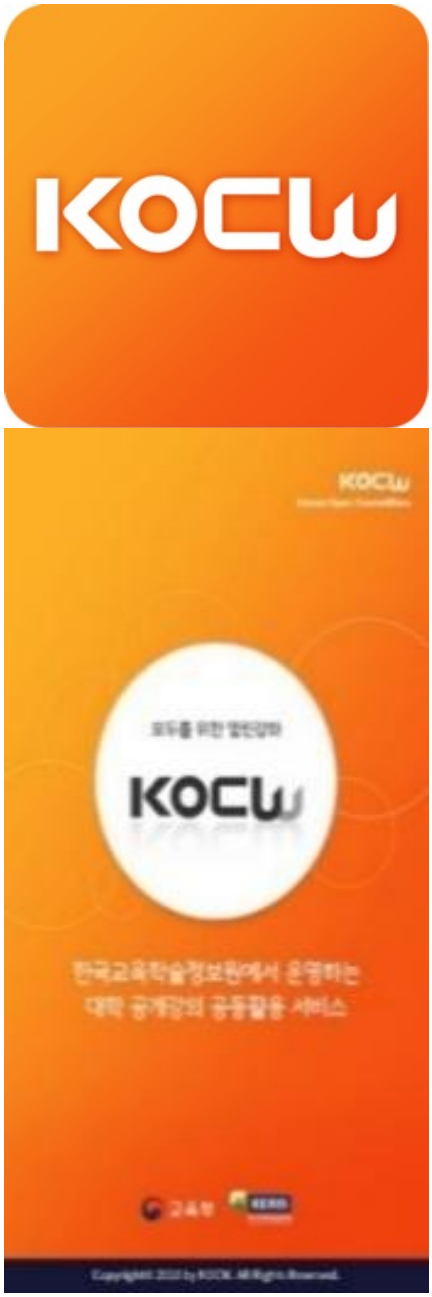
KERIS and KOCW: Development and Infrastructure

Since 2007, KERIS has operated centralized infrastructure – server, platform, network etc. – for KOCW with the MOE funding. As of September 2019, the KOCW server manages 15,777 courses created by 187 universities and 2,373 courses created by 25 other types of organizations including foundations, educational institutions and commercial broadcasting systems. When universities and other organizations develop courses for KOCW, they need to follow the Korea Educational Metadata standard, Korea's national standard for the development of sharable educational resources. Once the courses are developed, they can be uploaded on the KOCW platform by the course developers and disseminated via each university (or organization)'s course information sharing system or KOCW content server. Upon the request from a university or any organization involved in OCW development, KERIS installs a data provider so that the university or organization can collect real-time course usage data from the KOCW server (Chang, 2015).

There are no subject-based platforms for KOCW. However, the KOCW platform integrates a strong search engine which makes it possible for searching both by academic field and by theme. KOCW has a mobile app on Apple Store and Google Play Store (Figure 1).

Figure 1

KOCW mobile app



KOCW developers are mostly universities and public organizations such as the Korean National Commission for UNESCO, Korea Education Frontier Association, and Korea Copyright Commission. These public organizations tend to use KOCW to educate the public related to their mission. For example, the Korean National Commission for UNESCO offers courses on Education for Sustainable Development and World Heritage, and the Korea Copyright Commission provides courses such as “Introduction to Copyrights for University Students”, and “Contract with Publisher”.

KOCW developers also include several commercial companies. For example, a speech communication company offers KOCW on voice training and lecture skills. Three broadcasting companies provide their broadcasted documentaries and news programs on various social issues on the KOCW server. A dental clinic has two courses on implant technology on the KOCW server as well. KOCW has developed a few special programs which would promote the use of its OER for certain target groups. For example, it provides a list of OCW for 2-yr community college students. This service is titled KOCW College (or KOCWC). In close collaboration and consultation with Korea’s community colleges, KOCWC was created in 2014 with the purposes to support students in 2-yr colleges to improve their learning performance in a systematic manner and offer job-related courses for those 2-yr college students. For these purposes, the KOCWC site

lists 1,725 courses in 84 majors and job training courses in ten fields following the National Competency Standards which include the individual's knowledge, skills, and attitudes required to perform the duty in a certain industry sector at a certain level, and course metadata. It has a plan to offer more job training OCW which would help community college students and other OCW users prepare for various national-level examinations.

KOCW has a link to ACU-OCW, a collection of OER created entirely in English under the Korean government-funded ASEAN Cyber University Project. ACU-OCW offers 685 OER in various formats (e.g., video, audio, web sites, text, and weblinks) targeting the ASEAN member countries. Its server is now managed by KERIS.

NILE and K-MOOC: Development and Infrastructure

Since 2015, NILE has operated infrastructure – server, platform, network, etc. – solely for K-MOOC with the support from MOE. NILE has also managed K-MOOC's LMS (Learning Management System), Studio (Course development tool), and K-MOOC Insights (Data management tool). The K-MOOC platform is developed based on the edX platform and its LMS, Studio and Insights are also from edX tools. Table 1 outlines key functions of the K-MOOC platform.

Table 1

Key Functions of the K-MOOC Platform

Area	Key functions
Course and Content Design	Production and Utilization
	Course Design
Assessment	Quiz
	Assignment
	Test
Interaction	Discussion
	Wiki
Learning Management	Progress and Attendance Management
	Learning Support
	Learning Path Management
	Certification
Data Management	Big data Management

As of September 2019, the K-MOOC server manages 1,165 courses created by 96 universities. Among K-MOOC courses, eleven 15-week courses are counted as university credit for Korea's Academic Credit Banking System that was established in 1997 as an open higher education system which recognizes credits gained both in- and out- of universities such as K-MOOC (Usher, 2014).

No subject-based platform is used in K-MOOC. The K-MOOC server is linked to the national Online Lifelong Learner Portal server and the Academic Credit Banking System server, both of which are managed by NILE. But there is no communication between the NILE-managed K-MOOC server and the member organizations' servers. The K-MOOC app can be found on both Apple Store and Google Play Store (Figure 2).

Figure 2

K-MOOC mobile app

University eLearning Support Centers

Several e-Learning Support Centers have been established within HEIs across Korea's 10 regions with matching funds from MOE and the universities. Universities in the same region have collaboratively developed and shared online materials and courses for credits and non- credits, linking their network systems. For example, in the Southeast region, 50 HEIs, e-learning companies and research institutes formed an "E-Learning Cluster" and developed online content related to various Korean cultural studies for university credit and shorter vocational training content for lifelong education. But with the end of MOE funding, activities of the Centers have been gradually decreasing.

Other Consortia

Several consortia of HEIs have been formed over the past two decades. For example, KCU Consortium, founded in 1997, has over 80 member HEIs. Its infrastructure is managed by a commercial company commissioned by the Consortium and can serve 100,000 users simultaneously. Other smaller consortia operate their infrastructure in a similar way, or the representative university manages a server for its consortium members.

Japan

OER is officially defined as various types of lecture materials that a learner can use for free. These materials include lecture videos, e-textbooks, learning content objects, educational software and so on (Keskin et al., 2018, p.195). Two main organizations are engaged in the development and sharing of open educational resources in Japan: JOCW and JMOOC. These organizations are operated based on membership fees and receive no direct funding from the Japanese government. The infrastructure of both organizations is decentralized. Details of these two organizations and their infrastructure are discussed below.

JOCW: Development and Infrastructure

Inspired by MIT's OCW activities, the top six universities including the University of Tokyo, Osaka University, Kyoto University, Keio University, Tokyo Institute of Technology, and Waseda University launched a closed Alliance to develop and share their courses online. This Alliance was reestablished as an open consortium called JOCW or Japan OpenCourseWare (JOCW) in collaboration with MIT in 2006 (Keskin et al., 2018). JOCW member universities have shared course syllabi, video or audio lectures, and lecture notes via the JOCW website.

As a consortium, JOCW does not have a centralized infrastructure for its services except it provides links to the OCW webpage of its member institutions, and a repository of all members' OCW is available to the member institutions and the public. In addition, JOCW regularly publishes a newsletter to share the national and global news on open education and announce related events to JOCW member institutions.

Individual member institutions of JOCW have established and maintained their own server and platform and created their own portal which is linked to the website of JOCW. JOCW has a repository managed by the Open University Japan (OUJ)–CODE which is a GLOBE (Global Learning Object Brokered Exchange) member organization in Japan.

Unfortunately, the JOCW consortium has not attracted the attention of Japanese HEIs. As of July 2018, it has only 13 regular member institutions and 7 associate member institutions, and these numbers cannot be updated as the JOCW website has been down since the summer of 2019. Several scholars (e.g., Jung & Lee, 2015; Takeda, 2014) criticize the closed culture of Japanese educational institutions and the lack of support at both governmental and institutional levels and their effects on the development and implementation of OER for teaching and learning.

JMOOC: Development and Infrastructure

JMOOC or Japan Massive Open Online Education Promotion Council, founded in 2013, operates as a corporation with over 80 member institutions including universities, private companies and academic and professional associations as of September 2019. No communication and exchange structure is set up between the servers and repositories of the member institutions in JMOOC.

JMOOC offers over 140 courses (a few courses charge a fee and face-to-face components in free MOOCs are also charged) and attracts more than 500,000 learners, mostly from Japan. Matsunaga (2018) reports that JMOOC is a multiplatform consisting of four platforms:

- Gacco (meaning school in Japanese, managed by NTT Docomo),
- OpenLearning Japan (managed by NetLearning),
- Fisdom (managed by Fujitsu), and
- OUJ MOOC (managed by Open University Japan).

Most of the JMOOC member universities use Gacco or OpenLearning Platform, whereas Open University Japan uses its own platform, OUJ MOOC. Fisdom offers several MOOCs from commercial sectors. There is no course-sharing mechanism among these platforms except that the JMOOC homepage offers a course search function across the platforms. No mobile app at the JMOOC level can be found but Fisdom offers a mobile app for its courses (Figure 3).

Figure 3

Fisdom mobile app

Commercial entities are active members of JMOOC and participate in the creation and delivery of MOOCs in collaboration with universities and academic associations. Some of them have opened their own MOOC service and delivered small private online courses or SPOCs via their MOOC platform.

3.3 Quality of OER

Korea

KOCW - Diverse QA Measures and Link to Other QA Standards

Until 2019, there has been no centralized QA mechanism as KOCW is often used for voluntary sharing. But it has been a common practice that individual universities set up their own QA mechanism in developing OCW or other types of OER as those OER are open to the public and other universities and an existence of a QA mechanism for OER is one of the MOE's university evaluation criteria.

In 2019, KERIS introduced a formal QA system for KOCW and began to review existing KOCW courses that were voluntarily uploaded by individual universities in the past 10 years and requested that the universities improve or delete their courses if the quality of such courses did not meet the standards. With the introduction of KERIS's centralized QA system for KOCW, the universities have begun to refine and elaborate their QA system. For example, SNU's CTL developed internal evaluation criteria [1] for OCW and other types of OER and formed the Content Quality Management Committee which is responsible for QA of SNU's OER including OCW.

Beside the introduction of a centralized QA system for KOCW, KERIS provides A Guidebook for Digital Content Development and Management (in Korean) for the development of various types of OER and other educational resources (Lee et al., 2017). The Guidebook specifies both minimum required quality criteria and optional suggestions. Required criteria include:

- Check types of educational materials (e.g., ppt, handouts, links etc.),
- Check if copyright issues of all the materials are cleared (e.g, open licensed? need permission? properly cited? etc.),
- Specify lecture style (e.g., using whiteboard and/or ppt? offering demonstration? etc.),
- Check if any supporting tools are needed (e.g., projector? LCD? other supporting tools?), and
- Check lecture time.

KERIS guidelines for the development of OER do not follow a particular regional or international QA standards. Instead, they integrate key QA criteria for various standards and suggest common QA guidelines as listed above. They also recommend OER developers to follow the Korean Web Content Accessibility Guidelines 2.1 that are developed based on international standards.

K-MOOC: Centralized QA Mechanism and Link to International Standards

NILE operates a standardized QA mechanism for all K-MOOC developers. The first step is to evaluate a course plan prior to finalizing its funding to support MOOC development. Key evaluation criteria include:

- MOOC project team (if the project team has vision and strategies, matching fund, staffing, and previous experiences),
- MOOC development (whether there is a need to develop as a MOOC including appropriateness of content, instructional design and interaction strategies, assessment plan, instructor's expertise and teaching competencies),
- MOOC implementation (if there is a plan for QA, MOOC PR and dissemination), and
- extra points for linking to the Academic Credit Banking System.

It is worth noting that a plan for QA is included as an important criterion for funding K-MOOC during the initial MOOC selection stage.

Once a course plan is selected for funding, a consortium or a university must follow its QA plan for its MOOC development. To support MOOC developers, NILE provides Guidelines for K-MOOC Development and Management. The Guidelines include 32 criteria across 14 areas at 4 development stages as shown in Table 2 and add detailed explanations of each criterion with examples and best practices. K-MOOC developers are strongly encouraged to use these guidelines as a QA checklist during the course development and implementation.

As shown in Table 2, NILE conducts two evaluations during the MOOC development process: one at the Design Stage, and anther at the Testing Stage. This two-stage evaluation is conducted by a team of both internal and external content experts and educational technologists. Those MOOCs that are not meeting the quality criteria are returned to the developers for revisions and improvements before resubmission. In addition, the best MOOCs and research and evaluation results are distributed to the K-MOOC developers to share knowledge and experience of other K-MOOC members.

The NILE Guidelines are developed based on edX's course development guidelines and require MOOC developers to follow the Korean Web Content Accessibility Guidelines 2.1. The Guidelines have several appendices at the end to help MOOC providers effectively and efficiently manage their course development procedure. The appendices included in the Guidelines are: K-MOOC Development Proposal Form, Copyright and Open Course Agreement Form, Course Design Template, MOOC Content Translation Contract, MOOC Video Shooting Guidelines, Video Lecture Monitoring Checklist and Post-Course Evaluation Survey.

Following the NILE Guidelines, SNU, like other K-MOOC members, has developed its own QA mechanism and designated its CTL to manage the QA process. For the MOOC development, strict QA measures take place across three stages: Design, Development and Final stages. Detailed QA criteria that are developed based on the NILE Guidelines are applied at each stage. CTL invites internal and external experts to evaluate SNU's MOOCs. CU also follows the NILE Guidelines in developing their K-MOOC.

Table 2

Overview of K-MOOC's QA Guidelines

Stages	Areas	Criteria (required highlighted; all others recommended)
1. Design	1. Learning Content	1. Validity 2. Accuracy (required) 3. Concreteness 4. Learning level 5. Amount of content 6. Ethical aspect (required)
	2. Instructional Design	7. Learning objectives (required) 8. Teaching & learning strategies 9. Motivation
	3. Interaction	10. Learner-teacher interaction 11. Learner-learner interaction
	4. Support	12. Learning support
	5. Assessment	13. Assessment components 14. Assessment methods 15. Feedback
	6. NILE evaluation 1	16. Evaluation of MOOC design (required)
2. Development	7. Video Materials	17. Length of video lecture 18. Quality of video images (required) 19. Subtitles (required)
	8. Other Materials	20. Texts (required) 21. Images (required) 22. Documents
	9. Web Accessibility	23. Web accessibility (required)
	10. Copyrights	24. Copyrights (required)
3. Testing	11. Self-evaluation	25. Self-evaluation
	12. NILE evaluation 2	26. Final evaluation (required)
	13. Testing	27. Pilot testing (platform, LMS, user testing, etc.) (required)

Stages	Areas	Criteria (required highlighted; all others recommended)
4. Implementation	14. Support	28. Course information 29. Learner management 30. Learning support 31. Assessment management (required) 32. Completion management (required)

For each criterion, NILE offers detailed guidelines and suggestions. Let's review two examples.

Take, for example, the "Amount of content" at the Design stage. The NILE's QA Guidelines first introduce cases from global MOOC providers and say that expected learning hours per MOOC is between 25 and 125 hours in global MOOCs. In case of edX, average learning hours are set to be around 25 hours per MOOC. But if discussions, simulations or assignments are included, longer learning hours are recommended. In case of a video lecture, around 15 min. per video is recommended to maintain learner attention.

Take another example of "Web accessibility" at the Development stage. Following the Korean Web Content Accessibility Guidelines 2.1, the NILE Guidelines suggest four principles: 1) Perceivable - information and user interface components must be presentable to users in ways they can perceive, 2) Operable - user interface components and navigation must be operable, 3) Understandable - information and the operation of user interface must make sense, and 4) Robust - content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies. The Guidelines then offer specific strategies to apply these four principles in developing a MOOC. For example, for a "perceivable" principle, specific suggestions on alternative content formats to replace texts, alternative media formats to replace multimedia, and strategies to improve clarity of content presentation (e.g., color, size, background, direction, audio level, etc.) are provided.

SNU CTL's QA Manual for Educational Materials

SNU CTL has developed a faculty manual in both Korean and English to help its faculty members design, develop and utilize SNU's online course management system [2] called eTL that is linked to SNU's academic management system. The manual consists of 9 sections:

- Introduction.
- Course Navigation.
- Adding Resources.
- Activities.
- Group.
- Group Activities.
- User Management.
- Attendance Management.
- Grading.

Each section has detailed explanations on how to do things step-by-step with sample screen shots and concrete cases. Along with this manual, periodic faculty development sessions are offered. This manual, along with the manual for SNU students, is used as QA guidelines for (O)ER development and management.

CU CTL's Strategies for Quality MOOC Study

When developing a MOOC to be serviced on the K-MOOC platform, CU CTL applies the NILE Guidelines. When it comes to promoting the use of K-MOOC or any other educational resources by its students, CU CTL uses two reward mechanisms:

- Mileage System – when students study educational resources such as K-MOOC, KOCW and other materials to develop their own learning competencies outside the classroom, they will then be given certain points of miles which they can exchange for scholarship money.
- SOS (Study of Success) Program – This program financially supports student groups to study MOOCs together to develop their learning competencies.

Related Studies on QA for MOOCs in Korea

Despite the MOOC guidelines offered by NILE, several studies still indicate the quality being an issue in MOOC design in Korea. Lee, Keum, Kim, Choi, and Rha (2016) indicate a lack of appropriate MOOC design models as a reason for inconsistent findings with the quality of MOOCs. They argue that the MOOC-specific instructional design (ID) model is essential to guide design activities considering the unique features of the MOOC. Precedent studies on MOOC design indicate that most of the MOOCs in Korea and elsewhere are developed based on a generic ID model, that is, the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model. While this ADDIE model, which has been applied in designing various formats and types of instruction, can guide general design activities of MOOC development, it does not seem to address distinctive characteristics of MOOC teaching and learning.

Below, three studies are discussed that examined unique features of MOOCs and MOOC design principles and models in the context of Korea.

Limet al. (2014) analyzed the procedures engaged in preparation, development and implementation of SNU's first MOOC on edX and categorized important steps of principal facilitators in MOOC design and delivery. Principal facilitators are leading staff from a MOOC administration team, MOOC support team and MOOC instructors. Four steps include: Agreement, Design and Development, Administration, and Training and Communication.

- The Agreement Stage: As SNU's MOOCs are developed in agreement with edX, the process of MOOC design begins with "Agreement" which includes basic consensus on such items as infrastructure, administration methods, intellectual property rights, schedule of courses, etc. (edX, 2013a). Once the basic agreement is reached, SNU (through CTL's committee) selects classes to be developed as SNUx and begins to work with instructors of those classes and discusses schedule, design principles and media, delivery and usage methods, certification and other issues.
- The Design and Development Stage: At this stage, SNU CTL team and instructors discuss a course title, promotion video, overall structure of classes, video lectures and subtitles, learning activities, feedback, TA activities and other design issues.
- The Administration Stage: The next stage would be "Administration" of MOOCs, which is considered the most challenging part as MOOCs often have high enrollment. Helping MOOC learners to go through effective learning processes as smoothly as planned needs careful planning not just for learning support but also for technology support.
- The Training and Communication Stage. Lastly, the "Training and Communication" activities are critical for effective design, development and administration of MOOCs. In particular, periodic training on MOOC authoring tools, learning platform, course design and promotion, regular conduct of meetings via emails or video conferences, and consultation and academic events on MOOC design and research are important for quality design and delivery of MOOCs (edX, 2013b).

While this study offers stages that MOOC developers need to go through while they design and develop a MOOC in collaboration with an external global provider, it does not integrate these four stages into a systemic MOOC design model which can be applied in other contexts.

In another study conducted employing a SWOT analysis method, Lim and Kim (2014) identified seven elements that need to be considered in the design of MOOCs in Korea:

- what is the type of organization that offers MOOCs? (whether the organization is for-profit or non-for profit, public or private university, or global or local provider would affect the MOOC design).
- who are the target learners? (for example, learners' age, their network environment, and interest would affect the MOOC design).
- content area (depending on the content area – humanities, social sciences, technology, etc. -, the design principles would be different).
- authority to open MOOCs (whether any individual can offer a MOOC or only a certified group or organization can offer a MOOC would affect the MOOC design).
- contract unit (some global MOOC providers only communicate with top universities around the world while other providers work with any types of organizations or individuals, which would affect the MOOC design).
- qualification of the MOOC instructor (who will teach a course and deliver the content would affect the MOOC design). and
- link to a formal credit system (whether MOOC completion is counted as a university or training requirement credit or not would affect the MOOC design).

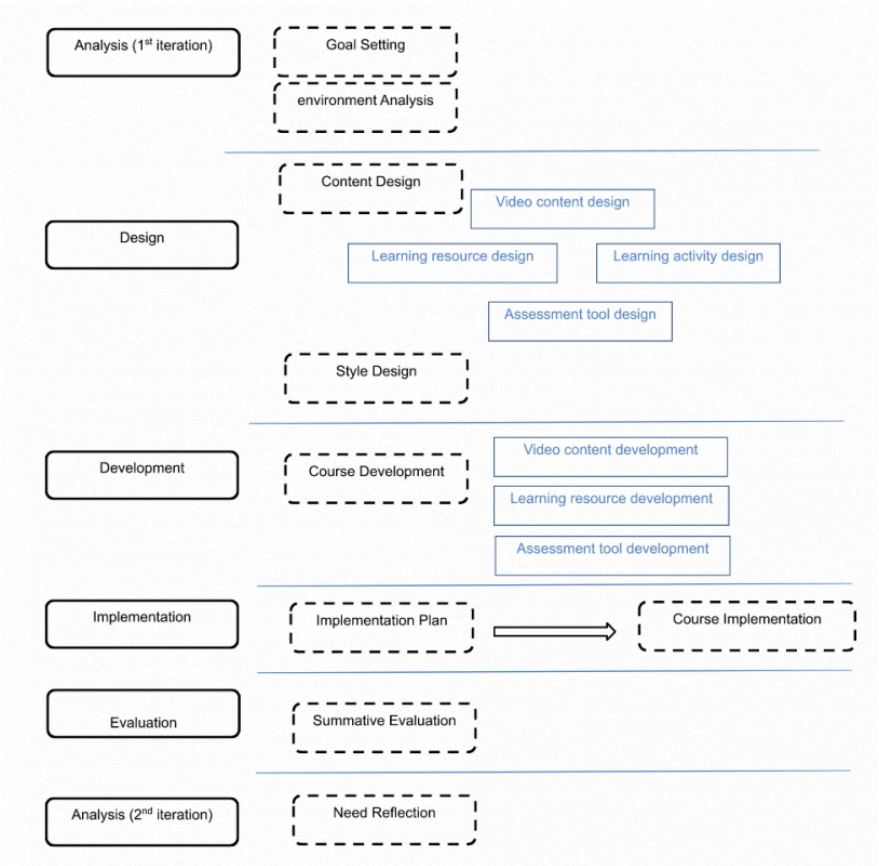
Unfortunately, the study by Lim and Kim (2014) does not suggest a MOOC design model which considers these seven elements delineated from the SWOT analysis of MOOCs.

Considering unique features of MOOCs investigated in the previous studies such as the ones analyzed above and other well-established e-learning design models (e.g., Alonso et al., 2005; Jung, 1997; Lee & Owens, 2002), Lee et al. (2016) developed an ID model which can be applied in MOOC design and specified step-by-step activities that would improve the quality of MOOCs in Korea. Through employing the model construction and model validation methodology suggested by Richey and Klein (2007), their study suggests a six-stage MOOC design model consisting of Analysis (first iteration) – Design – Development – Implementation – Evaluation – Analysis (second iteration) as shown in Figure 4.

- At the first Analysis stage, MOOC developers make predictions on learners and identify general purposes at the national, institutional and/or individual levels, and analyze availability and functions of platforms suitable for prospective learners and video shooting competencies.
- At the Design stage, the MOOC developers plan and design various types of MOOC content along with packaging and promotion strategies.
- At the Development stage, the MOOC developers actually produce various types of MOOC content and devise packaging and promotion strategies based on the design plan at the earlier stage.
- At the Implementation stage, they develop a detailed plan for MOOC delivery including timeline, learner supports and feedback and carry out the course based on the plan.
- At the Evaluation stage, they conduct both quantitative and qualitative evaluations. Quantitative data such as assignment completion rate, course completion rate, and academic achievement and qualitative data such as students' responses and personal goal attainment are collected and fed back to the second analysis stage.
- At the second Analysis stage, the needs of MOOC learners are reviewed based on the data collected during the evaluation stage and course content, assignment and learning support strategies are re-adjusted.

Figure 4

A design model for MOOCs (source: Revised from Lee et al., 2016, p.24)



Japan

JOCW: Decentralized QA Measures

JOCW does not have a set of common QA guidelines or criteria. In principle, each member institution is responsible for setting up its own QA system. In case of UH, OEC uses a set of key performance indicators in creating and implementing OCW and other OER of UH. These indicators [3] are related to well-established ID strategies for online courses. OEC is expected to produce 20 courses for JOCW and 200 OER content items per year and support six or more courses to integrate OER contents for flipped learning.

ICU does not have institutional level QA guidelines or criteria for creating its OCW. To develop ICU OCW, CTL contacts individual faculty members across different disciplines who are known to be good teachers and develops some of their class sessions as video clips. Faculty members decide which classes to be recorded. For all new faculty members, CTL offers the new faculty development program, which includes guidelines for syllabus development, various teaching strategies to promote critical thinking and learner engagement, and integration of various types of OER in their class. Various types of content (e.g., texts and video clips) offered in this new faculty development program are developed as OER and thus can be shared with other universities who wish to develop similar kinds of faculty orientation. As for the open campus talks, invited guest lectures, and other conference presentations, ICU's CTL develops their presentation videos as ICU OCW upon presenters' permission.

JMOOC: Limited QA System

JMOOC has a committee consisting of three experts in instructional design and online learning from the universities to oversee the quality of MOOCs and examine if the courses fulfill the quality standards as a MOOC. This committee evaluates the course development plans submitted by the universities in advance against a set of QA criteria. JMOOC QA criteria are kept for internal use only and thus could not be obtained for this report. But this evaluation of MOOC plans is an option. If a university submits its MOOC development plan and asks for approval from JMOOC, then it gets funding from JMOOC.

Once a MOOC is developed, the committee will review its overall quality and offer certification if the quality standards are met. Each MOOC is assigned to one of the following three categories:

- University-level courses provided by universities.
- Courses provided by technical colleges and vocational schools, courses recommended by public research institutions, and courses recommended by academic societies.
- Special and extension courses provided by universities, courses provided by companies and enterprises.

Like most of the JMOOC members, UH follows the JMOOC's QA standards in developing and delivering its MOOCs as explained above.

JMOOC's QA guidelines do not follow any international e-learning/OER standards specifically, but they are created based on instructional design principles suggested in several studies including the studies discussed below. One of the JMOOC platforms, gacco, offers a student manual to help its MOOC learners study their courses using various functions of the platform. The manual offers useful tips for enrollment, self-test taking, certification and various troubleshooting.

Ichimura and Suzuki (2017), acknowledging the lack of research informing MOOC providers to design high quality of MOOCs, analyzed MOOC-related literature with a focus on the content design of a MOOC and identified common design elements. Studies published on databases such as ERIC and Scopus, journals including Distance Education, and International Review of Research in Open and Distributed Learning (IRRODL), Google Scholar and other relevant sources were included in their analysis. Based on the analysis of these sources, the authors suggested 10 important key elements at two decision stages for quality MOOC design (see Figure 5).

As the Basic Design Decision stage, three dimensions and sub-items are considered:

- Resources such as human and intellectual resources, equipment, and platform need to be carefully analyzed.
- General structures such as course title, language used in the course, platform, domain, target audience, course level, applications (public/blended/flipped, etc.), pace, and accreditation should be carefully decided considering resources the MOOC design team has.
- Vision including course objectives and competencies as results of MOOC learning needs to be clearly stated.

Once the basic decisions are made, the MOOC developers should pay attention to the seven dimensions that are interrelated. The following dimensions ensure that the MOOC is an interactive learning environment:

- Learner Background and Intention including learners' diverse purposes for course engagement and their level of autonomy need to be thoroughly investigated for the selection of content and instructional, motivational and interactional strategies.
- Pedagogy including pedagogical approaches, learning contents, and teaching and learning strategies of the course has to be developed based on learner background information.
- Communication including how learners collaborate and build community in the course needs to be thoroughly designed.
- Assessment including assessment strategies and activities should be planned and developed considering learning objectives, content and learner information.
- Technological Infrastructure including MOOC platform, social media, technical platform of learning analytics, and access methods for course contents, video lectures and resources need to be examined and appropriate technological tools for specific learner groups.
- Learning Analytics Data should be collected. Decisions need to be made regarding types of data to be collected, points of data collection, purposes of data usages, and so on.
- Learning Supports need to be planned based on learner background, content, technology and other information.

Figure 5

Ten dimensions of MOOC design (Source: Revised from Ichimura & Suzuki, 2017, p.47)

Some small-scale consortia have developed their own set of QA guidelines in order to share online courses. For example, a consortium of Shikoku's five national universities developed the "Instructional Design Guidelines for Common Online Courses" to be applied in efficient online course development in those five member universities (Nemoto, Takahashi, & Takeoka, 2015; Takahashi, 2018). Instructors who develop an online course collaboratively are to review together such documents as an online course plan, an online course content sample written in a common template, an e-learning material sample on the Moodle, a Moodle course template, and a Moodle style sheet. In reviewing these documents, several ID criteria are often applied:

- Basic information (e.g., characteristics of learners, environments, etc.).
- Objectives and assessment.
- Course structure (e.g., content organization and sequencing).
- Content presentation (e.g., explanation, cases, and glossary).
- Practice (e.g., questions, feedback, etc.).
- Media design (e.g., images, video clips, audio, other data).
- Usability (e.g., navigation layout, accessibility, etc.)

Issues Related to OER and QA in OER in Japan

In general, the development and sharing of OER in Japan and QA system is not impressive. Several studies have indicated major issues in OER practices in Japan. A lack of funding is often indicated as a critical issue for the sustainable development of OER. Aoki (2011) points out two funding issues related to OER. One is that there are no private foundations like the Hewlett Foundation that support OER movements in Japan. Another issue is that in many cases, the Japanese government supports individual researchers who develop and study OER, but not HEIs that initiate OER projects. Even if the government funds the institutions, funding ends in a few years and OER projects tend to stop there or disappear.

Related to funding issues, a lack of vision and strategic planning on the development and sharing of educational resources at the national and institutional levels is indicated as a problem for slow OER movements in Japan. Shigeta et al. (2017, p.197) point out that the Japanese government, unlike its counterpart in Korea, does not have OER policy at the national level and its funding for open educational initiatives is quite limited. At the institutional level, as seen in the cases of two Japanese universities, they do not seem to position OER as an integral part of their education and thus do not make a serious effort to develop a strong QA system for their educational resources.

Another serious issue is a lack of skilled ICT personnel and support organizations within a university. Funamori (2017) revealed that almost 95% of Japanese universities surveyed in 2015 reported a lack of staff and insufficient support systems for creating digital content and maintaining infrastructure. He then pointed out that a great deal of effort and budget had been used in creating the catalog, keywords, abstracts, and other metadata in a digital format for databases of Japanese journal articles and bibliographic catalog systems (p.46). Not much contribution has been made for developing and sharing educational resources.

Finally, there is a cultural barrier introducing digital technologies and digital forms of educational resources in Japanese education. As indicated in several studies including Jung and Lee (2015) and Funamori (2017), face-to-face interaction is highly regarded as a most effective and desirable way of instruction and teacher-created materials are greatly valued. Thus, there is a reluctance among educators to introduce e-learning or online learning and use OER that have been created by someone else.

3.4 OER Policy

Korea

Each university in Korea develops its own policy on the development and uses of (open) educational resources ((O)ER). At the institutional level, the Office of Academic Affairs (or another university-level office) is often responsible for policies on (O)ER. At the operational level, the Center for Teaching and Learning (CTL) in each university plans,

develops, disseminates and evaluates (O)ER. Additionally, CTL often works with a committee when it makes major decisions. Participation in the development and utilization of (O)ER is promoted in many universities and is often included as a criterion for faculty evaluation and promotion. The development, utilization and sharing of (O)ER including KOCW and K-MOOC is promoted by Korean MOE and included as one of the criteria in the MOE's Evaluation of Universities. All universities are affected by this national level policy (Chang, 2015).

Among various OER, MOOCs have been strongly supported by the MOE and the National Institute for Lifelong Education (NILE), a governmental agency responsible for K-MOOC operation. A road map of K-MOOC [4] implementation created by the MOE and NILE offers key directions and tasks each year as shown in Figure 1 (Lee & Chung, 2019). Phase 1 (2015-2019) focused on the development and stabilization of the system with full government funding. Phase 2 (2020-2024) will see further development of the system and exploration of various business models for self-reliance in the future.

Following this development map, NILE develops more detailed plans and solicits a number of universities for new MOOC applications each year. Considering these plans, universities develop and implement their own policy on K-MOOCs.

- Phase 1: Launch and Establishment 2015-2019
- Phase 2: Advancement and Self-reliance 2020-2024 and so on

Figure 6

A road map for K-MOOC implementation (Retrieved and revised)

Category	2015	2016-2017	2018-2019	2020-2021	2022-2023	2024-
Key directions	Launch service	Build foundation for revitalization	Establish program's presence	Build foundation for self-reliance	Expand profit models	Implementation by private sector
No. of courses	27	300	600	1000	15000	2000
Key tasks	Pilot project for course development	Identify uses for courses such as credits and employee training	Expand participating universities and consortiums	Launch pilot paid services	Diversify revenue channels to include B2B and B2C	Self-reliant course development and implementation

Key University Policies

With the increase of K-MOOCs and other (O)ER, policies to promote the use of such online courses and resources have been introduced in many universities in Korea. One such policy is to promote and institutionalize various ways of utilizing online courses and contents in the university courses. For example, strategies such as utilizing online courses/contents for self-directed learning in flipped classrooms, utilizing online courses/contents for blended learning during face-to-face classrooms, introducing completely online courses in the traditional higher education system, and utilizing online courses/contents for remedial or group tutoring sessions (Lee et al., 2016) have been introduced to faculty members via faculty development programs and academic associations' conferences and seminars. Further, those who participate in the creation and utilization of such online courses and resources are recognized and rewarded during the promotion and evaluation process.

Another policy has been developed to support a collaborative relationship building or a consortium building with other universities and award different types of degrees and certifications to MOOC learners. NILE has recently introduced a new "Series Courses" category in which a set of courses related to the 4th Industrial Revolution are offered together. To apply for this category, universities are required to collaborate or form a consortium with other universities and institutions including four-year universities, two-year colleges, industrial colleges, education universities, Korea National Open University, research institutes, private companies, corporate affiliated research centers, and vocational education and training centers, and non-profit organizations, and create a set of courses under one series course category. For example, under a series course titled "Big Data Analysis with Python", courses such as Utilizing Python, Data Collection and Modeling, Resources Analysis and Statistics, Mathematical Modeling, and Data Visualization can be offered as a set. These series courses can be more effectively used to create nano-degrees and certifications in collaboration with other partner universities. Considering the evaluation criteria for a series course project (Table 3), several universities

have developed policies and guidelines to facilitate collaboration with other academic institutions in the creation and management of series courses and new types of degrees and certification.

Table 3

2019 K-MOOC Evaluation Criteria for a Series Course Project (Korean MOE & NILE, 2019)

Area	Evaluation Component	Evaluation Criterion
Essentials (20 points in total)	Project Team Structure (10 points)	Applicant institution's vision and plan for K-MOOC (2 points)
		Project team's organization and member composition (4 points)
		Budget and funding (4 points)
	Competency of Applicant Institution (10 points)	Experience with OCW or online course development and implementation in related fields (5 points)
		Applicant institution's specialization in related fields (5 points)
Course Development (60 points in total)	Selection of Courses (15 points)	Needs for a Series Course Development (10 points)
		Systematic Offering of Courses (5 points)
	Course Content and Structure (30 points)	Course content (15 points)
		Instructional design and interaction strategies (10 points)
		Assessment strategies (5 points)
	Instructor (15 points)	Instructor's expertise and reputation (10 points)
		Instructor's teaching competency (5 points)
Course Implementation and Utilization (20 points in total)	Course Implementation (10 points)	Course quality assurance plan (5 points)
		PR plan (5 points)
	Course Utilization (10 points)	Course utilization plan (10 points)
Total (100 points)		

Moreover, a policy to link MOOCs to the national Academic Credit Bank System (ACBS) has also been institutionalized in the universities that offer K-MOOCs. ACBS is an open higher education system which recognizes diverse learning experiences acquired from in- and outside-school settings. Learners can acquire credits through various education and job training institutes, part-time enrollment in traditional universities, certification acquisition from MOOCs and other lifelong education courses, and passing the Bachelor's Degree Examination program for self-education (Fulbright U.S.

Education Center, 2008). Once the learner accumulates the necessary approved credits, he/she can be awarded a degree.

Another important policy guideline related to copyrights of (O)ER has been developed. The universities that are selected as a K-MOOC provider use a consent form created by NILE (Table 4). Following the detailed guidelines provided by NILE, universities have refined their existing copyright-related policies and have educated their faculty members not to use the copyrighted materials without written permission from the copyright holders, and if possible to only use those materials in the public domain or with open license (NILE, 2019).

Table 4

K-MOOC and KOCW: Copyright and Consent Form (created by NILE)

Year of Development		Number of Enrollment	
Course Title			
Applicant	Name	Affiliation	Contact
Content Overview	Creative Commons License	• by • by-nd • by-sa • by-nc • by-nc-nd • by-nc-sa • Default: "by-nd"	
	Content Classification	Macro	
		Meso	
		Micro	
	Course Outline		

1. This course does not include any copyrighted materials without permission.
2. Copyright and ownership of this course belong to the participating faculty member and the university.
3. This course will be used for K-MOOC and KOCW.

Date: Applicant: (signature)

Two Cases: Policy Directions and Actors Involved

In the case of Seoul National University (SNU), depending on the types of (O)ER, three different policy frameworks for selection and management exist: 1) for internal courses, 2) for K-MOOCs, and 3) for global MOOCs, that is, edX.

To support the internal courses offered to SNU students (or sometimes open to the general public or community members), CTL, which is positioned under the Office of Academic Affairs, receives applications from faculty members in a wide range of majors and selects a certain number of courses considering its capacity to support (O)ER development. Two types of resources are often supported. One type is the development of a set of online video lectures to be used for blended or flip learning during regular classroom-based courses. In this case, each video lecture is composed of 15 – 20 minutes. Another type is the creation of a totally online course for faculty members who wish to

offer their courses completely via the internet. While CTL works closely together with faculty members and their teaching assistants in developing these online resources, it also offers a series of workshops for faculty and TAs to develop competencies in such areas as producing a video lecture, introducing flip learning, coaching, using an LMS, and other teaching strategies.

To support the courses that will be provided as K-MOOCs, CTL receives applications from faculty members. As these courses will be open to the public and represent SNU's education as K-MOOCs, the selection procedure is stricter than that of the internal courses. One of the most important criteria is the subject matter. Courses that show high demand from the general public and are expected to have high learning impacts are often selected as K-MOOCs as the Korean MOE and NILE emphasize and prioritize the courses related to topics of the 4th Industrial Revolution. So far, such courses as Youth Psychology, Happiness Psychology, Micro Economics, The Analects of Confucius and Modern Society, Language and Human, Understanding Religious Symbols, Reading Nietzsche, Data Mining, Humanoid Robot, Drone - From Principles to Programming, Robotics, Counselling, Contact Lenses: Selection and Fitting, Robot Manipulator and Underwater Robot, etc. have been developed and disseminated as K-MOOCs. Quality guidelines for K-MOOCs developed by NILE are applied in the development and management of these courses.

For edX courses, CTL does not develop new courses for edX from scratch. Instead, it selects a few courses from internal online courses and K-MOOCs and revises them for the purpose of edX courses. In selecting such courses, it considers whether the courses can represent the quality of SNU education and if they have shown high learner satisfaction.

During the process of establishing and implementing policies related to (O)ER development and use, several committees and teams are involved. Following the policy directions of the university, CTL works with the Curriculum Committee in making decisions on CTL activities. Within CTL, three teams work closely together to implement such decisions: 1) Instructional Team, 2) Development Team and 3) Planning & Support Team.

1. The Instructional Team is responsible for the design, development and management of online content and online courses together with faculty members and TAs.
2. The Development Team produces high quality online content and courses often in collaboration with external e-learning companies.
3. The Planning and Support Team manages the selection and planning process for online contents and courses, communicates with NILE regarding K-MOOCs and edX on edX courses, evaluates and approves digital contents developed by the Development Team and external companies, manages internal online courses and supports the Instructional Team.

In the case of C University (CU), CTL, positioned under the Office of Academic Affairs, is responsible for the development, delivery and evaluation of CU's online courses, OCW, MOOCs and other educational resources, and teaching and learning support. For its activities, CTL's Committee for Teaching and Learning, consisting of CTL director and team leader and a few faculty members from different departments, sets up relevant policies. CTL's policies include areas such as infrastructure, including CU's LMS and smart classrooms, online content development and improvement, K-MOOC development, sharing online contents with the community, promotion of CU's cyber campus, and participation in national level initiatives. CU offers one MOOC titled Human Images shown in Literary History on the K-MOOC server.

Actors involved in CU's (O)ER development and dissemination include CTL's two teams: 1) Teaching & Learning Support Team and 2) E-Learning Support Team.

1. The Teaching & Learning Support Team is responsible for CU's overall planning on teaching and learning including (O)ER development, evaluation studies on various teaching and learning strategies, a faculty mentoring program, various learner support and development programs, and other teaching and learning support activities.
2. The E-Learning Support Team is responsible for the development and management of CU's online content and courses and K-MOOCs. It also offers ICT/e-class training sessions, digital material development workshops for faculty and TAs, flipped learning and other innovative teaching strategy workshops, and other types of workshops for new, experienced and senior faculty members.

Japan

Overall, the development and dissemination of OER including OCW is still not popular in Japan (Shigeta et al., 2017). However, with the growing popularity of the concept of open education and MOOCs in Japanese HEIs in the late 2000s, several HEIs in Japan led by major national universities (e.g., University of Tokyo, Kyoto University, Osaka University, etc.) and a few top private universities (e.g., Waseda University, Keiyo University, etc.) launched the open education movement and established a center similar to UH's Center for Open Education (OEC) and began to promote the use of OER (especially MOOCs) within a university and among universities. As Shigeta et al (2017) argue, several universities in Japan have viewed MOOCs as a means to offer their education to adult learners and thus expand the opportunity for lifelong learning.

While major policy changes within HEIs have not been reported for OER development and sharing, a set of policies for JMOOC development has been created. Such policies include:

- In principle, MOOCs shall be developed in Japanese. In the case of MOOCs taught in English, Japanese subtitles should be added.
- In principle, MOOC content shall be provided and designed by full-time faculty members recommended by member HEIs.
- A MOOC shall be shorter than a 15 week-based university course. The recommended length is a 4-week course.
- A minimum lecture unit shall be set at 10 minutes.
- To sign up for each MOOC, a learner needs to provide their email address, password, nickname, and real name.
- To a learner who completed the course requirements, a course completion certificate will be issued under the name of the course instructor.

Shigeta et al (2017) explain that the slow OER movement in Japanese universities is a result of no national policy on OER and a lack of funding from the government and public foundations. Another reason for the slow development and use of OER is explained by the fact that the cost of learning materials, including textbooks, is not high compared with that in the USA and thus the universities do not feel the need to introduce free educational resources for students. They criticize the Japanese government for not developing OER policy and limited funding for open education activities in HEIs, and public foundations for not allocating funds for open education initiatives. As most OER initiatives are self-funded for a limited period and often are led by individual faculty members, institutional level OER policy development and changes are considered to be difficult or unnecessary.

In the case of the University of Tokyo (UToKyo), the Center for Research and Development of Higher Education (CRDHE) is in charge of the development and delivery of educational resources. CRDHE aims to support and improve the quality of education and research of UTokyo, support innovative projects for UTokyo's global education, and build an innovative university-wide educational infrastructure utilizing ICT. Specific projects include:

1. Online education: UTokyo OCW and UTokyo OCWx [5] (opening up UTokyo's regular courses and video clips to the general public, MOOCs (developing and offering seven Coursera courses and eight edX courses), TodaiTV (producing and delivering video programs for seminars and speeches to UTokyo students and the public),
2. Faculty development: Workshops for teaching staff (mainly TAs and graduate students), Workshops and online training for teaching staff (mainly TAs and graduate students) who wish to teach in English language, Online training on interactive teaching.
3. Educational information: Informational website on instructional design and teaching, UTokyo course catalog navigation system, UTokyo event navigation system

It is clear from the list of CRDHE's projects that CRDHE's function is similar to that of CTL in Korean universities. CRDHE plays the role of coordinator in developing and implementing MOOCs and OCW by working closely with UTokyo faculty and special project team members, and external forces. But it does not seem to develop an institutional strategic plan for UTokyo's online education and ICT use in education.

In case of the University H (UH), OEC, a university-wide organization under the Institute for the Advancement of Higher Education of UH, makes policies and action plans related to instructional design, the development and production of (O)ER and MOOCs, learning platforms, and copyrights. It then develops and disseminates (O)ER and MOOCs and promotes online learning and OER-based blended learning within the university. It also integrates various e-learning initiatives of different departments on campus and works closely with UH's OCW Office in developing and sharing OCW with other universities and the public. In particular, OEC has created a collaborative project titled Academic Commons for Education (ACE) and created and shared a number of online courses for liberal arts education with six other universities in the Hokkaido region. For the project, an open edX-based OER Repository has been set up among the universities and a policy to support such collaboration has been established.

OEC consists of two divisions: 1) E-learning Division and 2) CoSTEMP Division.

1. The E-learning Division focuses on OER and MOOC development and dissemination. OEC has developed over 500 OCW both at the undergraduate and graduate levels, eight online courses in the category of general education, and one edX MOOC titled 'Effects of Radiation: An Introduction to Radiation and Radioactivity'.
2. The CoSTEP (Communication in Science and Technology Education & research Program) Division creates and delivers educational programs for students and faculty members of UH to develop their communications skills for sharing knowledge in science and technology. Its role does not include OCW and MOOC development.

In the case of the International Christian University (ICU), CTL offers various means of support for faculty and students. It organizes and runs a series of faculty development programs including the New Faculty Development Program (NFDP) and MOODLE and Google Classroom workshops. It is noticeable that ICU's NFDP is developed as a flipped learning and blended learning format. It consists of three modes: online website, mobile app and face-to-face discussion session. New faculty members have to read and view online or app materials before attending each face-to-face session. Upon completing this 10-week program, the participants experience effective applications of video lectures in flipped and blended learning and come to understand the effective use of OER and ICT for their classes. They also become familiar with open licenses as all the materials (except some ICU's internal documents) on the NFDP website are creative commons licensed. Figure 7 presents the NFDP website and menus.

ICU's CTL is also responsible for the creation and dissemination of (O)ER. It supports faculty members in creating OCW and producing digital content for their courses. So far, ICU's OCW site lists over 90 regular courses online (primarily in video format) plus other special lectures and short courses. Regarding OER creation and utilization, no particular policies have been established. However, faculty members are required to apply "Online Information Posting Guidelines", "Privacy Information Guidelines" and "Confidential Information Posting Guidelines" when deemed necessary for OCW course offerings. In particular, no violation of copyright and property rights and rights and privacy of others are emphasized in these guidelines.

Figure 7

ICU's NFDP website

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In addition, a policy to promote the use of a university LMS, MOODLE, has been established and both synchronous and asynchronous online classes with other universities in Japan and other countries integrating various formats of (O)ER have been promoted alongside with ICU's recent project titled 'Top Global University Project' funded by the Japanese government. While the goals of this project are not directly related to the promotion of (O)ER, collaborative development and sharing of courses and educational resources have been emphasized especially to create a 'Global Liberal Arts Model'.

3.4 OER Change

Korea

Linking National Policy to Institutional Strategic Planning

The Korean government national policies play an important role in formulating institutional strategic plans of HEIs in Korea. In particular, the policy and guidelines of the University Evaluation, which is carried out by an evaluation team consisting of experts from academia and practical fields whom are appointed by the MOE, is considered to be vital as the evaluation result is directly linked to the MOE's funding decisions. In addition, the university accreditation in a 5-yr cycle conducted by the MOE-designated agency, the Korean Council for University Education, affects the strategic planning of Korean universities. A few years prior to the evaluation, the MOE announces the policy and guidelines for the next university evaluation and accreditation.

Recent key national policies include structural reforms of the Korean universities and the introduction of a flexible education system. To bring about structural reforms, the universities are requested to reduce the number of typical university student quota and increase the number of new types of student quota, restructure academic programs accordingly, take a specialization and concentration approach to their major offerings, and promote graduate education (in the case of research universities).

Another important national policy on higher education reform is to promote industry-university cooperation. For this purpose, a funding project titled 'Leaders in INdustry-university Cooperation (LINC+) has been created. In 2017, 75 universities and 59 junior colleges were selected for this project and have offered job training to their students, supported and vitalized start-up businesses, and worked together with the business sector in their local community to create jobs (Korean MOE, 2017). Several universities in the LINC+ project, including top universities such as Korea University and Yonsei University, have offered online courses for their students' job training and created an integrated portal system linking all databases and sites related to students' career development and management.

In promoting the flexible education system, it is suggested that high school graduates take various online courses and lifelong learning programs offered by certain universities while working and then later get a degree once they fulfill the requirement. Another way to introduce flexibility in higher education is by utilizing MOOCs. One of the national key policies is to invigorate K-MOOCs (Korean MOE, 2017; Korean MOE, 2019a). This policy has led many universities to allow their students (both prospective and admitted) to take MOOCs for both self-study and credits. Figures 8 and 9 show that 55% of the MOOC subscribers are in their teens and twenties, and over 58% are high school and university graduates, which indicates that the national policy to promote flexibility in higher education via K-MOOC has been successful at least concerning quantity.

Related to K-MOOCs, a policy to offer MOOCs in a smart learning environment has led to the development of a K-MOOC mobile app in 2017. The app allows MOOC users to study their course with no limitation in time and place.

Another policy to develop and share MOOCs with other countries such as Thailand and Ukraine has led some universities to develop their MOOCs in English. So far, out of 1331 MOOCs, 82 are offered in English, one in French and the rest in Korean.

Figure 8

Distribution of K-MOOC users by age group (NILE, 2018, p. 22)

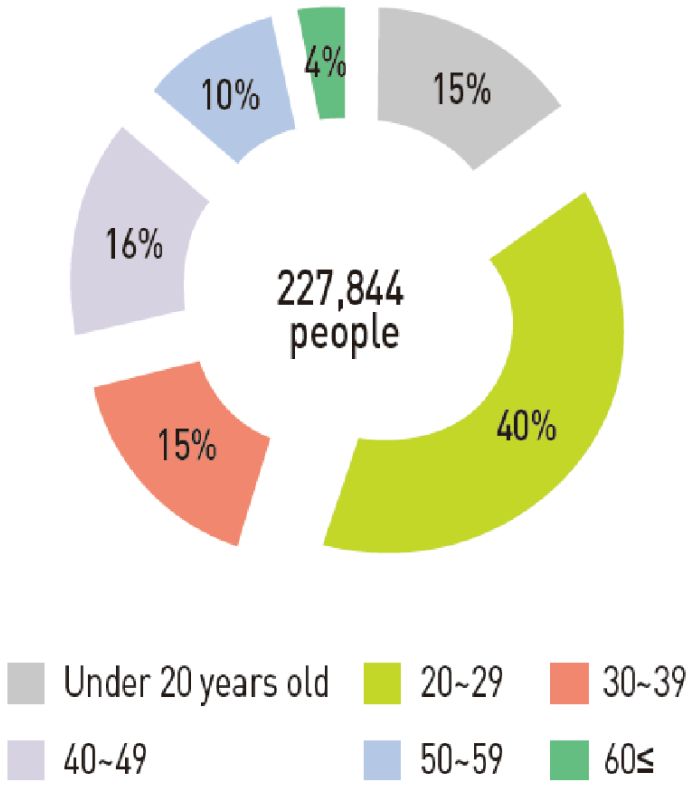
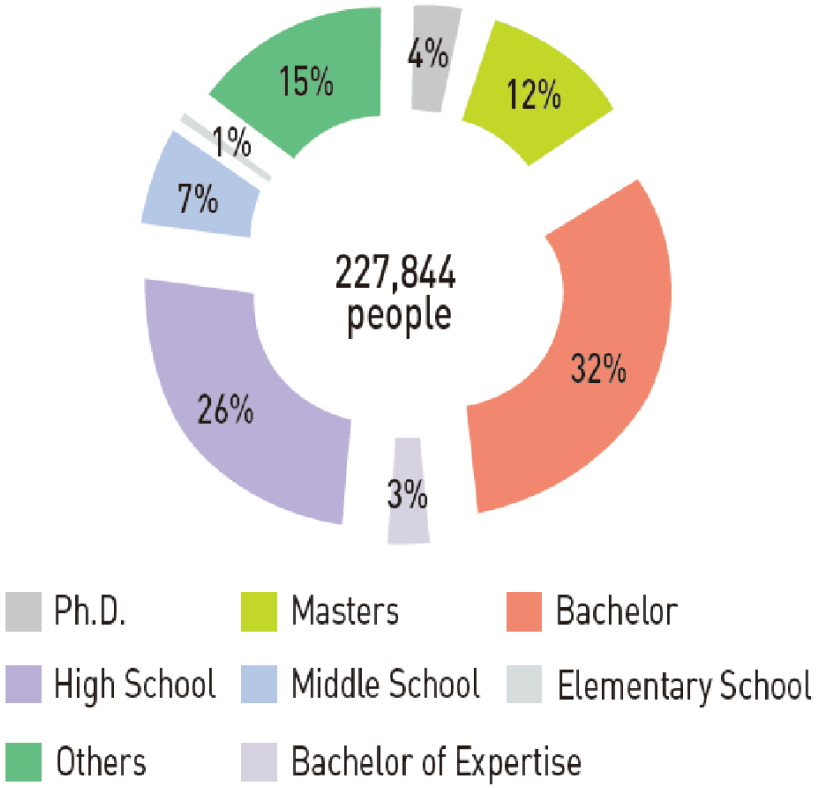


Figure 9

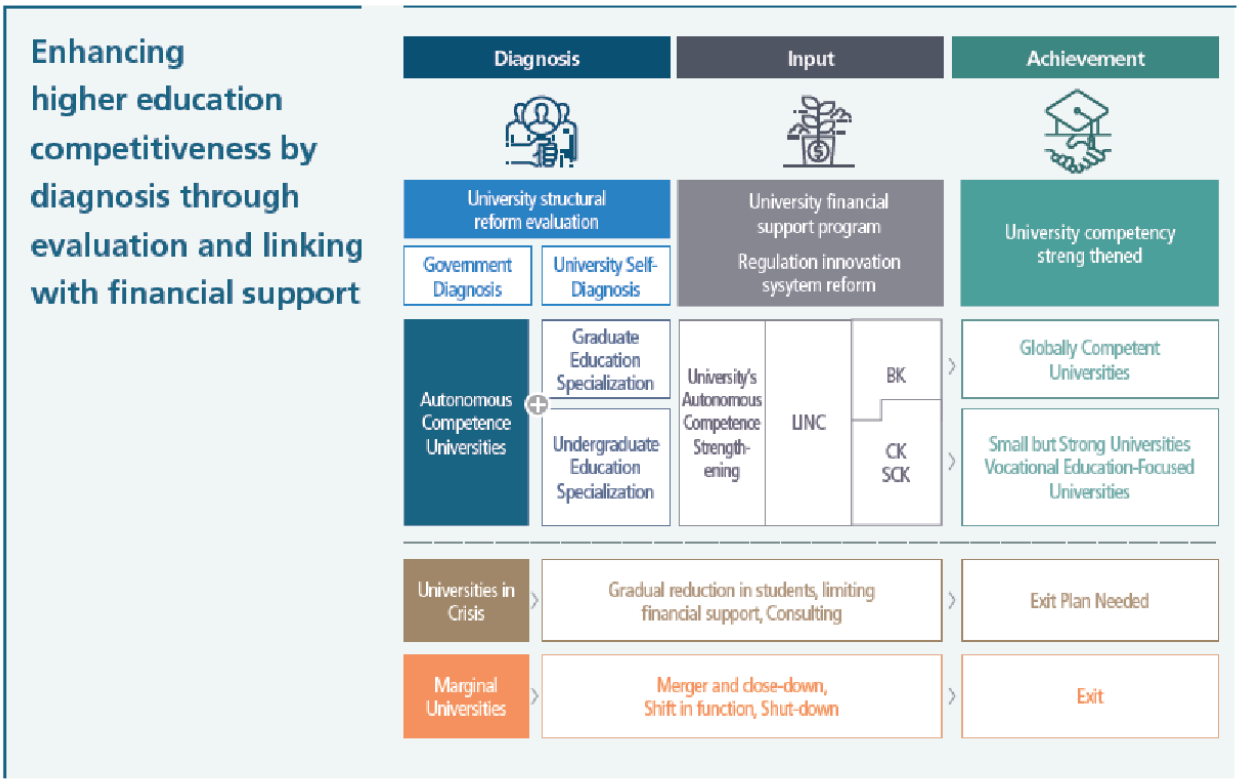
Distribution of K-MOOC users by educational background (NILE, 2018, p. 22)



Those universities that follow these national-level directions would get more financial support from the government. Figure 10 displays an overview of the Korean government's policy to link university evaluation and funding.

Figure 10

An overview of Korean MOE's policy to link university evaluation and funding (Korean MOE, 2017, p.52)



The MOE's 2019 university evaluation guideline titled 'The 2019 University Basic Competency Assessment Handbook' offers more specific directions for HEIs regarding the development and use of (O)ER. First, in the assessment area of Reforms in Curriculum and Teaching, the Handbook includes a university's effort to introduce innovative curriculum and teaching methods in both major and general education areas as one of the evaluation criteria. Integrating various ICTs, OER, MOOCs, and other resources in teaching and learning in innovative ways is highly promoted. Some examples include using OER (e.g., MOOCs and OCW) for flipped learning, student-centered learning, inquiry-based learning, creative and critical inquiry process, problem-based learning, service learning, and competency-based learning (Lee et al., 2017). Second, in the assessment area of Student Support, the Handbook includes a university's plan to develop a system to support student learning, career development and advancement to the post-graduate program. Introducing an online or offline system to encourage team-based learning with other majors and other universities and using an e-portfolio system to link student learning to job market are highly regarded in the university evaluation (Koreann MOE, 2019b).

In general, HEIs in Korea first analyze the national policies and university evaluation guidelines and then create the institutional strategic plans accordingly at the top leadership level. Then, various committees and offices (e.g., Curriculum Committee, Student Association, Center for Teaching and Learning, Career Development Center, etc.) develop action strategies to realize the institutional plans in collaboration with majors, departments, and other offices. During this process, seeking opinions from such stakeholders as professors, alumni, students, parents, employers, and local communities via interviews, surveys, and discussion forums is commonly practiced and encouraged.

Two Cases: SNU and CH

As discussed above, a top-down approach is often used to make key decisions to bring about institutional-level changes in HEIs in Korea.

In the case of SNU, based on the president's vision and the university's long- and short-term development plans, the Office of Information System and Technology (IS&T) develops and implements SNU's institutional strategic plan for digital transformation. The IT Committee, chaired by the university vice-president, works as a deliberation body which

discusses such matters as: SNU's institutional-level digital transformation plan, SNU's individual offices and departments' long-and short-term plans and their integration, matters related to SNU's informatization and research information system, and projects and funding for SNU's digital transformation. The Committee members include deans of major offices including the Office of Academic Affairs. SNU's digital transformation plan entitled 'SNU Information Integrated Development Plan' is developed every three years by IS&T in collaboration with other offices such as CTL (Office of Academic Affairs), Main Library, Office of General Affairs, and Office of Research Affairs.

The current plan focuses on offering world-class information service by building u(ubiquitous)-Campus in a flexible mobile environment with its improved information security system. Under this plan, IS&T has established wireless LAN and Ethernet cable Internet access to the campus network, converted computing network equipment into state-of-the-art gigabyte equipment for 18 zones on campus, installed 10 Gbps high-speed optical cables for backbone networks among different zones, and duplexed each zone in case of network failures. Under the u-Campus creation, four objectives are set to be built:

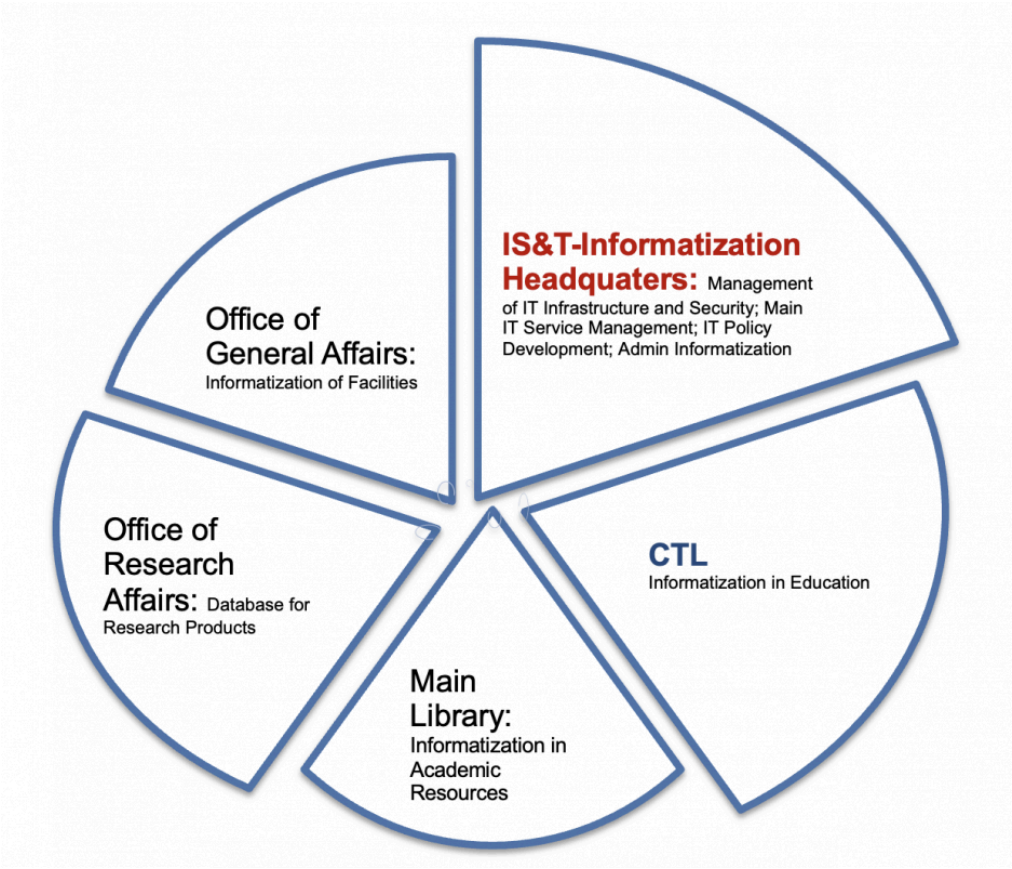
1. an innovative and smart IT environment,
2. an open IT environment for a creative knowledge community,
3. a convergent platform for maximized cost-efficiency, and
4. an integrated system of organizational structure, management and infrastructure to quickly respond to environmental changes.

While IS&T oversees the university level digital transformation and digital infrastructure (including hardware, software and network), CTL, an office responsible for support in teaching and learning, focuses on informatization in education by developing and implementing strategic planning for the development, management and support for online learning and (O)ER creation and use. In developing and disseminating online courses and resources, CTL considers the IS&T's institutional plan and objectives for creating a mobile-based u-Campus. Functions of different offices for SNU's digital transformation are presented in Figure 11.

While following the Headquarters (IS&T)' plans and guidelines, CTL can make requests to IS&T to change or improve digital infrastructure and the university plans that are needed for its tasks related to online learning and (O)ER. This part could be considered as a bottom-up approach. For example, CTL has asked the headquarters to consider introducing a more systemic and systematic policy to manage digital and online materials created by SNU's offices and departments other than CTL. IS&T is considering developing a standardized management guide to strengthen the governance system in digital transformation. Also, to more effectively and efficiently facilitate CTL's duties, systems such as video production equipment and studios and anti-plagiarism software are managed by CTL, not by IS&T.

Figure 11

SNU's structure for digital transformation



Like SNU, CH also adopts a top-down approach. Considering the national policies discussed above and the university's long- and short-term development plans, the Information & Computer Center (ICC) develops and carries out an institutional strategic plan for digital transformation every few years. It aims to respond to changes in information and communication environments efficiently and support teaching, research and administration by developing and managing various programs and systems. Unlike SNU, digital infrastructure (e.g., servers, platforms, studios, etc.) needed for CH's online courses, OCW and MOOCs is managed by the CTL.

At CH, a bottom-up approach is also introduced to meet the emerging needs of student groups, departments and offices. Students and faculty members have requested that their university develop an online career development system where students can design their career, assess their competencies for certain career paths, note their job prospects, obtain tutoring and mentoring services from the university, locate and take career development courses (including related MOOCs), and build a community with other students who have similar career interests. As a result, CH's Student Integrated Support Portal called Career Up Plus (CU+) has been created.

Japan

Lack of Linkage between National Vision and Institutional Strategic Plan

In many cases, a university's strategic planning regarding digital transformation at the institutional level happens via the university's future plan presented by its president or a reform committee. Naturally, a top-down approach is prevalent across HEIs in Japan in bringing about institutional-level changes including digital transformation. When a university develops its future plan, the national policy is seriously considered. In 2018, under the request from MEXT, the Central Council for Education presented a report titled 'Grand Design for Higher Education toward 2040'. The document lists several policy directions under six categories (Central Council for Education, 2018):

1. Vision for the year 2040 and ideal higher education: Shifting to learners-oriented education,
2. Education and research systems: Ensuring diversity and flexibility,
3. Quality assurance and information disclosure: Restructuring of quality assurance for "learning outcomes",
4. Sizes and locations of higher education institutions in light of the decline of the 18-year-old population: To maintain the "Basis of knowledge" for all generations,
5. Roles of individual higher education institutions: Diverse education provided by diverse institutions, and
6. Investment in higher education: Visualization of costs and expansion of assistance from all sectors in society.

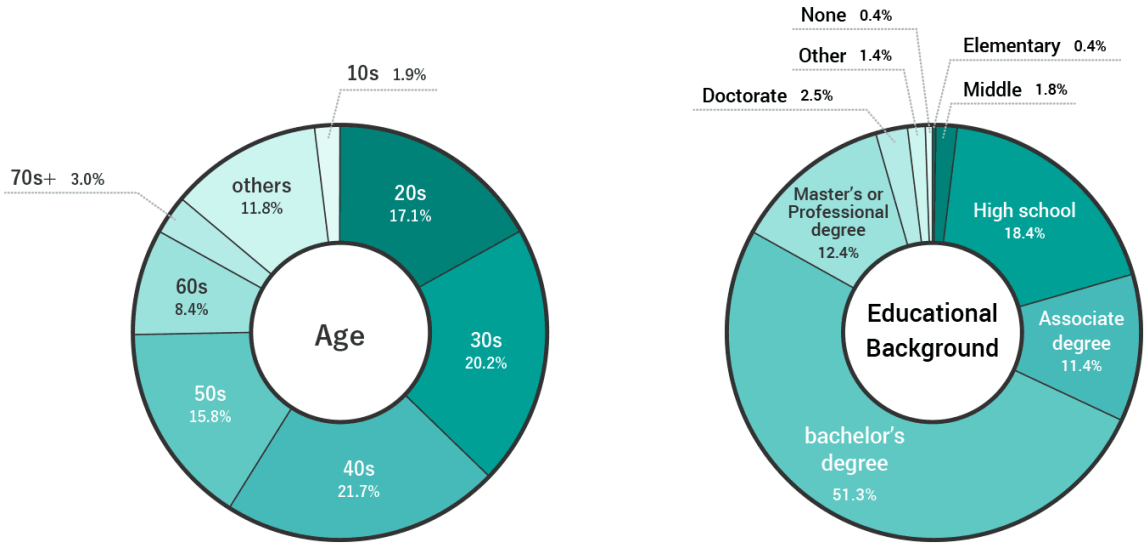
Under the policy direction 2) Education and research systems, diversity and flexibility in such categories as student population, teacher population, educational programs and strengths of universities are emphasized. Two policy directions included in this long-term design plan are to:

1. create and deliver 'diverse and flexible education programs' to broaden learning opportunities using advanced technologies and sharing educational resources, and
2. clarify and further develop strengths and features of individual HEIs from the perspective of human resources development by employing flexible and diverse approaches to teaching and learning.

JMOOCs are considered to be one exemplary case for a flexible education system, especially for lifelong learners. As shown in Figure 12, around 70% of JMOOC users are adult learners (whereas only 19% are in the 10s and 20s) and around 75% have associate or above degrees.

Figure 12

Distribution of JMOOC users by age and educational background



However, unlike the case of Korea, neither specific action strategies at the national level nor governmental annual funding schemes are linked to these policy directions. Past experiences with other national policies such as e-Japan Strategy, New IT Reform Strategy and i-Japan Strategy tell us that Japanese universities are likely to reflect the government policies in their future plan and vision, but not likely to develop specific action plans and allocate human and financial resources to implement such policies (Suzuki, 2009). It is more likely that specially funded MEXT projects for a certain period of time will be created to support a few selected universities with their innovative plans. Or, faculty members and researchers will apply for research grants individually or collectively to conduct research on ICT use in education or open education.

Another problem can be found in Japanese traditional culture of teaching and learning. Aoki (2010) indicates two gaps existing between the government vision and the actual implementation at the institutional level and between research and application. She explains that these gaps exist because the universities do not know how to take advantages of ICT in bringing about pedagogical innovation or do not believe research findings on the effectiveness of ICT for higher education. When the Japanese government first introduced the New IT Reform Strategy in 2006, it aimed to double the number of departments and programs which offer e-learning and utilize ICT with a learner-centered approach. However, it was found that most HEIs implemented ICT to reinforce traditional teacher-centered approach, not to bring about pedagogical changes. A majority of university classes continued to offer lecture-based teaching with faculty as sage on the stage and students as listeners.

Three Cases: UTokyo, UH, and ICU

Just like in the case of SNU in Korea, large research universities in Japan usually have a dedicated center or office for digital transformation at the university level. This office develops and implements the institutional strategic plans for digital transformation.

In case of UTokyo, the Information Technology Center (ITC) is responsible for campus-wide digital transformation. ICT has five divisions which carry out tasks related to various ICT services including (O)ER development and online learning.

1. Campuswide Computing Research Division: This division is responsible for operating, administering, and maintaining the Educational Campuswide Computing System (ECCS) at Tokyo University. It also promotes on-campus information literacy and provides an information technology environment with the latest technologies that are suitable for university education and research. Moreover, it promotes e-learning initiatives such as digitalizing teaching and learning materials and utilizing LMSs, and evaluates the effectiveness and efficiency of the current infrastructure system with the purpose of designing future e-learning and ICT services.
2. Digital Library Division: It supports academic activities by digitizing and updating scientific information and sharing it online. It also develops and provides access to a wide range of databases and offers training sessions for users of its resources.
3. Academic Information Science Research Division: This division is responsible for using the latest technology to develop big data processing and new innovative services such as the Web 2.0-enhanced library navigation system and the “GENSEN Web” automatic domain terminology extraction system. The division also conducts both research and education activities for future developments in a digital library, data mining, machine learning and privacy protection technologies.
4. Network Research Division: It is in charge of building, operating and maintaining a secure and stable network environment for research and education throughout six campuses and over 50 research facilities of Tokyo University. The division’s effectiveness is vital to ensure a smooth flow of the university’s research and educational data.
5. Supercomputing Research Division: It focuses on the operation and upgrades of the supercomputers to ensure the enhanced processing power and high quality services for the users from various departments (especially graduate schools) and research institutions at the university.

While ITC is in charge of supporting infrastructure for UTokyo’s online activities including online courses and resources, the development, maintenance and implementation of MOOCs and OCW are handled as “Special Educational Activities” and are managed by CRDHE. CRDHE’s policy and projects are discussed in the section above.

In the case of UH, the Information Initiative Center (IIC) is responsible for university-wide digital transformation. It conducts research and development to promote ICT application in research and education, develops and manages ICT infrastructure, and provides support and training for the use of ICT in education. It consists of seven divisions to accomplish these tasks:

1. Supercomputing Research Division focuses on research and development on the improvement of computing and software, big data system design, and their applications.
2. Information Network Research Division focuses on research and development on the next generation network, ubiquitous computing, and information distribution and their applications.
3. Digital Content Research Division focuses on research and development on digital content storage, processing, disseminating and utilizing and their applications.
4. Media Education & Research Division focuses on research and development on ICT use in education and support, e-system design, open education and their applications. The director of UH's OEC (Center for Open Education) is a faculty member who belongs to this section.
5. System Design Research Division focuses on research and development of crowding computing and optimization of information system design and optimizing algorithm.
6. Cyber Security Research Division focuses on research and development of cyber security and data analysis, safe and reliable network services and their application.
7. Cyber Security Center is responsible for the computer security of UH systems and training of UH members.

As seen above, IIC's main tasks focus on research, development and application of digital infrastructure and skills, but not on the development of a university-wide strategic plan for digital transformation. At UH, the institutional strategic plan for digital transformation is usually included in the university's strategy report which is developed every few years. The most recent comprehensive future strategy report was prepared in 2014 (Hokkaido University, 2014). It includes the promotion of open education with a great emphasis on "large-scale introduction of education employing ICT" to enhance UH's teaching and learning environment. Upon receiving a large grant from MEXT in 2013, IIC's Media Education & Research Division created OEC and allocated resources necessary for the development and dissemination of OER including OCW and MOOCs. Since then, OEC has led open education initiatives such UH OCW, ACE open courses and UH MOOCs. Most of the decisions at the operational level are made by the director and staff of OEC in close collaboration with faculty members who engage in UH's OCE and MOOC creation.

Individuals or departments/offices who receive the government research grant or MEXT project for their innovative ideas may be able to receive funding from the university even after the project is over as those ideas are often aligned with the UH's future strategy. One OEC project titled Nucla-hokkaido is an example case. The consortium of seven national universities in Hokkaido has developed and shared MOOCs for their liberal arts education.

While UTokyo and UH employ a top-down approach combined with a bottom-up approach to developing and implementing strategic plans with regard to digital transformation, ICU as a small private liberal arts college where government subsidy is only a small part of its budget, often takes a bottom-up approach in making such decisions. At ICU, the process to make decisions on institutional strategic planning with regard to digital infrastructure is somewhat simpler than that of UTokyo and UH. ICU's CTL plans which infrastructure ICU needs to establish for its education and services and applies for the special budget from the university. As for the large scale budget needed for the improvement or update of campus network and computer systems, the Information Technology Center, which is under the University Secretariat, makes a request to the university and a decision is made by the president often with the approval from the board of trustees as it involves financial investments. Recently, a new future plan to review and improve ICT infrastructure and its use in education was developed by CTL and presented to the board of trustees and the university administration. Decisions are yet to be made.

The problem with this bottom-up approach at ICU is that it can lead to the lack of a broad vision and institutional-level strategic plan for digital transformation unless the university's top leaders deliberately include the plan in the university's future strategic plan.

4. Micro Level

4.1 OER Infrastructure

Korea

Required Faculty Development

Most Korean universities have been implementing a policy which requires all newly hired faculty members to receive an orientation program. During this orientation program, the new faculty members are provided with information about the existing national- and institutional-level infrastructures, services and (O)ER available for their use. They are offered opportunities to develop skills to use the institution's LMS, educational software, MOOCs, and other technologies, and learn about flipped learning, blended learning, copyright issues and more.

The case of C University (CU), a large private university located in the southern part of Korea, shows a common practice among Korean universities. CU, like many other universities in Korea, specifies in its Teaching and Learning Bylaws that newly hired faculty members must spend a minimum of 14 weeks for professional development during their 1st semester and attend a teaching consultation or microteaching session by the end of the 1st year of their employment. Moreover, all faculty members are required to participate in at least one training program per year to improve the quality of their teaching. Those who are in the bottom 5% of the course evaluations from the previous semester should attend either a teaching consultation or microteaching session or two or more training programs.

For new faculty members, the Center for Teaching and Learning (CTL) of CU runs a 14-week professional development program for new faculty members, one hour per week. The program covers such topics as LMS, teaching methods, individual teaching consultations, library services, research grants, administration and important university rules. For other faculty members, CTL offers various training programs through face-to-face or online workshops and consultations, with a special focus on the training of the "CU-MOOC-Flipped Learning System" which supports the creation and implementation of online courses, flipped classrooms, and blended courses. If a faculty member submits the proposal to develop an online or blended course using this system, CTL's e-learning team supports the development of online content for the course.

(O)ER Creation and Utilization before and after COVID-19

Before COVID-19, (O)ER have been developed mainly at the national and institutional levels. For example, KOCW and K-MOOC as OER have been created, managed and disseminated mainly by two government-funded organizations: The Korea Education and Research Information Service (KERIS) overseeing KOCW and the National Institute for Lifelong Education (NILE) that is responsible for K-MOOC. Universities have uploaded their OCW and MOOCs onto KOCW and K-MOOC servers. At the individual level, only a few faculty members were engaged in (O)ER development despite consistent professional development and support for both new and experienced faculty members. In the case of CU, 97 out of 6,549 courses were offered online and shared with other universities. Lim et al. (2017) identified several barriers to faculty involvement in the creation of (O)ER such as the heavy workload put onto individual faculty members in creating all course materials, the continuous use of these materials as (O)ER without an opportunity for revisions or updates, and financial incentives not enough for faculty members to continuously share their copyrighted work such as textbooks and other materials from their lesson plans.

After COVID-19, most Korean universities have introduced emergency online teaching and supported their faculty members to create and implement online courses. A series of online surveys conducted with students, full-time faculty members and part-time lecturers at the Seoul National University (SNU) between April 8 and May 8, 2020 showed trends of emergency online teaching during COVID-19 (Park, 2020). The following presents key findings of three surveys conducted by SNU.

A survey with 716 full-time faculty members at SNU uncovered that around 80% of the members taught their classes via the synchronous platform Zoom, over 32% used self-created video lectures, and over 22% offered task-based online lectures (multiple answers allowed). Overall, many faculty members (80%) expressed satisfaction with the online

teaching platforms such as SNU's LMS and Zoom. On the other hand, less than 30% of the faculty were satisfied with the interaction with students. Some faculty reported difficulties in understanding students' reactions because many students muted video and audio during the class and while carrying out the synchronous online discussions while others noted students' active participation in class discussions and focused motivation during online classes. Several faculty members noted the need for support for students with a poor network environment.

Another survey conducted with SNU's 493 part-time lecturers revealed that around 70% offered synchronous online classes using Zoom and over 84% used asynchronous approaches (46% used self-created video lectures, and over 38% provided task-based online lectures). Compared with the full-time professors, more part-time lecturers adopted asynchronous formats. Many lecturers (70%) expressed satisfaction with the platforms, while only 30% were satisfied with the interaction between instructors and students. Several lecturers pointed out the urgent need for technical support and training to improve their online teaching.

A survey with 2,062 SNU's undergraduate students revealed that students were generally satisfied with emergency online teaching (3.53/5 points), that the lower their grade level the less satisfied they were with online teaching and that students majoring in music, fine arts and physical education who needed practicum were less satisfied with online teaching compared with their colleagues in other majors. The most popular type of online teaching was faculty-created video lectures (34%), followed by Zoom lectures (around 29%) and PPT-based video lectures (20%). It is clear from this result that students prefer to study via pre-recorded video lectures at their own pace while instructors prefer to offer their class using the synchronous tool, Zoom. It may be that instructors (both full-time professors and part-time lecturers) did not have enough time and expertise to design and develop good instructional videos. While instructors had difficulties in interacting with students, students reported difficulties more with increased workload in assignments and learning tasks and unstable connection, and less with interactions between peers and the instructor. Those students who were satisfied with online courses indicated time-saving and flexibility in time management as the main reason for their satisfaction whereas those who were not happy with online courses expressed disappointment over the quality of online courses and difficulties with practicum and hands-on experience. Many students indicated the need for clear assessment criteria and replacement of the current relative method with the absolute approach to learning evaluation for online courses.

Popular Tools, (O)ER Formats and Useful Functionalities

Many Korean universities use xinics' products such as Everlec to create and edit (O)ER and add a few other authoring tools. Using Everlec, faculty members create screen recording video which includes their face and voice and captures other moving images or videos. A report published by NILE (2017) shows that over 50% of KOCW materials are PPT-based video materials (see Table 5), which implies that a video lecture, which includes the presentation materials or PPT, the instructor's appearance, and voice is the most popular format of (O)ER among Korean faculty members. To develop this type of (O)ER, xinics' products are often used.

Table 5

File Format and Service Type of KOCW (NILE, 2017)

File Type	Format	PPT-based Video	Text-based	Flash-based	Audio & others	Total
	# of materials	122,590	66,847	34,301	3,423	227,161
	%	54	29.4	15.1	1.5	100

Reflecting this trend, NILE (2020) offers specific guidelines for K-MOOC providers to develop and utilize PPT-based video lectures.

A significant number of Korean universities use a locally developed LMS called iMaxSoft as it provides an optimal environment for delivering PPT-based video lectures, promoting interactions via various bulletin boards and providing

instant feedback via flexible mobile LMS. Compared with foreign products such as Moodle and Blackboard, iMaxSoft is known for its ease of use and intuitive user interface, and for the inclusion of a management mechanism for administrative academic affairs such as attendances, assignment submissions and grading.

As described above, many Korean instructors develop and use visual materials such as PPT, PPT-based audio/video lectures, and other freely available videos on YouTube, Ted Talks, MOOCs, etc. In the areas where certain procedures need to be shown (e.g. programing) and special characters and symbols need to be used (e.g., math class), computer screen recording is frequently used.

The video production and editing tools such as xinics' Everlec and iMaxSoft' Lecture Space are most widely used to create (O)ER. These tools have features that minimize post-production work and get it right the first time while recording. For frequent communication between students and instructor and students-students, Kakao Talk, the most popular SNS in Korea, is often used.

Japan

Optional Faculty Development

Many universities in Japan have their own campus-wide organization or team which oversees teaching and learning matters including (O)ER creation and diffusion. Good examples include the Center for the Promotion of Excellence in Higher Education (CPEHE) at Kyoto University, the Center for Open Education at Hokkaido University and the Department of Teaching and Learning at Osaka University. These organizations provide faculty members with information and training sessions regarding the creation and utilization of (O)ER. For example, CPEHE at Kyoto University offers frequent faculty development workshops on how to utilize (O)ER for effective teaching and learning (Fujioka et al., 2019). In addition, it runs an online training program called the Mutual Online System for Teaching & Learning (MOST) to help faculty members develop effective teaching and learning strategies including the use of various kinds of (O)ER available for higher education (Fujioka et al., 2019; Kubo, 2017). But the participation in these programs is mostly up to the individual instructor. Unlike their counterparts in Korea, attending faculty development sessions for a certain number of sessions or hours is not required for instructors in Japanese universities.

Another example is the CTL at International Christian University (ICU), which is a small liberal arts college located in Tokyo and well-known for its faculty support for ICT use in education. ICU's CTL offers a 10-week new faculty development program in a blended mode combining online materials and in-person seminar sessions. Most of its online materials are offered as OER for other liberal arts colleges as well. The program includes information session on OCW and other available (O)ER.

(O)ER Creation and Utilization before and after COVID-19

Unlike Korea, there has been no national level effort to develop (O)ER for higher education. (O)ER have been developed mainly at the institutional and individual faculty levels. For example, JOCW and JMOOC as OER have been created, managed and disseminated mainly by member institutions. Member universities have encouraged individual faculty members to create OCW and MOOCs and linked them to JOCW and JMOOC sites.

Before COVID-19, the adoption rate of OER was around 14% across Japanese universities (Shigeta et al., 2017). OCW was often mentioned as one of the most popular OER among Japanese faculty members. A large survey study conducted by Academic eXchange for Information Environment and Strategy (2017) revealed that OCW was often mentioned as popular OER by university instructors. Similarly, Kubo (2017) reported that OCW was the focus of OER discussion in many Japanese universities. But this trend seems to be changing during/after COVID-19.

Let's consider an example from ICU. As a member of JOCW, ICU has offered 143 courses as OCW and shared them with other universities and the public. Its OCW are mostly video recordings of regular classroom teaching sessions and thus the video quality of such OCW is not enough to be used as teaching materials in other courses.

With the COVID-19 pandemic, ICU was one of the first Japanese universities which made an early decision to offer its courses online. A survey conducted with 82 full-time faculty members and part-time lecturers by ICU's CTL between

May 20th and 27th, 2020 presents types of platforms and (O)ER used in emergency online teaching and learning at ICU. It revealed that around 55% of the instructors taught their classes via the synchronous platform Zoom, over 20% used self-created video lectures uploaded on Moodle, over 17% used both Zoom and Moodle, and 5% offered their classes mainly via reading materials. Over 23% of the instructors indicated that they decreased the amount of content covered in each class, especially video clips they used to show during the class hours were not shown during synchronous Zoom sessions due to slow connection and data shortage on the side of the student. Most frequently used (O)ER were instructor-created written materials, figures and tables followed by printed/e-textbooks or books. A few instructors used online materials offered by Open University UK and Creative Commons. Among the video materials used, 48% were instructor-created, 47% YouTube, and 20% were from other sources (e.g., Ted Talk, MIT OCW, OUUK, NHK, edX, IU library's Academic Video Online, etc.) when multiple answers were allowed. To create the video lectures, tools such as Kaltura and PPT were often used; to promote interactive online teaching, tools such as Kahoot and mentimeter were used.

During the COVID-19, the use of (O)ER has increased in Japanese universities and the concept of (O)ER has been expanded from OCW to print materials, audios, videos, web links, MOOCs, and more. Some universities have introduced various resources which can be adopted during online classes on their website. One example can be found here.

Popular Tools, (O)ER Formats and Useful Functionalities

After COVID-19, several Japanese universities have promoted the production of video materials using PPT, Kaltura, Koantic, and other content creation tools. In addition, they have updated and refined their LMS by adding useful free or paid plug-in tools. Also, free Google products such as classroom, meet, drive, form, slide, and doc have become quite popular. Test tools such as Kahoot, mentimeter, Quizlet, and Socrative have also been utilized. While a variety of tools and platforms have been introduced, the most popular technology for online learning during COVID-19 is the synchronous platform Zoom. PPT is widely used to create audio/video lectures. Line, the most popular social media in Japan, is used for communication between students and the instructor and between students for group projects.

4.2 Quality of OER

Korea

Guidelines for defining the quality of (O)ER

In defining the quality of (O)ER and infrastructures, faculty members often utilize the evaluation criteria offered by their institution. Each university's CTL or a similar unit which is responsible for (O)ER development, support and implementation has created the university's quality assurance (QA) criteria based on the national level standards and QA criteria offered by Korean Ministry of Education (MOE), KERIS or National Institute for Lifelong Education (NILE).

For example, CU's CTL provides the self-evaluation criteria for individual faculty members who are engaged in the MOOC creation and delivery. These criteria align with NILE's national level QA system (Table 6). Faculty members use these criteria together with NILE's Guidelines for K-MOOC Development & Implementation in creating and assessing the quality of their online courses and other (O)ER.

Table 6

Korea CU's Self-Evaluation Criteria for MOOC Creation and Delivery

Course Title		
Status	□ New MOOC	□ Revision of an Existing MOOC
Support for Interaction	□ Need for Teaching Assistant	□ No Need
	Evaluation Criterion	Review Result

#	Area	Component				
1	Content	Course Selection	Needs to develop as a MOOC considering demands from learners and society, etc.	□ Y	□ N	
2		Course Content	Needs-based content selection and structure	□ Y	□ N	
Comment on Content						
3	Instructional Design	Learning Objectives	Clear statement of performance learning objectives in each week (Refer to p.25 in NILE's Guidelines for K-MOOC Development & Implementation)	□ Y	□ N	
4		Teaching-Learning Strategies	Effective teaching and learning strategies to achieve learning objectives (Refer to p.26-31 in NILE's Guidelines for K-MOOC Development & Implementation)	□ Y	□ N	
5		Motivation Strategies	Appropriate strategies to promote and maintain learning motivation (Refer to p.32-33 in NILE's Guidelines for K-MOOC Development & Implementation)	□ Y	□ N	
Comment on Instructional Design						
6	Evaluation	Evaluation Components	Appropriate strategies to evaluate the achievement of learning objectives and feedback strategies (Refer to p.46-50 in NILE's Guidelines for K-MOOC Development & Implementation)	□ Y	□ N	
7		Evaluation Methods	Appropriate formative and summative evaluation methods for each module (Refer to p.46-50 in NILE's Guidelines for K-MOOC Development & Implementation)	□ Y	□ N	
Comment on Evaluation						
8	Interaction	Learner-Teacher	Learner-Teacher interaction strategies to promote learning support and feedback (including the use of email, announcement, discussion board, SNS, and other tools) (Refer to p.34-38 in NILE's Guidelines for K-MOOC Development & Implementation)	□ Y	□ N	□ N/A
9		Learner-Learner	Learner-Learner interaction strategies to promote knowledge/experience sharing, collaborative work, resources sharing, etc. (Refer to p.39-41 in NILE's Guidelines for K-MOOC Development & Implementation)	□ Y	□ N	□ N/A
10		Learning Support	Appropriate learning, administrative and technical support strategies to ensure effective learning and successful completion of learning objectives (Refer to	□ Y	□ N	□ N/A

			p.44-45 in NILE's Guidelines for K-MOOC Development & Implementation)			
Comment on Interaction						
11	Ethics	Content	Compliance with the Broadcasting Code Acts 9 – 45 regarding fairness, objectivity, human rights, diversity and inclusion, and other ethical measures (Refer to the Broadcasting Code)	□ Y	□ N	□ N/A
12		Language	Appropriate use of language following Broadcasting Regulations Act 51 (Refer to the Broadcasting Code)	□ Y	□ N	□ N/A
Comment on Ethics						
13	Web Accessibility	Web Accessibility	Compliance with the Korean Web Content Accessibility Guidelines 2.1 (Refer to p.8-29 in the Korean Web Content Accessibility Guidelines 2.1 and p.64-77 in NILE's Guidelines for K-MOOC Development & Implementation)	□ Y	□ N	□ N/A
Comment on Web Accessibility						
14	Videos	Video/Audio Quality	Quality of video and audio of lectures and other educational materials (Refer to p.53-6177 in NILE's Guidelines for K-MOOC Development & Implementation)	□ Y	□ N	□ N/A
15		Subtitles 1	Provision of subtitles in Korean of all video lectures (Refer to p.10-11 in the Korean Web Content Accessibility Guidelines 2.1 and p.68-69 in NILE's Guidelines for K-MOOC Development & Implementation)	□ Y	□ N	□ N/A
16		Subtitles 2	Synchronicity between videos and subtitles (Refer to p.10-11 in the Korean Web Content Accessibility Guidelines 2.1)	□ Y	□ N	□ N/A
Comment on Videos						
17	Learning Materials	Texts & Images	No errors in all text and image materials (Refer to p.63 in NILE's Guidelines for K-MOOC Development & Implementation)	□ Y	□ N	□ N/A
Comment on Learning Materials						
18	Copyrights	Management of Copyrights	Permission/clearance of copyright issues related to course content (Refer to p.81-87 in NILE's Guidelines for K-MOOC Development & Implementation)	□ Y	□ N	□ N/A
19		Indication of Copyrights	Indication of copyright information following international standards (Refer to p.78-80 in NILE's Guidelines for K-MOOC Development & Implementation)	□ Y	□ N	□ N/A

Comment on Copyrights			
Summary	# of Yes	# of No	# of N/A
Final Comments			

CTL and individual faculty involvement in the QA process

As mentioned above, CTL or a similar unit within each university is responsible for defining the quality of (O)ER and deciding platforms and tools for online education and its decision-making follows its own QA process and involves a representative faculty member from each school or discipline. For example, the internal regulation of CTL at CU states a few key QA considerations to follow in developing (O)ER including MOOCs and OCW. Table 7 shows the regulation at the planning stage of (O)ER development.

Table 7

Korea CU's QA Regulations for (O)ER Development Plan

Article 5 (Planning)

1. A plan for a new program (e.g., a MOOC, OCW, other resources) should be developed based on specific needs identified from a needs assessment study.
2. A plan should include:
    1. Background, need and objective of the program
    2. Recommendations and feedback from the needs assessment study
    3. Features, expectations and development process of the program
    4. Outcome evaluation and QA measures
    5. Strategies to share and diffuse the program
    6. Strategies to manage collaboration and budget details

Individual faculty members need to follow the CTL's regulations and guidelines when they develop and utilize (O)ER at the institutional level. Once the (O)ER development plan is submitted to CTL or a similar unit by an individual faculty member, it will be reviewed by a group of internal and external experts. Once the plan is accepted, a prototype is developed and evaluated by the same group of internal and external experts. Then the final product is evaluated by the same group of internal and external experts. This same procedure applies to the creation of MOOCs, video lectures for flipped learning, and other online materials. NILE's QA procedure is often adopted by many Korean universities when they develop online courses for K-MOOC and individual faculty members should follow the steps specified in this QA procedure (NILE, 2019).

Japan

No QA criteria for OCW, MOOCs and other OER exist in Japan at the organizational and national levels. However, CTL or a similar unit within some universities provides general guidelines for OER selection that individual faculty members can refer to when using (O)ER. Takahashi (2018) reports QA guidelines for e-learning design which have been applied in a collaborative online learning project linking five universities in Shikoku region in Japan. These guidelines were developed based on agreement between experts in online learning and instructional design from the five universities (Table 8) and have been applied in QA for e-learning and (O)ER.

Table 8

QA Guidelines for E-learning and (O)ER Design (revised from Takahashi, 2018, pp. 630-631)

Component	Suggestion
Scope of e-learning content	Any teaching materials that are developed and implemented for the online knowledge platform should be organized applying the following definitions: 1. The smallest unit of teaching material that can be used independently is called an "object". 2. The material composed of multiple objects is called a "module". One module corresponds to one lesson. 3. Multiple modules combining several modules is called a "block". Blocks are used accordingly based on the subject composition to make the overall course structure easy to understand. 4. One course consists of multiple modules or multiple blocks. “One course” refers to a group of modules (or blocks) that satisfies the academic activities corresponding to the criteria for credit.
Grading	1. Academic activities included in each module are used to check attendance. 2. Conducting and submitting a certain amount of academic activities in all modules is required to receive a grade for a course. 3. Grades will be evaluated based on a combination of the academic activities included in the module and other academic achievements (examinations, reports, assignments, etc.). 4. The minimum requirement for credit acquisition is to obtain a score of 60% or more for each test, report, assignment, etc. that is to be evaluated.

Component	Suggestion

Instructional design	1. Include the same number of modules that correspond to the number of traditional face-to-face lessons in one course.
	2. Indicate appropriate learning time for each module and create an optimal learning environment for online learners.
	3. Make several modules or blocks of content available to online learners to allow bulk learning of several topics at once.
	4. Set a recommended study period or set a deadline to help learners manage bulk learning of several topics.
	5. Introduce the course syllabus at the beginning of the course.
	6. Provide the following supplementary information at the start of each course, block or module, depending on the characteristics of the subject and the learners.
	  1. Contact information (e.g., emails, virtual office hours, technical support, etc.) for various inquiries.
	  2. A short video or visual introduction of a person in charge of the course.
	  3. Outline of the course (title, learning process, how to use available contents, how to approach the academic activities such as textbook learning, video learning, discussions, etc.)
	  4. Schedule (content publication/availability dates, deadlines, recommended study period, etc.)
	  5. Conditions for earning credits including items that will be graded, evaluation criteria for each item that will be graded (that is, obtaining a score of 60% or more for each test, report, assignment, etc. that is to be graded, or the score if it is 60% or more of the set cut-off line), how the academic activities in the modules are equivalent to attendance.
	7. Include academic activities (e.g., quizzes, reports, etc.) that are aimed to support the learning of prerequisite knowledge of the course if necessary.
	8. Assure the same quality as face-to-face lessons by providing an environment in which the learners can independently work on their academic activities and by allowing them to confirm how much they have achieved in their learning. To do that, the following should be included in each module or each lesson.
	  1. Lesson content in the formats of text, audio, video, images, etc.
	  2. Academic activities that are closely related to the lesson content in the forms of quizzes, short reports, online discussions, etc.
	  3. Requirements and conditions to pass each academic activity, method of feedback (automatic scoring, manual scoring, mutual feedback between students, individual feedback/bulk feedback on assignments from teachers/teaching assistants, posting of model answers, breakdown/commentary, etc.), setting a feedback period, etc.
	9. Include content and/or activity for further independent learning outside the class. Some examples are:
	  1. Reference information (links, articles, advice, reference materials, reference lists, etc.)
	  2. Academic activities to support learners who are having a hard time following the lesson content to review necessary content (links, articles, advice, reference materials, reference lists, quizzes, short reports, online bulletin boards, etc.).
	  3. Academic activities to support progressive learning (links, columns, advice reference materials, reference lists, etc.).

In the case of ICU, faculty members who participate in the new faculty development program are informed of (O)ER selection guidelines during a session on technology use for liberal arts education. Faculty members are provided with a

few links (e.g., Creative Commons, Open Education Consortium, Quality Matters, JMOOC, etc.) to explore some QA procedures for (O)ER and e-learning. As ICU, like many other universities in Japan, does not have its own QA guidelines for (O)ER and infrastructures, individual faculty members are the ones who make their own QA decisions during the (O)ER creation and selection.

4.3 OER Policy

Korea

One of the important policies that are specific to online courses or programs is related to faculty incentives. While different universities have different policies and practices in offering incentives to faculty who are engaged in the development and implementation of MOOCs, OCW and other (O)ER, two major incentives are common: monetary support for course/material development and additional points for faculty evaluation.

Individual faculty members are involved in decision-making processes via various committees and internal/external reviews. Major committees for (O)ER include: planning and steering committees of CTL, Cyber education committee, and IT committee.

Overall, Korean faculty members are well aware of institutional policies related to (O)ER as they are provided with announcements regularly via their department and CTL and receive frequent emails and SNS messages promoting the development and utilization of (O)ER. The reason for this is that the development and utilization of MOOCs and other online courses, flipped learning, blended learning and technology-enhanced approaches by faculty members are included in the MOE's Evaluation of University Basic Competencies as the most important evaluation criteria under the categories of learner-center approach and new learning initiatives.

Despite the emphasis on (O)ER creation and utilization, there is still a need for policy improvement to further promote (O)ER adoption by individual faculty members. Lee and Kim (2015) point out three challenges for the active adoption of OCW: 1) lack of mechanism to ensure the quality of OCW, 2) lack of support for the development and location of quality OCW, and 3) lack of technology competence at both faculty and institutional levels. To address these challenges, policies to support the training and re-training of faculty members, strengthening the incentive system and creating social and economic values of OCW are suggested.

Japan

Similar to Korean universities, different universities in Japan have different policies and practices related to support for (O)ER development and utilization by faculty members. Unlike Korean universities, monetary incentive is not common in Japanese universities. Instead, there might be a reduction in teaching load, assignment of a teaching assistant (TA), and technical support from CTL or a related unit.

In the case of ICU, in creating OCW, CTL provides video-recording and editing services and a TA is assigned in large classes. When creating other kinds of (O)ER for one's own class, no such CTL-level support is offered unless those (O)ER can be shared with other classes or partner universities. In making such support policies, CTL operates a committee which consists of a representative faculty member from each disciplinary area. As CTL makes a frequent announcement on OCW, most faculty members know these policies on OCW creation.

Unlike Korea, the creation and use of (O)ER is not formally reflected in either the university evaluation or the faculty evaluation. In the case of ICU, the participation in OCW development and other major (O)ER project development is mentioned as an innovative teaching activity, but no numerical point is assigned to (O)ER related activities in the faculty evaluation.

4.4 OER Change

Korea

As described above, individual faculty members in Korean universities are strongly and continuously asked to engage in the creation and utilization of (O)ER by their university as the (O)ER is included in the MOE's university evaluation. Thus, training workshops and information sessions are regularly provided by CTL to help faculty members develop the technical and pedagogical skills needed for (O)ER development and implementation. It is a general perception of many faculty members that their participation in (O)ER is important for the university as well as for their own teaching.

As (O)ER creation and utilization is important at the institutional level, faculty members who decide to develop (O)ER are well supported with (O)ER development grant and technical and administrative support. For example, in the case of a MOOC development for K-MOOC, CU offers USD 4,500 to an individual faculty member for one MOOC development, allows the faculty to use the MOOC internally after one-year service on K-MOOC, and adds 30 extra points to their teaching category in the faculty evaluation. In the case of the development of video lectures for flipped classrooms, CU offers USD 600 and adds 10 extra points to one's teaching category. For other kinds of (O)ER, CTL's studio facilities and instructional design support are provided to individual faculty members.

Korean faculty members often integrate external (O)ER to their courses or materials. In such cases, YouTube video clips, open resources on edX or other MOOCs are used with clear indication of their sources. (O)ER that are copyrighted cannot be used unless permission is obtained and copyright issues are cleared. NILE's guidelines on copyrights are to be followed in developing a MOOC.

Korean faculty members tend to use OCW to supplement their classroom teaching (Lim et al., 2017) or to introduce a flipped learning approach (Kang et al., 2016) without any significant revisions in those OCW. Lee and Kim (2015) report that Korean faculty members have both external and internal motivations affecting the use of external (O)ER. The external motivation is to support their university's effort to get good results in the MOE's university evaluation while the internal motivation is to share (O)ER, support student learning, and improve their teaching. A more recent study by Jung and Lee (2020) reveal that Korean faculty members are using (O)ER rather habitually with an expectation of their teaching performance improvement.

When sharing (O)ER, three types of target user groups are identified: other faculty members, students and the public (Lee & Kim, 2015). When sharing (O)ER with their colleagues, faculty members expect that their colleagues use (O)ER to prepare and improve instruction and to have vicarious experiences of other classes. When sharing (O)ER with students, faculty members use them as teaching materials during class hours, preview and review materials to be used at students' homes, and alternative materials for English language learning for students. When sharing (O)ER with the public, it is often to provide a flexible opportunity to access lifelong education (Figure 13)

Figure 13

Types of OER sharing among Korean faculty members (revised from Lee & Kim, 2017, p. 79)

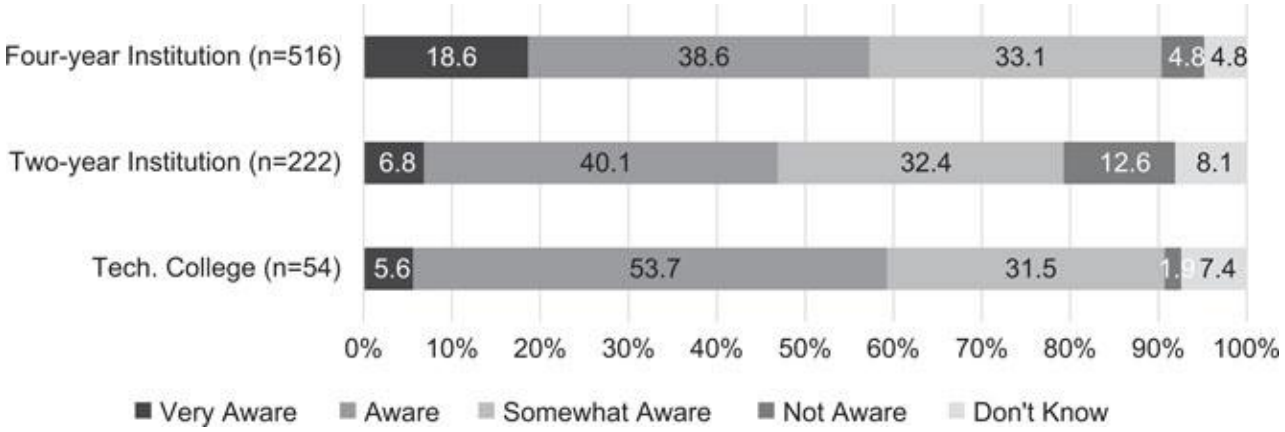
Japan

Japanese faculty members are involved in the (O)ER creation and advancement of the infrastructures via various faculty development workshops and events organized by CTL or a similar unit. Those who are interested in (O)ER creation and platform development often apply for the government research grants. One famous case is the establishment of the Center for Open Education at H University with the large government grant in 2014. Since then, it has developed various OER including OCW and MOOCs to promote student engagement and learning outcomes for both HU and other partner universities, managed HU's LMS, and provided supports to faculty members for (O)ER creation.

A large-scale survey with educators from Japanese higher education institutions between 2015 and 2016 shows that a majority of the respondents from the four-year institutions were well or somewhat aware of OER (Figure 14)

Figure 14

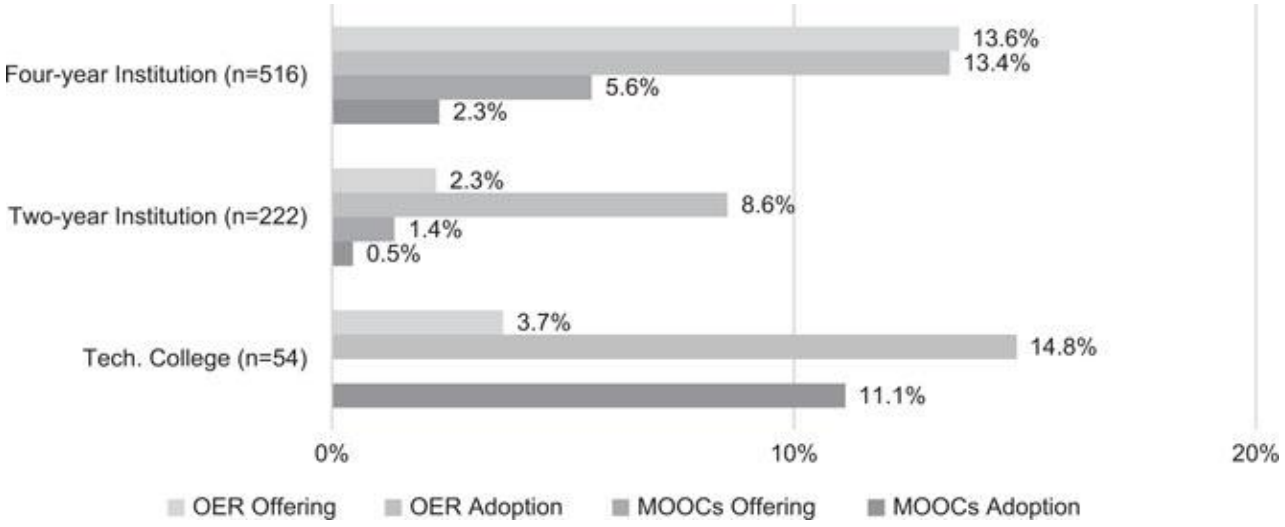
Awareness of OER in Japanese higher education institutions (Shigeta et al., 2017, p. 199)



However, when it comes to the development and adoption of OER, the figures are much lower. Figure 15 presents that 13.6% of the four-year institutions, 2.3% of the two-year colleges and 3.7% technical colleges developed OER, and that 13.4% of the four-year institutions, 8.6% of the two-year colleges and 14.8% technical colleges utilized OER. Shigeta et al. (2017) note that most of the institutions that developed OER were funded by the Japanese government.

Figure 15

Development/Offering and Adoption of OER and MOOCs in Japanese higher education institutions (Shigeta et al., 2017, p. 200)



As mentioned above, types of incentives and supports are diverse depending on the university budgets and policy directions. In the case of JMOOC, some monetary incentives are provided to faculty members who create and implement the courses. But generally financial incentives are not common in Japanese universities. The most popular type of support is technical and other supports via CTL or a similar unit. For example, HU's Center for Open Education offers technical and design support services ranging from consultation for instructional design and visual design to video recording and editing.

Jung and Lee (2020) reveal that Japanese faculty members, like their counterparts in Korea, are using (O)ER rather habitually. But, unlike Korean professors, social influence from their peers is more important than performance improvement in adopting OER. But in another study, Jung and Hong (2016) reveal that both Korean and Japanese faculty members tend to use (O)ER to improve effectiveness in instruction (55%), extension (16%), appeal (15%), and

efficiency (13%). On the other hand, faculty members from Europe indicate extension as the most important instructional priority for OER use (33%), followed by effectiveness (27%), appeal (25%), and efficiency (14%). It is important to note that in both Korea and Japan, OER are often used as supportive technology to provide quality content and offer learner-centered materials rather than disruptive technology to offer expanded and extended learning opportunities and improve sharing and networking.

Concerning the time and effort needed to locate high quality OER and revise and remix OER for their purpose, Japanese faculty members tend to use YouTube and OCW more often than other types of OER as these two technologies are perceived as simple to use and easily accessible without making any changes. A study conducted by Jung et al. (2013) show that while the USA faculty members used YouTube as educational content (65.4%), movies/TV shows (46.2%) and music videos (30.8%) for teaching, and to upload their own lectures (34.6%), Japanese faculty used YouTube as educational content (53.3%) and movies/TV shows (36.7%). None of the Japanese faculty members had created video lectures and uploaded the lectures to YouTube whereas over 34% of USA educators had uploaded their own lectures to YouTube. As this study was conducted several years ago, there might be some changes in this result. Overall, we can say that YouTube is considered as a source of supplementary teaching material and a personal entertainment and learning tool for Japanese educators.

5. Final Question

In this section, the question, “how are micro, meso and macro levels connected with one another?” is addressed.

Macro-level analysis is used to examine infrastructure, quality, policy and change aspects of (O)ER at the national, regional and international levels. For this macro-level analysis, close attention is paid to the broad national systems and policies in Korea and Japan, and interrelationships with regional and international worlds that shape the four aspects of (O)ER in higher education institutions in both countries. And consideration is made to take into account the sociocultural, political, economic, and other forces that impact (O)ER practices in higher education in both countries.

Meso-level analysis focuses on the study of infrastructure, quality, policy and change aspects of (O)ER in higher education in Korea and Japan at the group and institutional levels. For this meso-level analysis, detailed examination of a few selected universities in Korea and Japan is carried out, and their ties with national entities and mechanisms are reviewed.

Micro-level analysis involves the study of infrastructure, quality, policy and change aspects of (O)ER from the perspective of individual teachers. For the micro-level analysis, close examination of individual faculty members’ understanding and involvement with the four aspects of (O)ER is conducted.

Having completed all three levels of analyses, the following conclusions can be drawn (Figure 16):

- Government (macro-) level policies that support (O)ER in higher education are the key driving force for institutional (meso-) level changes and investments toward the establishment of infrastructures, policies and QA system.
- Regional and international collaboration (macro-level) provides incentives for institutions to move forward and be a leader in (O)ER movements. One example can be found at top universities in both Korea and Japan that participate in global MOOCs such as edX and Coursera.
- Having a government-funded (macro-level) supporting agency such as the Korea Education and Research Information Service and National Institute for Lifelong Education is one of the success factors that promote (O)ER creation and sharing at both institutional (meso-) and individual (micro-) levels. Each university and individual faculty can share their (O)ER with other universities and colleagues via the supporting agency.
- Membership-based (meso-level) consortia and partnership can also promote (O)ER co-development and sharing, but their success is more likely dependent on perceived mutual benefits and voluntary devotion by member institutions
- Listing (O)ER-related efforts of an institution as an evaluation criterion in a government (macro-) level University Evaluation system promotes institutional (meso-) level changes and investments toward the establishment of infrastructures, policies and QA system. Likewise, including (O)ER-related efforts of an individual faculty member as an evaluation criterion for faculty promotion encourages individual faculty members' (micro-level) (O)ER creation and adoption behaviors.
- Institutional (meso-) level incentives, recognitions and supports also positively affect individual faculty members' (micro-level) (O)ER creation and adoption.
- Individual faculty members (micro-level) are also affected by other colleagues' (micro-level) behaviors and beliefs on (O)ER creation and adoption.

Figure 16

Key success factors of (O)ER creation and adoption at macro, meso, and micro levels

As Bertalanffy (1968) once argued, the complexity exists within the elements of a whole system and thus one cannot understand the dynamics that occur among the elements unless all elements are thoroughly examined and put in a broader context. This macro-, meso-, and micro-level approach has helped the author understand the key elements of (O)ER such as infrastructure, policy, quality and changes from a systems perspective.

6. Conclusion

A macro-level study shows that in Japan, individual universities are responsible for their own digital transformation including ICT infrastructure, resources, and services without being supported by the government's action plan and necessary follow-through or funding. Thus, development and dissemination of (O)ER and campus e-transformation have been slow and not readily accepted. JOCW and JMOOC, two main organizations engaged in the development and sharing of OER, are operated based on membership fees and receive no direct funding and policy support from the Japanese government and thus until now have not attracted enough attention from Japanese universities even though a few large-scale top universities are offering MOOCs on global MOOC platforms such as edX and Coursera as an institutional-level initiative.

Whereas, in Korea, almost all universities and colleges have established a Center for Teaching and Learning (CTL) to develop and disseminate educational resources and support their faculty and students since early 2000 with the initial financial and policy support from the government and continuous follow-through and funding support from KERIS and NILE. With the promotion of OER, MOOCs and open education as a national initiative, Korean HEIs have also developed international partnerships with international organizations such as the World Bank's Open Learning Campus, Creative Commons, and several global MOOC providers, and shared their online courses, video lectures and other educational resources under the national- and international-level quality assurance framework.

From the cases of Korea and Japan, three macro-level factors are found to be critical to advance digital transformation of higher education. Those factors are: 1) the development and implementation of the government's policy and action strategy in digital transformation, 2) the existence and effective operation of supporting agencies at the national level, and 3) the provision of competitive funding and incentives to universities for their high accomplishment in digital transformation.

A meso-level report highlights the importance of a centralized QA mechanism and its link to national or international standards in promoting the development, dissemination, and sharing of online courses, OER and/or MOOCs of HEIs. For example, in Korea, KERIS's standard QA system combined with a specific guidebook has helped Korean universities to develop various types of quality OER and other educational resources and share them with other universities and the public. Moreover, NILE's standardized QA mechanism along with specific guidelines that are developed based on a global MOOC provider's course development guideline has made it easier for K-MOOC partner universities to develop and share MOOCs at international level.

In a context where no centralized QA system and development guidelines exist, institutional-level guidelines play an important role in OER development and dissemination. In Japan, several large national universities and a few top private universities have established CTL or a similar unit and developed their own set of guidelines or key performance indicators in creating and implementing OER. While this decentralized system could work well when institutions and individual faculty members are motivated to carry out open education movement even with no or little policy and funding support, it may not consistently ensure the active creation and quality of OER.

A micro-level report on the cases of Korea and Japan reveals that a policy requiring all newly hired faculty members to receive an orientation program and/or all faculty members to regularly participate in a faculty development program which includes OER-related knowledge and skills is important to promote individual faculty understanding and involvement in OER use, if not OER development and sharing. CTL in many Korean universities develops and implements faculty development workshops and seminars on ICT uses in teaching and learning, LMS functions, creation and uses of various educational resources including OER and MOOCs, innovative pedagogical approaches, and others and make it a requirement so that faculty members, especially newly hired ones, must attend all or some sessions. Similar faculty development sessions are offered in Japanese universities but the participation in these programs is not required for faculty members, unlike their counterparts in Korea. This policy difference may be one of the factors explaining faculty members' different levels of understanding of OER-related policies and information, and different rates in OER/MOOCs creation and adoption in the universities in two countries.

Another important policy that could promote innovative use of ICT in instruction and OER creation and dissemination is the one related to faculty incentives. While their incentive systems still need to be strengthened, Korean universities tend to offer various incentives to their faculty members. Common incentives include monetary support for OER or online course and material development, additional points for faculty evaluation, and involvement in OER-related decision-making processes. Similarly, several Japanese universities have provided their faculty members with incentives for OER development and utilization such as a reduction in teaching load, assignment of a teaching assistant, and technical support from CTL while monetary incentive is scarce.

It is hoped that the three studies conducted in Korea and Japan will help educators and policy makers in HEIs around the world better understand key policies, systems and other factors that are important to promote or hinder campus e-transformation and (O)ER creation, dissemination and sharing at the macro-, meso- and micro-levels.

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[1] Unfortunately, the internal evaluation criteria are kept as internal use only.

[2] A student manual is also provided in Korean language along with video lectures. https://edtechbooks.org/-yTgZ

[3] Unfortunately, the key performance indicators are kept as internal use only.

[4] For detailed K-MOOC plans and course list, see: https://edtechbooks.org/-CuiMk

[5] UTokyo's OCWx is an interactive version of UTokyo's OCW. While OCW is mainly lecture-based, OCWx includes extra activities such as assessment test items and learning activities. https://ocwx.ocw.u-tokyo.ac.jp/

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6

Analysis of Higher Education (HE) Systems' Approach in South Africa

National Infrastructures for Digital Educational Resources

Paul Prinsloo & Jennifer Roberts

1. Introduction

In this chapter, we present the case of open learning resources in distributed learning infrastructures in South Africa. The case will consist of and present not only macro, meso, and micro levels, but also focus on the specific elements of infrastructure, quality, policy, and change.

South African (higher) education is not exempt from the dramatic changes in international higher education, such as an increasingly competitive higher education landscape, funding constraints, competing narratives about graduate attributes, the growing phenomena of the casualisation of faculty, and the disruptive role of technology (Altbach, Reisberg, & Rumbley, 2009; Bleiklie, 2018; Golden & Katz, 2018; Gyamera & Burke, 2018). In the context of South African higher education, the impact of these changes is often exacerbated and deepened by context-specific issues such as demands for free access to higher education, expediting the transformation of South African higher education, and specifically racial and curriculum transformation, and the impact of competing in international ranking regimes (see, for example, Badat, 2016; du Preez, Simmonds & Verhoef, 2016; Ndlovu-Gatsheni, 2018).

When this chapter was conceptualised in 2017/2018, the notion that a pandemic caused by a microscopic virus would change and interrupt many dimensions of our lives, particularly education, was almost unthinkable. No one could not have foreseen or predicted the turmoil for education that unfolded during this study as the provision of educational opportunities globally were severely disrupted (e.g., Bozkurt et al.,2020). While many believed that the pandemic would be a great equaliser, the opposite happened, with intergenerational and structural inequalities being worsened (Belluigi et al., 2020). For example, Dube (2020) shares evidence of how COVID-19 deepened the digital divide, especially in rural South Africa where educators and learners alike were at a loss how to negotiate, afford and use various technologies, including low-technology solutions. The challenges faced by rural learners included the absence of network coverage, the closure of internet cafes, the lack of computer skills by some educators, and the cost of connectivity. As the pandemic is still far from over in the South African context, its impact on South African education will be felt for many years to come, as issues of lack of infrastructure crudely illustrated the continuing impact of the legacy of colonialism and apartheid.

Though it falls outside the scope of this country study, it is important to note that access to educational resources is part and should be part of the need for epistemic freedom and epistemic justice as proposed by Ndlovu-Gatsheni

(2018) and others. Against the need for epistemic justice, the sharing of educational resources (ER) and/or Open Educational Resources (OER) are two distinct but overlapping phenomena and practices. For the sake of this country study, we will use the abbreviation of (O)ER, and in line with the broader project, to explore and map digital infrastructures for the dissemination of both forms.

While there has been an increasing interest in OER "as a means of addressing key challenges in education and research… [m]ost OER research has, however, taken place in countries in the Global North" (Arinto, Hodgkinson-Williams, King, Cartmill & Willmers, 2017, p. 5). In this country study it is therefore important to situate South Africa in the context of the broader notion of the Global South with its "notable disparities in the level of access to the physical infrastructure and inputs needed for education (such as computer labs, classroom space and textbooks) as well as access to an enabling environment for educational innovation (such as policy and technical support) (Arinto, Hodgkinson-Williams, King, Cartmill & Willmers, 2017, p. 6). There is a real risk that digital interventions, such as foreseen by this project, may not ameliorate but reinforce these inequalities. In South Africa, as in the broader context of the Global South, access to (O)ER "is often exacerbated along spatial, gender and class lines" (Arinto, Hodgkinson-Williams, King, Cartmill & Willmers, 2017, p. 7).

The notion of 'open' in the nexus of (O)ER and digital infrastructure in the Global South therefore "hides a reef of complexity" (Hodgkinson-Williams & Gray, 2009, p. 101).

Three important considerations are of essence in this country study:

Firstly, the educational landscape in South Africa cannot be understood without accounting for and recognising the massive impact colonialism and apartheid had on society, and on education in particular. Education, and educational resources were an integral part of the colonial and apartheid imaginary and ideologies and were used to not only sustain these imaginaries but also to perpetuate them. These imaginaries and ideologies flowed from but also sustained and perpetuated particular epistemologies and ontologies. Knowledge – what counted as knowledge, what types of knowledge and whose knowledges were allowed to be (re)produced and disseminated – as informed and sustained by the colonial/modern imaginary. Education has been used through many years to sustain and perpetuate inequality through two main mechanisms, namely exploitation and opportunity hoarding (Tilly, 1999). Not only is education a valuable resource that "powerful, connected people command" but also a resource from which they "draw significantly increased returns by coordinating the effort of outsiders whom they exclude from the full value added by that effort" (Tilly, 1999, p. 10). Opportunity hoarding "operates when members of a categorically bounded network acquire access to a resource that is valuable, renewable, subject to monopoly, supportive of network activities, and enhanced by the network's modus operandi" (Tilly, 1999, p. 10). In Tilly's (1999) exploration of some 'future inequalities' he suggested that "educational institutions [will continue to] exercise greater and greater influence on the sorting of people into categories and hence into the receipt of differential rewards", and that exploitation may decrease but that opportunity hoarding will increase with "small, segregated camps of hoarders emerg[ing]" (p. 242)

Secondly, education has always been and continues to be ideological and value-laden (Apple, 2017; Bernstein, 2015). (O)ER are no exception. Hall (2011), for example, proposes that we should see OER in terms of and as a form of cultural oppression. We cannot disentangle OER from political and ideological influences and contexts. In line with understanding (O)ER as ideological, we need to understand (O)ER also as a "knot of social, political, economic and cultural agendas that is riddled with complications, contradictions and conflicts" (Selwyn, 2014, p. 6).

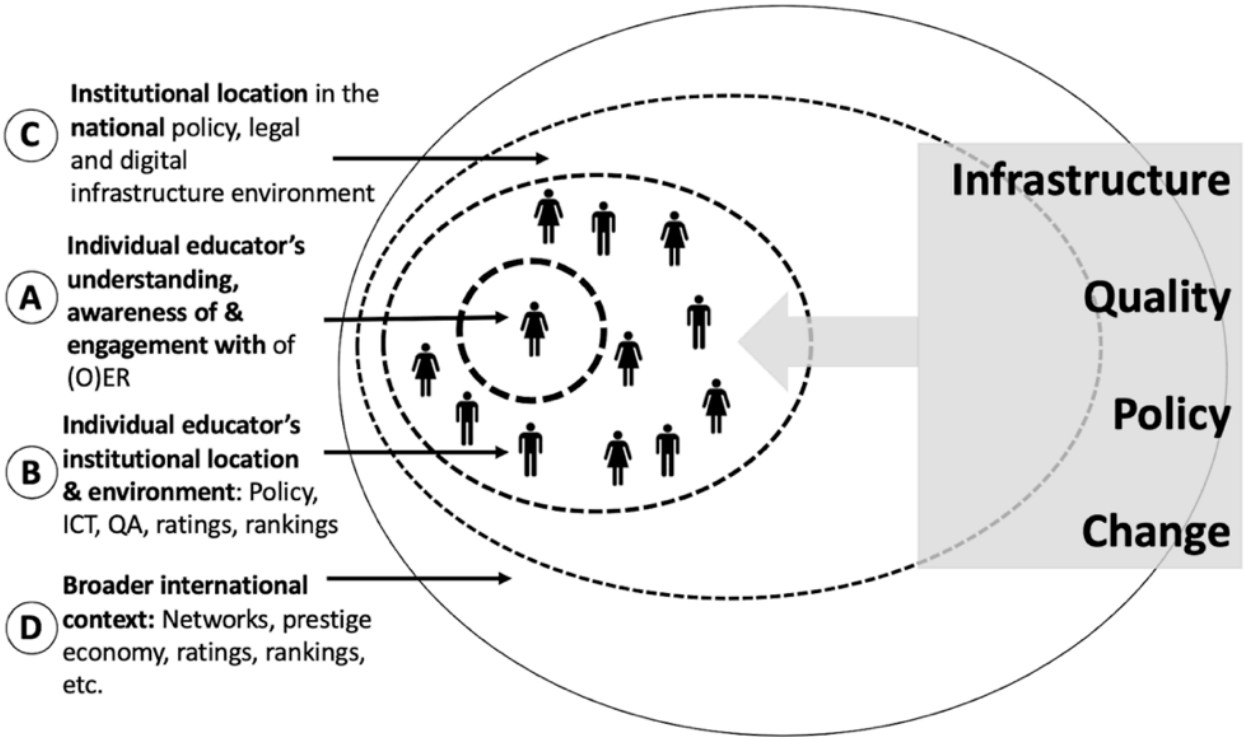
Thirdly, we cannot (and should not) expect of education or specifically (O)ER to address the vast inequality and disparities in South African (higher) education, on its own. Apple (2010) states that most of the hype and promises on the potential of (higher) education to make a dent in the inequalities and injustices, pretend as if education as institution and practice exist in a 'vacuum'. "The naïveté of these positions is not only ahistorical; but it also acts as a conceptual block that prevents us from focusing on the real social, ideological, and economic conditions to which education has a dialectical and profoundly intricate set of connections" (pp. 7-8). We need to see education, and the rhetoric of broadening access as connected and embedded in "relations of exploitation and domination – and to struggles against such relations – in the larger society" (Apple, 2010, p. 15). In a keynote in 2015 in South Africa, Tressie McMillan Cottom

pointed to the fact that if you "expand education in an unequal society without a redistribution of resources, you will [merely] reproduce inequality." Without the dedicated and intentional redistribution of resources and allocation of funding to support and widen access to quality higher education, "we create a situation where for-profit colleges and venture capitalists move in to "fix" education" (Prinsloo, 2015). This may result in a "two-tier system where the most disadvantaged students pay the most for the least quality education" (McMillan Cottom, 2015 in Prinsloo, 2015b). Commenting on the transformative potential of ICTs in/for South African higher education, Czerniewicz, Ravjee and Mlitwa (2007) wrote "It is possible to argue that changes arising from the innovative use of ICTs are dependent both on the broader socio-economic and political contexts, and on the local institutional struggles and strategies around the distribution of resources as well as the relational aspects of redressing historical inequities in educational institutions" (p. 68).

Figure 1 (below) illustrates our understanding of individual and institutional perceptions, (re)use and production of (O)ER in the context of South Africa. In the middle (A) we have the individual's perceptions, (re)use and production of (O)ER. Evidence suggests that "Personal motivation, especially the desire to enhance one's reputation, underpins some educators' practice of creating and sharing teaching materials as OER", as well as feelings of "personal fulfilment and confidence" and educators seeing their participation in (O)ER as "a way of asserting an epistemic stance, or one's own unique (individual or collective) perspective of knowledge" (Hodgkinson-Williams, Arinto, Cartmill & King, 2017, p. 586). [In the conclusion to this chapter, we revisit this figure in the light of the macro, meso and micro-analyses].

Figure 1

An overview of the case of open learning resources in distributed learning infrastructures in South Africa.



There is also evidence that in the context of South African universities, individuals' understanding, awareness of, and engagement with (O)ER are also shaped, and in many ways determined by their institutional location (e.g. role, department, discipline) and institutional environment (the character, values and mission and vision of the institution) (Point B). The institutional environment (Point B) is also constituted by (digital) infrastructure, quality assurance regimes and processes, policy and change. As we will see in the analysis below, the institutional environment also embodies and perpetuates particular understandings of Intellectual Property (IP), scholarly quality and gravitas, or the academic prestige economy (Ball, 2000; Blackmore 2016; Morley 2016). The institution (Point C), while having its own

unique characteristics, processes and values, is, however, embedded in a national policy and legislative context (e.g. copyright) and (digital) infrastructure. We also cannot, and should not, ignore or underestimate how the broader international context (Point D) with its networks of inclusion and exclusion, asymmetries in knowledge production, the prestige economy, ratings and rankings impacts on national systems of higher education, individual institutions and individual faculty or staff member in a higher education institution.

The analysis in this chapter follows the following sequence: the analysis moves from macro, meso to micro level and concludes with illustrating how individual (O)ER practices are entangled in institutional policies, and the broader international context and how these responses (on both individual and institutional levels) are shaped by infrastructure, quality, policy and change. The pandemic has also illustrated how (O)ER are impacted by macro-societal factors whether environmental, social, technological, political, economically and/or legally.

1.1 A brief note on the methodology used

At the inception of this study, the researchers did a desktop study on publicly available institutional documents, conducted a literature research on (O)ER in South Africa and contacted several individual South African researchers who published in the field. We acknowledge respondents at the end of this chapter.

2. Macro level

2.1 OER Infrastructure

From the analysis of the policy and regulatory environment as well as feedback from the respondents it is clear that there is, at present, no national repository, or indeed, plans to establish a national repository with the subsequent infrastructure. Respondents were unanimous in stating that a national repository could potentially be hugely valuable to raise the profile of OERs across HE and to the public. It was suggested that such a repository and its infrastructure could have materials from multiple institutions (e.g. Open Education Consortium model). A repository could be designed to share resources from academics and clustered not only around disciplines but also levels of study. For example, a web tab for students leaving High school, first years, post graduates etc.

With regard to the technological and technical set-up behind it (meta data standards, host servers etc.) and how such a national infrastructure underpinning a repository is maintained, evidence suggests that new open source platforms are being developed for open repositories. One respondent suggested that a national repository could potentially be built in something like Drupal. Hosting and maintenance are important considerations and it would be preferable if such a repository will not be hosted by any individual institution but rather by government (e.g. DHET) or other organisations.

The following elements such as copyright, funding and public and commercial collaboration will illuminate some aspects of an emerging infrastructure.

Copyright

South Africa's maturity and infrastructures pertaining to (O)ER "revolves around the Copyright Act of 1978" (ROER4D, 2017, p. 4). "This implies that all educational resources produced by school educators belong to their employers (i.e. provincial departments of education, school governing boards or private institutional management) and, in the case of college or university educators, to their HEIs" (ROER4D, 2017, p. 4). This is of importance with regard to understanding two potential producers of (O)ER, namely educators as users and as creators, and the institutions as copyright holders. Having said that, it is also crucial to note that "[w]hile national legislation and the relevant education departments play an important role in enabling or constraining OER activity, South African HEIs can set their own IP regulations, which can further influence OER opportunities" (ROER4D, 2017, p. 4). At the time of its publication, ROER4D (2017) reports that 20 out of 25 universities have IP policies that align with the Copyright Act meaning that the IP of the works produced by academics vest in the affiliate institution. In the light of increasing competition (Bleiklie, 2018), it is therefore unlikely that universities may have "any strategic intent to openly share these resources" (ROER4D, 2017, p. 4). One exemption in the context of the higher education institutional landscape is the University of Cape Town (UCT) who "'automatically

assigns' copyright to the authors, allowing them to relicense their teaching materials and share them as OER" (ROER4D, 2017, p. 5).

In the case of UCT, the institution automatically assigns to the author(s) the copyright, unless UCT has assigned ownership to a third party in terms of a research contract, in: scholarly and literary publications; paintings, sculptures, drawings, graphics and photographs produced as an art form; recordings of musical performances and musical compositions; course materials, with the provision that UCT retains a perpetual, royalty-free, nonexclusive licence to use, copy and adapt such materials within UCT for the purposes of teaching and or research; and film (UCT, 2011).

Funding

Goodier (2017) reports on an investigation pertaining to the allocation and use of public funding through the South African National Treasury dedicated and channelled specifically to OER. "In South Africa, education expenditure has been on the increase for decades, from ZAR 31.1 billion in 1995, to ZAR 59.6 billion in 2002, and to ZAR 105.5 billion in 2007 (OECD, 2008)" (Goodier, 2017, p. 235). In this context, learning and teaching materials are highly-valued and often costly resources. In general, learning and teaching support materials (LTSM) "range from teacher and learner created resources to commercially produced classroom resources such as wall charts, workbooks, textbooks, e-books, readers, stationery, science kits, dictionaries, encyclopaedias, etc." (DBE, 2014, p.3). Goodier (2017) mentions that despite austerity that has seen the decrease in funding on public education, an increase in funding for LTSM "has been seen as a valid strategy" (p. 236). There is also evidence that "LTSM (including textbooks) form a large part of the South African publishing industry's print output, with the government as one of its largest consumers (PASA, 2004)" (Goodier, 2017, p. 242).

Public and commercial collaboration

Goodier (2017) mentions an education technology company and OER publisher, Siyavula, who is dedicated to making open textbooks and other materials available for all school grades in South Africa. Siyavula is in a successful partnership with the Department of Basic Education (DBE) who reviews and endorses the materials produced by Siyavula released under Creative Commons licences and "are free for users to print and adapt as needed, depending on the licence chosen" (Goodier, 2017, p. 242). With regard to the collaboration model/agreement between Siyavula and the South African government, Goodier (2017) writes "Siyavula produces textbooks as OER through a sponsorship model where a sponsor signs on to fund production costs in exchange for advertising in the books, which is one of the factors that makes the books cheaper for the government" (p. 243).

Evidence of a growing attention to digital resources and access platforms is found in, for example, the digital education initiatives of two of the seven provinces in South Africa, namely Gauteng and Western Cape (Goodier, 2017). "Having resources available on these platforms explicitly under an open licence would help to facilitate adoption and use as well as potentially reduce costs over time" (Goodier, 2017, p. 245).

Also see Kwet (2019) for a critical discussion on the increasing commercialisation of South African education's foray into digital and elearning and the worrying role of Silicon Valley in this regard.

2.2 Quality of OER

There are no national quality standards for (O)ER. However, there are quality criteria developed specifically for distance education (see, for example, Welch & Reed, n.d.) and these are being revised to include open education practices.

The relationship between (O)ER with quality can be understood in terms of three aspects, namely, (1) to what extent can (O)ER improve the quality of learning materials; (2) how (O)ER can improve the quality of teaching practices; (3) and how OER can influence student outcomes. There is evidence that (O)ER has the potential to improve the quality of education (e.g. Kanwar, Kodhandaraman & Umar, 2010), but its potential is linked to the quality of (O)ER which had been the subject of a number of studies (Arinto, Hodgkinson-Williams, King, Cartmill & Willmers, 2017).

National standards regarding (O)ER and their creation, dissemination and quality assurance

The Open Learning Policy Framework (DHET, 2017) refers to funding for infrastructure support and quality measures and sustainability of OER. There is not currently a system in place. Institutions where OER are placed in a repository have their own quality assurance. In the case of UCT formal measures are not in place but the repository relies on a pride of authorship model where the author only puts resources out into the open that they believe are valuable and of a high standard. (See the discussion of the Open Learning Policy Framework, DHET, 2017 later in the document).

Who are the actors involved in setting and assuring them?

Respondents indicated that depending on the potential model, there may be different layers of quality assurance. One respondent specifically mentioned "the authors' pride of publication is one step". There is also the issue of the responsibility to ensure that there is no third- party copyright infringement, or, if institutional branding is used, whether its use is in aligned with institutional policy. Of crucial importance to the author's pride and institutional reputation is the need for proof reading and editing that is a fundamental step that could be managed by the host. Assuring the quality of the content would require some peer review which would more than likely deter authors and certainly it would slow the process of publication.

How do they relate and adhere to international elearning standards and specifications?

More than one respondent indicated that the issue of context is of crucial importance and it will have to be ensured that these international standards take into consideration the specificities of the local/national context. Home-grown models need to be developed that correlates with international standards.

2.3 OER Policy

There are, currently, no overarching national policy with regard to digital infrastructures and their implementation in the specific context of (O)ER. As such, the following section focuses on the South African policy environment as it pertains to (O)ER and specifically attends to any mention of digital networks or infrastructure.

Evidence from the policy and regulatory environment is very scarce with regard to (O)ER. The National Education Policy Act (No. 27, 1996) mentions, for example, "achieving the cost-effective use of education resources and sustainable implementation of education services" (p. 7). The Department of Basic Education's (DBE) Action plan 2014 (2011) mentions "Apart from assisting learners, libraries in schools provide an additional resource base that teachers can draw from when preparing lessons" (p. 129; emphasis added). The Draft National Policy for the provision and management of Learning and Teaching Support Material (LTSM) (DBE, 2014) states

> *The process of LTSM development may be undertaken by commercial companies, non-governmental organisations, Open Educational Resource initiatives as well as by internally producing / commissioning the development of LTSM for subjects where necessary, i.e. state publishing. In cases where the DBE commissions the development of material, all intellectual property and reproduction rights shall reside with DBE (p. 12).*

Interestingly, while (O)ER is specifically mentioned, what is more concerning is a seeming contradiction where the copyright of all commissioned materials will reside with the DBE. When materials are obtained from a "single source (provider) for the development of LTSM, the intellectual property rights will remain with the creator (author) and producer, unless the DBE procures the copyrights from the creator" (p. 12). Where CC licenced materials are used, the prevailing licencing regimes will remain in place but when "material is created by a teacher for use in the classroom, the intellectual property shall reside with the particular teacher and/or school" (p. 13).

Of concern is the fact that the 2008 review of South African policies for education does not mention (O)ER once (OECD, 2008). The report (OECD, 2008) mentions that "The curriculum was also heavily reliant on resources, textbooks and

even classroom space, whereas many poor schools were already struggling with few and outdated textbooks and minimal resources" (p. 82). The report furthermore confirms that "In many schools, textbooks are the main – sometimes the only –educational resource" (p. 180).

In the next section we will discuss a number of South African policies and regulatory frameworks and map any reference to, or guiding principles pertaining to (O)ER.

White Paper on Post School Education and Training (DHET, 2014a)

The main policy objectives of the White Paper tie in with the introduction above and address the elements of education and social justice, expanding access, improving quality and increasing diversity, co-operation between education and the workplace and the provision of a single coordinated system. (O)ER are specifically mentioned in the Policy and the Policy provides a broad framework for situating the discussion pertaining to the role and scope of a national infrastructure for (O)ER.

The key elements of the White Paper (DHET, 2014a) are as follows:

- The aim of the paper is to set a framework that provides the focus for post school education in South Africa. The Department of Higher Education and Training (DHET) in South Africa will use this framework to develop their HE plans until the year 2030.
- An emphasis is placed on a diverse range of HE institutions for post school education. These include universities, colleges and vocational training centers.
- The importance of partnerships between educational institutions and the workplace is stressed
- The post-school education system should strive to develop political, social and cultural thinking graduates who are able to function effectively, creatively and ethically in a democratic society
- Transformation is one of the key elements of the white paper. Education is seen as a means of addressing the high-income gap in South Africa, as well as poverty and inequality. It strives to do so through building a non-racial and non-sexist post school education system.
- The paper also addresses the concept of differentiation in order to meet a range of social, economic and educational requirements
- A target of 25% university enrollment of the population of South Africa should be achieved by 2030 (up from the current rate of 17.3%)

Universities are seen as the main provider for high-level educational skills for the labour market in South Africa and are the dominant producers of new knowledge. The White Paper focuses on growing research and innovation, particularly in areas that have been identified as important for national development. In addition, the universities are mandated with strengthening social justice and democracy in order to overcome the inequities that were inherited from the apartheid government.

Despite very significant growth, South Africa still has a post-school education and training system that does not offer sufficient places to the many youth and adults seeking education and training. Expansion is needed, both in terms of numbers of available places, and the types of education and training that are available. There should be greater differentiation and diversity among our institutions in order to provide for the wide variety of need of both students and employers" (DHET, 2014a, p. 2).

The White Paper (DHET, 2014a) also makes mention of the role of DE as well as Open earning (OL) and these elements are formalised in the "Policy for the provision of distance education in South African universities in the context of an integrated post-school system" (DHET, 2014b) which will be discussed below. Outside of the UNESCO definition of OER, as referred to at the start of the document, the Policy mentions OER in the context of "building an expanded, effective and integrated post-school system" (DHET, 2014a).

The previous White Paper on Education and Training (DE,1995) introduced the concept of open learning, which it defined as follows: "Open learning is an approach which combines the principles of learner centeredness, lifelong

learning, flexibility of learning provision, the removal of barriers to access learning, the recognition for credit of prior learning experience, the provision of learner support, the construction of learning programmes in the expectation that learners can succeed, and the maintenance of rigorous quality assurance over the design of learning materials and support systems" (DE, 1995, p. 24).

The White Paper (DHET, 2014a) mentions that digital technology should be used to enhance access to learning materials and to optimise student engagement and that collaborative development should be employed to develop these high-quality learning materials as OER. "The DHET will support efforts that invest a larger proportion of total expenditure in the design and development of high-quality learning resources, as a strategy for increasing and assuring the quality of provision across the entire post-school system. These resources should be made freely available as open resources. This would be in line with a growing international movement, supported heavily by organisations such as UNESCO and the Commonwealth of Learning, which advocate the development of open education resources. Key motivations for OER are the potential improvements in quality and reductions in cost" (DHET, 2014a, p. 13).

Of specific interest in this country study, is the fact that OER is mentioned in the context of establishing a "network of education providers supported by learning support centre and/or connectivity for students" (p. xv). One of the advantages of such a network of providers will be

> *…the development and availability of well-researched, high-quality national learning resources (made available as open education resources [OER]1), collaborative development of learning resources, more efficient use of existing infrastructure, and an increasing emphasis on independent study as preparation for subsequent lifelong learning (DHET, 2014a, p. xv).*

OER is furthermore an integral part of achieving the goal of "attaining meaningful post-schooling [that] must be supported by the development and sharing of well-designed, quality learning resources that build on the expertise and experience of top-quality scholars and educators" (p. 54). The White Paper (DHET, 2014a) states that "The advent of the OER movement with open licensing of content provides a framework for such engagement" (p. 54). As such the DHET will "invest a larger proportion of total expenditure in the design and development of high-quality learning resources, as a strategy for increasing and assuring the quality of provision across the entire post-school system. These resources should be made freely available as open resources" (p. 54; emphasis added).

Of particular importance is the commitment of the DHET to

- Provide support for the production and sharing of learning materials as open education resources at institutions in the post-school sector. In particular, all material developed by SAIVCET will be made available as OER. Other potentially successful initiatives in the area of OER across the post-school education and training sector will be supported.
- Develop an appropriate open licensing framework for use by all education stakeholders, within an overarching policy framework on intellectual property rights and copyright in the post-school sector. In particular, the policy framework will seek to address the dissemination, adaptation and usage of education resources developed using public funds.
- Acquire electronic resources through the South African National Library and Information Consortium (SANLIC) for the entire sector, to ensure equal access to learning material and information resources.
- Encourage the use of open-source software wherever possible, as well as the purchasing of shared software licences by collective entities such as the South African Technology Network and other consortia that may be created (DHET, 2014a, p. 54; emphasis added).

The White Paper (DHET 2014a) also emphasises two specific aspects of OER namely that it should be well-researched and of high quality (DHET, 2014a, p. xv), as well as the use of ICTs for teaching purposes, "including open learning resources" (p. 22).

With regard to the provision of technology and a technology infrastructure to realise its aspiration to "building an expanded, effective and integrated post-school system" (DHET, 2014a), the White Paper mentions the provision of "up-

to-date information technology capacity for conducting … management and academic functions" (p. 19). Central to the White Paper (DHET, 2014a) is the notion of "equitable access to appropriate technology" as "an indispensable infrastructural component for effective education provision, and … central to the notion of opening learning opportunities in the post-schooling sector" (p. 53).

The White Paper (2014a) commits the government to improve ICT access by:

- developing an integrated ICT plan that will provide strategic direction to the DHET for the improvement of equitable access to and use of appropriate technology across the post-school education and training system;
- prioritising collaboration with the Department of Communications and other government departments and stakeholders to facilitate increased bandwidth and reduced costs for educational purposes, with particular emphasis on reaching those in more remote areas;
- engaging with stakeholders to negotiate easier access to and reduced costs for Internet-enabled devices;
- bidding for funds to ensure that a comprehensive, enabling ICT infrastructure is put in place for all providers of post-schooling, particularly providers of distance higher education;
- facilitating the shared establishment and management of ICT-enabled, networked learning support centres in areas where home-based provision is likely to be difficult in the short to medium term (DHET, 2014a, p. 53).

The White Paper (DHET, 2014a) furthermore sets out the vision of a transformed post-school system which is integral to the government's stance on policies that ensure economic and social improvement for all South Africans, in order to redress the legacy of apartheid and overcome the injustices and inequities of colonialism and apartheid. In summary, the White Paper (DHET, 2014a) commits itself to the following:

- "Digital technology, and therefore e-learning, has become more accessible in South Africa" and therefore needs to be incorporated into educational provision (DHET, 2014a, p. 49).
- "Digital technology should be used where appropriate to enhance access, improve communication and generally optimise student engagement" (DHET, 2014a, p. 50).
- The development and availability of well-researched, high-quality national learning resources (made available as open education resources).
- The definition of OER's that is used is the one provided by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) referring to OER as "educational resources that are openly available for use by educators and students, without an accompanying need to pay royalties or licence fees" (UNESCO and Commonwealth of Learning, A Basic Guide to Open Educational Resources (2011: 5).
- Due to improved technology infrastructure, the development and availability of well-researched OER's will enhance the learning opportunities of students.

Policy for the provision of distance education in South African universities in the context of an integrated post-school system (DHET, 2014b)

The Policy for the provision of distance education in South African universities in the context of an integrated post-school system (DHET, 2014b) needs to be read in conjunction with the White Paper on Post School Education and Training (2014a). The Policy (DHET, 2014b) focuses mainly on university education and "is part of a broader focus on building the capacity of the post schooling system" and "Since the current infrastructure within the South African university sector cannot accommodate the needed expansion, distance education would make a significant contribution to the required growth in the sector" (p. 3). In the White Paper (DHET, 2014a) the target university student numbers were set at to increase from 17.3% to 25% of the South African population. In order to allow for the increased number of students, DE Is seen to make a significant contribution to this required growth. In addition, DE is important to address the affordability issues of university education. According to this policy DE is a distinct subset of education provision because it has the potential to:

1. “Open access to post-schooling education opportunities for those who cannot or who chooses not to attend traditional campus-based provision.
2. Lower costs per student by amortising curriculum design, materials development and some teaching costs across larger numbers of students and by obviating the need for continuing investment in physical infrastructure” (2014b, p. 6).

Therefore, this policy has as its central theme the notion of a triple challenge: greater access for students, turning access into success and finally, affordability. One of the key provisions of the policy is to promote the development and use of Open Educational Resources (OER’s). One of the issues that is stated as being most important in the provision of DE is the collaborative development of shares high quality learning programs and resources using OER’s. This will be done through improved access to and use of appropriate technology and the provision of technological infrastructure.

The Policy (DHET 2014b) notes that “High quality learning resources are integral to high quality distance education and a growing reliance on resource-based learning among universities generally is noted” (p. 14). The Policy (DHET 2014b) also confirms the position that

> *… DHET will pursue the adoption or adaptation, in accordance with national needs, of an appropriate Open Licensing Framework, such as the Creative Commons, foruse by all university stakeholders, within an overarching policy framework on intellectual property rights and copyright in university education. In particular, in line with the Unesco Paris Declaration on OER of 2012, learning resources developed partly or wholly using public funds administered by the DHET will be published under an open licence that encourages their use and adaptation for re-use (p. 16).*

Two other aspects worth mentioning is the fact that Teaching Development Grants will also be “utilised to encourage collaborative development and use of OERs” (DHET, 2014b, p. 16), and that the Policy (DHET, 2014b) allows for the sharing of OERs with other countries “especially when these are released under an open licence that permits adaptation” (p. 17).

DHET Call for Comments on the Open Learning Policy Framework for Post-School Education and Training (2017)

This Framework (DHET, 2017) sets out the strategic intent of the DHET in steering the post-school education system towards increasing access, improving quality cost-effectively through the concept of Open Learning. It is important to note that the Framework (DHET, 2017) “The DHET does not view open learning as the only solution for the many challenges in the post-school sector in South Africa” but introducing “open learning practices as one practical way of addressing crucial issues of widening access to affordable, quality learning opportunities: (p. 366).

The Framework (DHET, 2017) defines OER as

> *Any educational resources (including curriculum maps, course materials, textbooks, streaming videos, multimedia applications, podcasts, and any other materials that have been designed for use in teaching and learning) that are published under an open licence and are available for use without an accompanying need to pay royalties or licence fees. Openly licensed content can be produced in any medium: text, video, audio, or computer-based multimedia (p. 363).*

Its aims are, inter alia, to “provide a framework for building a shared, common post-school education and training (PSET) system, making extensive use of open learning approaches and distance education methodologies” (DHET, 2017, p. 368). The Framework (DHET, 2017) also aim to “identify instruments and mechanisms for steering the PSET system towards increasing access and quality through the incremental adoption of open learning approaches and through appropriate monitoring, evaluation and quality assurance” (p. 368).

Outside of a broad discussion of open learning as it relates to various aspects of curriculum and pedagogy, the first time OER is mentioned is in the context of discussing “cost efficiency”. The Framework (DHET, 2017) states that “Operational and ongoing costs may be kept low, both through economies of scale (in cases where enrolment numbers

are substantial and expenditure on additional physical infrastructure is unnecessary or limited) and by making use of open education resources (OER) and open licensing" (p. 374). Interestingly, the Framework (DHET, 2017) states that the "motive of cost efficiency" should be viewed in context and that "Cost-benefit ratios and economies of scale in open learning are complex rather than absolute, and should not be taken for granted" (p. 374). The Framework (DHET, 2017) recognises that "putting in place expensive technological infrastructure, and the need for collaboration in developing the high-quality courses and learning materials which produce not only deeper and more satisfying learning, but also higher success rates, usually result in considerably higher levels of initial expenditure than more traditional approaches" (p.374) but that this expenditure may decrease over time in cases of large-enrolment courses considering the incremental effect of economies of scale.

The Framework (DHET, 2017) acknowledges the proliferation of OER, open education licencing policies and OER repositories "in both school and post-school education and training, often driven by public policy and facilitated by the extensive use of ICT in materials development" (p. 375). As such it commits itself to "building a network of educational institutions supported by learning support centres and appropriate technology, collaborating in the development of learning materials, and committing to the development and use of OER" (p. 378). Interestingly, the Framework (DHET, 2017) discusses "open licencing" separate from, but in the context of its discussions on OER. It states that "Open Licences have been developed to ensure that copying and sharing happen within a structured legal framework that is more flexible than the traditional 'all rights reserved' status of copyright. This allows for more flexible use, re-use and adaptation of materials for local contexts and learning environments, while still allowing authors to have their work acknowledged" (DHET, 2017, p. 396).

The DHET (2017) also commits itself to raising awareness pertaining to a number of key OER issues that include

> *…writing up and sharing case studies of good practice to support implementation efforts, assisting stakeholders to understand issues around Intellectual Property Rights (IPR), open licencing, quality in OER, and how IPR are being challenged and reshaped by the rapid digitisation and online sharing of information and resources (p. 397).*

Part of the DHET's (2017) commitment include "the development of OER as one of the priorities for recognising staff excellence in PSET institutions" and supporting "the sustainable development and sharing of quality learning and teaching materials" (p. 397).

Policy on Free and Open Source Software Use for South African Government (2006)

This Policy (South African Government, 2006) states that all new software that is developed by and for the South African government will be based on open standards. This will include learning materials for higher education developed by employees of government institutions (universities and TVETs). All content developed using government resources will be made open content. To this end all staff and student's work that is published in the course of their work or studies should carry a copyright.

South Africa Connect – South Africa's Broadband Policy (Republic of South Africa, RSA, 2013)

This national broadband policy and its associated strategy aims to provide a roadmap for achieving affordable broadband access to all South Africans. It presents a model for the development of an open access broadband network. The underlying concept is that evidence indicates that an increase in broadband penetration is correlated with an increase in the Gross Domestic Product (GDP). The Policy (RSA, 2013) also states that access to broadband enables flexible, pen learning environments.

The Policy (RSA, 2013) refers to the National Development Plan (2012, in RSA, 2013, p. 5) which foresees an

> *… ecosystem of digital networks, services, applications, content and devices, will be firmly integrated into the economic and social fabric of the country. Together, these broadband elements provide an enabling*

> *platform for economic enterprise, active citizenship and social engagement and innovation. It will connect public administration to the active citizen; promote economic growth, development and competitiveness; drive the creation of decent work; underpin nation-building and strengthen social cohesion; and support local, national and regional integration.*

As such the Policy (RSA, 2013) addresses four key variables that need to be addressed to ensure a link between economic growth and broadband namely:

- broadband must reach a critical mass of South Africans;
- access to broadband must be affordable;
- demand-side skills must be developed so broadband services can be used effectively; and
- supply-side skills must be developed so that the economic and innovative potential of broadband can be exploited (p. 6).

Four aspects are addressed namely "digital readiness" (p. 7), "digital development" (p. 8), "digital future" (p. 8), and "digital opportunity" (p. 9). With regard to "digital readiness", the Policy (RSA, 2013) speaks on the importance of removing bottlenecks, and an "autonomous, accountable and well-resourced regulator" (p. 7).

The overall goal of the Policy (RSA, 2013) is "to achieve a universal average download speed of 100 mbps by 2030" (p. 11). In reflecting on this Policy, Katz (2013) commented that if the broadband targets are achieved through an investment of R65 billion, over R130 billion would be added to the GDP of South Africa. One of the targets of the policy is that 50% of all schools must have broadband at a speed of 5 Mbps and by 2020 this figure should be 100% of schools with broadband at 10 Mbps.

E-Education Policy 2004 and Operation Phakisa (OPE) 2015

The White Paper on e-Education (RSA, 2004), set some of the core goals for e-education in South Africa and emphasised a shift from traditional 'bricks and mortar' learning institutions to a collaborative, personalise system, embracing the use of digital technologies. The Policy (RSA, 2004) stated that "It is no use having state-of-the-art technology unless it can be sustained" (p. 10), and that deployment of ICTs does not, per se, "guarantee their efficient utilisation" (p. 11). The Policy (RSA, 2004) foregrounds the issue of equity as a key criteria for the deployment and use of technology in South African schools.

The SA Broadband policy (RSA, 2013; discussed above) set targets for 50% of all school to have access to broadband at 5MBps. In 2015, the Department of Basic Education (DBE) realised that this target was not going to be achieved and thus Operation Phakisa in Education (OPE) (2015) was put forward.

OPE was developed to fast track digital technology for the transformation of public education and aims to digitise all schools and the entire South African society. The White Paper on e-Education (RSA, 2004) envisaged that all learners should have become computer literate by 2013. This was not achieved and thus the launch of OPE in 2015 in partnership with the big players in the industry – Google and Microsoft. See Kwet (2019) for a critical overview of not only OPE but the increasing engagement of Silicon Valley in South African education.

Copy Right Amendment Bill (Republic of South Africa, 2017)

The Copyright Reform Bill is being considered currently in South Africa. This new law (still under consideration) will dramatically redefine the notion of 'fair use' and impact on the promotion and use of OER. Commenting on the draft bill, Gray and Oriakhogba (2019) state that "The new educational right combined with the proposed adoption of a fair use policy will make clear that open education resource producers have a green light to produce the best possible materials". For an overview of the Bill's origins and processes, see Nicholson (2019). There has also been, and continue to be fierce criticism against the Bill, see for example, Mostert (2017).

Summary

In summary, the South African government has developed and published policy documents on the transformation of the HE sector, ranging from post-school education, distance education and open learning. The main thrust of all the policy documents is to redress the inequalities in education brought about by the apartheid government, and their focus is on providing education for the purpose of employment for its citizens. The policies refer to improved technological infrastructure in order to support online learning and the use of OER's. However, there is currently no policy on OER's – only the Open Learning Policy Framework (RSA, 2017) that promotes the concept of OER's. Many of the policies are forward thinking but will need to rely on the efficient implementation, particularly of technological infrastructure, to support these ideals.

Which actors are involved?

As can be seen in the above analysis of the South African policy and regulatory environment, there is a clear understanding that the government will not be able to address the various challenges on its own and is open for and will actively seek engagement from civil society and the corporate world. It is however important to heed the warnings of Kwet (2019) and others of the increasing interest and influence of venture capital and commercial entities to offer solutions at a price.

2.4 OER Change

How is change (in terms of funding, managing and promoting the infrastructure) promoted on the national level?

Change in terms of driving an open philosophy in education as foreseen by various policies and frameworks has not yet materialised. The Open Learning Policy Framework for Post-School Education and Training (DHET, 2017), however, stipulates clear guidelines and a vision based on open learning principles. Currently, much of the change happens at individual institution-level, for example at institutions such as UCT and Unisa.

Who drives change on this level (universities, governments, commercial entities…)?

Once again it is clear from the preceding discussion on the national policy and regulatory framework that the government has put in place a number of guidelines and frameworks to steer change. As stated above, most of the current change, however, happens at individual institutional-level. Also see the comments about the warnings issue by Kwet (2019) regarding the role of venture capital and specifically Silicon Valley. Also see Hoosen and Butcher (2019).

A leitmotif running throughout this country study is, firstly, a recognition of the immense legacy and continued impact and structural inequalities arising from colonialism and apartheid. Whether in referring to digital infrastructure and who has access, who is included and who continues to be excluded without recognising apartheid's legacy, will not understand the potential and desperate need for (O)ER. Another leitmotif is a concerted policy-focus on addressing the legacy of apartheid but also preparing our students for a digitally connected world. As such there is ample recognition of the role of open learning and specifically (O)ER.

Having recognised the support for and various initiatives from government to increase access and to support the development and dissemination of educational resources with open licencing, much of this still need to be realised. There is, however, ample evidence of individual institutions such as UCT, and to a much smaller extent Unisa, who have embraced and foreground (O)ER.

3. Meso Level

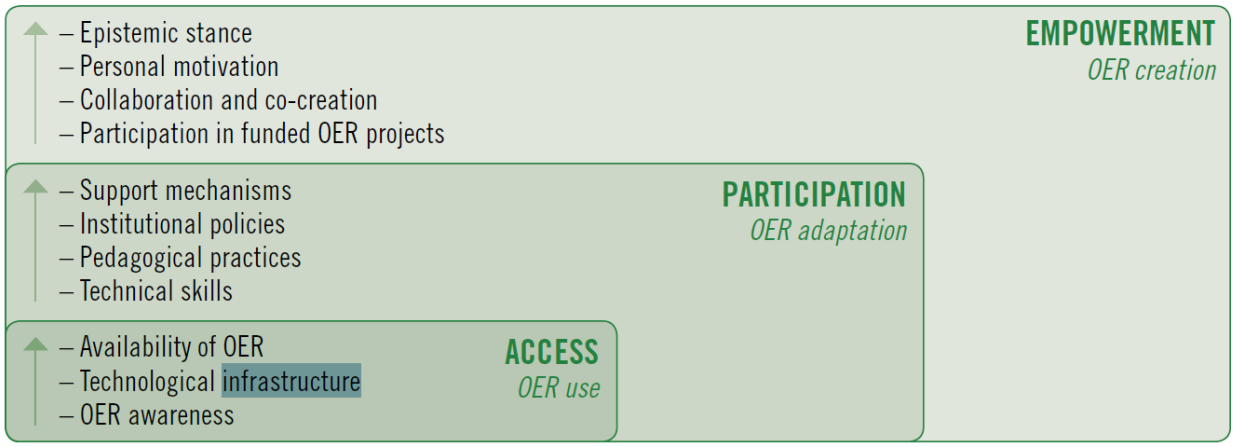
"Information and communication technologies (ICTs) provide a range of opportunities to share educational materials and processes in ways that are not yet fully understood" (Hodgkinson-Williams & Gray, 2009, p. 101).

3.1 Framing institutional responses in the nexus of (digital) infrastructure and (O)ER

In the context of the Global South, disparities in the level of access to physical and digital infrastructures impact immensely on educational innovation (Arinto et al., 2017). "Rural communities generally have poorer physical infrastructure and internet connectivity" (Arinto et al, 2017, p. 7). It is also concerning that "improving access to it through infrastructure, repositories and software tools has not resulted in the predicted increase in use, due largely to the lack of attention to practices supporting OER uptake, use and reuse" (Arinto et al, 2017, p. 10). Together with the availability of OER, awareness, an appropriate technological infrastructure is crucial in ensuring access to OER which, in turn, influences participation in OER and empowerment through OER creation (Figure 2 below)

Figure 2

Levels of social inclusion through OER use, adaptation and creation, with the structural, cultural and agential factors that impact on each type of OER engagement (Arinto, Hodgkinson-Williams & Trotter, 2017, p. 587)



The link between the deployment of OER and digital infrastructure is "one of the most challenging questions that has emerged in the literature concerns how the deployment of OER – as a largely digital innovation – may in fact reinforce global, regional and national economic and social inequalities through a 'digital divide'" (de Oliveira Neto, Pete, Daryono & Cartmill, 2017, p. 71). While there is no doubt that the internet and digital technologies have impacted dramatically on society, as well as the production and dissemination of knowledge, it is crucial to understand that in many respects, the benefits of increased access to the internet is not evenly distributed (PewResearch, 2016; World Bank, 2016). We have to consider evidence that with the growing access to

> *...the internet and to wireless communication, abysmal inequality in broadband access and educational gaps in the ability to operate a digital culture tend to reproduce and amplify the class, race, age, and gender structures of social domination between countries and within countries (Castells, 2009, p. 57; emphasis added)*

It is therefore important to note Castells' concern that networks not only include, but also exclude, and "the cost of exclusion from networks increases faster than the benefits of inclusion in the networks" (p. 42). Central and agentic to being included or excluded is the issue of (digital) infrastructure. In their study on" Adoption and impact of OER in the Global South", Hodgkinson-Williams and Arinto (2017), define 'structure' to

> *… denote relatively enduring relations among human actors, the social positions they occupy, and things made by humans. These can include infrastructure, such as power supply, hardware, software, connectivity and information and communication technologies (ICT); the availability of OER in various repositories and portals as well as support of OEP on collaborative platforms; open licensing (such as*

> *CC); government or institutional policies, strategies, programmes and procedures; and funding from donors, governments and/or institutions. Structure also refers to the socioeconomic and geographic context in which students and educators are located (p. 34).*

In the context of this analysis, it is therefore crucial that we note that though (digital) infrastructure plays an important role in the adoption, production, use and dissemination of OER, it is part of a broader structural context including policies, funding and culture. While it is taken for granted that "Educators and students require access to particular infrastructure to adopt digital OER" we often forget that "A prerequisite for accessing digital OER is some form of power supply. In the Global South, access to uninterrupted electricity cannot be taken for granted" (Hodgkinson-Williams & Arinto, 2017, p. 37).

Amid the variables impacting on OER development, use and adaptation in the Global South, infrastructure, and specifically digital infrastructure plays a crucial role. In the research done by de Oliveira Neto et al, 2017), they identified the following variables in determining the adoption, development and use of OER by instructors in terms of digital infrastructure - location of internet access, devices to access the internet, and internet cost, speed and stability. Regarding the role of 'location of internet access'. They've found that use of OER does "not appear to be highly influenced by the types of locations that respondents use to access the internet" (p. 94). Instructors that are employed by an HEI, access to the internet was not a defining feature of whether they use OER or not" (p. 94). The devices used by the instructors also were not found to have a significant impact on the use of OER. Neither internet cost, speed not stability of internet provision plays a significant role in instructors' adoption of OER. "The reason for this is that they worked or studied in contexts that provided at least the minimum level of ICT access for them to engage with OER. Once that condition was met, infrastructure issues no longer acted as a defining set of variables for OER use" (de Oliveira Neto et al, 2017, p. 111).

It is crucial to emphasise that the above research points to the role of digital infrastructure in instructors' adoption of OER, but not students' access to OER. Hodgkinson-Williams and Arinto (2017) - "adequate internet access was available only to educators" (p. 38). The impact, especially in the context of Unisa (to be discussed later) is that "all teaching materials must be printable and deliverable by post so that every student gets the same educational experience"; should an academic wish to use OER in their teaching, and that "these resources [can] only be offered as 'additional' or 'optional' materials for the online students" (Cox & Trotter, 2017, p.309). Research also shows that access to digital infrastructure may not be a significant variable in higher education institutions, but it is a huge factor in pre-higher education settings, and also in rural environments (Hodgkinson-Williams et al, 2017).

Hoosen and Butcher (2019) found that in the South African context, there is "no national or institutional policy that mandates that educational materials produced with public funds be openly licensed" (p. 22). They found evidence that there are some higher education policies that are supportive of academics and senior students who want to publish their work at OER, but there is not "the same expectation to publish learning and teaching materials as there is to publish research — which is an income-generating activity for the universities and often for the academics themselves" (p. 22). Another factor to consider is the fact that Section 12 of the South African Copyright Act (98 of 1978) already "allows reproduction of copyrightable materials for educational purposes" (in Hoosen & Butcher, 2019, p. 22). This means that academics are already sanctioned to reuse copyrighted materials for teaching purposes and are "not really required to engage with OER" (Hoosen & Butcher, 2019, p. 22). The proposed Amended Bill will furthermore mandate the "open sharing of publicly funded research" (Hoosen & Butcher, 2019, p. 23).

Hoosen and Butcher (2019) found that the "adoption of OER is increasing at universities where either the institution or individual educators are able to attract funding from international donors and government to support OER initiatives" (p. 33). Examples of such are, the University of Cape Town (UCT)(to be discussed later), where OER initiatives are financially supported from funds in the office of the Vice-Chancellor and institutional seed funding for the development of a MOOC. The UCT's Centre for Innovation in Learning and Teaching (CILT — formerly the Centre for Educational Technology) "has been able to attract donor funding each year from 2007 to date in order to pursue an OER and Open Educational Practices (OEP) agenda" (Hoosen & Butcher, 2019, p. 33). The South African Department of Higher Education and Training (DHET) also supports cross-institutional OER development activities (such as the OER Term

Bank) and has “been able to attract funding from the European Union to fund additional OER projects” (Hoosen & Butcher, 2019, p. 33).

3.2 Mapping the context

Re-visiting the national context

Without duplicating the previous analysis (macro-level), it is important to understand the potential and role of institutions in producing, adapting and using (O)ER and the digital infrastructures that would make this (more) viable, by taking note of the following:

- Since the publication of the previous analysis, South African higher education gained one additional public traditional university bringing the total of state-funded, public tertiary institutions to 26 institutions (including six comprehensive universities, and universities of technology and eight universities of technology (updated 5 November 2019)
- The growth of private, for-profit higher education institutions may have a different approach and sentiments pertaining to (O)ER than public, state-funded higher education institutions. Currently there are as many as 119 private higher education institutions, including a number of theological seminaries (Macha, & Kadakia, 2017).
- There is (still) only one dedicated, comprehensive distance education provider in South Africa with close to 350,000 students.

In the light of the fact that there is still “no uniquely South African definition for OER, or (O)ER” (previous analysis), and no national initiative to develop such, institutions are left to their own understanding of the need, the role and infrastructures needed to development institutional approaches to (O)ER. As noted previously

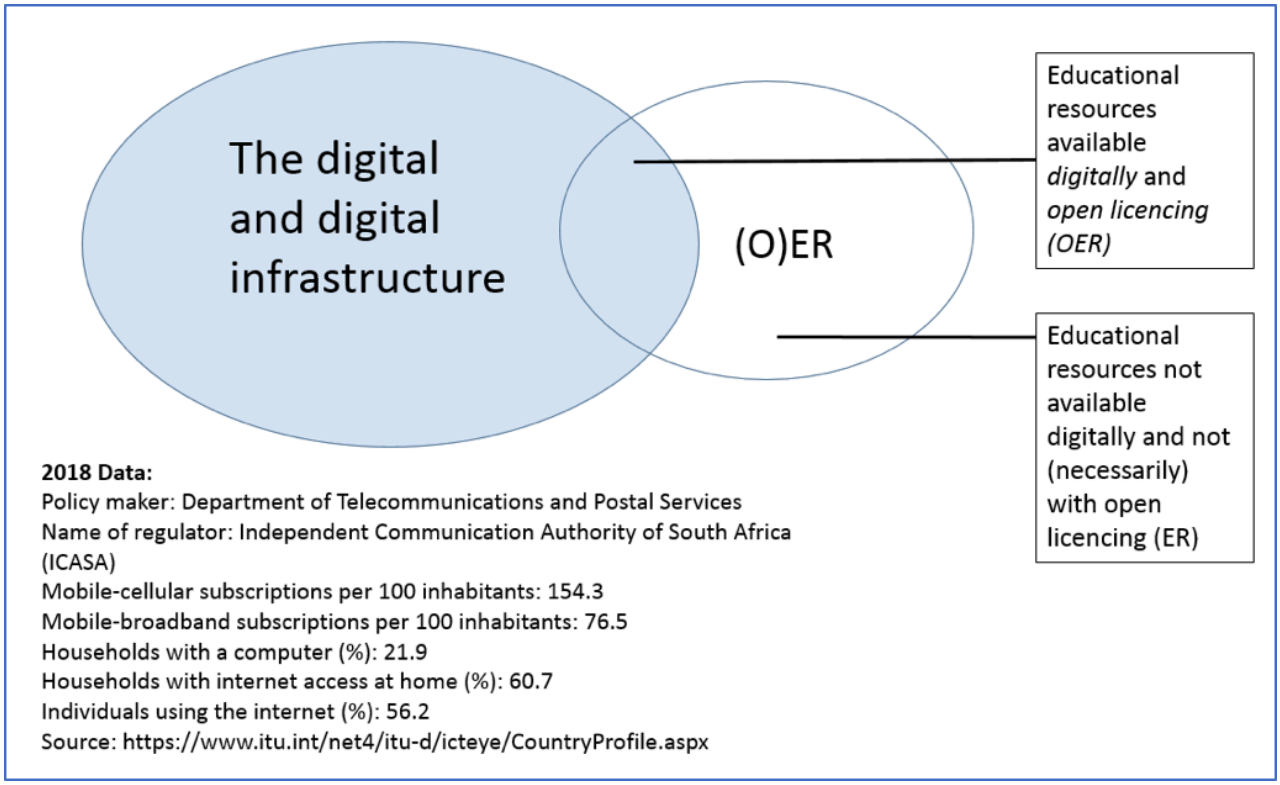
For the sake of understanding some of the idiosyncrasies of (O)ER as it overlaps with and intersects with the digital and digital infrastructures in South Africa, it may be useful to understand that educational resources (ER) in the context of South African higher education are mostly not licenced under an open licencing regime, and there are also examples of ER being licenced with open licencing, but which are not available digitally.

In this particular analysis, the below figure (Figure 2), from the previous analysis, also shape and impact on institutional responses to (O)ER. For example, though institutions can provide Wifi on campuses and in the case of traditional universities, residences, individual institutions rely on national initiatives to provide digital infrastructure (as indicated on the left-hand side of the below figure). Important to remember specifically in the context of the Global South, is the reality that “It is worth noting that, while this discussion has been premised on OER being digitally mediated, it is not the case that all OER are digital” (Hodgkinson-Williams & Arinto, 2017, p. 39). There is ample evidence of how OER are distributed making use of printed copies (see Arinto et al, 2017).

It is therefore important to understand this analysis of institutional responses in the context of the right-hand side of the figure (Figure 3).

Figure 3

Mapping the intersections between digital and digital infrastructure and (O)ER

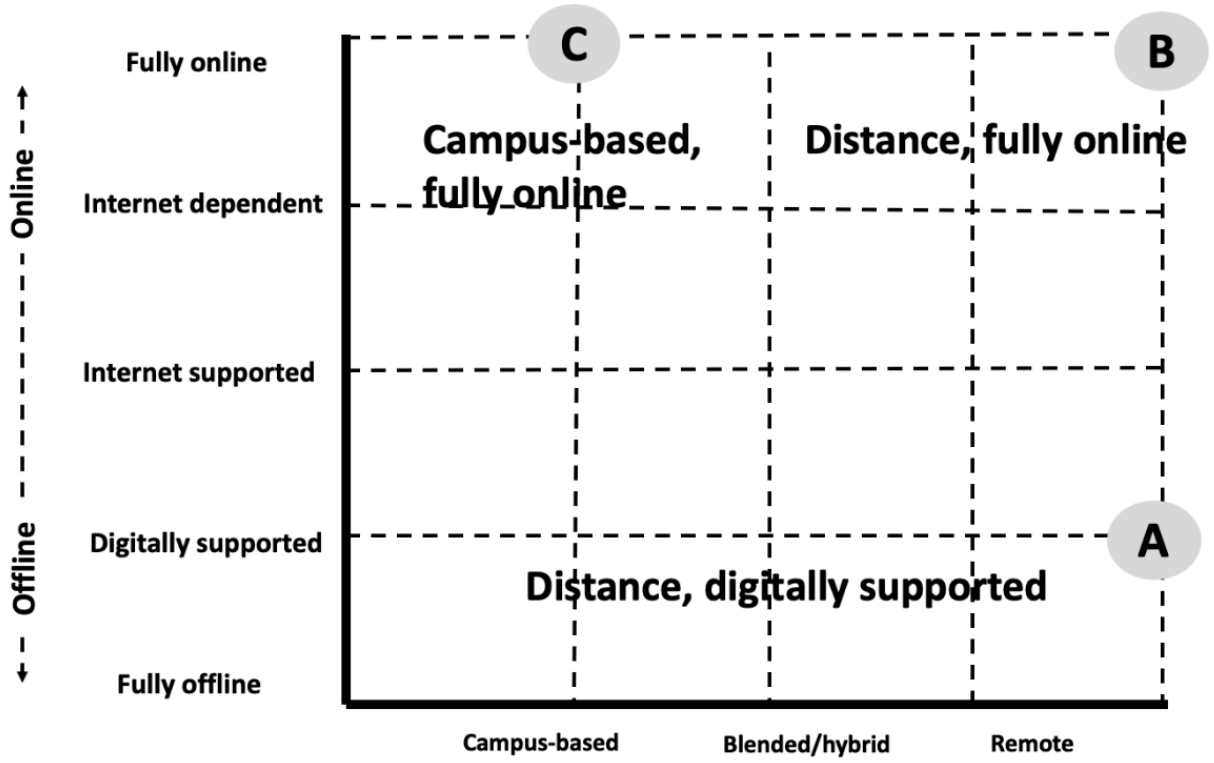


As institutions also have different pedagogical approaches and various approaches to using technology in education, it is useful to look at the different options provided in the South African Department of Higher Education and Training (DHET) "Policy for the provision of distance education in South African universities in the context of an integrated post-school system" (DHET, 2014b). Though the Policy deals specifically with the provision of distance education, the diagram provided in the Policy (p. 9) on the different modalities of using online technologies provide a useful heuristic for this study on institutional responses. As can be seen in Diagram 1 below, the different possibilities arise from institutions being totally campus-based, to, on the right-hand side of the spectrum, fully remote. In the South African context, the University of South Africa (Unisa) is the only dedicated fully remote institutions offering non-compulsory face-to-face classes comprising of no more than 40% of the total credit time for undergraduates (30% for postgraduates) as allowed by the Policy (DHET, 2014b, p. 9).

As can be seen in Diagram 1 (below), an institution can be fully remote and digitally supported (position 'A') which means that all the learning may comprise of printed study materials while the learning may be supported digitally via non-compulsory online discussion forums and availability of digital learning resources. The second illustrated possibility is where the institution is remote from its learners but fully online (position 'B'), and the third option illustrates campus-based fully online learning. Particularly helpful for our discussion of the nexus of digital infrastructure and (O)ER is the different forms of technology-enabled learning as illustrated by the vertical axis in Diagram 1 - ranging from fully offline, digitally supported, internet supported, internet dependent to fully online.

Diagram 1

Mapping different modes of teaching and learning (adapted from DHET, 2014b, p. 10).



Currently there is no comprehensive database regarding the use of digital platforms for learning in the context of South African higher education. Complicating the matter is the fact that the Policy on Distance Education Provision (DHET, 2014b) does not distinguish between the different modalities (as represented on the left-hand side in Diagram 1), and we therefore have no reliable and comprehensive source to indicate how many students access institutional digital learning platforms to support their learning or whether their learning is dependent on accessing these platforms (e.g. Prinsloo, 2019).

In the next sections we will briefly provide an overview of some aspects of digitality in South Africa, the use of Learning Management System (LMS) and institutional repositories in South African higher education.

3.3 A short overview of Digital South Africa

The following overview (Table 1) is based on a report “Digital 2019 South Africa” (2019):

Table 1

Some aspects of digitality in South Africa

Aspect	Figures
Total population	57.73 million (urban % 67%)
Mobile subscriptions	98.05 million (170%)
Internet users	31.18 million (54% penetration)
Active Social Media Users	23 million (40%)
Mobile Social Media Users	22 million (38%)
Annual digital growth - mobile subscriptions	+9.8%
Annual digital growth - internet users	+1.2%

Aspect	Figures
Annual digital growth - Active Social Media Users	+28%
Annual digital growth - Mobile Social Media Users	+38%
Average daily time spent using the internet via any device	8 hours 25 minutes

The eLearning Africa Report (2019) (p. 165) states that 56.2% of the population has access to the internet, with close to 2% of the populations having fixed broadband subscription. South Africa has 23 million active Facebook users, and 23 million active users on Instagram.

The World Bank (2016) reports that “the effect of technology on global productivity, expansion of opportunity for the poor and the middle class, and the spread of accountable governance has so far been less than expected” and “Digital technologies are changing the world of work, but labour markets have become more polarized and inequality is rising—particularly in the wealthier countries, but increasingly in developing countries” (p. 2; emphasis added). There is also evidence that it is the “better educated, well connected, and more capable have received most of the benefits—circumscribing the gains from the digital revolution” (World Bank, 2016, p. 3). The Report (World Bank, 2016) states that “Access to the internet is critical, but not sufficient” (p. 4). The Pew Research report (2016) on smartphone ownership and internet usage in emerging economies states that 42% of adults own a smartphone. They Report (Pew Research 2016) that in general men have greater access to the internet than women. In South Africa 46% of men have access to the internet compared with 39% of females. Of the total population, 47% access the internet several times a day, 18% once a day and 29% at least once per week. Regarding smartphone use, 37% of the population in South Africa own a smartphone, 52% own a mobile phone that is not a smartphone with only 10% who do not own a mobile phone. It is also clear that access to the internet, and smartphone ownership is directly correlated with higher socio-economic income and status.

3.4 Learning Management System (LMS) use in South African public higher education: a brief overview

There is, as far as we could establish, no recent comprehensive overview of LMS use, or the scope and details of fully online teaching in South African public higher education. Most of the research reports, share findings of single institutional, or multi-institutional use (students, lecturers) of the LMS. Research by Bagarukayo & Kalema (2015) found that “there is no common approach to it across South African Higher Education Institutions” and “the level of eLearning usage and adoption varies in different universities due to several challenges such as those of technology and institutions” (p. 168). These authors provide an overview of LMS use in nine South African higher education institutions (Table 2).

Table 2

A summary of LMS use at nine South African higher education institutions (Bagarukayo & Kalema, 2015)

Institution	Description and use
University of Pretoria (UP)	• WebCT
University of South Africa (Unisa)	• Open Source Software (OSS) Sakai
University of Cape Town (UCT)	• Initially used WebCT and Moodle
University of Western Cape (UWC)	• Home-grown OSS KEWL
Nelson Mandela Metropolitan University (NMMU)	• Initially SharePoint 10, replaced by Moodle

Institution	Description and use
University of Johannesburg (UJ)	• A commercial LMS
University of Kwazulu Natal (UKZN)	• Moodle
Tshwane University of Technology (TUT)	• Blackboard

Ng'ambi, Brown, Bozalek, Gachago, and Wood (2016) present an analysis of literature regarding 20 years technology-enabled learning in South African higher education. This research entailed “a national survey of all 22 HEIs to uncover possible associations between use of such technologies and transformation of pedagogical practice” (p. 846). They propose to understand the development of technology-enabled learning in four phases. Phase 1 was characterised by using technology “predominantly for drill and practice, computer-aided instruction, with growing consciousness of the digital divide” (p. 843). During the second phase “institutions primarily focused on building ICT infrastructure, democratizing information, policy development and research” and “they sought to compare the effectiveness of teaching with or without technology” (p. 843). During phase 3 “institutions began to include ICTs in their strategic directions, digital divide debates focused on epistemological access, and they also began to conduct research with a pedagogical agenda” (p. 843). In the fourth phase, “mobile learning and social media came to the fore” (p. 843). During this phase the “research agenda shifted from whether students would use technology to how to exploit what students already use to transform teaching and learning practices” (p. 843). The authors conclude that “there is a clear shift in South Africa’s HE from relatively low/poor ICT infrastructure where institutions were solely responsible for both infrastructure and education provision to a more cloud-based ICT infrastructure with ‘unlimited’ educational possibilities, with a higher reliance on low-cost, mobile, flexible, ubiquitous technology solutions often initiated and provided by academics and students” (pp. 852-853).

The research by Ng'ambi et al, (2016) provides a useful meta-framework to understand the evolution of technology-enabled learning in South African public higher education. Considering the range of potential use of technology in South African higher education - ranging from fully offline, digitally supported, internet supported, internet dependent to fully online (Diagram 1), available evidence suggests that most of the teaching in South African higher education can be classified in the spectrum of digitally supported, internet supported, and internet dependent. There is, however, an emergence of fully online teaching such as the various MOOCs offered by UCT (Czerniewicz, Deacon, Walji & Glover, 2017) and the signature courses at Unisa (Baijnath, 2014; Hülsmann & Shabalala, 2016).

3.5 Focus of this meso-analysis

In this analysis, we will firstly focus on the role and extent of institutional repositories in (O)ER, before looking in more detail at two selected two institutions as case studies to investigate and map the nexus between (digital) infrastructure and (O)ER. The choice of the two institutions was purposeful. The first institution, the University of Cape Town (UCT) is not only the best research-intensive public higher education institution in South Africa, but also has a unique approach to (O)ER, Intellectual Property, Copyright and (O)ER. UCT is furthermore at the forefront of offering MOOCs, many of these as OER. The Centre for Innovation in Learning and Teaching (CILT) led by Laura Czerniewicz, is prolific in its research into (O)ER, and its professional development. The second institution, the University of South Africa (Unisa), is the largest open distance education provider on the African continent and one of the mega institutions in the world with more than 350, 000 students. As an Open Distance Learning provider, one would expect Unisa to be at the forefront of (O)ER policy and praxis. In each of the two cases, we made use of publicly available information, policies, and personal communication between the researchers and specific individuals in these two institutions.

After the discussion of these two case studies, we will also present and briefly discuss governmental repositories and the role of commercial publishing in the specific context of South Africa. Finally, we will provide an illustrative overview of (O)ER repositories ‘outside’ of formal higher education but with links to a network of higher education institutions and other stakeholders across the African continent.

Analysis and findings

The role of institutional repositories

"South African higher education institutions are the largest producers of research output on the African continent" and as such, South African researchers have a "moral obligation to share their research output" (Raju, Raju & Claassen, 2015, p. 263). Bangani (2018) traces the first Institutional Repository at a South African university to the repository at the University of Pretoria (UP) in 2000 and the "library's open access policy was approved in 2010 with UP becoming the first university in South Africa to have an open access policy" (Bangani, 2018, p. 42). In 2015, most South African public universities had an institutional repository (IR). In the light of the definition of 'open data' as "as data that is free to access, free to use, and free of most restrictions for reuse", Raju et al, (2015) state that "librarians and researchers in South Africa are grappling with the management of open data: there are no policies and strategies nor are there efficient implementation roll-outs" (p. 268). In 2015, by the time these authors published their research findings, they stated "Of the 23 established South African institutions of higher education, 19 institutions have institutional repositories" (p. 269). There are furthermore "four South African higher education libraries that offer a hosting (or acting as publisher) open access journals service" (p. 273).

Van Wyk and du Toit (2016) state that the "digital curation of scholarship is expected to add value to existing knowledge and assist in creating new knowledge" (p. 107) and as such the sustainability of digital collections and services has to be secured. "Sustainability in institutional repositories and digital scholarship curation requires a socio-technical approach, where decision-makers need to realise its value and align technical and financial operations in support of scholarship curation" (p. 108). Their research indicates that there "are 35 institutional repositories in Southern Africa registered on OpenDOAR (Open DOAR 2016)" and that "Public higher education institutions have most of the registered institutional repositories in Southern Africa" (p. 108). These authors raise a concern pertaining to the reasons "why the management of digital scholarship appears to be underdeveloped, in terms of lack of visibility, ranking and open access to research in South Africa" (p. 108). The research found that "all indications are that the institutional repositories may be at peril, as serious sustainability threats surfaced" (p. 113). The research furthermore raises concerns pertaining to "insufficient understanding and support of scholarship curation at governance level", "serious gaps in the understanding of open access and application of open access protocols and standards" and the "lack of awareness and knowledge regarding scholarship curation, and the value that web visibility holds for the entire institution" (p. 114).

3.6 Two institutional case studies – the University of Cape Town (UCT) and the University of South Africa (Unisa)

University of Cape Town (UCT)

Hodgkinson-Williams, Paskevicius, Cox, Donnelly, Czerniewicz, and Lee-Pan (2013) have documented the emergence of OER in the context of UCT. They pinpoint the emergence in 2007 in which a Shuttleworth Foundation funded an 18-month-long research project, called Opening Scholarship. The project aimed "to explore the opportunities that digital media and open dissemination models could offer for enhanced communication and more effective knowledge sharing at UCT" (p. 33). The project mapped the "current status of OER in South Africa and at UCT, as well as of policy, organisational, technological, legal and financial issues that would need to be addressed to maximise the fragmented approach to sharing teaching and learning resources by individual academics at UCT" (Hodgkinson-Williams, 2009, in Hodgkinson-Williams et al, 2013, p. 33). Interestingly, the researchers found that

> *...many resources already being shared on the Internet by academics at UCT. The problem of lack of visibility was due to the absence of metadata — a necessary component that attaches descriptive information to a resource. It could be said that these resources were being 'shared below the radar,' as it was the intent of the creators that they be shared, but the lack of metadata meant materials were not easily discoverable (Hodgkinson-Williams et al, 2013, p. 35; emphasis added)*

In the light of the existence of many shared materials, the team decided "... from the outset that the planned [OER] directory should operate as a portal for accessing content rather than hosting content, as initial investigations showed

that most teaching materials at UCT were already online" (Hodgkinson-Williams et al, 2013, p. 36). Significant in the context of UCT is that

> *Although the OER team had, in principle, the support of UCT's senior management to undertake the project, there was no formal policy, mandate or set of procedures in place obliging academics to share their teaching and learning materials outside their classroom. There is no regulation forbidding academics to publish a selection of their materials as OER at UCT (Hodgkinson-Williams et al, 2013, p. 39).*

By the time OER emerged, many academics at UCT were already sharing educational resources.

In the context of this meso-analysis, the principles that were used to institutionalise OER at UCT is worth noting (Hodgkinson-Williams et al, 2013, p. 41-42):

1. The OER initiative would be resource-based and not course-based (i.e., based on individual learning resources such as e-books, manuals, lectures captured on podcasts or webcasts, lecture notes or presentations), so that materials from the current collection held by academics could be made available after undergoing a moderation process where potential third-party copyright issues are investigated.
2. A 'moderation' process by the OER team would only include checking for copyright compliance and not include an institutional quality assurance process, so the responsibility of the accuracy of the resource was taken by the academic author, following the 'pride-of-authorship' model
3. UCT OpenContent would generally not host resources, but rather act as a directory, referring to where the resources are already hosted (on the institutional learning management system, on departmental websites, on the Cloud, etc.) in order to reduce duplication and to maximise the use of existing infrastructure (emphasis added).
4. The software selection would favour open source software to reduce costs and would need to be integrated with the UCT login system. A single sign-on service would be provided so that there was no additional username and login required for academics to contribute their resources.
5. The software would need to allow individual academics to upload and maintain their resources directly so that the process of making materials available would not need intermediary technical personnel (emphasis added).
6. The management of the OER initiative would be built into the portfolio of the Curriculum Development Officer in CET, as this person already deals with supporting the development of digital resources for teaching and learning.
7. The maintenance of the UCT OpenContent directory would be included in the portfolio of the CET's Learning Technologies team.
8. The OER initiative would be seen as part of a more ambitious OpenUCT project that included making research and community engagement resources available to the general public, and would need to work collaboratively with these "open" initiatives and any other OER initiative …

Interesting, in the context of this analysis, are the directions for further research pointed out in Hodgkinson-Williams et al, (2013) that included, inter alia, the following:

- What are the key constraints that inhibit academics from sharing a selection of their teaching and learning materials as OER on UCT OpenContent or any other platform
- How does an institutional "directory" compare with a repository model?
- How can educational analytics help to map the OER terrain more accurately and immediately and identify direct or indirect return on investment?
- How does OER challenge, extend or improve the status quo of dissemination of scholarly materials at universities?
- How can OER be made more "discoverable" and most appropriately targeted?

Cox and Trotter (2016) define the institutional culture at UCT as collegial despite it having "modestly tight (coherent) policies that are also reasonably well-implemented, but these policies happen to preserve the autonomy of the university's scholars who, themselves, engaged in the policy-development process to ensure this" (p. 151). The collegial culture did, however not flow from policies-as-steering mechanism, but rather that the collegial culture "produced the policies which reinforce and protect it" (p. 151).

In the South African context, the University of Cape Town (UCT) has been at the forefront of OER development. The UCT Centre for Innovation in Learning and Teaching (CILT) has since 2007 attracted both external and institutional funding for OER-type initiatives. Hoosen and Butcher (2019) mentions the following initiatives:

- The first initiative was the Opening Scholarship project (2007-2009) funded by the Shuttleworth Foundation
- the OER UCT project (2009-2010)
- the UCT Vice-chancellor's OER Adaption Project (2012-2014)
- the Canadian International Development Research Centre (IDRC)-funded Research on OER for Development (ROER4D) project (2013-2017).
- The current Digital Online Textbooks for Development (DOT4D) project (2018-2020) is also funded by the IDRC.

In addition to these projects, UCT has also funded the development of twelve Massive Open Online Courses (MOOCs), and several of the materials in these courses are released under Creative Commons (CC) licences.

UCT Intellectual Property Policy (2011)

"UCT asserts legal and beneficial ownership of Intellectual Property arising from work by Employees and Students except as otherwise agreed in writing by an authorised officer of UCT" (UCT, 2011, p. 13). As such UCT holds the copyright for all syllabi and curricula, UCT produced publications, photographs and digital images taken by employees "for UCT media or publicity or specifically commissioned by UCT" as well as specifically "commissioned works and course materials that fall outside the scope of normal academic work" (p. 14). What is unique about UCT is that, as far as we could establish, it is the only public higher education institution that "automatically assigns to the author(s) the copyright" with regard to "scholarly and literary publications" as well as course materials, "with the provision that UCT retains a perpetual, royalty-free, non- exclusive licence to use, copy and adapt such materials within UCT for the purposes of teaching and or research" (p. 14). Regarding research and teaching related to software development at the university, UCT has adopted an Open Source as the default.

In terms of Creative Commons, UCT "supports the publication of materials under Creative Commons licences to promote the sharing of knowledge and the creation of Open Education Resources. UCT undertakes certain research projects that seek to publish the research output in terms of a Creative Commons licence" (p. 15).

UCT Metadata and Information Architecture Policy (2012)

The purpose of the policy is to provide guidance on managing "metadata and its application to information assets and services to improve the governance, interoperability, retrievability, re-use, storage optimisation, structure and classification of information assets and services" (p. 2). In terms of this analysis it is important to note that the "Metadata and Information Architecture for all of UCT's scholarly resources are managed on behalf of UCT by Library Service" and "Ownership of and responsibility for metadata as they are applied to information resources, while under the custodianship of Library Services and Information and Communication Technology Services (ICTS), nevertheless resides with the owner of the data or information collection" (p. 4). The Policy also states that "All content objects generated, managed and published by the University of Cape Town and its direct affiliates must be tagged and stored with sufficient metadata" (p. 5). Where applicable "metadata should support re-use and interoperability of content between content management systems and content publication media" (p. 5).

UCT Open Access Policy (2014)

The Policy (UCT, 2014) origins are to be found in the fact that UCT is a signatory of The Berlin Declaration on Open Access to the Sciences and Humanities. As such the institution is committed to follow and promote "an open access approach with regard to scholarly communication and education. This policy provides the basis for the University to preserve the scholarly work of UCT scholars and to make this scholarship discoverable, visible and freely available online to anyone who seeks it" (p. 1).

The Policy provides guidance to UCT to achieve the following:

- increase discoverability and visibility of scholarly output at UCT
- preserve, present and facilitate access to the institution's research and knowledge production;
- ensure the full participation of the UCT academy in global knowledge communities;
- contribute their academic resources to social and economic development;
- develop research capacity within the institution and region by sharing research knowledge and practices;
- manage the rising costs of library materials and access to scholarly knowledge;
- increase citations to and maximize the visibility of UCT scholarship (p. 1).

Interestingly, the Policy (UCT, 2014) acknowledges that "sharing scholarly content predates the internet and there is strong evidence that there are many and various current activities at the level of the individual academic as well as by research and development groupings" (p. 1). The Policy also states that "activities in the digital scholarship, scholarly communication, and open scholarship and education arenas to date have tended to take place through funded projects, and it is evident that the time has come to move from project status to the coordination, support and embedding of digital scholarship within the institution" (p. 1).

The Policy also mentions the pressures "exerted by the policy environment in the global north which increasingly requires academics to make their work available through open access" (p. 1), resulting in an urgent need to increase the visibility of academic work from the Global South.

The Policy (2014) furthermore describes specific responsibilities for authors and the institution. The responsibilities of authors include:

1. must deposit an appropriate version [peer-reviewed] of Scholarly Publications into an officially designated Institutional Repository or into an acceptable curatorial system which can be harvested by UCT; or
2. if prevented by a publisher's copyright terms or other good reason from doing so, must notify the Institutional Repository in writing that he/she will not be doing so and the reasons for this (p. 3).

The University's responsibilities are as follows:

1. encourages Employees and Students to make all forms of works of scholarship available through the appropriate platforms and service in digital format and of a type that is consistent with policies and practices. This includes (but is not limited to) essays, books, conference papers, reports (where permitted by a funder of the research leading to the report), educational resources, presentations, scholarly multimedia material, audio-visual works and digital representations of pictorial and graphical materials.
2. Recommends that Authors avoid the transfer of copyright to publishers, where the publisher does not permit archiving, re-use or sharing, as a minimum, of a submitted version of a Scholarly Publication. UCT will provide a simple mechanism through which Authors can inform publishers of their need to comply with UCT's policy so it is consistent with the permissions granted by the staff member to the University; and
3. encourages Authors to publish their Scholarly Publications in peer-reviewed open access journals. In this case the Author should supply the metadata to the Institutional Repository in order to maximise institutional and personal discoverability.

The Policy (2014) furthermore acknowledges that the Institutional Repository as central to realising the Policy but also that staff and students may already/also "make their works available through repositories such as arXiv and PubMed Central" (p. 4). The Policy states that authors" may satisfy preservation and access requirements" (p. 4), on the condition that "such a repository makes the work accessible in full-text to the public, without costs or other restrictions (other than customary restrictions) and that it offers to preserve and maintain the work indefinitely" (p. 5).

In their reflection on the policy and the development of OER in the context of UCT, Cox and Trotter (2016) state that the Policy "does not mandate that academics share their teaching and learning materials as OER, but simply encourages them to do so, as is befitting in a collegial cultural environment" (p. 153). The importance of institutional policy, financial, technical and legal support are important as structural elements in the acceptance and production of OER, but Cox and Trotter (2016) state that - "UCT scholars do not view these institutional policies and support mechanisms as

'motivating' factors for OER activity, but simply as hygienic factors creating the conditions necessary to allow them to act on their own personal volition regarding OER" (p. 153). As such institutional culture is more important than policy in motivating academics to engage with OER (Cox & Trotter 2016). "The behaviour and judgment of peers acts as a powerful mechanism in shaping academics' own beliefs and pursuits" (Cox & Trotter 2016, p. 156) and the pressures of publishing in scholarly peer-reviewed journals in the context of the institutional and individual researcher prestige economy, partially explains "the relatively low levels of OER contribution at the university" (Cox & Trotter, 2016, p. 156).

In the research done by Cox and Trotter (2016) they confirm that individual lecturers' agency plays a much more important motivating role than policy - the latter being regarded as "merely a hygienic factor" (p. 158).

The study by Hoosen and Butcher (2019) lists several OER initiatives at UCT, such as:

- UCT's Vice-Chancellor's OER Student Adaptation project provided funds for senior students for each Faculty to work with lecturers to make existing learning and teaching materials available as OER. Funding of ZAR 150,000 was provided by the university (p. 151)
- UCT provided funding and technical support to academics to create MOOCs, some of which were released as OER (p. 151)
- UCT has an institutional repository OpenUCT
- In 2018, an institutional instance of Figshare was launched at UCT, Zivahub which is specifically intended as an open data repository but has the functionality to curate OER and open access materials.
- UCT hosts an OERTerm Bank where equivalents of academic terms can be sought in 11 of the 12 official languages in South Africa. This is a collaboration between the South African Department of Higher Education and Training (DHET), the University of Pretoria (UP) and UCT.

UCT's Institutional Repository

In contrast to Unisa Open that does not form part of the Unisa Institutional Repository (see discussion below), Open UCT functions as the Institutional Repository and offers a range of sources such as research outputs, OER, theses and dissertations, and other publications. The repository hosts the following communities:

- Open Education Resources
  - Teaching and Learning
  - MOOCs
- Disability Inclusion in Education: Building Systems of Support Brochure (Weeks 1-5)
- Other Publications
  - Book reviews
  - Other / General
  - Policy Briefs
  - Presentations
  - Reports
  - Working Papers
- Research Output
  - Books
  - Chapters in books
  - Conference Publications
  - Journal Articles
  - Other / General
- Theses / Dissertations
  - Masters
  - Other / General
  - PhD / Doctoral

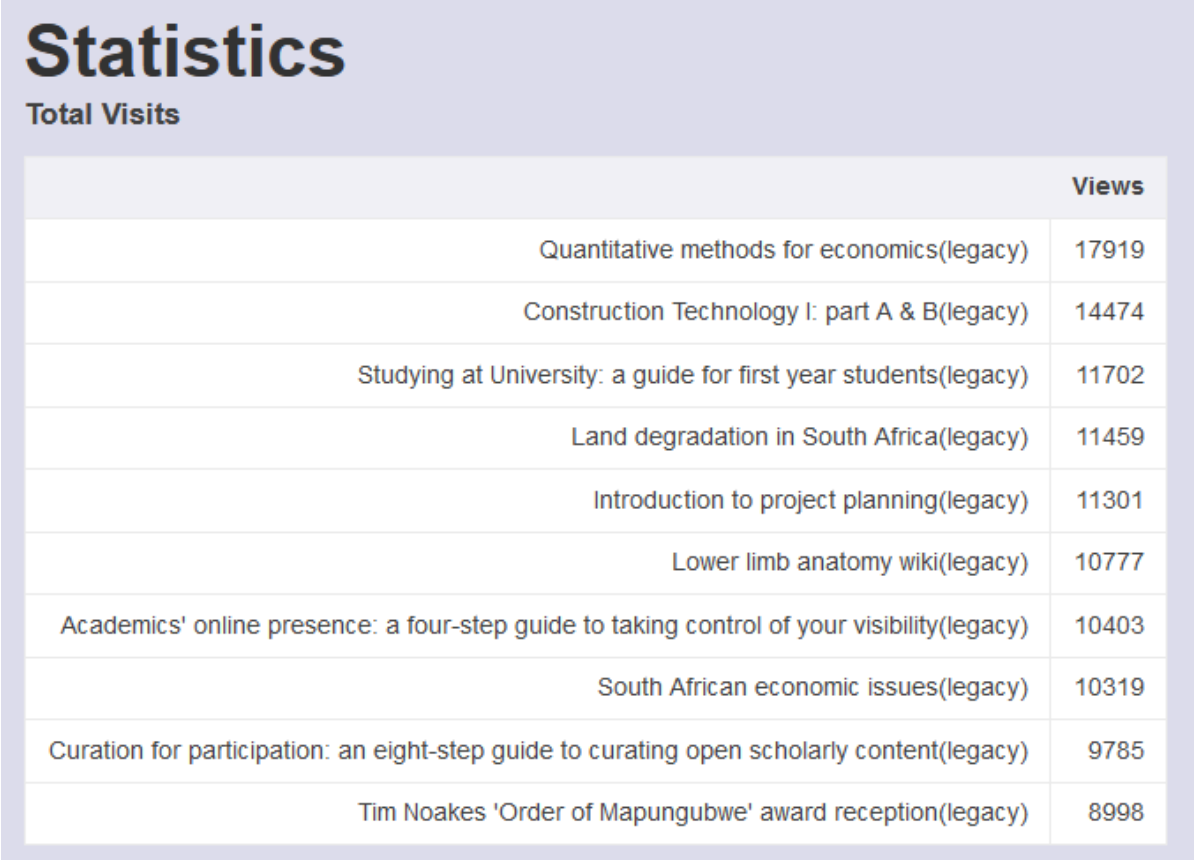
Of particular interest to this study is the dates of resources contributed to this repository:

- 2010 - 2020 (14220)
- 2000 - 2009 (7895)
- 1990 - 1999 (2959)
- 1980 - 1989 (1490)
- 1970 - 1979 (593)
- 1960 - 1969 (215)
- 1950 - 1959 (130)
- 1940 - 1949 (91)
- 1930 - 1939 (23)
- 1926 - 1929 (2)

Interestingly, the repository's statistics (on 10 February 2020) show the following most viewed resources (Figure 4, below):

Figure 4

Statistics of most viewed resources



Statistics

Total Visits

	Views
Quantitative methods for economics(legacy)	17919
Construction Technology I: part A & B(legacy)	14474
Studying at University: a guide for first year students(legacy)	11702
Land degradation in South Africa(legacy)	11459
Introduction to project planning(legacy)	11301
Lower limb anatomy wiki(legacy)	10777
Academics' online presence: a four-step guide to taking control of your visibility(legacy)	10403
South African economic issues(legacy)	10319
Curation for participation: an eight-step guide to curating open scholarly content(legacy)	9785
Tim Noakes 'Order of Mapungubwe' award reception(legacy)	8998

University of South Africa (Unisa)

The University of South Africa (Unisa) is the only dedicated distance higher education institution in South Africa. It is furthermore a comprehensive university offering vocational as well as academic certificates, diplomas, in addition to undergraduate and postgraduate degrees. Founded in 1873 as the University of the Cape of Good Hope, it became the first public university in the world to offer teaching solely by means of distance education in 1946 (Unisa, 2019). Unisa has the largest student population in South Africa with close to 350 000 students. Unisa accounts for around 40% of all HE students in South Africa.

Being a distance education institution, Unisa students are not centrally located in one geographical area. The students are dispersed around the whole country with a substantial percentage of students living in rural areas. Access to the appropriate physical infrastructure and hardware therefore remains a challenge to these students. In addition, the regular supply of electricity and connectivity relies on national provision of these services. The electricity supply in South Africa is often unpredictable due to “load shedding” which affects all communities. However, the students living in poor, rural areas where there is weak infrastructural support, tend to rely on the correspondence form of teaching as these isolated areas can often only be connected through using the postal system.

Unisa enjoys a relatively high level of internet and computer access on their main campus in Pretoria as well as their six regional offices. Internet access however, varies in different parts of the country – some provinces enjoy high speed, consistent bandwidth, while other provinces e.g. Limpopo and the Eastern Cape which are more rural, have unpredictable and slow connectivity.

Bergquist and Pawlack (2008) define institutional cultural types according to six academic types – collegial, managerial, developmental, advocacy, virtual and tangible. The managerial institutional culture revolves around bureaucracy, hierarchical, efficiency and assessment of work. Chetty and Louw, 2012, define the culture of Unisa as a managerial one. The managerial culture, according to Cox and Trotter (2017), is hierarchical, employs an expansive policy with tight implementation. The university utilises a top-down, hierarchical approach and the agency of the academics is controlled by the tightly-defined policies. In their study, Cox and Truter (2017) suggest that the institutional culture at Unisa is a demotivating factor for the uptake of OER’s for the staff in that they would have to deviate from their usual practices. In a managerial culture, this could cause fear as the academics are used to working within a strict framework and are concerned about the repercussions of not operating within a strict policy framework.

OER Adoption at Unisa

In 2014, Unisa approved its OER strategy, called Unisa Open (de Hart, 2019). This strategy was developed to guide the university in terms of its use of OER’s, licensing of teaching and learning materials, as well as the management of its own intellectual property. It was set up as a special project in the office of the Pro-Vice Chancellor and was developed by Kerry de Hart in order to align the university with the imperatives of the South African White Paper for Post-School Education and training in South Africa (2014a).This White Paper states that post-school education will follow the principles of openness and that the Department of Higher Education and Training (DHET) supports the development of high quality OERs which should be made freely available.

The 2014 Unisa strategy document (de Hart, 2019) focused on 5 strategies:

1. Development of an effective management system for intellectual property.
2. Establishment of an open licensing framework.
3. Systematic integration of high quality, available OER as appropriate into courses and their subsequent release for use by others.
4. Contribution to the global OER repository of resources.
5. Evaluation and review of institutional policies to incorporate OER values and processes.

The 1st strategy refers to the collection and curation of all Unisa course material and how to effectively manage the institutional intellectual property. The 2nd strategy refers to the establishment of an open licensing framework and states that Unisa will have to develop a policy on the licensing of material to allow publication under suitable licenses. To this end it was proposed that Unisa creates a copyright office to address all the copyright issues involved in developing OERs. The strategy also makes recommendation that Unisa needs to develop a framework and policy on licensing of their intellectual assets.

The 3rd strategy proposed was the systematic integration of high quality, available OERs into courses and their subsequent release for use by others. The procedure to do this includes: awareness raising and changing pedagogical approaches, providing appropriate technical infrastructure, extensive skills training, amendment of existing policies,

development of guidelines for the use of OER in study material and finally, linking existing institutional systems, policies and strategies.

The 4th strategy revolves around the contribution of Unisa OERs to the global repository of resources, not only through their materials but also in the form of MOOCs.

The final strategy proposed was the evaluation and review of institutional policies to incorporate OER values and processes. This should be done through and evaluation, review and revision of all relevant Unisa policies and procedures.

It must be noted however, that this 2014 document is only a strategy for OER adoption. The intention was to develop it further into a Unisa policy and to date, this process is still underway. Until the strategy is formalised into Unisa policy, it will be difficult to meet many of the targets proposed in the strategy.

The 2014 strategy was further developed as the Open Educational Resources (OER) Strategy: 2017 – 2021 by the Centre for Professional Development (CPD) in 2017 and approved by Unisa senate on 31 May 2017 (Mashile, 2019). This strategy refers to the 2014 strategy but proposes that the implementation was seemingly unrealistic to be incorporated into the daily work at Unisa.

According to Alice Goodwin-Davey from the Centre for Professional Development (Goodwin-Davey, 2017), the 2017 OER strategy supports the following:

- Development of an effective in-house strategy for openness at Unisa
- Systematic integration of high quality available OERs into Unisa courses
- Quality Assured, targeted, open Unisa courses as contributions to the global OER repository of resources
- Contributions to the global OER repository of researchers
- Integrated campuses with other HE institutions

Deadlines were set for each of the above activities and many of these deadlines have already passed.

Unisa Intellectual Property Policy (2012)

This policy states that Unisa is the owner of all IP created by members of the staff within the normal course and scope of their employment (Unisa, 2012a). In addition, Unisa is also the owner of all IP created by students during their postgraduate studies. The lecturers, who are the actual developers of the teaching materials, do not hold the copyright over these materials and therefore are not able to share them openly. According to Cox and Truter (2017), this means that Unisa possesses the copyright over the lecturer's developed materials and maintains the management of the creation side of OER adoption. The 2014 strategy document (de Hart, 2019) made recommendations that the policy on licensing of Unisa intellectual assets needs to be developed. The current IP policy was approved in 2012, so to date, this recommendation has not been implemented.

The Unisa policy does however make provision for the individual lecturers to petition their relevant tuition committees in order that they may make their own creations available as OER. Cox and Truter (2016: 25) found in their research that "while this appeal mechanism does not appear to be well advertised, it does offer an opening for some lecture-led OER".

Unisa Policy on prescribing books, readers and journal articles and recommending books and journal articles (2013)

This policy states that when prescribing a book for use in a study course, the availability of appropriate OERs should be considered before taking the decision to prescribe the book. The quality of those OERs first needs to be assessed to ensure that the OER is the best source that is available and if found to be not the best resource, then the OER should be recommended and not prescribed (Unisa, 2013 b).

At postgraduate level, the academic teaching staff are encouraged to make use of e-reserves or OERs as prescribed readers, rather than a textbook.

Following the recommendations made in both the 2014 and 2017 strategies, it can be noted that Unisa policies have not been updated to incorporate the creation and use of OERs. The current Policy on Implementing the Unisa Curriculum (2012) and the Framework for the Implementation of a Team Approach to Curriculum and Learning Development at Unisa (2013) make no reference to OERs and neither do any of the ICT policies (Unisa, 2012a; Unisa 2013 b).

The Unisa Library Guides

Academic staff at Unisa are however, encouraged to make use of existing OERs in their teaching. This is demonstrated through the Unisa library, which through their Library Guides, offers comprehensive information on OERs and guidelines for the academic staff on how to find suitable material for use in their teaching practices. These library guides provide information and links to webinars from UNESCO, COL and Open Professional Education Network (OPEN). In addition, links to recent publications by Unisa staff on OERs are also provided.

The Unisa Institutional Repository (http://uir.unisa.ac.za/)

This is an open archive of scholarly intellectual and research outputs generated by Unisa and consists of theses and dissertations, research articles, conference papers and other digital assets. Although, as mentioned earlier, Unisa retains the Intellectual Property of all outputs generated by its staff and students, these are accessible through the Unisa Institutional Repository. At this stage only research outputs are available in the open digital archive and there is little course material that is being shared openly.

Centre for Professional Development

The CPD department at Unisa has been charged with providing capacity building for staff in OER and offers face to face workshops, roadshows and a free online course for staff who are interested in learning more about OERs (Goodwin-Davey, 2017).

Unisa Open

An anomaly in the context of Unisa is a site dedicated to OER outside of the institutional repository (discussed above). Possibly resembling the state of limbo of OER adoption and use at Unisa, much of the site's links are no longer active.

The site has a useful overview of "What are OERs" and contain links to various sources. Disappointingly, the two links provided on Unisa Open are both broken. The first link is supposed to link to "OER documents @ Unisa (Unisa OpenCourseware and learning objects)" and the second link is supposed to link to "A collection of all Unisa documents which support OER - Examples of resources (full courses and learning objects) that have been created by Unisa and openly licensed." The site also hosts a list of search engines for OER but many of the hyperlinks have been removed.

A useful OER provided on this repository, is basic conversational skills in several South African languages e.g. Zulu, Tswana and Northern Sotho. In the context of this discussion, it is crucial to note that Unisa Open is hosted separately from the Unisa Institutional Repository.

3.7 Government Associated Repositories

In the context of South Africa, higher education institutions have been the main players of the open access movement, through the development of institutional repositories. South African university libraries have taken on this role of managing, creating and populating these institutional repositories. The International African Institute (2020) states that there are 38 digital repositories in South Africa, the vast majority being associated with Higher Education institutions. This number includes separate repositories at some universities for theses and dissertations.

According to the Academy of Science of South Africa (ASSAF, 2020), online, open access ("Gold route") versions of South African research journals should be funded in significant part through a per-article charge system (linked in the case of higher education institutions to an agreed fraction of output publication subsidies, and in the case of other research-producing institutions to adapted budgeting practice), but publishers should still sell subscriptions to print copies and should maximise other sources of income to lower the article-charge burden.

- A federation of institutional Open Access repositories, adhering to common standards, should be established ("Green route"), with resources made available to help institutions in the preliminary stage, this virtual repository to be augmented by a central repository for those institutions which are unable to run a sustainable repository.
- National harvesting of South African open access repositories should be undertaken as a matter of urgency, preferably by the NRF.
- The importance of affordable bandwidth for research communications for this purpose be drawn to the attention of DST officials negotiating for better rates.

Most South African repositories are university based (International Africa Institute, 2020). Below is a list of those repositories that are not hosted by an individual university but are rather associated with a government funded institute (International Africa Institute, 2020).

Africa Portal

This is a collaborative project between the Centre for International Governance Innovation (CIGI) and the South African Institute of International Affairs (SAIIA). It is a research repository on African affairs and not just South Africa. It provides a digital platform for sharing informed perspectives on matters relating to development, economics and politics in Africa. All material is available for free.

SciElo South Africa (Scholarly Publishing Unit – SPP)

The Academy of Science of South Africa's (ASSAF) SciELO (Scientific Electronic Library Online) SA open-access publishing platform is funded by the Department of Science and Technology (DST) and endorsed by Department of Higher Education and Training (DHET). Journals on the SciElo platform are also indexed on the Web of Science (Czerniewicz, 2014).

SciElo SA is the Scientific Electronic Library Online in South Africa and is the main open access searchable full-text journal database serving the South African academic community. The database covers a selected collection of peer-reviewed South African scholarly journals and forms an integral part of the SciELO Brazil project. SciELO SA is managed by the Academy of Science of South Africa (ASSAf), funded by the South African Department of Science and Technology and endorsed by the South African Department of Higher Education and Training (DHET) (www. Scielo.org).

The objective of SciELO is to contribute to the development of scientific research by disseminating and making freely available, using electronic publishing, academic publications in developing countries, including South Africa.

ASSAF's Scholarly Publishing Program maintains quality of publication through an external, independent review system of all South African research journals and is carried out every 5 years. This quality review is undertaken in addition to the one that is carried out and overseen by the Council on Higher Education (CHE) in South Africa. The following aspects of quality control are reviewed:

- Quality of the editorial and review process
- Fitness of purpose
- Positioning in the global cycle of new and older journals listed and indexed in selective, established databases; financial sustainability; and scope and size issues

The methodology used to review the journals comprises of a questionnaire that is sent to all the editors, peer reviews of the journals and a panel discussion on the findings. Recommendations are thereafter sent to each of the publisher and editors of the journal. In addition, the findings are also reported to the South African Departments of Science and Technology (DST) and of Higher Education and Training (DHET), the Council for Higher Education (CHE), the National Research Foundation (NRF), Universities South Africa (USAf) and all research–active institutions.

The Scholarly Publishing Unit takes responsibility for ensuring that Open Access initiatives are promoted to enhance the visibility of all South African research articles and to make them accessible to the entire international research community. For a journal to be included in SciELO, it has to be a South African open access journal with no "embargoes"

and must be willing to adopt a Creative Commons licence. Other criteria that must be adhered to for inclusion in SciELO relate to the editorial process, peer reviews, business related criteria and bibliometric assessments.

Currently there are 8 subject areas available on this database. There are:

- Agriculture (8 titles)
- Applied Social Sciences (17 titles)
- Biological Sciences (17 titles)
- Engineering (9 titles)
- Exact and Earth Sciences (8 titles)
- Health Sciences (17 Titles)
- Human Sciences and (30 titles including the South African Journal of Education)
- Linguistic, literature and arts (9 titles)

African Journal Archive

The African Journal Archive is a retrospective open access journal service that preserves and makes available African journal literature dating as far back as 1906, originating from a wide base of publishers and societies on the African continent. The Carnegie Corporation of New York initiated and sponsored the Sabinet (South African Bibliographical and Information Network) Gateway project. Sabinet makes it available as a collection via the Sabinet African Journals' platform which has been available online since 2001. The collection includes more than 430 titles and over 350 000 full text articles. However, a subscription fee is charged for access to the collection.

Sabinet offers the following open access models: gold, green and article level open access which means that certain articles in an issue are open access while the remaining ones are subscription based.

Council for Scientific and Industrial Research (CSIR)

The CSIR has an open access electronic archive called ResearchSpace. Dedicated to archive, collect, preserve and distribute scholarly digital materials created by the CSIR.

National Research Foundation (NRF)

The National Research Foundation (NRF) was established as an independent government agency in 1998. With the mandate of prompting and supporting research in all fields of science and technology to contribute to the improvement of the quality of life in South Africa. They have a limited number of publications that are free to access.

Southern Africa Labour and Development Research Unit (SALDRU) (Open SALDRU)

The SALDRU repository contains publications from research conducted within the research unit. The repository is however curated by the University of Cape Town. Other than universities, repositories are available from state owned institutes and foundations.

African Higher Education Research Online (AHERO)

AHERO is an open access archive of texts from Higher Education in Africa. It is however, maintained by the University of the Western Cape. The collection includes research reports, journal articles, conference papers, book chapters, working papers, booklets, and policy documents. All the resources have been submitted by the authors and are reproduced with their permission. South African authors are starting to publish their articles in this repository. Submissions to AHEORA are reviewed to ensure that the content is relevant. Authors retain copyright for their articles.

3.8 Private and commercial publishing houses in South Africa

As can be seen from the information presented above, university repositories are the main source for open access for academic publications in South Africa. In addition, there are a few government-funded repositories as listed above. A

search to establish whether any private or commercial entities manage, and curate repositories yielded very scarce information.

According to Crow (2002), the open access journal publishing model has impacted on and changed the roles for conventional commercial model for journal publication. The Open access journal publishing model has two streams in their business model. The first is “for profit” publishers. Publisher makes content free to the end-user, profit is generated through payment of article processing charges paid for by the author or their academic institution. Costs of publication are therefore paid for up front and not through subscriptions at the end of the supply cycle. The 2nd model is “not for profit” using open source software such as Open Journal Systems (OJS). There are no costs incurred by the authors or the end-user and referred to as the “Diamond Open Access Model (Fuchs & Sandoval, 2013 & Clobridge, 2014).

The following is a list of the most popular and well-known academic publishers in South Africa. A search on their websites indicated that only AOSIS publishers have a repository of their academic publications available as open access. AOSIS makes it content free to the use through open access but charges upfront page fees from the author or their institution in order to make their business profitable. Some of the other publishers have e-resources available but essentially these are only electronic versions of their publications which are for sale to the end user.

Academic publishers in South Africa comprise of the following:

1. Aosis (see discussion below)
2. Juta
3. Oxford University Press
4. Imbali academic publishers
5. Wits University Press
6. Maruma publishing
7. Johnathan Ball publishers
8. Macmillan Education South Africa
9. Protea Books
10. Penguin/Random House
11. Pearson Publishers.
12. Van Schaik

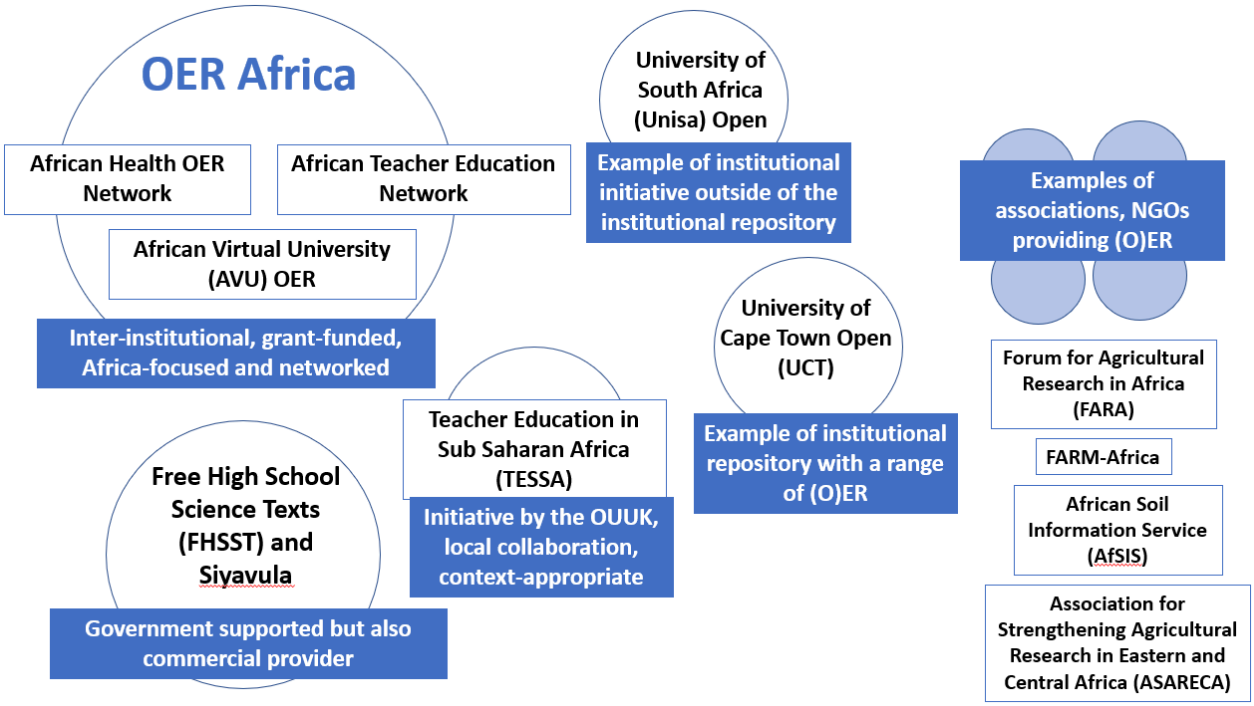
According to the website, Aosis Open Journals (https://aosis.co.za/about-journals/) is an open access publisher meaning that all their content is available without charge to the reader. They follow the ‘for profit’ funding model discussed above, and profit is generated through charging page fees to the author(s) or their institution (Crow, 2002). A strict peer review policy is in place to ensure ethical and quality standards. Raju, Rauju and Claasen (2015) assert that South African Higher Education libraries through their institutional repositories (IR), provide open access publishing. They suggest that these libraries will start to take on the role of the publishers in the future. From the above information this might indeed be the case as the academic publishers seem to be stuck in their traditional role of publication.

3.9 Inter-institutional consortia, association-based and non-governmental repositories

Hoosen and Butcher (2019) in their report on the creation and adoption of OER links the creation, adoption, and impact of OER on the maturity of the (digital) infrastructure in its geo-political context. The following overview attempts to provide a descriptive overview of several regional repositories comprising of inter-institutional, non-higher education and non-governmental repositories. Figure 5 (below) provides and overview of the diversity, nuances, and scope of (O)ER in a selection of players, that will be discussed in the section that follows:

Figure 5

An overview of a selection of inter-institutional consortia, association-based, non- and non-governmental repositories



We start this overview with, in our opinion, the sterling and comprehensive work by OER Africa.

OER Africa

Established in 2008, OER Africa has the vision to support the emergence of: "Vibrant and sustainable African education systems and institutions that play a critical role in building and sustaining African societies and economies through free and open development and sharing of common intellectual capital". OER Africa benefited with grants from The William & Flora Hewlett Foundation have provided OER Africa with grants with the aim

> *…to establish dynamic networks of African OER practitioners by sensitizing and connecting like-minded educators – teachers, academics, trainers, and policy makers – to develop, share, and adapt OER to meet the education needs of African societies. By creating and sustaining networks of collaboration – face-to-face and online – OER Africa supports African educators and learners to harness the power of OER. In turn, they can develop their capacity and join emerging global OER networks as active participants who showcase Africa's intellectual property, rather than passive consumers of knowledge produced elsewhere.*

OER Africa states that they:

- Develop and test effective models of continuous professional development for supporting OER practices, and
- Share knowledge gained through a range of mechanisms.
- Develop an evidence-based CPD framework comprising a set of inter-related learning pathways on effective OER practices.

From the information presented, the work done by OER Africa is made possible by grants. The first grant was used for planning and the partner institutions were:

- Kwame Nkrumah University of Science and Technology (KNUST)
- University of Cape Town (UCT)
- University of Ghana (UG)
- University of the Western Cape

The report by Bateman (2008a) “Revisiting the challenges for higher education in Sub-Saharan Africa: The role of the Open Educational Resources Movement” informed the choices OER Africa had as to where we might geographically work most effectively. Bateman (2008) states that “the OER movement offers a substantial opportunity as a catalyst for reform within the HE sector. A central tenant of the movement on which Africa could capitalize is the power that comes from sharing knowledge in all its forms and at all levels” (p. 44). This early grant/planning phase also saw the development of the African Health OER Network (discussed below) in collaboration with the University of Michigan.

The second and the third grant allowed OER Africa to focus

> *attention on raising awareness about the benefits of OER, supported collaborative development, adaptation and implementation processes within faculties, courses and programmes, and supported development and elaboration of OER policy frameworks at institutional, national, regional and continental levels.*

During this period OER Africa expanded to include:

- African Council for Distance Education (ACDE)
- Agriculture Education Network – this included collaborating with the Agshare planning and pilot project, funded by the Bill and Melinda Gates Foundation. OER sensitisation took place at Makerere in Uganda, USIU and Moi in Kenya and Haramaya in Ethiopia. Agshare II was a collaboration with three institutions, Haramaya and Mekelle Universities in Ethiopia and Makerere University in Uganda to create and openly share different types of OER that strengthen MSc agriculture faculty. RUFORUM came on board as a new partner in this phase
- African OER Teacher Education Network which included working with the Open University (UK) TESSA Initiative.
- Health OER Network – Work here was expanded during this period through a separate grant from the Hewlett Foundation. A consultative forum with partners and representatives from other African countries was held in 2009.

Network spaces were being strengthened with both internally developed resources and external resources, such as:

- Saide Education Studies
- Agshare course materials
- Course design and development guide
- Count materials
- Health Information Building Blocks

OER Africa also conducted research and documented the creation and use of OER in several case studies, including but not limited to:

- Bunda College of Agriculture, University of Malawi
- Kamuzu College of Nursing
- Partnership for Higher Education in Africa (PHEA)
- KNUST (Health OER Project)
- University of Ghana (Health OER Project)
- UCT (Health OER Project)
- Exploring the Business Case for OER.

This period also saw the development of several resources and toolkits such as:

- Policy Review and Development Toolkit (Mays, 2012)
- Copyright and Licencing Toolkit (Saide, 2012).
- A Basic Guide on OER (Butcher, 2011)
- Open Educational Resources and Change in Higher Education: Reflections from Practice (Glennie, Harley, Butcher, & van Wyk, 2012)

Communities of practice were also established during this grant periods and provided space on the OER Africa website to collaborate in the development of course materials and to provide a home for their OERs such as

- Skills for a Changing World included English Literacy & Language Development (Greyling, W., & van Wyk, 2010); Finding Your Way in the World of Work. Activity Guide for Office Administration: Level 2 (Randall, 2006); and Mathematical Literacy University of Free State, 2010)
- Ace Maths (see Sapire & Reed, 2011)
- Health OER
- Household Food Security Facilitators Programme – consisting of 6 different modules written by different combinations of Ferreira, Barlow-Zambodla, and Kruger (2012, 2010).

During the second and third grant periods, OER Africa also published two research reports, namely:

- OER Africa's Potential Domain Areas and Partners (Bateman, 2008b)
- OER Africa: Communities of Practice.

The fourth grant (ended 2017) allowed OER Africa "to embed OER practices within African Higher Education Institutions through improving both content and delivery of higher education by promoting a contextually relevant model for harnessing OER." As such OER Africa worked with the following institutions:

- Africa Nazarene University – ANU (Kenya) on block teaching
- University of Pretoria, Faculty of Veterinary Science on continuing professional development.
- Open University of Tanzania in developing teaching and learning resources.
- University of the Free State on continuing professional development.

The continuing development of specific OER policy and the incorporation of the use of OER in intellectual property regimes of selected institutions were galvanised in this grant. A significant number of conference papers and publications, workshops, etc., were presented. A full list of these are available here.

During August 2017 and February 2019 OER Africa received a fifth grant that allowed them to

> *...determine what kinds of continuing professional development (CPD) are needed by African faculty to be able to implement these improvements successfully and sustainably, as well as to model approaches to CPD that might be scaled successfully without additional cost once they have demonstrated their effectiveness.*

The following higher education and training institutions were involved during this period:

- Haramaya University
- Dire Dawa University
- Mekelle University
- Vaal University of Technology (VUT)
- National Open University of Nigeria (NOUN)
- Open University of Tanzania
- Dar es Salaam College of Education (DUCE)
- University of the Free State (UFS)
- South Africa's Technical and Vocational Education and Training (TVET) Colleges

During the current (sixth) grant period, OER Africa "aims to develop collaboratively the professional competences and skills of stakeholders within African higher education institutions so that they can implement OER practices to improve the quality of teaching and learning." An evidence-based CPD framework comprising a set of inter-related learning pathways on effective OER practices will be developed. OER Africa will furthermore "seek to systematically develop African academics' competence while providing immediate access to relevant and useful skills and knowledge that will make their teaching and learning easier to implement and more effective."

African Health OER Network (URL: https://edtechbooks.org/-NsJE)

The African Health OER Network "seeks to enable participants to develop, adapt, and share health education resources to augment limited human and other resources in the health sector and impact positively on overall health provision in Africa and beyond". Although the repository hosts a wide number of resources, the website features the following:

- Health Promotion I Module Guide (Schaay et al., 2002)
- Growing an Institutional Health OER Initiative: A Case Study of the University of Cape Town (Mawoyo, 2012).
- Haematology - The White Blood Cell Count (Koffuor, 2012)

The full list of resources available on the African Health OER Network is as follows:

- Behavioural Sciences (1)
- Dentistry (8)
- Ethics (49)
- Health Services Administration (4)
- Informatics (40)
- Medicine (41)
- Nursing (2)
- Nutritional Sciences (1)
- Optometry (2)
- Pharmacology (11)
- Public and Community Health (21)
- Reports (12)
- Research Design (11)
- Useful Guides (6)

African Virtual University (AVU) OER

"African Virtual University offers OER's that are linked to specific courses. There are 73 published modules of ICT Integration in Mathematics, Biology, Physics, Chemistry and Education, ICT Basic Skills and B.Ed. professional courses available in 3 languages, English, French and Portuguese."

The English resources include areas such as:

- Applied Computer Science (Administration Resources; Computer Science Resources; Informatics Resources; Linguistics Resources; and Mathematics Resources)
- Online Journal Publications (Access, equity, and ethics; Open, distance and eLearning systems and institutions)
- Policy Briefs (on a wide range of topics such as, but not limited to ICTs in Open and Distance Learning, Mobile Learning Resources, Massive Open Online Courses, Quality Assurance, etc.)
- Teacher Education (including, but not limited to resources in Biology, Chemistry, ICT Basic Skills, Mathematics, Physics, and ICT Integration in Education)

The French and Portuguese resources include, inter alia, resources in biology, Chemistry, and Physics.

African Teacher Education Network

The aim of the African Teacher Education OER Network (ATEN) is about "encouraging understanding, use, and sharing of Open Educational Resources (OER) to support teacher education and development in Africa". The Network is "a loosely connected group of teacher educators – with participants from Botswana, Ghana, Kenya, Malawi, Mauritius, Mozambique, Nigeria, South Africa, Swaziland, Tanzania, Togo, Uganda, Zambia, UK and USA."

The Network lists its resources under a broad category named "Teacher Education OER Projects" that include the following:

- ACEMaths
- Advanced Certificate: Education
- Creating a Caring School
- Data Informed Practice Improvement Project (DIPIP) Project
- Saide Teacher Education Series
- University of Fort Hare B Prim Ed

Under a different category called African Teacher Education OER, the following are listed:

- Early Childhood Development (16)
- School Leadership, Management, Administration and Governance (105)
- Subject Teaching (94)
- Assessment (15)
- Curriculum (13)
- Discipline, safety and security (26)
- Human resource management (5)
- ICT integration (8)
- Inclusive education (37)
- Information literacy (10)
- Outcomes based education (6)
- Quality assurance (9)
- Teachers and teaching (105)

Free High School Science Texts (FHSST) (Siyavula)

In 2002, “The Free High School Science Texts project begins publishing Open Educational Resources (OER) as a group of students get together with the conviction that they need to share their knowledge, for free. With the collective power of volunteer collaboration, the project produces open textbooks for Gr 10-12 Mathematics, Physics and Chemistry, allowing teachers and learners to print or share them digitally.” Flowing from these early beginnings, in 2007 “Siyavula is born as a fellowship project within the Shuttleworth Foundation, with the aim of making openly licensed content available for all grades and subjects within South Africa”. Siyavula collaborates with the South African government that “prints and distributes millions of the open textbooks to all learners in the country”. Siyavula furthermore produces “additional open content in Gr 4-9 and refines the collaborative authoring process, volunteer contribution and unique content production pipelines.”

A major development in the lifecycle of Siyavula takes place in 2007 when Siyavula transitions into a technology company with help from the Shuttleworth Foundation (international) and a local financial services group, PSG Group Limited. “Siyavula Education is spun out as a company in pursuit of long-term sustainability and stability” and focuses on “building an integrated learning experience, drawing on the benefits of open content and adaptive practice for mastery in Maths and Science". In 2014, “Siyavula becomes part of the Omidyar Network” and the company “turns its attention to expanding into international markets bringing Siyavula Practice to the world."

A wide range of resources on primary and secondary Maths and Sciences are freely available and downloadable under two different CC-licencing schemes:

CC-BY-ND

You are allowed and encouraged to freely copy these versions. You can photocopy, print and distribute them as often as you like. You can download them onto your mobile phone, iPad, PC or flash drive. You can burn them to CD, email them around or upload them to your website. The only restriction is that you cannot adapt or change these versions of the textbooks, their content or covers in any way as they contain the relevant Siyavula brands, the sponsorship logos and are endorsed by the Department of Basic Education. For more information, visit Creative Commons Attribution-NoDerivs 3.0 Unported.

CC-BY

These unbranded versions of the same content are available for you to share, adapt, transform, modify or build upon in any way, with the only requirement being to give appropriate credit to Siyavula. For more information, visit Creative Commons Attribution 3.0 Unported.

Teacher Education in Sub Saharan Africa (TESSA)

In 2005, Teacher Education in Sub-Saharan Africa, TESSA, was started by “a team from The Open University, led by Professor Bob Moon, with funding the Allan and Nesta Ferguson Foundation, and later from the William and Flora Hewlett Foundation.” The founding strategy included forming a consortium with “14 Higher Education institutions from nine

African countries, and four international organisations.” The consortium's founding partners were as follows:

- Egerton University, Kenya
- Kigali Institute of Education, Rwanda
- Kyambogo University, Uganda
- Makerere University, Uganda
- National Teachers' Institute, Nigeria
- The Open University of Sudan
- The Open University of Tanzania
- The Open University, UK
- University of Cape Coast, Ghana
- University of Fort Hare, South Africa
- University of Education, Winneba, Ghana
- University of KwaZulu-Natal
- University of Pretoria, South Africa
- University of South Africa
- University of Zambia

The following international organisations were involved at the time of the founding of the consortium:

- The BBC World Service
- African Virtual University (AVU)
- The Commonwealth of Learning (CoL)
- South African Institute of Distance Education (SAIDE)

TESSA is a network of teachers and teacher educators stretching across Sub-Saharan Africa. At the heart of the network is a bank of open educational resources (OER), linked to the school curriculum, and designed to support teachers and teacher educators in developing active approaches to learning. The network is co-ordinated by The Open University, UK.

The large databank of materials developed, sourced and administered by TESSA “is available to enhance and improve the quality of and access to local school-based education and training for teachers”. Tessa is a project of The Open University (UK) and “have been produced in partnership with local African educational experts”. The resources are “free to everyone to use and adapt, under a creative commons license”. Of particular interest for the discourses surrounding the importance of context in OER, it is important to note that the “TESSA units have been adapted to ten country contexts and are available in four different languages on the TESSA website: Arabic, English, French and Kiswahili. In addition, these materials are also available in generic versions in English and French, so are applicable for you wherever you are in sub-Saharan Africa.” The units developed by TESSA focus on several activities that teachers may apply depending on their local needs and contexts. There are also handbooks to help teachers and teacher educators “integrate and make effective use of the resources in their classrooms and in their courses.”

Of further importance is the fact that “The Open University we work with partners to facilitate the use of TESSA resources in contextually appropriate ways.”

Between 2005 and 2007, “colleagues from these institutions worked together to develop a bank of resources to support student learning and teacher learning. Resources were developed in English and translated into French Kiswahili and Arabic”. The modus of operandi entailed that participating colleagues “formed local teams and versioned the resources for use in their own country.’ During this period the consortium was joined by La Direction des Formations à Lomé in Togo.

The TESSA website became fully operational in 2010 “with ten different versions of the resources, published as OER. Materials were also made available in print and on CDs, as required.” Since 2010 TESSA worked on several individually funded projects namely:

- widening participation (to include Colleges of Education, Government agencies and Civic society organisations);
- embedding TESSA in institutions (including universities, colleges and schools);
- improving access using tablets, mobile phones and a re-developed web-site;
- developing new materials (including TESSA Secondary Science, Teaching Practice Supervisors Toolkit and Inclusive Education Toolkit).

In the period 2016-2019 TESSA obtained funding from the Ferguson Foundation that was used for “strengthening the network, involving new partners, and enabling institutions and Governments to take ownership of the OER and the ideas they contain.” The latest update (on the TESSA webpages) regarding TESSA’s strategic objectives refer to:

- Improving access to TESSA resources
- Building the capacity of teacher educators through the provision of a MOOC
- Embedding TESSA in teacher education institutions in selected countries
- Ensuring sustainability through the strengthening of the network and the development of new collaborations and partnerships.

Forum for Agricultural Research in Africa (FARA)

The Forum for Agricultural Research in Africa (FARA), is “the apex continental organization responsible for coordinating and advocating for agricultural research for development (AR4D)” and functions as an umbrella organization bringing together and forming coalitions of major stakeholders in agricultural research and development in Africa. FAR furthermore “serves as the technical arm of the Africa Union Commission on matters concerning agriculture science, technology and innovation". Conceived in the late 1990s, FARA was founded by a “core group of committed champions, including both African scientists and enlightened donor aid officials, who believed in agriculture’s potential to lift the continent from poverty, yet realized that this would only be achieved if the continent’s weak and fragmented agricultural research systems could somehow be brought together and strengthened under a common banner”. Central to FARA’s Strategic Plan (2019-2028) is “Providing access to global and regional knowledge and data systems to identify expert solutions and funding opportunities for priority issues such as food security, nutrition, poverty and climate change”.

In service of this strategic goal, FARA offers a library with free, downloadable resources including research reports, dissemination notes, books, policy briefs, annual reports, country and technical reports, presentations and journals.

FARM-Africa

FARM-Africa was established in 1985 in response to the famine in Ethiopia and currently its 200 staff works in the Democratic Republic of the Congo, Kenya, Tanzania, and Ethiopia. Core to the values of FARM-Africa is a commitment to “Deep expertise and insightful evidence-based solutions are at the heart of everything Farm Africa does.” Though not specifically only a repository of resources, FARM-Africa services included a range of resources but as far as we could establish, none published specifically as OER, or under a CC-licence. What is interesting, and a first in this short overview of open repositories on or for the African continent, is FARM-Africa's commitment to participate in the Open

Data initiative - “At Farm Africa we believe in transparency in our work and this is highlighted by our commitment to the IATI (International Aid Transparency Initiative).” As such their data are published on the IATI repository

African Soil Information Service (AfSIS)

The mission of Africa Soil Information Service (AfSIS) (established January 2009)

> *...is to rapidly expand the use of world-class information technology and data science to ensure that Africa’s soil and landscape resources are described, understood and used effectively to raise agricultural productivity and lower ecological footprints as a means of increasing the prosperity of Africa’s communities and nations.*

As such AfSIS works “with a wide range of stakeholders to develop demand-driven spatial data and information products and services and helps to build institutions for improving the management of soils and landscapes”. Their research and development include:

- Development of soil and landscape information infrastructure and systems including core databases, protocols, standards, software, IT and data science.
- Creation of agronomic decision support applications that add value and inform decision making at multiple levels, from national and regional policy formation to farm-level land management with project partners.
- Institutionalization, capacity strengthening and learning support for deploying institutional soil and landscape information systems and services.
- Sustainable business development and communications innovation support.

AfSIS provides access to a range of published research under the following categories:

- Agriculture
- Carbon Storage
- Climate Change
- Digital Soil Mapping
- Ecology
- Food Security
- Forestry
- Geostatistics
- Land Degradation
- Land Use
- Remote Sensing
- Soil
- Soil Fertility
- Spectroscopy
- Water

At the time of this research, it was unclear how many of the linked research papers were available for free, and how many of the articles were hosted on other platforms such as ResearchGate or behind publisher paywalls. Of particular interest for this research, is the fact that AfSIS had a Wiki page but the service has since been disabled/discontinued. The following message provides the rationale for its closure:

Approximately 18 months ago, we completed a technical review of the infrastructure and software we used to serve Wikispaces users. As part of the review, it became apparent that the required investment to bring the infrastructure and code in line with modern standards was very substantial. We explored all possible options for keeping Wikispaces running but had to conclude that it was no longer viable to continue to run the service in the long term. So, sadly, we had to close the site - but we have been touched by the messages from users all over the world who began creating wikis with it and now running them on new platforms.

Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) (URL: http://www.asareca.org/)

The Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) is a “not-for-profit sub-regional organization of the National Agricultural Research Systems (NARS) of 11-member countries, namely: Burundi, the Democratic Republic of the Congo, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, South Sudan, Sudan, Tanzania and Uganda." As such ASARECA “brings together scientists from the national agricultural research institutions of the member countries, national agricultural extension service providers and other strategic development-oriented partners to generate, share and promote knowledge and innovations to solve common challenges facing agriculture in the member countries” (emphasis added).

The publications include the following:

- 11 Annual Reports
- 10 ASARECA in the Media
- 7 Books
- 5 Briefs
- 21 Brochures and Leaflets
- 20 Climate Change
- 29 Conference/Workshop Materials
- 11 Discussion Papers
- 6 Impact Stories
- 1 Operational Manuals/Guidelines
- 3 Policies and Frameworks
- 89 Policy Newsletter Documents
- 10 Posters
- 12 Programme publications
- 14 Project Documents
- 38 Research Papers
- 13 Strategies
- 9 The Agriforum Newsletter
- 12 Training Manuals

Once again, it is notable that while none of these resources, as far as the researchers could establish, is published as OER, the will fall under the broader definition of (O)ER as used in this research project.

3.10 Summary of findings of the meso-analysis

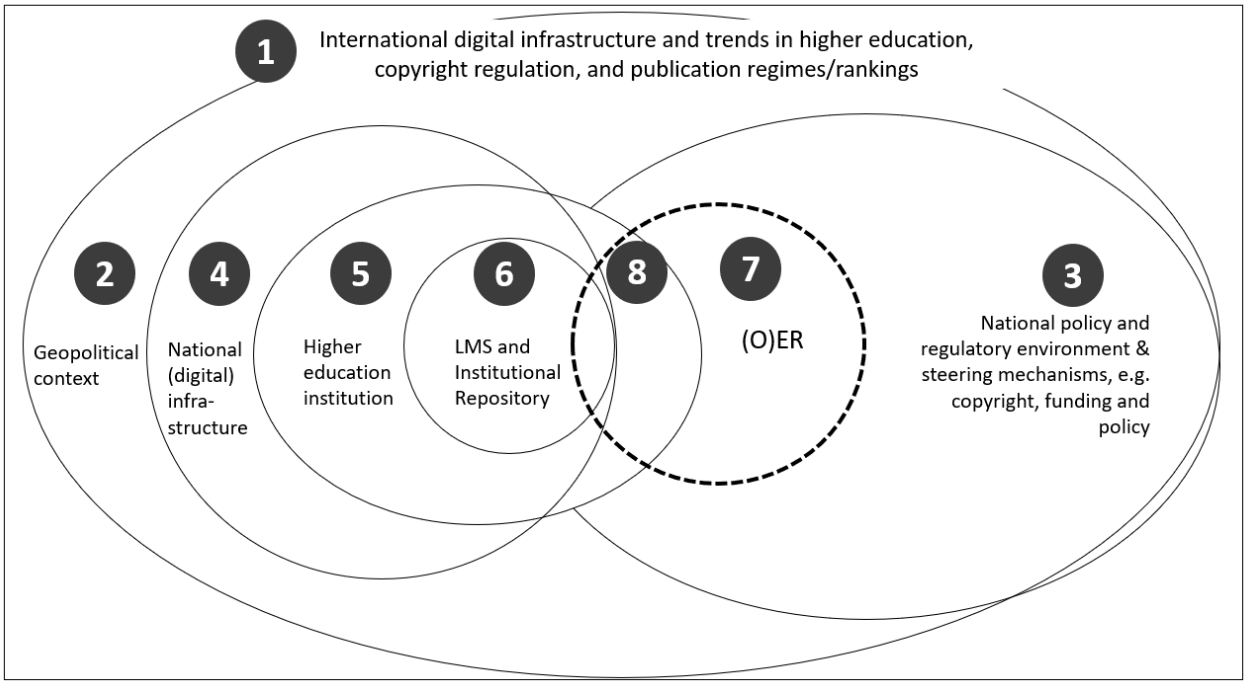
The above overviews and analyses focused on South African institutional repositories as broader context, two specific higher education case studies, government and commercial providers, as well as a selection of inter-institutional consortia, association-based and non-governmental repositories. We have found that:

1. International digital infrastructure and trends in higher education, copyright regulation, and publication regimes/rankings impact on (O)ER – not only the institutionalisation of (O)ER, but also the production, dissemination and use of (O)ER. For example, in the context of UCT, academics were sharing resources in several formats before the advent of (O)ER as phenomenon, but as a research-intensive institution, publishing in high-impact journals and the role of university rankings shape individual researchers' practices.
2. Understanding the geopolitical context is crucial. For example, we cannot ignore the intergenerational legacies of colonialism and apartheid, and evidence of the continued marginalisation of knowledges from the Global South in the historical asymmetries of knowledge production, validation and dissemination in the Global North and the Global South.
3. To comprehend the scope, nuances and various forms of (O)ER in any geopolitical context, it is important to map and understand the role of national policy and the regulatory environment and such as copyright legislation, and funding, but also the role of inter-institutional consortia, external higher education institutions and stakeholders (such as in OER Africa and the TESSA project), government repositories, as well as repositories for specific communities (e.g. health, education and agriculture), often provided by associations and/or non-governmental organisations.
4. Also flowing from the geopolitical context is the provision of (digital) infrastructure. Higher education institutions depend on the provision of (digital) infrastructure e.g. access, cost, bandwidth and sustainability of internet connectivity, but also on basic levels such as the provision of sustainable electricity, water, and security. In this respect, the analysis of inter-institutional consortia and NGOs play an important role in making training and information resources available.
5. The institutional mandate and character of a higher education institution plays an important role as it responds to a range of factors, e.g. research-intensive (e.g. UCT) or open distance learning (e.g. Unisa), with differences in student numbers, course offerings, and use of the LMS and Institutional Repository.
6. (O)ER, in each of the institutions that formed part of this analysis, therefore must be understood as emerging from and entangled in all these different intersecting, and often mutually constitutive (f)actors.

Figure 6 (below) illustrates these different (f)actors as (1) international digital infrastructure and trends in higher education, copyright regulation, and publication regimes/rankings; (2) the geopolitical context; (3) the national policy and regulatory environment & steering mechanisms, e.g. copyright, funding and policy; (4) the national (digital) infrastructure; (5) the role, scope, and strategic and operational priorities of higher education institutions; (6) the LMS and Institutional Repositories; and (7) (O)ER, which may be found in the LMS and Institutional Repositories, in digital formats, but also (8) outside of not only the LMS and Institutional Repository, but also in non-digital formats.

Figure 6

Overview and synthesis of findings



Context is everything. As our analysis has shown, the two institutions' responses to (O)ER must be understood in context – whether referring to international (digital) infrastructure or trends in higher education, copyright regulation, and publication regimes and rankings, the national or the institutional context. We introduced this Part 2 of the broader project with a quotation from Hodgkinson-Williams and Gray, (2009) stating "Information and communication technologies (ICTs) provide a range of opportunities to share educational materials and processes in ways that are not yet fully understood" (p. 101). These authors referred to the fact that these opportunities hide "a reef of complexity" (Hodgkinson-Williams & Gray, 2009, p. 101).

While the purpose of the analysis was on looking at the nexus of digital infrastructure and (O)ER, we conclude with the reminder that the notion of 'structure' or infrastructure denotes far more than physical structures but also illuminate the role of "enduring relations among human actors, the social positions they occupy, and things made by humans", issues "such as power supply, hardware, software, connectivity and information and communication technologies (ICT)", platforms, licensing regimes, as well as "government or institutional policies, strategies, programmes and procedures; and funding from donors, governments and/or institutions" (Hodgkinson-Williams & Arinto (2017, p. 34). And, as these authors remind us, we ignore the impact of the "socioeconomic and geographic context in which students and educators are located" (p. 34).

4. Micro level of the digital infrastructures for digital educational resources

Early evidence pertaining to the impact of COVID-19 on perceptions, (re)use and production of (O)ER

Interestingly, one would have expected more early evidence of how learners, faculty and educational institutions' perceptions, (re)use and production of (O)ER changed as a result of, and during the pandemic. While there are a number of published papers reflecting on responses in the South African educational context, there is very little evidence, so far, of changes to the perceptions, (re)use and production of (O)ER in response to the pandemic.

For example, Lopes and McKay (2020) point to the impact of education and specifically literacy on a population's understanding of the risks, and of making informed choices. The authors point out how the formal education sector "is

primarily focused on preparing people for the labour market, and little or no learning is related to citizenship or individuals' capacity as social actors to take collective action in critical or emergency situations" (Lopes & McKay, 2020, p. 18). The authors, though they mention access to correct and trustworthy information, do not discuss the role and potential of (O)ER. Anciano et al. (2020) report how many, if not most South African learners were stuck at home without resources and without access to resources. They refer to attempts by the government to make education accessible on TV and radio - but these efforts were not enough "to bridge the divide of South Africa's unequal access to resources" (p. 2). Some schools attempted to make printed materials available, but most schools were left without recourse.

Dube (2020) shares evidence of how COVId-19 deepened the digital divide, especially in rural South Africa where educators and learners alike were at a loss how to negotiate, afford and use various technologies, including low-tech solutions. The challenges faced by rural learners included the absence of network coverage, the closure of internet cafes, the lack of computer skills by some educators, and the cost of connectivity. Interestingly, (and disappointedly) the recommendations only refer to the provision of hardware, training and skills with no mention of the huge potential of (O)ER. This may, however, be embedded in the need to solve first issues first, namely access to the internet. In a non-peer reviewed paper, Mhlanga and Moloi (2020) provide an overview of initiatives to reach learners and to capacitate educators during this time, especially on primary and secondary school levels. From the government's side it included making a number of national TV channels available as two recording studios. Other initiatives included zero-rated data applications and educational websites. Looking at the list of strategies and interventions provided by the South African government (South African Government, 2020), the majority of initiatives refer to providing access or making access to the internet available. One specific reference to making materials available is the initiative by the National Reading Coalition (NRC) who has "identified extensive lists of additional resources and organizations that are willing to make their materials available". No further information is provided. While the website of the NRC has a comprehensive list of reading resources, there is very little other information on either the update of these resources, or specific additional interventions in terms of (O)ER in response to the pandemic. From the information provided, the main 'driver' of providing access to (O)ER during this period was and continues to be the Department of Basic Education (DBE). The website of the DBE (DBE, 2020) provides access to a range of materials such as study material, multimedia, reading material, COVID-19 guides, related links, broadcast support, tips for parents, links for schools and links for parents. Of concern is the report by Spaull (2020) that for "the poorest 80% of learners in South Africa, virtually no curricular learning is taking place during lockdown" and that "At most, 5–10% of learners can continue learning at home given their access to computers and the internet. (p. 6).

In the context of higher education the published information mainly refers to access to hardware and the internet - whether through data vouchers or zero-rated access. For example, Vally, Shiohira, Nyoni, Mapatwana, Muchesa & Makhoabenyane, (2020) refer to Friedman (2020) reporting on UCT's strategy for students - "Students, many of whom are from poor socio-economic backgrounds and lack access to the internet and other resources, have been provided with data (30GB), USBs, printed materials, zero-rated (or free to access) educational websites and smart devices to help them access learning resources and lessons (p. 20). In the light of the dearth of published research on the use of (O)ER at Unisa, it is significant that van den Berg (2020) states that the pandemic has revealed the need for open content. She points to the

> *current economic climate as well as the unavailability of textbooks [which] reiterated the need for the implementation and development of quality open educational resources (OERs). They do not only have the potential to replace full textbooks, but additionally provide a wide range of resources [...] such as assessment worksheets, shorter texts for courses, videos, lab exercise guides, and more. Different platforms for the use and development of OERs exist, such as OERAfrica and OERu. The call for OERs is not unique to ODL, as national and international media have also made similar requests in the past few months (p. 9).*

Though evidence may still emerge on how the pandemic changed and continues to change perceptions, the (re)use and production of (O)ER, the pandemic does signify the importance of openness in education and highlights (O)ER issues

that should be taken into consideration, such as the importance of the buy in from the teachers and lecturers that needs to be underpinned by robust institutional policies, quality control and improved access.

With the above as an introduction, we now turn to positioning individual responses in terms of perceptions, (re)use and production of (O)ER in the South African higher education context.

Positioning the micro level of the digital infrastructures in the South African context

As we explored the different layers of this analysis of digital infrastructures for digital educational resources in the specific context of South Africa, we referred to how mapping the notion of 'open' in the nexus of (O)ER and digital infrastructure in the Global South "hides a reef of complexity" (Hodgkinson-Williams & Gray, 2009, p. 101). Individuals' production, use and re-use of digital (O)ER are entangled and have to be understood in broader international trends and contestations, for example, the asymmetries in knowledge production between the Global North and the Global South, the marginalisation of ontologies and epistemologies that falls outside the sanctioned canons of the Global North as well as role of publishing, editorial boards, copyright, impact and ranking regimes and dynasties, most of these situated in the Global North.

Research outside the context of South Africa on reasons why individuals (re)use and produce (O)ER include, but are not limited to He & Wei, (2009), Pegler (2012), Reed (2012), Rolf (2012) and in the broader context of the developing world, Hattaka (2009).

This analysis documents individual responses in the specific context of South Africa, in the nexus between (digital) infrastructure and (O)ER. At the start of this chapter, we referred to the below figure (Figure 7) to provide an overview of our understanding of the individual or micro-level in the context of South Africa.

Figure 7

Mapping the micro-level

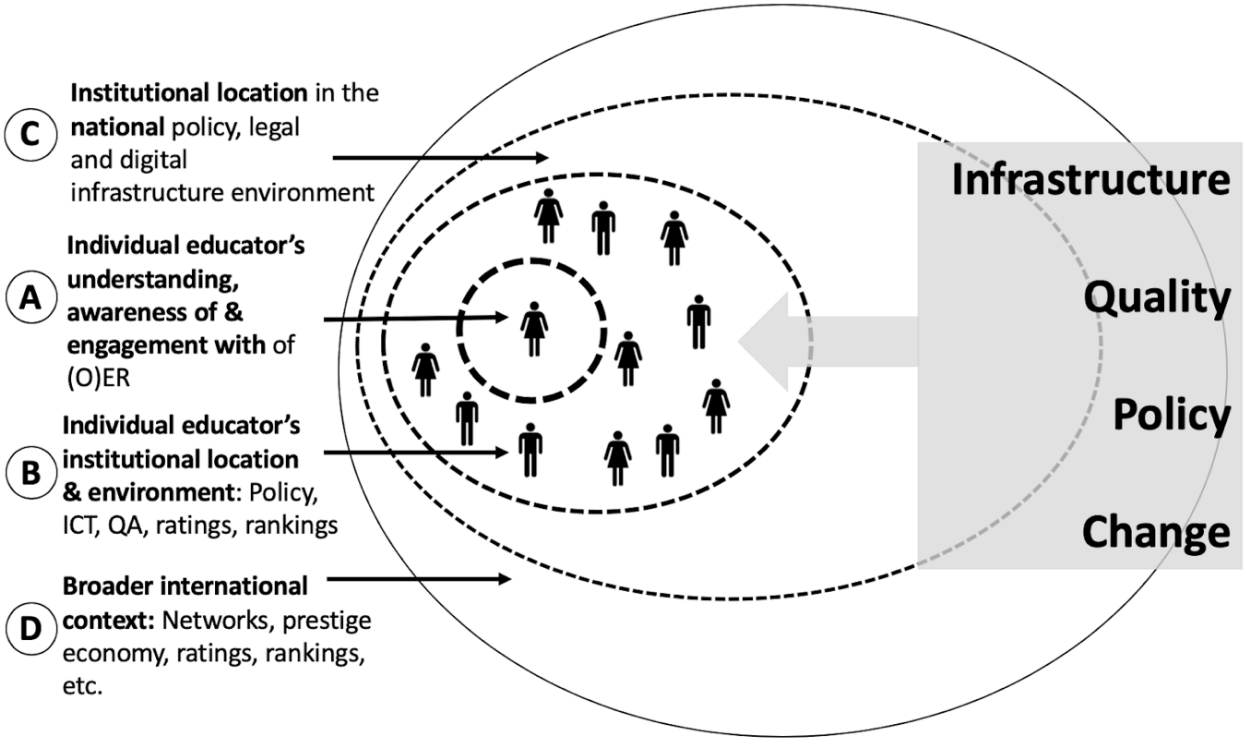


Figure 7 illustrates our understanding of individual perceptions, (re)use and production of (O)ER in the context of South Africa. In the middle (A) we have the individual's perceptions, (re)use and production of (O)ER. Evidence suggests that "Personal motivation, especially the desire to enhance one's reputation, underpins some educators' practice of creating and sharing teaching materials as OER", as well as feelings of "personal fulfilment and confidence" and educators seeing their participation in (O)ER as "a way of asserting an epistemic stance, or one's own unique (individual or collective) perspective of knowledge" (Hodgkinson-Williams, Arinto, Cartmill & King, 2017, p. 586). This is vital for people from marginalised communities whose histories and knowledge have been side-lined or suppressed by colonial or hegemonic powers" (Hodgkinson-Williams, Arinto, Cartmill & King, 2017, p. 586). There is also evidence that in the context of South African universities, individuals' understanding, awareness of, and engagement with (O)ER are also shaped, and in many ways determined by their institutional location (e.g. role, department, discipline) and institutional environment (the character, values and mission and vision of the institution) (Point B). For example, the research by Cox and Trotter (2016) points to how "OER-related policy intervention is mediated by an institution's existing policy structure, its prevailing social culture and academics' own agency (the three components of what we're calling 'institutional culture')" (p. 147). In their research, Cox and Trotter refer to the work of Archer (1996; 2003) and specifically Archer's understanding of the relationship between culture/structure and agency, and two guiding concepts namely, 'analytic dualism' and 'concerns' of agents. Analytic dualism refers to the interplay between 'structure' and 'agency' while the 'concerns' of agents refer to "those internal goods that they care most about" (Archer, 2007, p. 42). Individuals' agency are flowing from what they care about but are tempered by social structure.

The institutional environment (Point B) is also constituted by (digital) infrastructure, quality assurance regimes and processes, policy and change. As we will see in the analysis below, the institutional environment also embodies and perpetuates particular understandings of Intellectual Property (IP), scholarly quality and gravitas, or the academic prestige economy (Ball, 2000; Blackmore 2016; Morley 2016). The institution (Point C), while having its own unique characteristics, processes and values, is, however, embedded in a national policy and legislative context (e.g. copyright) and (digital) infrastructure. We also cannot, and should not, ignore or underestimate how the broader international context (Point D) with its networks of inclusion and exclusion, asymmetries in knowledge production, the prestige economy, ratings and rankings impacts on national systems of higher education, individual institutions and individual faculty or staff member in a higher education institution.

Research by de Oliveira Neto, Pete, Daryono and Cartmill, (2017) explored, inter alia, whether countries with higher levels of GDP per capita produced more (O)ER. Their research covered Brazil, Chile, Ghana, Kenya, Colombia, India, Indonesia and Malaysia and they found that "South Africa – the most economically developed country by GDP per capita [...] had the lowest rate of instructor OER use compared to Ghana and Kenya" (p. 83). Interestingly, "it is instructors from countries that are less economically developed who have sought out more OER for use" (p. 84). Their research found that gender, age, digital proficiency, or qualifications of instructors played a significant role in instructor's use of (O)ER. Of significance for this study is their finding that most (63%) South African respondents "say their institutional policies support OER, but only a minority (37%) have used them" (de Oliveira Neto, Pete, Daryono & Cartmill, 2017, p. 101). The majority of South African instructors have not applied any form of open licencing to their work, and/or have retained full copyright to their work (p. 106).

A recent study on South African institutions' (re)use and production of (O)ER, Hoosen and Butcher (2019) state that "There has been modest uptake of OER in South Africa" (p. 147). While Hoosen and Butcher (2019) provide an excellent overview of the higher education institutional landscape, there is very little, if any findings on the micro-level.

The most recent publication is the research by Cox, Masuku and Willmers (2020) on "Open textbooks and social justice: Open educational practices to address economic, cultural and political injustice at the University of Cape Town". The authors found that

> *open textbooks have the potential to disrupt histories of exclusion in South African HE institutions by addressing issues of cost and marginalisation through the creation of affordable, contextually-relevant learning resources. In addition to this, they provide affordances which enable lecturers to change the way they teach, include student voices and create innovative pedagogical strategies (p. 1).*

The research "sought to surface the various barriers academics face in creating

> *open textbooks as well as the barriers faced by students in accessing materials" (p. 4). The first finding of the research is "Academics at UCT are aware of the challenges related to the cost and utility of traditional textbooks and are experimenting with new approaches towards resource creation through open practice" (p. 5). The second finding was that "Time is a significant cost to the academic in open textbook production" (p. 5). While open textbooks address the issue of cost to students, "there is still a cost involved in the production and ongoing delivery of open textbooks, particularly in terms of the time required on the part of the academic to author, format and publish these resources" (p. 5). The issue and impact of 'cost' is "therefore shifted from the student to lecturers, a situation which is compounded by the lack of formal institutional recognition for activity in this area" (p. 5; emphasis added). The third finding refers to how "Open textbook authorship models are providing avenues to explore innovative, student-centred pedagogical approaches" (p. 6). Another finding was "Open textbook authors are attempting to make content more accessible in terms of relevance, format and genre in order to promote greater inclusivity" (p. 6). Of particular importance in the context of this chapter is the finding that "Open textbook activity appears to be on the rise at UCT despite a range of institutional barriers to open textbook development activity" (p. 6). The most important barrier mentioned was "the current 'Ad Hominem' academic promotion system" (p. 6) referring to "the fact that the academic reward system at UCT was skewed towards the publication of research outputs over textbooks and otherlearning materials, and that their resource creation efforts were seen as something over and above what they were supposed to be doing" (p. 6). The sixth finding was that "Academics at UCT acknowledge that there is a legacy of gatekeeping in the selection of prescribed textbooks which serves to perpetuate political misframing and exclusion" (p. 7), and the 7th finding refers to student involvement - "Open textbook authors at UCT are including students in content development processes in order to shift power dynamics and build confidence in terms of students' ability to contribute" (p. 8).*

We will now turn to map evidence and our analysis pertaining to four different aspects namely infrastructure, quality, policy and change before summarising our findings. In the preceding meso-level analysis, we focused on two specific institutions namely the University of Cape Town (UCT) and the University of South Africa (Unisa). These two institutions, while subject to the same international trends and national policy and legislative environment, have very different mandates and institutional cultures. UCT is a research intensive institution and the highest ranked South African higher education institution on the Times Higher Education (THE) university rankings. Unisa, is a comprehensive higher education institution, offering vocational as well as academic qualifications ranging from higher certificate to PhD levels. Unisa is also a dedicated distance education institution and classifies itself as research-active (in contrast to research-intensive) (see Prinsloo and Nthebolang, 2020). Selecting these two institutions and mapping individuals' agency in these two very different institutional contexts allow for interesting, contrasting but also complementary analysis.

4.1 Methodological pointers

While we did find new published research, especially with regard to individuals' understanding, use and production of (O)ER, we continue to be at loss to provide a comprehensive overview due to a relative dearth of published research on individuals and institutional perceptions, (re)use and production of (O)ER. Except for the research by Hoosen and Butcher (2019) on institutional responsiveness and policy frameworks pertaining to (O)ER, and the research on open textbooks in the context of UCT by Cox, Masuku and Willmers (2020), most of the research dates from 2017 - Arinto, Hodgkinson- Williams and Trotter, (2017); Cox & Trotter (2017); Czerniewicz, Glover, Deacon & Walji, (2017); de Oliveira Neto, Pete, Daryono and Cartmill (2017); as well as Hodgkinson- Williams, Arinto, Cartmill and King, (2017).

As in analysis of the macro and meso-levels, we approach the micro-analysis by discussing the four different subsections - infrastructure, quality, policy and change - first in general terms in the context of South Africa, before discussing findings to two cases studies namely the University of South Africa (Unisa) and the University of Cape Town (UCT). In the previous macro and meso analyses we provided a rationale for the use of these two institutions as case

studies. With this micro-analysis focusing on individuals' perceptions, (re)use and production of (O)ER, our findings provide evidence that in both cases, individuals' perceptions, (re)use and production of (O)ER are shaped and determined by institutional policies, processes, infrastructure, and support, or the lack of. Interestingly, of the two institutions, one would have expected that in the light of the fact that Unisa is an open, distance learning institution that the institution and individuals in the institution would be at the forefront of celebrating the potential of (O)ER. The analysis and findings below provide interesting insights into the context of individuals' perceptions, (re)use and production of (O)ER in the two case studies. It is also evident while the four shared elements in the chapter - infrastructure, quality, policy and change - are distinct elements in the awareness/perceptions, (re)use and production of (O)ER, there are also considerable overlaps and in many cases, these four elements are mutually constitutive.

4.2 OER Infrastructure

Infrastructure refers to, not only the digital infrastructure, but also the processes, the policies and, importantly the institutional culture. The previous analyses provide evidence of the digital infrastructure of South African higher education institutions (including, but not limited to their learning management systems, and digital repositories). While these digital infrastructures impact and shape individual's perceptions, (re)use and production of (O)ER, individuals may also decide to use extra-institutional infrastructures to (re)use and produce (O)ER. While there is anecdotal evidence of individuals using extra-institutional digital infrastructures and platforms (e.g. blog spaces, open data repositories, etc), we could not trace published evidence of such. We now turn to institutional culture as infrastructure.

If we consider institutional culture as infrastructure, the research by Cox and Trotter (2016) points to the impact of institutional culture on individuals' awareness, use and engagement with (O)ER. For example, the UCT has a "collegial institutional culture" (emphasis added) and "modestly tight (coherent) policies" that "preserve the autonomy of the university's scholars who,themselves, engaged in the policy-development process to ensure this" (p. 151). Unisa, according to Cox and Trotter (2016), has a "managerial institutional culture" (emphasis added) and "a hierarchical power structure, but its heavy rules and regulations contribute to a relatively clear institutional mission and vision" (p. 152). Scholars, at Unisa, according to Cox and Trotter (2016) "must comply with these tight policies, but doing so yields productive results because academics see how they contribute to the broader institutional strategy" (p. 152). They point out that a strong policy imperative will be crucial for faculty in the context of Unisa to actively embrace (O)ER.

As pointed out in the previous meso-level analysis, the national policy and legislative frameworks provide a clearly defined structure in which institutions and individual researchers and faculty enact their agency (e.g. Archer, 2003). Cox and Trotter (2016) refer to the Copyright Act of 1978 "which grants certain types of employers copyright over certain outputs of their employees' work-product" (p. 152). Most universities in South Africa "interpret this to mean that the copyright of their academics' teaching materials is vested in the institution, not in the individual creator or creators" (p. 152). Even when institutions confer the copyright of teaching materials to faculty, the institution continues to own, by default, the copyright (Cox & Trotter, 2016).

University of Cape Town (UCT)

Unlike other South African universities, "UCT academics are allowed to possess

> *the copyright of their teaching materials and thus turn them into OER" (Cox & Trotter, 2016, p. 152). This view is supported by both the UCT Intellectual Property Policy and the UCT Open Access Policy (Cox & Trotter, 2016). UCT also supports academics in this endeavour by, inter alia, the OpenUCT Institutional Repository, "provision of OER grants by theCentre for Innovation in Learning and Teaching (CILT)" as well as "the regular OER workshops and training sessions held by CILT and the legal advice scholars can obtain when licensing their materials as OER" (Cox & Trotter, 2016, p. 153).*

University of South Africa (Unisa)

Unisa owns all the Intellectual Property [IP] of work by staff members created "within the normal courses and scope of their employment" (Cox & Trotter, 2016, p. 154) and although staff could petition the relevant tuition committees to make the works available as (O)ER, at the time of the research done by Cox and Trotter (2016) most of the staff

interviewed were not aware of the possibility and/or the processes. Nothing prevents staff from incorporating (O)ER in the courses and offerings on condition that all students have access to the same quality of education. This confirms the research done by de Hart, Chetty and Archer (2015) who found that “although there is knowledge and understanding of OER, this has not been converted into active participation” (p. 18). The research also found that participants in the research had a limited understanding pertaining to IP and open licencing formats and processes. de Hart, Chetty and Archer (2015) also found that “Activities relating to the use of OER (accessing, redistributing and re-using) are far more frequent than activities relating to contributing to OER (revision, remixing, developing)” (p. 32).

Summative comments: Infrastructure

From the relatively outdated and scarce evidence pertaining to educators’ awareness, perceptions, re(use) and production of (O)ER it would seem as if we have to agree with Hoosen and Butcher’s (2019) assessment that (O)ER adoption in South Africa and by South African educators has been “modest” (p. 147). The huge difference in (O)ER adoption in the two cases - UCT and Unisa - clearly point to the crucial role institutional culture as infrastructure plays on not only the awareness of educators, but also the institutional support and availability of platforms. It is clear that while both institutions have institutional repositories, awareness and use of the institutional repositories and digital infrastructures at UCT are alive and getting stronger while, as we pointed out in the previous analyses, the current impasse, or seeming lack of political will and leadership at Unisa, has a negative impact on the micro-level of re(use) and production of (O)ER. Intellectual Property (IP) regimes at these two institutions are also vastly different. While there is evidence from UCT of the use of MOOCs in their teaching (Czerniewicz, Glover, Deacon & Walji, 2017), we could not find any evidence of what kind of and the scope of use of (O)ER in teaching at Unisa. While all teaching materials (outside of prescribed textbooks) are available on the institutional LMS, there is no centralised database of what types of (O)ER are included. At not one of the two institutions could we find evidence of functionalities that would be helpful for teachers to edit their own or others' (O)ER and/or for collaborative work.

4.3 Quality of OER

According to Hodgkinson-Williams, Arinto, Cartmill and King (2017), quality assurance of (O)ER is an essential part of the Open education cycle where (O)ER are “ideally certified through some type of quality assurance mechanism, either by the OER creator, their peers, an educational body or the hosting organisation” (p. 32). There is evidence that many educators feel overwhelmed by the amount of available online resources and are “anxious for quality guidelines; without these they doubted whether they had sufficient expertise to judge whether a resource was of appropriate quality” (Hodgkinson-Williams, Arinto, Cartmill & King, 2017, p. 42). Interestingly, while many educators emphasise ensuring the quality of (O)ER, there was no evidence of quality assurance and feedback activities as “personal practices” (Hodgkinson-Williams, Arinto, Cartmill & King, 2017, p. 50). There are also concerns by educators about the quality of their own work and to open their work for peer assessment, and evidence that educators would use existing (O)ER to benchmark the quality of their own work. The research also found that “While the formal quality assurance mechanisms are still nascent in individually developed OER, these are more well developed in OER creation that is supported by institutions or NGOs” (p. 57). In the research by Madiba (2018) skepticism about the quality of (O)ER remains a challenge in the adoption, use, production and dissemination of (O)ER. Interestingly, Madiba (2018) refers to lecturers’ misunderstanding and feeling frustrated “about how to strike a balance between determining the quality of educational resources on the open platforms and the maintenance standards that their respective departments or faculties demand from them” (p. 73) and fearing use of (O)ER by authors whose reputation is in doubt, or not yet established. Of particular interest is Madiba’s (2018) point that the production of high quality (O)ER will need “ constant support and encouragement from all quarters to ensure sustainability” and that the use of most (O)ER is based on a needs or just-in-time basis instead of “for more strategic, reflective integration” (p. 90).

With regards to the quality aspect of (O)ER in Africa, Butcher and Baijnath (2020) assert that there does not seem to be any kind of quality control for OERs. They state that the reason for this could be that lecturers prefer textbooks as they will have been through a rigorous review process whereas the (O)ER might not have been subject to this kind of review. (O)ER Africa does however recommend that the quality criteria on evaluating an (O)ER as developed by British Columbia

OER Librarians, be used by lecturers as a checklist. Little evidence exists to suggest that South African lecturers are indeed using this checklist and further research will have to be carried out in order to assess this.

University of Cape Town (UCT)

While the University of Cape Town (UCT) has an Open Access Policy (2014) referring to UCT's adoption of The Berlin Declaration on Open Access to the Sciences and Humanities (p.1) there is no explicit mention of the notion of 'quality' in this policy. Having said that, as the highest rated higher education institution on THE University Rankings (Boonzaier, 2020) and as a research intensive higher education institution, it can be assumed that UCT is synonymous with quality. The second aspect to consider is that the Intellectual Property Policy of UCT (2011) confers the IP of all outputs to individuals and in the light of UCT's rankings and the impact of the prestige economy, one can only assume that when individuals (re)use and produce (O)ER that quality will be at its core. These assumptions are, however, play out differently in the production of (O)ER, as reported by Cox, Masuku and Willmers (2020) on the barriers impacting on faculty's adoption of and production of (O)ER. They report that "the lack of institutional reward for open textbook development was compounded by a lack of support for the textbook development process, a lack of established quality assurance mechanisms and a lack of funds to buy out academics from their teaching commitments" (p. 6). Another factor impact on the quality of open textbooks "related to the specialist expertise required to review a textbook, particularly in highly technical subject areas where the resource embodies an author's particular vision regarding an innovative or unconventional pedagogical approach" (p. 7).

University of South Africa (Unisa)

In the research by de Hart, Chetty and Archer (2015) they found that "Respondents were apparently confident about the quality of their [(O)ER] offerings and were not concerned about their work being subject to scrutiny by others" (p. 33). According to these authors, this was a change from previous research done in 2011 "where the attitude of academics to exposing their work to extensive peer review was regarded as a perceived barrier to OER implementation at the institution" (p. 33). The research did not investigate participants' view of the quality of (O)ER.

In 2014, Unisa launched an OER strategy (ICDE, 2014) but since then, the strategy has been withdrawn from the institutional repository and as indicated in the meso-analysis, communication between the researchers and stakeholders at Unisa suggest that the strategy is being revised. Unisa was however, one of the first South African universities to have developed a framework for the implementation of (O)ER. While Mays (2020) refers to the Unisa Open site and provides an overview of what this repository contains, the subsequent links on OER @ Unisa that, according to anecdotal evidence contained the Framework for the implementation of OER @ Unisa, are no longer functional.

The research by Cox and Trotter (2017) pointed to the scope and impact of the 'managerial culture' at Unisa, and the impact of the policies guiding Intellectual Property Rights on the production of (O)ER at Unisa. There is also the issue of the increasing emphasis on commercialising Unisa's IP (Prinsloo & Nthebolang, 2020), and the fact that despite it being distance education institution and not research intensive but 'research active', individual faculty is not exempt from the impact of the 'prestige economy' on faculty's commitment to produce high quality research. With all of these factors at play, the notion, practice and assurance of (O)ER is, currently, dormant, at Unisa.

Summative comments: Quality of OER

The issue of quality of (O)ER foregrounds the different discourses, power-relations and ideologies impacting on individual instructors' awareness/perceptions, (re)use and production of quality (O)ER. The quality of (O)ER is not exempt from the 'prestige economy', rankings, and the cost (Cox, Masuku &Willmers, 2020) of producing high quality (O)ER. Both the macro and meso analyses highlight the absence of both a national approach, and institutional approaches to ensuring quality in (O)ER. As the above analysis shows, while there is evidence (in the case of UCT) of individual lecturers being committed to producing high quality (O)ER, there is no uniform understanding of quality in (O)ER, nor frameworks and processes to ensure quality in (O)ER.

4.4 OER Policy

In the previous analyses (macro and meso), we detailed the national and higher education institutional policy environments, and the preceding analyses show, individuals' awareness/perceptions, (re)use and production of (O)ER is intimately linked to these policy environments. Chikuni et al. (2019) identified four dominant discourses in OER policy, being access, collaboration, empowerment and transformation. They found that

The extent to which OER can democratise access to education and redress socio-historic inequalities in the provision of educational resources is not guaranteed. Some scholars argue that OER could in some contexts perpetuate inequalities if the same barriers of accessing education in a traditional classroom have not been dealt with. OER policies are written as optimistic accounts on how to publish OER but they do not do a good job in encouraging reuse (p. 165).

In their paper, Chikuni et al (2019) explored the institutional policy environment at four South African universities who have OER policies in place: UCT, University of North West University (NWU), University of the Western Cape (UWC) and University of Witwatersrand (Wits). UWC has had a specific OER policy in place since 2004, whereas Wits does not have a policy but only a strategy which was developed in 2011. UCT has OER embedded into their Open Access policy and at NWU they have statements and declarations on OER. Chikuni et al (2019) concluded that access, collaboration and transformation emerged as dominant themes. With regard to access, significant challenges were found among the learners (and by deduction all users including the lecturers). Some of these challenges have already been mentioned and included, among others, lack of knowledge about OER, lack of institutional support and socio-economic factors such as digital literacy knowledge, access to hardware and bandwidth.

Another important finding from Chikuni et al (2019) was the emphasis that has been placed on the use of OER but not on the reuse and adoption of them. They found that the main constraint among users is once again their unease with the quality of the OER.

With regard to the Policy environment of the two institutions we used as case studies - UCT and Unisa - the different policies have already been documented in the meso-analysis. In the case of UCT we provided evidence of how, on the one hand, the policy environment supports the (re)use and production of (O)ER (Cox & Trotter, 2017), but how the institutional culture, role and maintenance of a 'prestige economy' and endorsement of particular forms and notions of research are barriers to the production of quality (O)ER (Cox, Masuku & Willmers, 2020).

Summative comments: Policy

While we found ample evidence of how policy-as-infrastructure shapes individuals' (re)use and production of (O)ER, we found no published evidence of how individuals' actions inform policy development for (O)ER. Having said that, it goes without saying that the voices we cited in the macro and meso analyses, as well as this one, are known to have impacted on policy development at their respective institutions. Individuals who come to mind are Laura Czerniewicz and Cheryl Hodgkinson-Williams in the context of UCT, and Elizabeth Archer and Kerry de Hart in the early days of the formulation of a strategy for the implementation of (O)ER at Unisa. Without underestimating the role and influence of individuals in shaping institutional policy and implementation, and taking into account the current impasse regarding (O)ER in the context of Unisa - it takes more than individual agency to change institutional thinking and policy as El Khawas (2000) so clearly illustrates.

4.5 OER Change

There is a danger that amid the hype but also the hope of how (O)ER can address intergenerational inequalities and injustice, that we may assume that all educators have embraced (O)ER and all are committed to (re)use and produce (O)ER. Though there has been change, and there are increased levels of awareness and (re)use, an analysis of research articles on the uptake of (O)ER by educators in South Africa paints a different picture and varies from little to modest acceptance (Hoosen & Butcher, 2019). The reasons for the relative low uptake of both the use of, and reuse of (O)ER in South Africa, have been discussed in macro and meso analyses relating to the lack of national and institutional policies

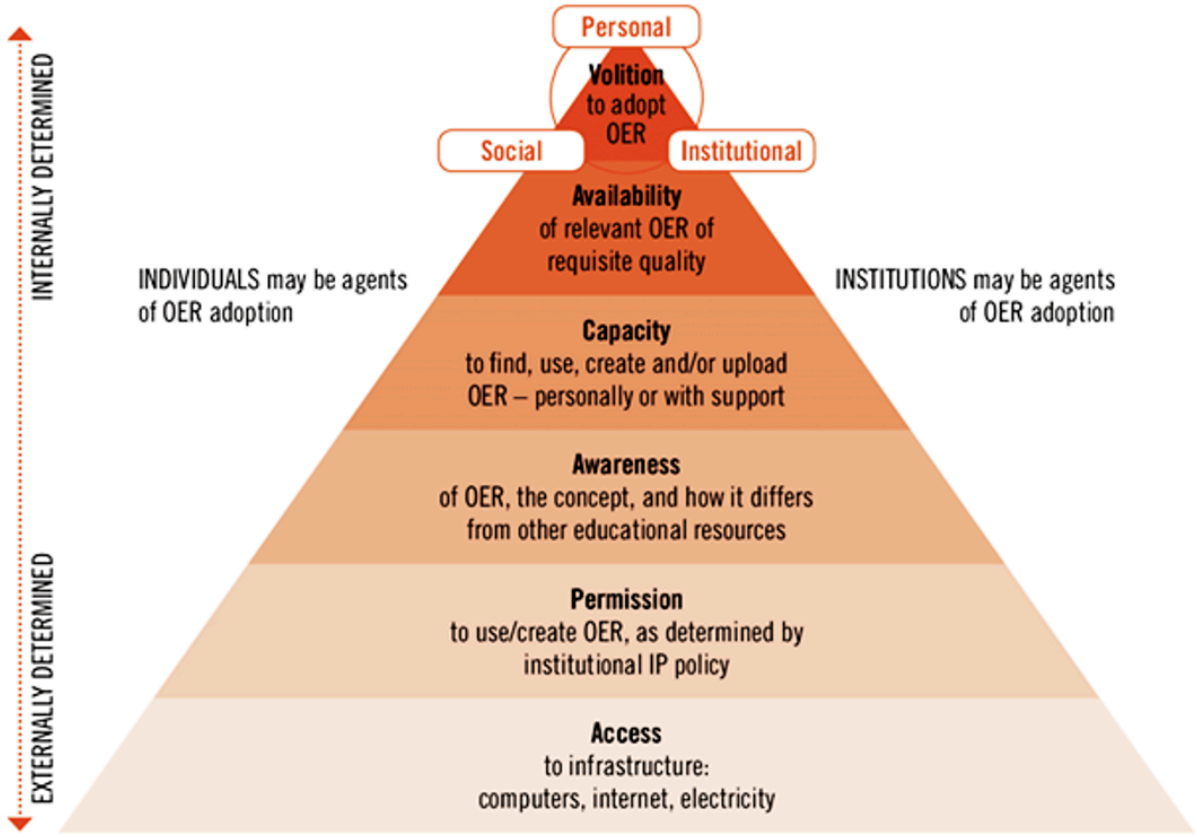
at many South African universities (e.g. Cox & Trotter, 2017; de Hart, Chetty & Archer, 2015; Hodgkinson-Williams & Arinto, 2017).

Though the issue of change runs like a leitmotif throughout the analysis, we briefly recap some of the analyses and link these to the individual or micro-level in the context of this chapter.

Cox and Trotter (2016, 2017) present an (O)ER framework (the OER Adoption Pyramid) based on educators' understanding and adoption of (O)ER at different institutions - namely Unisa, UCT and the University of Fort Hare (UFH). According to them the "success of a proposed OER-related policy intervention is mediated by an institution's existing policy structure, its prevailing social culture and academics' own agency (the three components of what we're calling 'institutional culture)'(Cox & Trotter, 2016, p. 147). The Adoption Pyramid focuses "on the factors that are essential for OER activity in an institutional setting, sequenced according to the level of personal control lecturers have over them (from externally determined to internally determined)" (Cox & Trotter, 2017, p. 287). Their findings indicate that OER adoption "is shaped by a layered sequence of factors – infrastructural access, legal permission, conceptual awareness, technical capacity, material availability, and individual or institutional volition – which are further influenced by prevailing cultural and social variables" (p. 287). Their framework "utilises a layered analytical approach, focusing on the factors that are essential for OER activity in an institutional setting, sequenced according to the level of personal control lecturers have over them (from externally determined to internally determined)" (p. 300). The pyramid (figure 8) is constituted by a number of levels - starting with 'access' at the bottom, followed by 'permission, 'awareness', 'capacity' , 'availability' and 'volition to adopt (O)ER.

Figure 8

OER adoption pyramid (Cox and Trotter, 2016)



According to Figure 8 above, individual academic staff members may either be agents of (O)ER adoption themselves or alternatively, the institution needs to be the agent of (O)ER adoption. The externally determined variables relate to

factors often outside of the control of the individual but within the control of the institution. The institution, through its infrastructure, provides the hardware and software as well as band width etc that the academic staff members need. In addition, top management determines the (O)ER policy and strategy that their particular institution will adopt and follow. This also includes the institutional policy on copyright and ownership of the (O)ER.

It is at the access level where individual staff members have the least control, particularly where the culture of the institution is a managerial or bureaucratic one. The second level refers to the use and reuse of the individuals' work and is based on who owns the IP for that particular work. Some institutions retain ownership of all work created by their staff members (e.g. Unisa), while other institutions, such as UCT, allow individual creators control of their IP. This has implications for whether the actual creator of the (O)ER has permission to share it or not. Awareness, as third level, can refer to either the individual or the institution's awareness and understanding of (O)ER. It involves an understanding of how OER differs from other copyright-restricted materials.

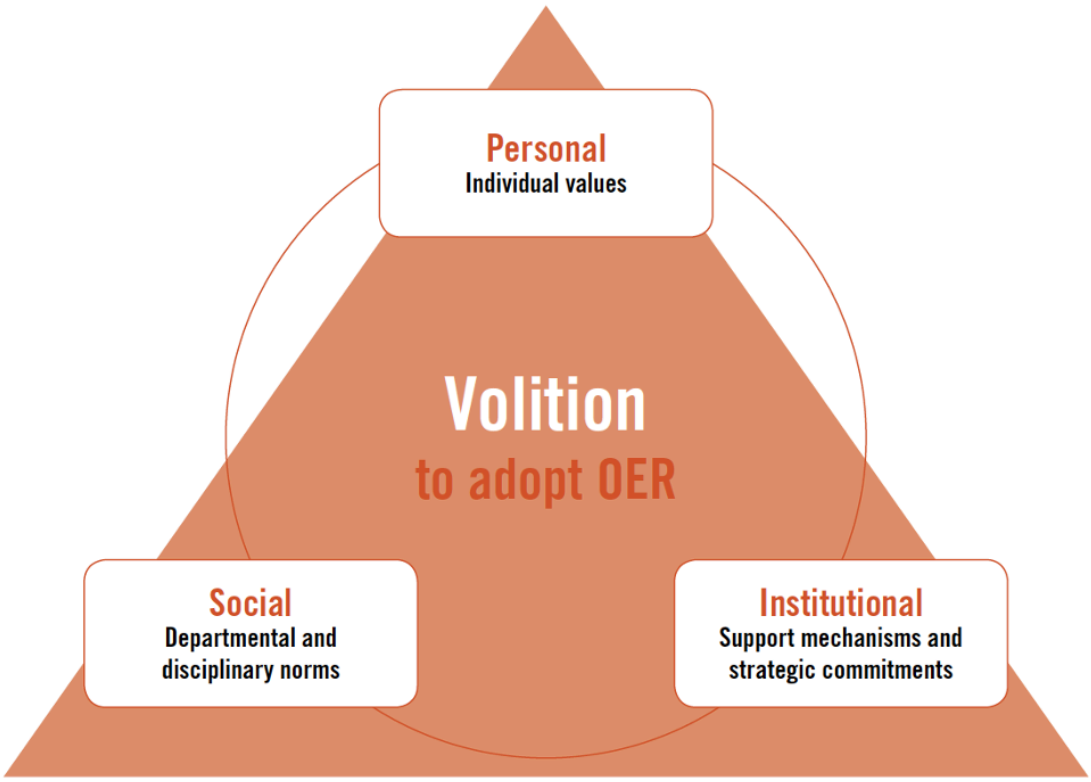
The fourth level refers to the capacity of the individual staff member to be able to find and create (O)ER – their technical skills and ability to perform the task. Institutional support services pay an important role here. Roberts (2016), in a survey of teaching and research staff at Unisa, found that the respondents' perception of their own ability to be technically sound, was very low and that training in this area was required.

Availability (as fifth level) refers to the actual accessibility of (O)ER that is relevant to the lecturers to use and/or share. A general concern in South Africa, is the lack of availability of context relevant (O)ER. Most works are from the Global North and are particularly Eurocentric. This is at a time when the movement towards the decolonisation of the curriculum is a central trajectory in South Africa. In addition, in South Africa, we have eleven official languages and so large gaps exist is finding language relevant content too. This opens a large opportunity for South Africans to develop and create their own context and language relevant (O)ER or at least to reuse existing ones and change them to suit the local requirements.

The final factor of the pyramid is volition (illustrated in Figure 9), referring to the academic staff members' and their institution's motivation and desire to adopt (O)ER. This suggests that if one enjoys the access, permission, awareness, availability that are necessary for participation in OER, then volition is the main factor that determines whether OER will be used, reused and created

Figure 9

Figure 9: The final factor of the OER adoption pyramid – volition (Cox and Trotter, 2017, p. 303)



The notion of a lecturer's or institution's volition is, however, complicated because – regardless of who holds copyright over the teaching materials – individual volition is potentially shaped by both social context (departmental and disciplinary norms) and institutional structures (policies, strategies and mechanisms), while institutional volition is often shaped by its lecturers' desires and the social context that pertains across multiple sites at the university (pp. 302-303).

Though individuals are potential (O)ER agents based on their internal volition - their "personal, idiosyncratic, internal beliefs and practices that have bearing on whether or not they might adopt OER" (p. 303), it is the institution, who at the end, "is in fact the unit of agential analysis regarding the 'creation' side of OER adoption" - "the institution would need to decide whether it wanted to openly license and share the teaching materials that it holds copyright over" (p. 303).

To discuss change, and the possibility for change, we will now discuss the findings of Cox and Trotter (2017) of the application of their Adoption Pyramid to UCT and Unisa (See the summary in table 3 below and the discussions following the table)

Table 3

University of Cape Town (UCT) and the University of South Africa (Unisa)

	University of Cape Town (UCT)	**University of South Africa (Unisa)**
Access (First layer)	"comparatively good access, with stable, high-speed broadband and Wi-Fi on campus, computers for all staff members, many computer laboratories and terminals for student use, and reasonably stable electricity provision.	"UNISA enjoyed a similar level of access to UCT, but with slightly less predictability in its electricity supply. This good level of access, however, pertained only to academics, as many students did not have reliable access because they live in poor, rural areas with weak

	University of Cape Town (UCT)	University of South Africa (Unisa)
	Its electricity supply was, however, not Uninterrupted…" (p. 306)	infrastructural support, or in urban townships far from the UNISA satellite centres" (p. 306)
Permission	"UCT lecturers possess copyright on their teaching and learning materials, allowing them to transform any of their teaching resources into OER" (p. 307)	Unisa retains the copyright of everything produced by staff, but at the time of this research (2017) there was a view that lecturers could apply to have the materials shared under a different copyright regime
Awareness	Due to the policy environment and collegial culture at UCT, lecturers "the onus of OER action on individual lecturers" (p. 310).	"the fact that the institution holds copyright over teaching materials developed by staff means" that even if staff wanted to share materials openly, they could not (p. 312)
Capacity	"technical capacity was relatively high, sometimes at a personal level, depending on a lecturer's prior level of engagement with OER, but quite certainly at an institutional level where OER experts were available for consultation and support" (p. 313)	While most staff were "relatively fluent technically because so much of their work was mediated by computers and the internet"
Availability	Lecturers were generally aware of databases but had anxiety about sharing their own resources.	Respondents were positive about the availability of resources but could not make their own products available due to institutional policy on IP
Volition	The collegial and supported environment at UCT meant that the choice to participate in (O)ER dependent on the individual	Most lecturers were positively inclined to support (O)ER the "most meaningful action regarding OER is located within the managerial strata at UNISA, where policy and other structural elements are controlled" (p. 326).

The differences between UCT and Unisa with regard to the possibility and scope of change is well-illustrated through the research by Cox, Masuku and Willmers (2020) in the context of UCT on Open Textbooks (as discussed earlier) and the research by de Hart, Chetty and Archer (2015). Taking into consideration that the research by Cox et al. (2020) was discussed earlier in this chapter, we will just highlight their findings: (a)"Academics at UCT are aware of the challenges related to the cost and utility of traditional textbooks and are experimenting with new approaches towards resource creation through open practice" (p. 5); (b) "Time is a significant cost to the academic in open textbook production" (p. 5). While open textbooks addresses the issue of cost to students, "there is still a cost involved in the production and ongoing delivery of open textbooks, particularly in terms of the time required on the part of the academic to author, format and publish these resources" (p. 5); (c) "Open textbook authorship models are providing avenues to explore innovative, student-centred pedagogical approaches"; (d) "Open textbook authors are attempting to make content more accessible in terms of relevance, format and genre in order to promote greater inclusivity" (p. 6); (e) "Open textbook activity appears to be on the rise at UCT despite a range of institutional barriers to open textbook development activity" (p. 6); (f) "Academics at UCT acknowledge that there is a legacy of gatekeeping in the selection of prescribed textbooks which serves to perpetuate political misframing and exclusion" (p. 7); and (g) "Open textbook authors at UCT are including students in content development processes in order to shift power dynamics and build confidence in terms of students' ability to contribute" (p. 8).

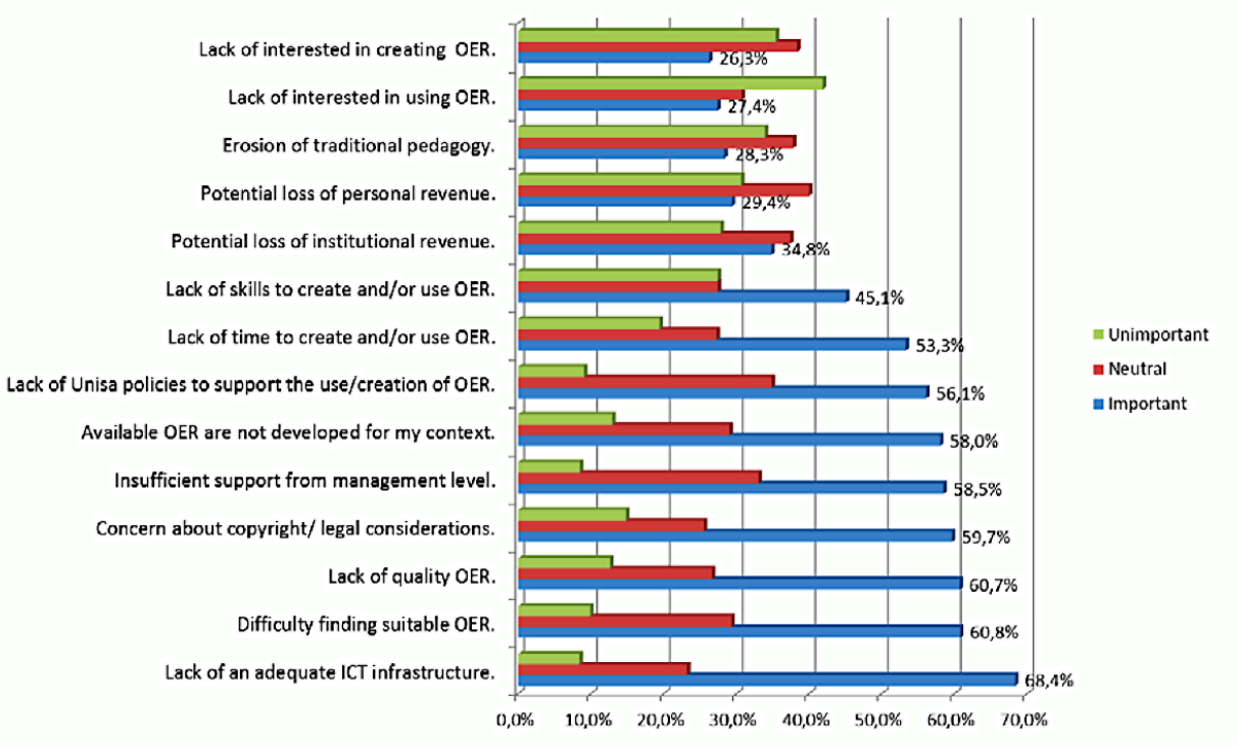
During 2015, de Hart, Chetty and Archer (2015) undertook an investigation to gauge the uptake of OER by Unisa staff. The results of their survey indicated that staff were aware of OER and understood them, but they were reluctant to actively engage in the process. Although this research was carried out with staff at Unisa, the authors suggest that the results might be generalisable to other contexts as well. De Hart et al. (2015) found that participation in accessing OERS was relatively high (74.1%), however, only 31.0% of the respondents indicated that they had developed their own OER. A further interesting finding was that the respondents indicated generally that they were prepared to share their

own work only if they could make money from this. This shows that many of them did not understand or comprehend the ethos of OER. The concern was not that they were not confident about the quality of their work but that other people could make money from it.

Figure 10 (below) shows the perceived barriers of Unisa staff to engagement with OER. The biggest barrier was a lack of an adequate ICT infrastructure, followed closely by difficulty in finding suitable OER for the South African context. Other concerns expressed by the respondents include lack of quality OERs, concern about the copyright and legal considerations, and insufficient support and policies to support them. The respondents did, however, suggest that lack of interest in creating and using OERs was not a factor but that they needed to learn the necessary skills to create OERs. In addition, they were concerned about the additional time constraints that would arise as many academic staff are already overworked.

Figure 10

Perceived barriers of Unisa staff engagement with OER (de Hart, Chetty and Archer, 2015, p. 34).



The authors of this paper grouped these barriers into three different groups, namely, the intrinsic natures of OER, institutional infrastructure challenges and the personal attributes of the staff members. The barrier according to de Hart, Chetty and Archer (2015) with the highest response, was the lack of adequate infrastructure to assist and support the use and creation of OER. Staff need to be guided by institutional policies regarding OER and at this stage Unisa does not have an OER policy – only a strategy document from 2014 which was updated and scaled back in 2017.

According to Bergquist and Pawlack (2008) there are six types which define the culture of an academic institution - collegial, managerial, developmental, advocacy, virtual and tangible. Cox and Trotter (2017) describes Unisa in terms of a managerial type of institutional culture, utiltising a top-down, hierarchical approach where the agency of the academics is controlled by tightly defined policies. They further suggest that this type of culture at Unisa could be a demotivating factor for the staff buy in and uptake of OER. Unisa staff are used to working within strict policy frameworks and the lack of an OER policy could be a contributing factor to the perceived barriers to staff engagement with OER.

The Unisa results indicate that academic staff access OER on a regular basis but are less enthusiastic to revise and re-use OER. They also seem hesitant to develop new OER for sharing. As mentioned above, sharing OER is not a common practice among Unisa staff. They are generally amenable to sharing their work only if they are compensated financially for doing so. This goes against the general ethos of OER. In addition, there is a large concern that other people could make money from their own work. This indicates that training is definitely required for the Unisa staff in order for them to fully understand the true spirit of OER and the various copyright procedures that are available.

Summative comments: OER Change

As illustrated in the two case studies, increased adoption, (re)use and production of (O)ER is found at the intersection of individual choices, skills and motivation, and institutional understandings, mandates, and infrastructures (ICT, culture and policies).

5. Conclusion

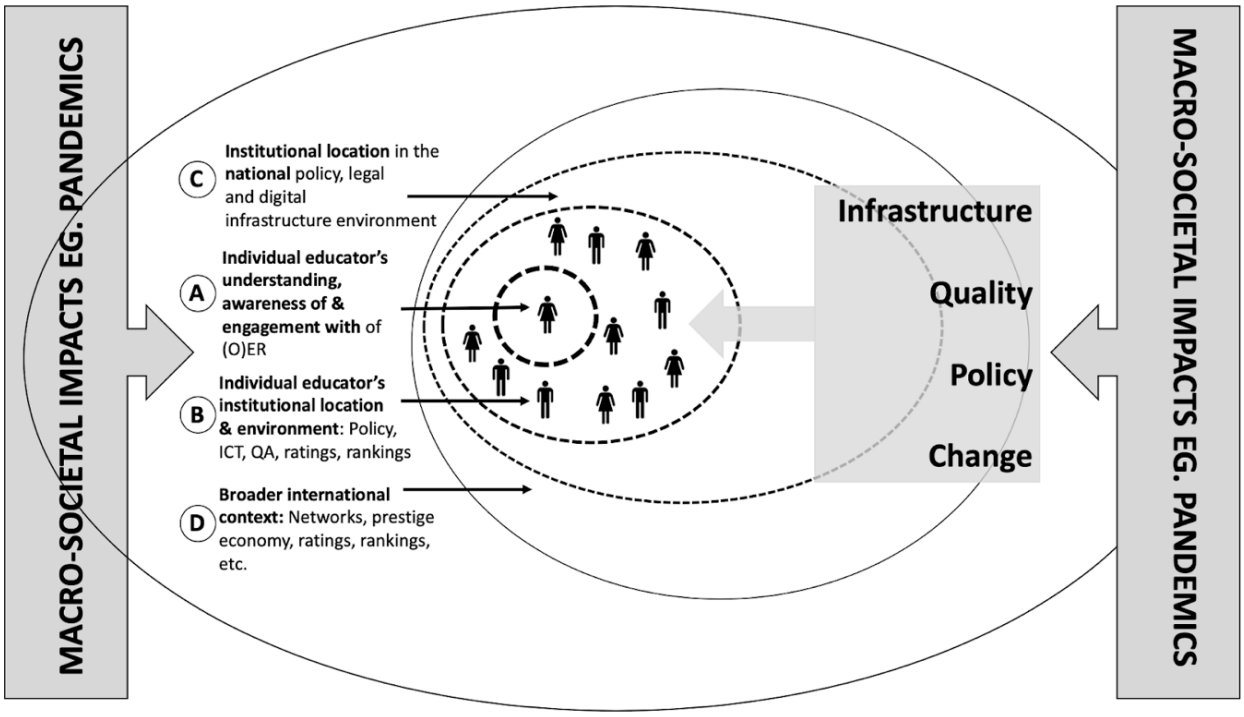
We would often assume that individuals in higher education institutions have total agency on whether to participate in open education, and specifically in the form of (re)use and production of (O)ER. Our findings and analysis in this chapter, show however, that individuals' (re)use and production of (O)ER is found in the nexus between individuals' understandings, skills, motivation and engagement and disciplinary and institutional contexts. Institutions are also not totally independent and context-free but embedded in broader discourses and ranking regimes, a 'prestige economy' and political, economic, social, technological, environmental and legal factors.

We started this final micro- analysis by pointing to the impact the COVID-19 pandemic had on education systems across the world and how the pandemic exacerbated intergenerational inequalities in the South African context. As we analysed the early emerging findings of how education in South Africa responded to the pandemic, we noted the lack of evidence that the pandemic forced individuals and institutions to re-assess (O)ER. Maybe it is too early. We mentioned the brief glimpses (Butcher & Baijnath, 2020; van den Berg, 2020) pointing to a re-assessment of (O)ER but only the future will tell to what extent the COVID-19 pandemic may be a turning point, or not.

We conclude this analysis of the micro-level with an adaptation of the first figure at the start of this chapter by adding the impact of macro-societal factors on the awareness/perceptions, (re)use and production of (O)ER (Figure 11).

Figure 11

Final mapping individual perceptions/awareness, (re)use and production of (O)ER



Drawing from this figure (figure 11) we can summarise the findings for the South African context around the national ideology for education. Context is everything, and the history of an unequal, colonial country, driven by apartheid ideals, is forefront in the recovery and the development agenda for South Africa. The key focus of the post-apartheid national policies is the transformation of the higher educational landscape, in order to address the inequalities of the apartheid strategies. This is the overarching educational philosophy for the new economic, social and political structures in South Africa.

Against this background of transformation, educational resources need to be seen as part of the epistemic freedom and justice as proposed by Ndlovu-Gatsheni (2018). Taking this forward is the statement by Walker (2019),

> *To be fully involved in learning and development and fair-achieved outcomes in formal education, students would need opportunities to develop their epistemic capability of being able to both retrieve information and make interpretative contributions to the common pool and practical deliberation (Walker, 2019, p. 264).*

It is this transformational background that runs that through the South African case study. A leitmotif running throughout this country's study is, firstly, a recognition of the immense legacy and continued impact and structural inequalities arising from colonialism and apartheid. Referring to digital infrastructure and who has access, who is included and who continues to be excluded, without recognising apartheid's legacy, will not lead to an understanding of the potential and desperate need for (O)ER. Another leitmotif is not only a concerted policy-focus on addressing the legacy of apartheid, but also preparing our students for a digitally connected world. As such there is ample recognition of the role of open learning and specifically (O)ER at a national level.

Institutional policies and practices vary considerably in South Africa, which can be seen as a country of two contrasts – pockets of world class educational excellence on the one end of the spectrum, and a continual struggle with a developing country's unique challenges with respect to broadband availability, connectivity, ownership of suitable devices and levels of digital literacy, on the other. This is evident from the two case studies that were presented. The University of Cape Town (UCT) operates under a collegial managerial style where collaboration is central to its ethos and enjoys good access to physical and digital structures (see Bergquist and Pawlack, 2008). As such, acceptance of OER is encouraged and rewarded. UCT's policy on copyright also plays a significant role – because researchers are the owners of their work, they are more inclined to share and make it openly available.

The second case study focused on Unisa. Being a distance educational institution, many Unisa students are physically removed from the necessary technological infrastructure and lack the prerequisite digital competencies. In addition, Unisa operates under a managerial framework where staff are expected to adhere to institutional policies – and Unisa does not have an approved policy on OER. This is particularly challenging to the research staff and is exacerbated by the copyright policy which states that all work produced remains the property of the university.

We would often assume that individuals in higher education institutions have total agency on whether to participate in open education, and specifically in the form of (re)use and production of (O)ER. Our findings and analysis in this chapter, show however, that individuals' (re)use and production of (O)ER is found in the nexus between individuals' understandings, skills, motivation and engagement and disciplinary and institutional contexts. Institutions are also not totally independent and context-free but embedded in broader discourses and ranking regimes, a 'prestige economy' and political, economic, social, technological, environmental and legal factors.

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Figure 11 illustrates how individual (O)ER practices are entangled in institutional policies, and the broader international context (on the left) and how these responses (individual and institutional) are shaped by infrastructure, quality, policy, and change. And how, as the pandemic has illustrated, how (O)ER are impacted by macro-societal factors whether environmental, social, technological, political, economically and/or legally.

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7

The Case of Spain

Victoria I. Marín

1. Introduction[1]

Geographically and politically, Spain forms part of the European Union and is located in Southwestern Europe. Internally, it is a constitutional monarchy composed of 17 autonomous communities and two autonomous cities. However, the Government of Spain is the central government, which also establishes the national policies for all areas of the society, including education. The autonomous communities and cities have varying degrees of autonomy to put into practice those policies. The Spanish population is around 47 million inhabitants, and the official language is Spanish, although some autonomous communities have co-official languages (Aranese, Basque, Catalan and Galician), which are also considered within the educational laws and educational curriculum.

Being education an essential issue to regulate, there has been a succession of educational laws with each government change since the start of the democratic period of Spain's history (1975) until nowadays, although many of them never came into force. The most recent one corresponds to the educational law approved in 2020. These educational laws regulate only the pre-university educational levels, since different ministries are responsible for these levels (Ministry of Education and Vocational Training) and higher education (Ministry of Universities).

Changes in the universities' law have been not as often as the educational laws, and the current one corresponds to the year 2001 – with a modification in 2007 -, although a new law is being currently worked on (draft bill published in August 2021, approval expected in the first half of 2022), in order to address the challenges of the Spanish University of the XXI century, deal with structural problems, and being pioneer in the changes from social, economic, cultural, scientific, technological contexts and from all other disciplines. The current universities' law provides higher education institutions with the autonomy to create and propose study programs according to the established rules. However, the curricula leading to obtain a degree must have in the centre of their objectives the acquisition of competences by the students, and emphasis must be placed on the learning methods of these competences as well as on the procedures to evaluate their acquisition. In addition, the existence of quality assurance systems, leading to accreditation processes of university degrees, should be guaranteed. Finally, each Spanish autonomous community decides on the university fees per credit and study program of the public universities of its provinces.

In terms of structure, as in other European countries, the Spanish higher education system is structured in 4 years with 240 ECTS in the undergraduate programs, which could be optionally followed by a postgraduate program (Master) with 60-120 ECTS and a doctorate program. The system also comprises university and professional studies (advanced vocational training).

The Spanish university system is made of 84 universities, among which 50 are public and 34 are private. Six out of the total are completely online and, except one of them – the National University of Distance Education, UNED - all of these universities are private.

The number of students and study programmes has increased every year. Data from the academic year 2020/2021 (Ministerio de Universidades del Gobierno de España, 2021) shows that the Spanish universities had 1,309,742 undergraduate students (55.6% women and 5.8% foreign students), 234,214 postgraduate students (55.6% women and 23.1% foreign students) and 89,353 doctoral students (50.1% women and 27.4% foreign students). Regarding the university staff, 125,471 were teaching and research staff, 63,281 administrative staff and 26,408 research staff. The offer of the Spanish higher education system consists of 3,008 degree programs (bachelor), 3,638 master programs and 1,156 doctorate programs.

According to the annual report "Digital Society in Spain" (Martín Carretero et al., 2019), Spain has a strong commitment with digital transformation and is one of the best-connected countries in the world, being leader in the deployment of the fibre optic broadband in Europe and the third country among the OCDE countries. While this digital transformation is clearly leading in some areas (e.g., digital public services), some others have still room for improvement, and this is the case of education, especially noticeable in schools with the COVID-19 pandemic in the most recent report (Fundación Telefónica, 2021).

In the context of higher education, the document approved in January 2021 by the Conference of Vice-Chancellors of Spanish Universities (CRUE) constitutes a proposal for debate of the University 2030. Digital transformation is a key concept in this document and has a specific section devoted to it, as an element linked to the change of the organisational model and to reach a cultural change (CRUE, 2021). Challenges include educational technologies and online training, training/accreditation of digital competences, decision making based on information analytics, electronical administration, academic certifications of diplomas and competences, and the digital transformation from the perspective of the leadership at the universities (strategic plans for digital transformation). In addition, the document refers to the report "360º ICT,Digital Transformation in the Spanish University", which presents a roadmap for Spanish universities based on six pillars: 1) vision, which addresses how digitalisation can help and provide value to the organization; 2) the transformation of the university processes through the application of ICT; 3) the (online) interaction formats with the students (interactions through new channels, like social media, with almost 24/7 availability); 4) the design of services due to new realities like Big Data or Internet of Things (e.g., learning analytics' services); 5) a new model of university, that combines virtual students' support and personalized support, use of MOOCs; and 6) a change in the culture of the organization, which includes thinking differently, promoting innovation, among others (Cabrero et al., 2017).

Against this background, as well as current general and specific developments in digitalisation, this book chapter provides an overview of the digital transformation in Spanish higher education at the macro, meso and micro level. The macro level will explore further aspects related to the national context and infrastructures; the meso level will cover the regional (autonomous communities) and institutional contexts; and finally, the micro level will address teaching and learning processes, and specifically explores faculty's perceptions and awareness regarding (O)ER infrastructures and actors. While most of the methodology followed in the study corresponds to desktop research (through available literature, official documents, institutional websites, other related websites, etc.) and content analysis (e.g., open access and OER policies in the meso level section), the major data source of the micro level are the findings of an empirical survey conducted by the author of the report that covers a representative sample of the faculty's population in Spain (400 full answers) across 64 universities out of the 84 total. The exploration of these three levels will provide the reader with main insights of (O)ER infrastructures, and policies, measures for change and quality issues regarding to those infrastructures, in the Spanish higher education system and institutions.

2. Macro level

2.1 (O)ER Infrastructure

The digital infrastructure in Spain is mostly centralised, although there are also infrastructures for each autonomous community, which will be described in the Meso level.

One of the most relevant players for higher education at the national level is RedIRIS, which stands up as the Spanish academic, research network that provides advanced communication services to the national scientific community and universities starting from 1988. It is funded by the Spanish Ministry of Science and Innovation but it is managed by a public corporate entity called Red.es (Spain Ministry of Energy Tourism and Digital Agenda, 2017), which is an agency of the Spanish Ministry of Economy and Business (Ministerio de Economía; Industria y Competitividad, n.d.). This agency is also the promoter of initiatives like “Escuelas conectadas” (Networked schools) in the school context and Actívate in the context of university MOOCs. The affiliated institutions with RedIRIS are over 450, for the most part universities and public research centres (Ministerio de Economía; Industria y Competitividad, n.d.). The infrastructure state-wide services offered by RedIRIS includes, among others, the connectivity-related services such as IPv4 and IPv6 routing and multicast content distribution, private networks to connect research groups in different geographic locations as if they were on the same networks via virtual and optical circuits and the roaming service.

Another key agent in the context of digital repositories is FECYT, which is a public foundation managed by the Ministry of Economic Affairs and Competition that, by applying the principles of rationalisation, transparency and efficiency, endeavours: to develop instruments of social participation in support of science; to be a suitable tool for the spread of science and the growth of scientific culture; to become the channel for communication with the Spanish scientific community overseas; and to become the benchmark of Spanish R&D metrics (FECYT, n.d.-b). This foundation has built an infrastructure of Open Access scientific repositories (RECOLECTA), which is described later.

Relevant previous initiatives

The project ARCA or RSS Aggregator for the Academic Community was conceived as a federation of metadata on multimedia contents and scheduled broadcasts offered by the members of the national academic and research network RedIRIS. Its aim was to introduce those contents to the academic community, since most of them were being unnoticed due to the lack of means at that time. The project was originated at the University Carlos III of Madrid.

As a feeds aggregator, the system collected automatically the information in xml (RSS 2.0) documents that the affiliated institutions elaborated with their contents and integrated in the database to be shown to the user in an intelligible and navigable way. Therefore, the users could subscribe to the ARCA portal’s news through RSS. ARCA is the predecessor of RECOLECTA.

The OCW-Universia supported universities with technical support and a content management system based on eduCommons, an US open source project for the creation of OCW projects. This system had specifications based on the IEEE standards 1484.12.1-2002 Learning Object Metadata Standard (IEEE LOM) and ISO 15836 Dublin Core Metadata (Dublin Core) and allowed universities to import/export courses and materials in IMS packages.

Current state of digital infrastructures of educational repositories

Educational repositories in Spain are receiving more attention at the school context, where Procomún stands out as the national repository.

Procomún is a repository of OER created by the Ministry of Education, Culture and Sports (MECD) and the Spanish autonomous communities that integrates school learning objects, teaching experiences and communities. The educational community (both teachers and students) can find and create structured, open educational resources in a classified standardized form (LOM-ES). Procomún includes a search engine that allows users to find learning objects through multiple criteria and a teaching social network linked to the educational resources through social labelling and user feedback, among others (INTEF, n.d.). Other initiatives include the platform of the National Centre of Curricular Development in non Proprietary Systems (CEDEC), which has as aim to design, promote and develop digital educational resources for schools through open source software; the portal of the National Institute of Educational Technologies and Teacher Training (INTEF), and Agrega, as the precursor of Procomún. Additionally, most of the Spanish autonomous communities have also developed their own OER portals (García & Calle, n.d.). Since 2015, the program of "Escuelas conectadas" is still an important initiative derived from the agreement between the Ministry of Economy and Business

and the Ministry of Education and Vocational Training, to a great extent financed by the European Regional Development Fund, in order to generalise the high speed broadband connectivity in schools (Martín Carretero et al., 2019).

In higher education, the national project RECOLECTA should be mentioned. In addition, initiatives regarding MOOCs are highlighted.

RECOLECTA or Recolector de Ciencia Abierta (Open Science Harvester) is aimed at creating a nationwide infrastructure of Open Access scientific repositories, which also include educational resources. It is configured as a platform that gathers all the national scientific repositories together in one place and provides services to repository managers, researchers and decision-makers. RECOLECTA is the result of the collaboration between the Spanish Foundation for Science and Technology (FECYT) and the Network of Spanish University Libraries (REBIUN) run by the Conference of Vice-Chancellors of Spanish Universities (CRUE) since 2007 (FECYT, n.d.-b).

The objectives of RECOLECTA are (FECYT, n.d.-b):

- To promote and coordinate the national infrastructure of Open Access digital scientific repositories in an interoperable manner based on the standards adopted by the global community.
- To foster, support and facilitate the adoption of Open Access policies by all researchers from R&D centres and universities.
- To give greater visibility, and both domestic and international application of the results from research carried out in Spain.

Interoperability between Open Access repositories is only possible if the deposited files use a common storage and exchange of information's language and, that is what RECOLECTA ensures, by requesting all repositories to comply with international standards for interoperability. Repositories that want to be harvested in RECOLECTA should meet the RECOLECTA-DRIVER Criteria (described in the section of Quality), which are based on the DRIVER (Digital Repository Infrastructure Vision for European Research) Guidelines and the OpenAIRE Guidelines (European directives). The RECOLECTA-DRIVER Criteria includes two levels of interoperability: one is the syntactic use of OAI-PMH (Open Archives Initiative-Protocol Metadata Harvesting), which ensures the resource to be harvested correctly, and the second one is the semantic use of OAI_DC vocabularies.

Regarding the (O)ER based on MOOCs, many Spanish universities use MiríadaX, which is a platform for Iberoamerican MOOCs in Spanish supported by the private telecommunications company Telefónica Learning Services based on Madrid (Oliver et al., 2014; Oliver Riera et al., 2015). As private and for profit platform to offer courses, the Spanish Tutellus is based on a model in which the commercial courses do not have publication cost and the course coordinator receives around the 80% of direct benefit from the incomes regarding enrolments. Some Spanish universities that do not have presence in MíriadaX offer free contents through this platform (Oliver et al., 2014). Other platforms where some universities are offering MOOCs are Actívate, which was promoted by Google Spain -from May 2019 by Google Ireland- and the Spanish Ministry of Industry, Trade and Tourism; and Educalab -now AprendeIntef- which is an initiative of the INTEF of the Spanish Ministry of Education and Vocational Training (Martín et al., 2015).

2.2 Quality of OER

The study by Medrano et al. (2012) on the status of digital repositories that implemented the OAI-PMH protocol in Spain and the quality of its metadata provided as conclusions that:

- The major issue is a product of orthographical and typographical inconsistencies and the lack of control mechanisms, e.g. titles and descriptors too long, diverse ways to refer to the same language or type of file.
- Many data providers use automatic tools for generating metadata of their resources; others give this task to low-qualified people or different persons that apply diverse criteria when loading the data; and there are also providers that only obtain metadata from external sources.
- There are repositories that fill out all the fields but not in the right way and vice versa.

National quality standards in adherence to international standards are addressed to improve the situation of digital repositories of educational resources in higher education in Spain.

Actors in national quality assurance

UNE is the Spanish Association for Standardisation endorsed by the Internal Policy of the Ministry of the Interior of Spain since its foundation in 1986. The main Spanish business association, top Spanish companies and a significant representation of Public Entities from all levels are members of UNE (UNE, 2018). In 2017, it was divided into two organisations: the Association with the same name (UNE), which is the legal entity in Spain devoted to the development of standards; and AENOR, which is a commercial entity for evaluation and certification of the compliance of standards, and also a society of UNE. AENOR also offers training with the same purpose (AENOR, 2019).

Another relevant actor in national quality assurance of digital educational resources is the work group of repositories of REBIUN, the Spanish Network of University Libraries, which has been working on studies and reports concerning the status of digital university repositories in Spain (Santos-Hermosa, 2017), including a recent guide in 2021 to evaluate institutional repositories.

The work group of trends in educational resources and quality criteria in new learning environments of CRUE should be mentioned as a third author in the overview of national quality assurance.

National quality standards

There are two main national quality standards in the field of digital educational resources, both of them developed by UNE: the 71361:2010 and the 71362:2017.

The standard UNE 71361:2010 is related to the standardised labelling of digital educational resources. It includes a list of categories for this labelling and a descriptive table with the different elements of the aggregated and simple data that belong to each category with its corresponding definition. For each element it is indicated (INTEF, red.es, & Spanish Autonomous Communities, 2010, p. 4):

- The character of the element: compulsory, recommended, optional and/or conditioned.
- The type of data (e.g., vocabulary).
- The values space for controlled vocabularies.
- The size, which sets the minimal allowed maximum of elements.
- The order, to define if the order of the list of instances is relevant or not, with the following values: not specified, ordered or disordered.

The objective of the work done to implement this standard is to design and develop a reference framework for the creation of educational repositories based on standardised digital objects, which could be reusable and transferable. Based on the international validated and accepted standardisation initiative Learning Object Metadata (LOM) of the Learning Technology Standards Committee (LTSC) created within IEEE, LOM-ES was developed as a metadata schema that considers and satisfies the specific needs of the Spanish educational community (INTEF, red.es, & Spanish Autonomous Communities, 2010, p. 3).

The basic structure of LOM-ES is based on the nine original categories of LOM v1.0 and has being modified in some of each elements, as follows (INTEF et al., 2010, pp. 4-6):

- General: description of the (O)ER. Information related to the technical and expressive characteristics of the media-based (O)ER, and its level of aggregation, are included.
- Life Cycle: characteristics of the history and current state of the (O)ER.
- Meta-metadata: information on the own metadata instance.
- Technical: requirements and technical characteristics of the (O)ER. The vocabulary of names for operating systems and web browsers has been extended.
- Educational: educational characteristics of the (O)ER. The modifications in this category affect the elements with extended vocabularies: type of educational resource, recipient, context, description and cognitive process.
- Rights: intellectual property rights and conditions of use of the (O)ER. New extended vocabularies are incorporated for the elements of authors' rights and access.
- Relation: characteristics that define the relation between this (O)ER and other related (O)ER.
- Annotation: it allows to include comments about the educational use of the (O)ER and information on when and by whom were created those comments.
- Classification: it describes the (O)ER in relation to a concrete classification system. New taxonomical sources are generated for the classification purposes: educational level, competence, accessibility and discipline.

The second Spanish standard is the UNE 71362:2017. Teaching and learning, technology, accessibility and educational experts from the academic sector, the business sector and the public administration were involved in its creation. It provides guidelines to define and assess the quality of digital educational materials quantitatively and qualitatively (Fernández-Pampillón Cesteros, 2017). Fifty-six national and international quality models formed the basis for the first version of the quality model of the standard. The standard defines a digital educational material of quality as being effective from the pedagogical perspective -good academic results are obtained when the materials are used with reasonable teacher or student effort or dedication-, technological view -simple, reliable, and transparent use-, and accessibility point of view -ease of access and use by any individual, with or without disabilities- (Fernández-Pampillón Cesteros, 2017, p.1). The UNE 71632 norm offers quality indicators to be scored and a rubric to guide this score, as well as guidelines to help with the evaluation. The different criteria of the quality model and tool measure are presented in Table 1.

Table 1

Quality criteria for digital educational materials (Standard UNE 71632). Source: adapted from Fernández-Pampillón Cesteros (2017, p.2), free translation by the author of this report.

Dimensions		
Pedagogical effectiveness	Technological effectiveness	Effectiveness regarding accessibility
Pedagogical description (pedagogical value and coherence)	Format and design	Structure of the learning scenario
Quality of the contents	Reusability	Navigation
Ability to generate learning	Portability	Operability
Adaptability	Robustness: technical stability	Accessibility of audiovisual content
Interactivity		Accessibility of text content
Motivation		

Derived from these quality criteria, a quality assessment tool for digital educational materials has been developed, which is aimed at four types of users (Author/Creator, Consumer/User, Reviewer/Evaluator, and Supplier/Distributor) and has two different application profiles (adaptations of the quality tool): teacher and student (Fernández-Pampillón Cesteros et al., 2017).

On the other hand, the quality criteria of RECOLECTA should be mentioned as a part of national quality standards related to open access resources.

The guide for the evaluation of institutional research repositories is based on international criteria, being the main reference OpenAIRE (Open Access Infrastructure for Research in Europe), and aims at ensuring interoperability of all the open access resources and a quality access to their contents (FECY et al., 2014). The basic elements include the implementation of OAI-PMH (definition of compulsory and recommended requirements) to solve problems in different implementations of open access repositories, the requirements to be met by the resources and the Dublin Core mandatory and recommended elements (Metadata). Though this guide is focused on institutional research repositories, some guidelines may be also applicable to digital educational materials sometimes deposited in those institutional repositories.

The guide defines 53 evaluation criteria for the repositories, regarding visibility -through its presence in national and international directories and of a normalised name-, policies, legal aspects -regarding intellectual property of the contents distributed-, metadata -metadata characteristics and format that the documents should have-, interoperability, logs and statistics, and security, authenticity and data integrity (FECYT et al., 2014). While some of those criteria are basic and mandatory, others are just recommended. All have closed answers with values of Yes or No to evaluate if the repository complies them or not.

Concerning metadata evaluation criteria, there are some rules that should be applied in order to be harvested in RECOLECTA (FECYT et al., 2014):

- The metadata format OAI-DC is used.
- All the items have the field title (dc:title), description (dc:description) and type of publication (dc:type). This latter has to be assigned according to the type of documents and vocabulary OpenAIRE (European directive) with the document version.
- All the items have the field publication date (dc:date) and it is presented in the established format (norm ISO 8601 - AAAA-MM-DD).
- All the items have the field authors' rights (dc:rights) and information of the level of access, according to vocabulary of types OpenAire.
- All the items have the field author (dc:creator), a field of format (dc:format) according to the registered list of IANA (types of media of Internet- types MIME).
- All the items have the field language (dc:language) according to the established vocabulary (ISO 639-3).
- All the items have the field identification (dc:identifier).
- An indexation policy known by the authors where it is established exists: language used, keywords, etc.
- A system of normalised classification is applied (e.g., CDU, UNESCO).
- The metadata exportation is allowed in another format than Dublin Core Simple.
- Some format of technical and/or conservation metadata is used.

In order to be included in RECOLECTA, the Repository Manager for each repository should follow the next steps (FECYT, n.d.-c):

1. Ensure that the resources in the repository are involved in these categories: Institutional repository, Thematic repository, Magazine portal or Journals owned by an institution without institutional repository.
2. The resource must accomplish standardized quality criteria (RECOLECTA-DRIVER Criteria) so that records can be located. Some of them were already mentioned before (metadata evaluation criteria) (FECYT et al., 2014), others appear in the mentioned document regarding the OAI-PMH protocol (FECYT, n.d.-a): size of set between 100 and 500 records, implementation of an elimination strategy (transitory or persistent), the dates' format coincide, progressive delivery of records, minimal lifetime for the "ResumptionToken" of 24 hours and a valid email address of the repository manager.
3. Access to RECOLECTA Validation & Harvester Tool. The access by the repository manager will be checked via OAI-PMH.
4. If the resources are suitable, it is possible to ask to be harvested. RECOLECTA managers will verify that the first and second steps have successfully been completed before harvesting the resource.
5. Resources harvested can be located through the RECOLECTA search engine.

CRUE-TIC published an initial report on their work on MOOCs and the criteria to evaluate them that included a preliminary evaluation, the evaluation of the MOOC model in terms of quality and the evaluation of its sustainability. The report includes a proposal to be reviewed of criteria of pedagogical quality for the elaboration of MOOCs at the universities and two questionnaires: one for experts on the quality and sustainability of MOOCs and another more general for the university community as MOOCs users. The indicators for quality criteria of MOOCs in the proposal are formed by three dimensions: planning/management (administration, accreditation), learning design (instructional design, contents, resources and activities, evaluation) and communication-interaction (communication, mentoring) (CRUE-TIC, 2015).

2.3 OER Policy

There are no specific national policies regarding digital infrastructures for digital educational resources in higher education and their implementation. However, three laws have some influence on this topic: the Spanish Law 14/2011, of 1st June, on Science, Technology and Innovation, entitled "Open Access Dissemination"; the Spanish Law 37/2007, of 16th November, on the reuse of information in the public sector, which obeys the European Union directive 2003/98/CE; and the Spanish Law 11/2007, of 22th June, on the electronic access by the citizens to the public services. In addition, the Spanish Education Law should also be mentioned.

The main actor involved in national policies regarding digital infrastructures and their implementation in Spain is the same public government and, more concretely, the Ministry of Science and Innovation.

Other actors that are contributing to the development of policy with guidelines and recommendations in reports and working papers are the CRUE, the REBIUN, the FECYT and the CEOE (Spanish Confederation of Corporate Organisations).

National policies

The Article 37 of the Spanish Law 14/2011, of 1st June, on Science, Technology and Innovation, entitled “Open Access Dissemination”, defines the basis at a national level for the publication of research activity in Open Access repositories when it has been mostly funded through the General State Budget of Spain (public funding) (FECYT, 2011). The Ministry of Science and Innovation is responsible for providing centralized access to those repositories, and its connection with similar national and international initiatives. This responsibility derives in the RECOLECTA initiative that was previously explained. Although this policy addresses research repositories, institutional repositories often include both research objects and digital educational resources.

The Spanish Law 37/2007, of 16th November, on the reuse of information in the public sector, has clear consequences on digital educational resources, since it establishes that the exercise of the intellectual property rights of the public organisms and administrations should be done in a way that eases the reuse of that information, concretely by offering the possibility of its free usage or giving them a license. This law ensures that the amount of data that derives from

organisations and projects financed with public funds or created by a public institution is made available to society (García & Calle, n.d.).

In the Article 42 of the Spanish Law 11/2007, of the 22th June, on the electronic access by the citizens to the public services, a national scheme of interoperability (ENI) was planned. This establishes the set of criteria and recommendations to be taken into account for decision-making technological interoperability (Portal of Electronic Administration Political Ministry Territorial and Public Function General Secretariat of Digital Administration, 2010).

Within this framework, the Article 111.bis of the Spanish Law 2/2006, of 3rd May, on Education, addresses aspects that affect digital educational resources. Some of the highlights are: 1) the objective of establishing standards that ensure the interoperability between the different information systems used in the Spanish Educational System, 2) the establishment of formats by the Ministry of Education, Culture and Sport, with previous consultation with the Autonomous Communities, that should be supported by learning tools and support systems in the context of the public digital educational resources. The objective is to ensure its use with independence of the technological platform where they are hosted (Spanish Government, 2006). In addition, the same Article states that the Ministry of Education, Culture and Sport will offer digital and technological platforms of access to the educational community, which will be able to incorporate educational resources from the educational administrations and other actors for its shared use. This statement continues by specifying that those resources should be selected according to parameters of methodological quality, adoption of open standards and availability of sources that ease its dissemination, adaptation, reuse and redistribution, being recognised as such. These statements are kept in the most recent modification of the Education Law that came into force in 2021.

The Spanish Law of Universities does not specify anything related to this topic and the Spanish General Law of Telecommunications only mentions that public universities are prioritised in terms of having an improved network connection (Spanish Government, 2014).

Working papers

There are also some documents that work as recommendations for the development of policies.

For instance, the CEOE establish in their "Digital Plan 2020: the digitalisation of the Spanish society" the prioritisation of the transformation of the educational system to adapt it to the new digital society, by putting the focus on learning and the use of the opportunities of technologies. One of the proposals include the promotion of MOOCs in higher education for new knowledge as a way to create synergies between the universities and the companies that require that knowledge (CEOE, 2016).

The CRUE publishes periodically reports that address the digital transformation in the Spanish Higher Education system and pose guidelines / recommendations, e.g.:

- "Towards an open university. Recommendations for the Spanish University System", which deals with open government, open data and open access of the universities and poses some best practices from different Spanish universities (CRUE, 2014).
- "ICT 360º, Digital Transformation at the University" (Cabrero et al., 2017) and "UniversiTIC 2017. Analysis of ICT in Spanish Universities" (Gómez Ortega, 2017), which inform about the trends regarding digital transformation at the universities and propose strategic action lines.

From the library' side and with the support of the CRUE, REBIUN published the report "Educational Open Resources: state of the art and guidelines for its promotion in Spanish Universities", which focuses on the results of a questionnaire answered by universities regarding the situation of the institutions regarding educational repositories, open licenses and institutional incentives / policies for its use, among other aspects. At the end, the report provides a series of recommendations for the promotion of open educational resources in Spanish universities that concerns, e.g., the interoperability among platforms or the creation of a specific policy for open educational resources (Santos-Hermosa et al., 2019).

Within the line of the report "Towards an open university. Recommendations for the Spanish University System" by the CRUE, the FECYT published a brief paper on recommendations "Towards an open access by default" to support the implementation of the Article 37 of the Spanish Law 14/2011, of 1st June, on Science, Technology and Innovation, entitled “Open Access Dissemination”, focusing mainly on research publications (FECYT, 2017).

On the other hand, the document “Digital Spain 2025” - presented in 2020 - as an up-to-date agenda that promotes the digital transformation of the country contains a collection of measures, investments and reforms, in their deployment may also bring new insights to the policies to be developed in Spain regarding infrastructures for digital resources.

2.4 (O)ER Change

Change agents

The major agent for change in the field of digital educational resources and its infrastructure is the Ministry of Science, Innovation and Universities. It defines the main challenges to address in R&D, which in turn establish the calls for research projects to be funded with public budget to which companies, universities and other institutions can apply. One of those current challenges was entitled "Economy, Society and Digital Culture" and includes a focus on the Internet of Things, digital infrastructures and 5G networks, smart services and applications, cloud computing and big data, high performance computing, natural language processing, cybersecurity and digital identity, applications for the digital tourism and digitalisation of the cultural heritage (Ministerio de Economía; Industria y Competitividad, 2017).

Other agents involve private entities, such as telecommunications companies, banks and, mainly associations and foundations (NGOs).

However, most of the change specifically regarding digital educational resources is not happening at this macro level, but rather at the meso and micro level, with funding schemas coming from the autonomous communities and the same universities. As noted in the report by Fundación Cotec para la innovación (2018), the R&D funding is not keeping pace with the economic growth in Spain, in terms of public and private investment. A timid trend towards private investment for R&D has been identified in the last years.

Funding schemes

Among the funding schemes to promote change in this field, the calls for R&D projects and other initiatives, and awards for the creation of (O)ER can be highlighted.

Previous national calls of the Ministry of Science, Innovation and Universities for R&D projects oriented to the society challenges focused on contributing to solutions to social, economic and technological problems in a mainstream way and on publishing its results in forums of high scientific and technological impact, enabling the technology transfer and internationalising their activities (Ministerio de Ciencia; Innovación y Universidades, 2018). It included as one of the topics "Digital economy, society and culture". The budget was of 268,198,000€ to distribute to three or four-years' projects.

On the other hand, the Ministry of Economy and Business published a call for R&D in the field of digital enabling technologies, which relates to the challenges of the economy, society and digital culture previously described. These technologies refer to ICTs of high impact and disruption capability, strategic for the development and the digital transformation of the economy and the society, e.g. Internet of Things, Big Data, Blockchain, supercomputing, cloud computing, natural language processing, robotics, cybersecurity, biometry, artificial intelligence or virtual reality (Ministerio de Economía y Empresa, 2019). The budged was of 9 millions of euros for subventions and loans addressed to universities and/or companies.

Between 2008 and 2013 an agreement between the CRUE and Red.es enabled the launch of the program "Profesionales digitales” (Digital professionals) with three calls for Spanish public universities with the objective of encouraging the national industry of digital contents (videogames, animations, mobile contents, virtual reality, advanced video and audio, etc.) through the creation of Centres for Production and Experimentation, but also for the development of training

programmes, of collaboration between universities and the industry, and sharing and dissemination actions like the creation of a portal to ease communication and knowledge exchange and the launch of a federated repository of digital contents (CRUE & Ministerio de Industria; Turismo y Comercio, 2011). The digital contents developed by the universities should be stored by themselves but the metadata were to be accessible according to the bibliographic publication standards (OAI-PMH, RSS,...); the interoperability between the generated digital content and the different content delivery systems and virtual campus, but also its independence should be guaranteed. Those metadata would be exported to the federated and central repository, which would rely on the federated identity management systems used in the eduroam system. The program was framed in the Plan for the Promotion of the Digital Content Industry, which was included in the initiatives of the "Digital Agenda for Europe" and the Strategy 2011-2015 of the Avanza2 Plan. According to the third call, the first and second calls funded 21 and 10 universities, respectively. The maximum amount of the Program in this last call was of 8,000€ to be jointly financed by Red.es and the universities (50% each). Regarding to the sustainability of the program, Red.es was stated as the responsible of maintaining the communication portal and the repository, whereas the universities should ensure that the executed actions within the program would be operational within the next 5 years of its launch.

Some private companies are also pushing universities towards change in the form of calls for R&D projects oriented to the areas defined by the challenge "Economy, Society and Digital Culture". One of them is the telecommunications company Vodafone, through its program Vodafone Campus Lab, which funded a maximum of 3 projects of 50,000€ to be developed in one year related to the following topics: artificial intelligence applied to predictive telecommunications radio network, improvement of the 5G network and data analytics/big data (Vodafone, 2018).

Another is the BBVA Foundation, which is financed by the BBVA bank, which offers a call for research projects in different areas, among them digital economy and society, digital humanities and big data. Five projects can be funded in each area during 2 years, with 75,000€ each and 100,000€ in the case of the big data area (Fundación BBVA, 2018).

From the NGOs' side, the Hergar foundation is worth to be mentioned. This is an organisation devoted to the educational research and promotion, which also has an annual call for R&D projects in the fields of application of ICTs in adult learning and health sciences; applied and technological research in social and law sciences, and humanities, and applied and technological research in engineering studies. This call is also open to other educational/business/scientific institutions and offers a maximum of 5,000€ for one project in each field during a year (Fundación Hergar, 2019).

Aside research funding and the program "Profesionales digitales", the creation of OCW sites by the universities before the creation of MOOCs has also been recognised in the form of awards.

Since 2007, OCW-Universia encouraged universities to join the OCW Consortium and provided them with technical support and infrastructure. The agreement between OCW Universia and the universities was based on the development of the OCW site by the universities, with at least 10 courses that followed the principles of OCW. According to Frías-Navarro et al. (2014), the main problem in this initiative (and its sustainability) was the lack of incentives for participation, neither official recognition for the teachers nor economic support were offered. However, between 2007 and 2014, in order to motivate teachers to participate in the initiative, each year the award MED-Universia for the best courses offered in the institutional OCW was announced and university teachers could apply for it. This prize was promoted by OCW-Universia with the sponsorship of the Ministry of Education and Science (Aranzadi, 2011; Universia, 2014). As an international initiative to which also Spanish universities participating in the OCW-Universia project could apply for between 2011 and 2014, the "Awards for OpenCourseWare Excellence (ACE)" of the OCW Consortium are worth to be mentioned. Several Spanish Universities OCW sites and courses were recognised with those awards (OEC, n.d.).

Between 2015 and 2018, the Tordesillas Group, an academic network formed by universities from Brasil, Portugal and Spain with the aim of scientific and educational cooperation, published an annual call for awards for the creation of MOOCs. These MOOCs had to count with the participation of university teachers of at least 2 universities of the Group, and of different countries. The prize included the required support and assistance for the development and

implementation of the MOOC with an appropriated level of quality, and had the sponsorship of the bank Santander (branch universities) and the travel agency The Travel Brand (Grupo Tordesillas, 2018).

Also, between 2015 until 2018, the association for the development of the educational technology and new technologies applied to education Edutec, which is constituted by Spanish and Iberoamerican universities and founded in 1993, launched the prize Edutec-Fundación Da. María Paula Alonso de Ruiz Martínez with the sponsorship of the Spanish foundation Da. María Paula Alonso de Ruiz Martínez. The aim of this prize was to acknowledge educational innovation with ICTs and educational professionals from any educational level could apply for it (Edutec, n.d.)

Not many of the public or the private initiatives seem to put emphasis on the sustainability of the projects, reducing their evaluation and control to the lifetime of the project.

Other measures

The National Agency for Quality Assessment and Accreditation of Spain (ANECA), as the organism in charge of issuing certifications that enable professionals to apply for professorships (permanent positions) in Spanish universities, has also some influence on change in this field.

It included, though with a low score, the creation of own teaching material in any kind of format as one of the merits to obtain the accreditation to work as Assistant and Associate Professor (Profesor Ayudante Doctor and Profesor Contratado Doctor): 7 and 9 points out of 100, respectively (ANECA, 2007).

The elaboration and teaching of an online course in standing platforms like OCW, EdX or Coursera is also a complementary merit to obtain the accreditation to work as Full Professor in some of the fields of knowledge (e.g. in social sciences) (ANECA, 2017).

3. Regional and institutional infrastructures for digital educational resources (meso level)

3.1 (O)ER Policy

As noted earlier, Spain has mostly a centralised higher education system, which implies that the Higher Education Law applies for the whole country. However, autonomous communities and universities are given certain degree of autonomy in developing some specific regulations under the national laws.

Here the policies in the autonomous communities and in the universities that have some connection to (O)ER are highlighted.

Policies in the autonomous communities

Certain autonomous regions in Spain have Open Access mandates already, mostly focused at scientific and academic production, namely:

- Region of Madrid: the Official Gazette of the Region of Madrid, Nº 53, of 4 March 2009, contains the publication of Order 679/2009, of 19 February, which defines the regulatory basis for grants aimed at R&D programmes among research groups in the Region of Madrid and technology grant announcements co-financed by the European Social Fund (B.O.C.M. of 4 March 2009)

Article 7 of said Order states the policy on promoting Open Access to the results from scientific research promoted by the Region of Madrid (FECYT, n.d.-b).

- Principality of Asturias: besides the creation of an Institutional Repository, the Principality of Asturias has adopted a series of specific measures to foster its use and facilitate access to scientific information, the distribution thereof and the preservation thereof in all those areas in which public resources are used. The 12 January 2009 the Council adopted policies to promote the development of Open Access to the Principality of Asturias research (FECYT, n.d.-b).
- Autonomous Community of Catalonia: Since 2009 [2], the Catalan Interuniversity Council (CIC), composed by all Catalan universities, agreed on carrying out several actions to foster open access at the university level. The aim was that academic promotion and research projects evaluation system takes only into consideration those publications included in an open access repository. Although this has not become completely true, most of the universities ask their faculty to publish pre-print versions of their works in their institutional repositories, ensuring their open access.

Open Access and Open Education policies at the universities

At the university level, 64.2% of the higher education institutions (34) had an Open Access Policy, which means that universities have decided in favour of open access dissemination (Santos-Hermosa et al., 2019). Surprisingly, the same report indicates that 52.9% of these policies did not include any recommendation or obligation for open access publication.

Most of the universities do not have a specific policy for OER [3], as this kind of resources do not have any special consideration by the institution or because the policies were created for research, not for teaching and learning. Nevertheless, Santos-Hermosa et al. (2019) point out the fact that several universities (30%) were planning to develop new strategies to correct this situation and to foster OER publication, through support calls with publication incentives; mostly as part of institutional digitalisation strategies that the universities have developed.

As mentioned before, 34 of the Spanish universities had Open Access policies and mandates already (mostly public ones), and in their mandates they mention the platforms where the resources are placed (FECYT, n.d.-a). In some of the cases these policies make special reference to educational resources. In Table 2, a summary of the universities with open access policies and their publication dates, as well as the mention to (O)ER - if appears -, is provided. Other universities that are not listed may have the development and use of (O)ER as part of the university strategic areas. This is for example, the case for the Universidad Internacional de Andalucía (UNIA) or the Universidad Carlos III de Madrid (UC3M).

Table 2

Summary of universities with open access policy and mention to (O)ER. Source: own elaboration based on FECYT (n.d.-a).

Universities	Open Access Policy (date of publication)	Mention to (O)ER?
Universidad de Almería	Yes (2017)	No
Universidad Autónoma de Barcelona	Yes (2012)	Yes. Teaching staff is encouraged to deposit educational resources in the institutional repository.
Universidad de Alcalá de Henares	Yes (2013)	No
Universidad de Alicante	Yes (2006)	Yes. The own repository includes teaching as one of its areas and accepts teaching material in any language, including learning objects, handbooks, teaching

Universities	Open Access Policy (date of publication)	Mention to (O)ER?
		units, exercises, teaching guides.
Universidad de Barcelona	Yes (2011)	Yes. It is mentioned that the academic community is encouraged to deposit those contents in the institutional repository and to participate in open dissemination projects, such as, for example, OpenCourseWare.
Universidad de Burgos	Yes (2014)	No
Universidad de Cantabria	Yes (2012)	Yes. It recommends including them in open repositories and participate in open dissemination projects, such as for example at that point was OpenCourseWare, but also other similar initiatives that could be developed.
Universidad Complutense de Madrid	Yes (2014)	Yes. It is stated that the teaching and research staff of the UCM will be able to deposit in the institutional repository their teaching materials or other materials that are not published according to the quality criteria set by the UCM and its centres.
Universidad de Extremadura	Yes (2013)	Yes. Among the institutional context of open access, the educational resources are specifically included.
Universidad de Girona	Yes (2012)	No
Universidad de Granada	Yes (2016)	No
Universidad de las Islas Baleares	Yes (2014)	Yes. it is stated that the teaching and research staff are encouraged to deposit in the institutional repository other academic publications different from the scientific ones (e.g., educational materials) done within the teaching activity of the UIB. The deposit in open access of other learning objects that could be interesting for students or teachers is also promoted.
Universidad de León	Yes (2011)	Yes. It states that the members of the community of the university must deposit other academic publications done within the teaching activity of the university in the institutional repository. It is also promoted the deposit in open access of all the learning objects that could be of interest for students or teachers.
Universidad de Lleida	Yes (2012)	Yes. It is specified that the teaching and research staff are recommended to deposit an electronic copy of their publications (teaching materials included) in the institutional repository of the university and, if corresponds, in the open access teaching material repository UdL OpenCourseWare. If they are published with an open access license in UdL OpenCourseWare, the institutional repository collects them.
Universidad de Málaga	Yes (2013)	No
Universidad de Huelva	Yes (2015)	Yes. It is specified that the teaching and research staff will be able to deposit their teaching materials and other not published materials done during their academic activity and that could be of interest for the students in the institutional repository. These materials will be subject to open access licenses Creative Commons.
Universidad de Sevilla	Yes (2014)	No

Universities	Open Access Policy (date of publication)	Mention to (O)ER?
Universidad de Valladolid	Yes (2016)	Yes. The teaching and research staff of the university will be able to deposit their teaching materials and other not published materials done within their academic activity and that could be interesting for the students (learning objects) in the institutional repository.
Universidad de Vic	Yes (2012)	Yes. It is specified that the teaching and research staff are recommended to deposit their academic and research publications (teaching materials included) produced during their activity at the UVic in the institutional repository of the university.
Universidad de Zaragoza	Yes (2013)	Among the institutional context of open access, the university includes specifically the educational resources like OpenCourseWare or others.
Universidad Politécnica de Cartagena	Yes (2010)	No
Universidad Politécnica de Cataluña	Yes (2009)	No
Universidad Politécnica de Madrid	Yes (2010)	Yes. It encourages the publication of academic and scientific documents from UPM instructors and students, in its repository and in the digital collection.
Universidad Politécnica de Valencia	Yes (2011)	Yes. It is specified that the university will incentivise their teachers to disseminate the learning objects generated within their teaching activity in the open through the institutional repository.
Universitat Pompeu Fabra	Yes (2011)	No
Universitat Rovira i Virgili	Yes (2013)	No
Universitat Oberta de Catalunya	Yes (2010)	The academic community of the UOC must deposit their academic publications (teaching materials or educational modules) done within their teaching activity in the UOC in the institutional repository. The deposit with open access of all the learning objects that could be of interest for students or teachers is also promoted. If they are published with an open access license in the OCW of the UOC, the institutional repository collects them (UOC, 2010, p.3).

All the universities with open access policies have similar written commitments, including the coordination with institutions of the university system in order to allow national (i.e. RECOLECTA) and international (i.e. DRIVER) academic and research production collectors to index the produced knowledge by the universities and provide access to it. This implies the use of standard protocols of exchange of metadata (i.e. OAI-PMH, Dublin Core).

Three institutional cases stand out: Universitat Oberta de Catalunya (UOC), Universidad Internacional de la Rioja (UNIR) and UC3M, which are described further as follows. The first two ones are completely online and private universities and have major (O)ER policies - UOC with longer trajectory than UNIR -, where as the UC3M is a traditional and public university that has been a pioneer in the development of OER in Spain due to an advantageous supportive context to open education.

The UOC

The UOC has an open access policy since 2010 and in 2019 launched its Open Knowledge Plan as a path to follow to become a fully open institution: from teaching to research; from publication to dissemination, to reach by 2030.

The Open Access policy of the UOC is one of the most comprehensive of all the universities with this kind of policy. It specifies different conditions depending on the belonging to the different university groups: research community, academic community, doctoral students and other students (degree or master). Only the ones that refer to the academic community mention (O)ER. The teaching materials are to be published first under copyright during a specific time period, after which they are published with a Creative Commons license (UOC, 2010).

The Open Knowledge Plan establishes 6 main work areas (Universitat Oberta de Catalunya, 2019): open publications, FAIR data, open learning, open innovation, open to society and evaluation research models. Regarding open learning, copyright during six semesters is by default applied to the learning courses produced at the UOC, but the possibility to publish them open is possible from the beginning - however, only 4% of the new learning courses were asked to be published in an open format from the start. The intention within this work area according to the Plan is to move from a closed model with open educational materials as an exception by default towards an open model with the possibility to make exceptions in copyright. It is clearly stated at this point in the Plan that there is an intention of commitment towards OER: "we commit ourselves to promote the use and creation of OER" (Universitat Oberta de Catalunya, 2019, p. 18). Later in the document, it is also stated that the use of open platforms as open knowledge spaces and open management, including the promotion of the use of open source software, will be promoted (Universitat Oberta de Catalunya, 2019, p. 22).

The UNIR

The UNIR developed its own Open Education policy (UNIR, n.d.), through the Research Institute for Innovation & Technology in Education, in which specified that the institution's vision towards Open Education is focused on every form (OER, data, research results, policy, licensing, technology and content authoring) to reach by 2020.

As the policy states, "Open Education becomes a key part of the university's strategy to combine Open, Universal and Free content (OUF) with proprietary services, and to find a balance between economic profit and social benefit" (UNIR, n.d.). UNIR encourages both staff and students to "use, create and publish OE resources and services to enhance the quality of the student experience, enhance the provision of learning opportunities for all, and improve teaching practices".

The strategic priorities of the policy are five: P1) increase the amount of UNIR resources released as OER, P2) integrate existing OER as appropriate into UNIR courses, P3) support the creation of OER as academic resources, P4) develop an open access approach for UNIR research data, and P5) contribute to the awareness of open education into society and the academic community at large.

Regarding the UNIR priorities of the open education policy, the ones related to OER are highlighted (UNIR, n.d.):

> *P1: UNIR will gradually increase the amount of current educational resources released as OER, up to 40% of the total broadcast by text and video. UNIR will implement an open policy to release learning resources, lessons, video-casts, open classes and other educational material, incrementally, every academic year, from various faculties, scientific fields and degrees. Whether or not OER are used or published in a school or service will ultimately be a decision for the rector and the exec board. Where use, creation and publication are to be restricted, schools and services are encouraged to identify and communicate a rationale for restriction. The University reserves the right to remove resources that do not comply with its policies, and/or request removal of resources from external repositories/sites.*
>
> *P2: UNIR will increase the use and re-use of existing OER within UNIR courses to the level that 60% of course materials are comprised of OER, and utilized as part of the teaching-learning process. UNIR teaching staff will be trained online and through seminars on how to identify, evaluate, adapt and share*

relevant OER within their teaching activities. Online open resources, after a quality check, will be combined with academic, proprietary materials, so that students, authors and lecturers are encouraged to integrate both approaches into a successful learning flow. Other OER repositories will be integrated for a bi-directional relation, so that OER can be freely shared. Cross capacity-building actions will be put in place through courses, open classes and workshops dedicated to Open Education and OER.

P3: At least 20% of all UNIR learning material produced by faculty will be created and distributed under open licences. UNIR teaching staff will be trained in Open Education and equipped with knowledge, skills and technologies to produce OER. The university will encourage faculty and students to create and publish OER to enhance the quality of the student experience, provided that the resources are fit-for-purpose and relevant. Whether or not OER are used or published in a school or service will ultimately be a decision for the rector and the executive board. Where use, creation and publication are to be restricted, schools and services are encouraged to identify and communicate a rationale for restriction. The university reserves the right to remove resources that do not comply with its policies, and/or request removal of resources from external repositories/sites.

Concerning the recommendations for faculty, first it is established that the responsibility to ensure that they have the necessary knowledge and rights to publish an OER and that all such resources published comply with all relevant policies lies on the staff and the students. Then the staff and the students are advised to publish OER using a Creative Commons attribution licence (e.g., CC-BY), and other Creative Commons licences (e.g., to add a non-commercial use or share-alike element) may be used if the creators feel this is necessary or appropriate for their particular resource, or to comply with the licence of any third-party content used in the resource. Recommendations include the publication of written and interactive digital teaching resources in an appropriate repository or public access website in order to maximize discovery and use by others, or link or federate them from the university repository to other repositories. Concretely, audio/video-based OER teaching resources are to be published at the University's multimedia repository. In addition, faculty and students are encouraged to collect data where possible on the usage of their OER. Special mention is made to students producing OER as part of their programme of study or within a faculty-directed project; in that case the policy guidelines should be followed and OER should be checked by a member of staff before publication (UNIR, n.d.).

The UNIR policy refers also to sustainability as key activity, along with networking and dissemination. Collaboration with national and international partners to ensure the correct implementation of the policy are mentioned, including the support of the UNESCO Chair on eLearning and the ICDE Chair on Open Education Resources.

The UC3M

According to Vida Fernández and Webster (2014), the fundamental guidelines of open education are part of the university's philosophy, concretely,

sharing, reducing barriers and increasing access to education. The development of open education activities at the UC3M has been determined by two circumstances that have fostered the creation of open courses. Firstly, the broad experience of its teachers for more than a decade in the use of information technologies thanks to the university's Virtual Learning Environment (Aula Global) that has encouraged faculty to digitize their teaching materials and put them online for their students. Secondly, the change in the teaching and learning methodology brought about by the new programs designed according to the criteria of the Bologna Process to adapt them to the European Higher Education Area. UC3M was one of the first universities to adhere to the Bologna Process, so since 2008 a more practical approach to teaching based on continuous formative assessment has become widespread, which has led teachers to create their own teaching materials. This favorable context has allowed UC3M to successfully develop its open education policies. (Vida Fernández & Webster, 2014, pp. 146-147)

As in other Spanish universities, OCW was the first OER initiative to be set up at the UC3M in 2006. This project helped to foster an open publishing culture among faculty members and has been a catalyst for other OER initiatives. UC3M

has won several awards of excellence for the quality of its OCW courses by Universia and the OpenCourseWare Consortium. Subsequent initiatives include UC3M MOOCs in MiriadaX (2013) and in edX (2014).

Institutional digital strategies

Only few universities have developed or were developing digital strategies and plans to boost the digital transformation of the institutions. For example, as to July 2019, the Universidad de Murcia presented its Digital Strategy that includes five strategic lines and 20 objectives: transform users in ambassadors, build alliances that improve the university's competitiveness, transform data into managed assets, innovate through agile and intelligent experimentation and adapt the value proposition before it is too late. Based on this strategy a Digital Transformation Plan was developed in 2021 to give place to operational plans with concrete actions. Among the strategic line "transform data into managed assets", the integration and enhancement of the data quality of the different units is the main objective. Consistent with its first strategic line, the website for the institutional strategy includes an open section for participating in the strategy.

The Universitat Jaume I (UJI) started a process for the design of the digital plan in 2018 with the aim to guide and promote the process of digital transformation of the university in all its missions (initial and continuous training, research and knowledge creation, and dissemination among all the social sectors), with special emphasis on the training aspects. In the Digital UJI Plan, published in March 2020, four main action lines have been highlighted: the identification and promotion of the digital competence (students, faculty members and staff), the promotion of digital and online education, transfer and communication of digital identity for visibility of research, and the digitalisation of processes and digital services.

In an incipient phase, the Universidad de Salamanca Digital as the digital strategy of the university set up as main objectives: follow the guidelines of the European Convergence process, guarantee citizens´ access to university administration, break down the barriers of access to the knowledge of the university (space, time and money), gain international presence and serve students from all over the world, and climb up the world rankings.

Other universities have a vice-rectorate of digital transformation, which would be connected to the development of a digital plan in the future. For example, the vice-rector of Digital Transformation at the Universidad de Extremadura includes as competencies, among others: the actions towards the digital transformation in training, research and management of the university, training actions for the whole university community in terms of ICT, the push towards designing and coordinating online and blended learning studies, as well as the creation, development and maintenance of technological infrastructures.

Although only a few universities were found to start moving towards the development (and implementation) of a digital strategy plan at the institutional level, many of them included strategic lines related to digitalisation within their institutional strategic plans.

3.2 OER Change

Change agents

From the Santos-Hermosa et al. (2019) report, the most important change agent at the universities is the Library (84.9%) and people working there. This is easy to be given since one of the functions of the library is to have any institutional document classified and easily accessible. Other minor agents are Technology and Computer Services, Faculty and the Virtual Campus Services.

As a library agent, the area of libraries, information and documentation (until 2013, CBUC) of the Consortium of University Services of Catalonia (CSUC) is also to be acknowledged. The CSUC shares academic, scientific, library, transfer of knowledge and management services to associated entities to improve effectiveness and efficiency, and it is formed by ten Catalan universities (Universitat de Barcelona, Universidad Autónoma de Barcelona, Universidad Politècnica de Catalunya, Universitat Pompeu i Fabra, Universitat de Lleida, Universitat de Girona, Universitat Rovira i Virgili, UOC, Universitat de Vic-Universitat Central de Catalunya, Universidad Ramon Llull) and the Catalonian government.

In some of the universities, some schemes for incentivising the creation and use of (O)ER are also identified as an aim (derived from the digital plans of the universities), but they have not always been carried out. Although the university board fosters these decisions, the unit that takes responsibility is the Library, for example:

“The UdG Library will facilitate the introduction of documents into the repository by providing the necessary support. This action will be done at no cost, since the Library will assume this task as it has been doing until now.” (Universitat de Girona)

“The University will adopt the incentivising measures that could consider with incidence on assessment and funding of projects. Regarding the repositories, both those owned by the university and those being shared cooperatively, the university is committed to facilitate through its Library all the necessary support for getting the documents introduced into the repositories.” (Universitat de Vic)

“The University will adopt the appropriate incentivising measures –funding of the departments, consideration in the support calls, etc.- addressed at the accomplishment of the mandate of 1st of January 2012.” (Universitat de Lleida)

Virtual Campus Services receive different names among institutions, and some of them are important agents regarding providing support to faculty in order to produce (O)ER. Sometimes also in combination with IT Services.

For example, the Centre of Education and New Technologies (CENT) of the Universitat Jaume I offers university teacher training and support for the use of the institutional learning management system and multimedia tools. Similarly, the Digital Campus of the Universitat de les Illes Balears, offers university teacher training (but also student support to use the institutional learning management system) too, and support for videoconferences the production of multimedia learning materials, such as podcasts, videos, websites, etc.

Another example is ULLmedia, which is responsible for producing promo videos, informative videos, and educational videos for the Universidad de La Laguna, as well as for offering advice on how to prepare scripts and audiovisual materials, and how to successfully share content across the network.

In the case of the UC3M, two important working groups were set up to establish a stable and coordinated basis for furthering the creation, use, dissemination and preservation of OERs and supporting instructors in the process (Malo de Molina, 2013):

- MaREA. This is a multidisciplinary working group composed of professors who are specialists in Intellectual Property Rights, Open Access and OERs and interactive technologies; as well as members of the Library and Communications and Computing Services. Its aim is to define policies and strategies for creating, managing and disseminating quality educational resources.
- UTEID (Unit for Educational Technology and Innovative Teaching). This is a unit that is integrated in the Library Service with support from the Communications and Computing Service and the Undergraduate Management and Academic Support Service, to a) support faculty in creating educational resources, using new educational technology, and protecting, preserving and disseminating these resources; b) evaluate platforms and tools for course design, content creation and student evaluation. It supports teachers participating in projects such as Khan Academy Zero Courses, MOOC-UC3M and MOOC-Universia. (Vida Fernández & Webster, 2014, p. 147)

Other minor change agents at this level are the Group 9 of Universities, the Network of OER and open education in Spanish (Red de Recursos Educativos Abiertos y Educación Abierta en Español, REA-Net) and the Cátedra Santander-UA of Digital Transformation.

The G-9 is an non-profit association formed by nine Spanish public universities (Universidad de Cantabria, Universidad de Castilla La Mancha, Universidad de Extremadura, Universitat de les Illes Balears, Universidad de La Rioja, Universidad de Oviedo, Universidad del País Vasco, Universidad Pública de Navarra and Universidad de Zaragoza) that has as objective the promotion of collaboration between the universities that belong to the group, in terms of teaching and research activities and services. The teaching activities include the development of training courses for students and university teachers in a shared platform.

REA-Net was based on Madrid and had as main aim to promote information networks and contact about open education in Spanish-speaking countries with the objective of promote cooperation between its members and place OER in the formal academic contexts.

The Cátedra Santander-UA of Digital Transformation is a unit created within the University of Alicante and with the support of Santander Bank in order to establish a centre for reflection, debate and research in the field of the adaptation of society to the digital age.

Funding and prizes schemes

In Spain, there are several partial public funding schemes for the elaboration of open educational resources at the primary and secondary school level, but universities usually fund with their budgets any initiative regarding this kind of resources. An exception was a funding scheme from the Junta of Andalucia, in Southern Spain, which supported, in 2005, projects on educational resources by a total amount of 12.000€ each. Although the funding scheme was addressed to public schools, universities were also included [4].

As examples, some experiences related to fostering the creation and publication of OER at the institutional level can be mentioned as follows.

Universitat Jaume I

As an action connected to the digital plan and the trajectory of the university promoting open educational projects, the Universitat Jaume I had an annual call for the elaboration and publication of open teaching materials (OER) in the teaching collection "Sapientia" (manuals) and in the OpenCourseWare of the university (multimedia courses) and another one to support the elaboration and teaching of MOOCs [5] (total funding: 18.000 €; plus a symbolic honorarium: 180-720€). OER were to be published in the institutional repository, as part of the corresponding collection: "Sapientia" or "OCW". MOOCs too. The university would disseminate the open materials using an open license of Creative Comments, preferably CC BY-SA. Support for creating the multimedia materials was offered within the OER and the MOOC calls through two procedures: 1) teaching video recordings using the classrooms with multimedia table; in this case the postproduction was responsibility of the author and the IT service would support in the problems that could appear regarding formats and tools to be used; and 2) teaching video recordings at the LABCOM with the means that would be established for the purpose; in this case it is needed to book a time slot to do the recordings and postproduction would not be done. Regarding the implementation and teaching of a funded MOOC, the call stated that the university would provide the technical means and needed support.

Universidad de la Laguna

It has calls for the creation of digital educational materials, MOOCs, and educational innovation projects. The university also offers prizes for best teaching innovation projects, which have been MOOCs in some cases. Technical support is offered by the multimedia service of the university in terms of technical questions related to the production of the digital educational materials and providing information and counselling regarding the intellectual property of the contents (teachers can choose among three options for their Creative Commons license). OERs must be published in the institutional repository, the virtual campus and the multimedia channel, if corresponds. The teaching vice rector offers support to the participants regarding the organisation, content structure, technical and methodological aspects of the MOOCs through their technical support units. MOOCs will be published on the MOOC platform of the university and in MiríadaX with the license CC BY NC ND.

Universidad Politécnica de Valencia

In its institutional strategic plan 2015-2020, the elaboration, dissemination, visibility and accessibility of information and results are included as a strategic project, which with regard to (O)ER, considers: 1) the production of digital contents, 2) the organisation of digital contents in the institutional repository, and 3) the promotion of MOOCs.

The university has created the Online Teaching Plan (Plan de Docencia en Red), in order to incentivise instructors to create digital and reusable educational materials and publish them in the institutional repository. This Plan includes an

annual call with a total funding of 35.000 € (plus a symbolic honorarium: 20-400 €). The OER to be created could be: digital learning objects (polimedia recordings, screencast recordings, educational videos, virtual laboratories or teaching articles), learning modules (with one or more learning objects), videonotes, and MOOCs.

The same Plan also publishes an annual prize for acknowledging the best quality and use of the produced materials in the previous call.

Universidad de Alicante

The Institute of Educational Sciences offers an annual call to support educational innovation projects for the promotion of blended and online teaching, including support to university teachers for the development of MOOCs (Massive Open Online Courses) and NOOCs (Nano Open Online Courses), and support for the faculties to develop blended and online teaching and learning processes in the official study programs of the university. Among the conditions for the publication of those educational resources is that they should be released with a Creative Commons license and disseminated through the institutional repository (with the possibility to host the materials in other open platforms).

Universidad Carlos III de Madrid

As in other universities, the UC3M offers an annual call for the development of OCW for faculty. The OCW office of the university devised a system to provide teaching staff with the necessary resources for DIY course production, such as induction sessions, eduCommons (CMS) Workshops, Help Desk (e-mail, telephone, face-to-face), as well as manuals and reference guides (Webster & Pardo, 2011).

Institutional projects

Here we mention some funded projects related to (O)ER related to specific universities or to interuniversity collaborations where Spanish universities where involved:

- OpenMed: Opening up Education in South-Mediterranean Countries. It was an Erasmus+ Capacity Building in Higher Education project (2015-2018) directed at widening participation and adoption of OER and Open Educational Practices (OEP) as a bottom-up approach to support the modernisation of the Higher Education sector in the South-Mediterranean. The project involved an international consortium composed by five partners from Europe and nine from South Mediterranean Countries, including two Spanish universities (the UNIR and the Universidad de Sevilla).
- Open Educators Factory is an UNIR project that explores how to transform university educators from "agents of resistance" into "agents of change" for Open Education. As part of the project, a platform to allow university educators to self-assess their capacity and level of development in terms of Open Education and to provide them with some guidelines to further adopt openness in all dimensions of their activities was developed.
- #metaOER was an UOC project (2012) with the main aim of developing a simple system (using Web 2.0 tools: Delicious) to centralise open resources about OER.
- Authorship model of OER for versioning (RAO) was an UOC project (2011), which challenged the traditional interpretation of (O)ERs understood as developed by experts and closed, lasting and created as a fragmented process from different perspectives (pedagogical, economic and technological).
- OportUnidad was a Latin-American project in which the UOC took part (2012-2014). The main objective was to contribute and maintain a common space between the higher education of Latin-American and the European Union though an ascendant approach, and also and specially to increment the use of open educational practices and resources (OEP and OER).
- OERTest (Testing an Open Education Resource Framework for Europe) was an Erasmus LLL project in which the UOC and the Universidad de Granada took part – along with the University of Duisburg-Essen. The objective was to develop standards for the OER offer, including guidelines for the evaluation of the work done by the students through those resources, quality standards, management models, etc.
- DIPROMOOC (2019-2022). This is a national funded project carried out by the Universidad de Sevilla that aims at the design, production and evaluation of T-MOOCs (hybrid between xMOOCs and cMOOCs, putting the focus on the development of tasks by the students) for the teachers' development (all educational levels) of teaching digital competences.
- colMOOC (2018-2020). This was an Erasmus project in which the UOC, the Universidad de Valladolid and Telefonica Education Digital are involved. The project aimed to deliver innovative MOOCs with the integration of services based on conversational agents and learning analytics.

Other minor institutional projects could be acknowledged as part of the annual calls of some universities to create and publish (O)ERs, which can be observed in the decisions of the same calls or in the institutional repositories.

For example, a teaching innovation project was developed collaboratively between the Universities of Cantabria and Oviedo for a year (2014-2015) with the aim of promoting awareness of MOOCs and analysing them within the context of some educational degree programmes; and then using this preliminary analysis and developing it with the aim of establishing a MOOC Best Practice Guide (Calvo Salvador & Rodríguez-Hoyos, 2016).

Other measures

Some of the autonomous communities have their own professorship accreditation schemes, which are only valid in the community where it was published, while the national professorship accreditation scheme from ANECA is valid for all the autonomous communities in Spain.

For example, the Catalan University Quality Assurance Agency (AQU) includes as part of the teaching merits for a tenure-track lecturer, to have created and published teaching materials in different fields (social sciences, natural sciences), and to have participated in teaching innovation projects. Most of the accreditation agencies include both activities as teaching merits.

On the other hand, most of the actions that are stated in the university open access policies point towards actions related to the libraries, and include the need for interoperability between repositories.

For example, the open access policy of the UOC includes as interoperability protocols the following: The institutional repository uses the DSpace free software application, the technical characteristics of which are adapted to the ISO 14721:2003 Open Archival Information System (OAIS) reference model. The UOC undertakes to follow the current standard metadata exchange protocols (OAI-PMH, OAI-ORE and SWORD) and those that may appear in the future in order to increase the visibility and interoperability of the repository's contents (UOC, 2010, p.6).

Formal recognition in the form of certificates or authorship acknowledgment is also a usual way of promoting change. For instance, the funding calls of the Universidad de la Laguna mention the acknowledgement of the authorship of the OERs and MOOCs through certification after publishing the materials in the institutional platforms. Similarly, the funding calls of the Universidad de Alicante include the certification of having conducted a teaching innovation project.

3.3 OER Infrastructure

As mentioned in the macro level, the last report UNIVERSITIC published by Conference of Vice-Chancellors of Spanish Universities (CRUE) includes an overview of the situation of infrastructure in 49 Spanish universities (out of 84, but including 84% of the university students in Spain) as of December 2016 [6].

The results regarding the IT basic infrastructure show that 83% of the universities have classrooms with multimedia projector and wireless Internet, 87% have professional rooms for recording and producing multimedia content and 90% of the institutions have IT support services for teaching - 78% for the elaboration of teaching materials. In addition, above 90% state that the teaching staff is using the institutional learning platform and 90% have institutional software licenses. The cooperation between Spanish universities is made clear through the 49% that provide IT infrastructure to other higher education institutions (Gómez Ortega, 2017).

Regarding digital repositories, 88% of the universities affirm to have an institutional repository- mostly developed with open-source software-, among which 80% specify to have institutional digital teaching materials in their repositories, but the percentage is reduced to 61% when talking about open institutional digital teaching materials. Other digital contents refer to MOOCs initiatives (85% of the universities have some offer related to MOOCs) and multimedia portals with digital contents for teaching (a Youtube channel, iTunes) (with 81% of the universities).

According to another report with answers from the 70% of universities affiliated to CRUE (Santos-Hermosa et al., 2019), the universities show overall interest in publishing their educational resources. 88.7% publish them in a closed virtual campus and the 77.4% in an open institutional repository; others publish the educational resources in OpenCourseWare (OCW) (34%), consortia repositories (15.1%), local repositories (11.3%) and others (1.9% corresponding to MOOCs, blogs, etc.). This report also remarks the high percentage of teaching materials in open access and the common practice of duplicate publication of open educational resources and incompatibility among platforms (virtual campus and open repositories). This duplication can be also seen in external platforms (Youtube, Slideshare, Issuu).

Regional networks or consortia

One of the biggest HE networks that involves Spanish universities (79), but also Iberoamerican ones, is Universia, which is supported by the Santander Bank (Frías-Navarro et al., 2014). Between 2007 and 2011, Universia promoted the project OCW, by offering support to universities to develop their own OCW. Up to 2011, 44 Spanish universities published 1,331 OCW courses in their institutional sites (Aranzadi, 2011). Although some universities still maintain and/or feed their OCW sites, many have already closed their OCW sites and/or replaced them MOOCs (Martín et al., 2015; Oliver et al., 2014).

Another Higher Education (HE) network related to (O)ER, the G-9 shares a virtual learning platform based on Moodle where elective courses for students and professional development courses for instructors are offered for free from any of the 9 universities involved in the network.

In the macro level report, REBIUN as the university library network and RedIris as the provider for infrastructure in the universities were mentioned. In this meso level, CSUC (Consortia of University Services of Catalonia) can be mentioned as the manager of e-infrastructures for universities and research centres in the autonomous community of Catalonia.

One of those infrastructures are the digital repositories for university data, including research and teaching repositories (some of them being described as follows); and the libraries services.

There are different HE consortia related to sharing repositories at the university level:

- MDX (Materials docents en xarxa – Learning Materials Online) (https://www.mdx.cat/). This is an (O)ER cooperative repository shared by 9 Catalan universities (UB, UAB, UPC, UPF, UdG, UdL, URV, UOC and UVic) and a Valencian university (Universitat Jaume I) with the aim of increasing the visibility and promotion of the teaching production of the participating institutions, of contributing to educational innovation and to free access to knowledge. MDX is supported by the CSUC. The repository is based on DSpace and uses the interoperability protocol of the Open Archives Initiative (OAI). The basic metadata collected per item is as follows:

dc.contributor.author	Universitat de Barcelona. CRAI
dc.date	2016-10-10T17:18:31Z
dc.date	2016-10-10T17:18:31Z
dc.date	2018-09-26
dc.date.accessioned	2019-10-22T03:26:49Z
dc.date.available	2019-10-22T03:26:49Z
dc.date.issued	2019-10-22T03:26:49Z
dc.identifier.uri	http://hdl.handle.net/2445/68287
dc.format	3 min.
dc.format	video/mp4
dc.language.iso	cat
dc.rights	cc-by (c) Universitat de Barcelona. CRAI, 2016
dc.rights	info:eu-repo/semantics/openAccess
dc.rights	http://creativecommons.org/licenses/by/3.0/es/
dc.subject	Formació d'usuaris
dc.subject	Universitat de Barcelona. CRAI
dc.subject	Universitat de Barcelona. CRAI Unitat de Serveis a Usuaris
dc.subject	CRAI Audiovisual
dc.title	Com accedir als recursos electrònics: revistes, llibres i bases de dades [vídeo]. Curs 2018-19
dc.type	info:eu-repo/semantics/other

- TDX (Tesis Doctorals en Xarxa – Theses and Dissertations Online), cooperative repository of doctoral theses in digital format defended in any of the 16 participating universities (mostly from Catalan-speaking autonomous communities: Catalonia, Valencia and Balearic Islands; and Andorra). Since 2011, TDX takes part in the cooperative MetaArchive with the objective of preserving doctoral theses, which is done through the LOCKSS program. The doctoral theses in TDX are described with metadata Dublin Core and follow the interoperability protocol OAI-PMH (Open Archives Initiative-Protocol for Metadata Harvesting). This repository is also supported by the CSUC.

Two platforms constitute the main infrastructures for MOOCs at the institutional level:

- MíriadaX, which includes MOOCs from both universities in (mainly) Ibero-American countries, as well as from companies/organisations. Currently many of the courses have a fee for enrolment and certification, which is verified by blockchain. 31 Spanish universities (out of 84) were involved in the publication of MOOCs in MíriadaX [7]. It is supported by the private telecommunications company Telefónica Learning Services based in Madrid and Universia.
- Coursera MOOCs of 5 Spanish universities, being three of them business schools and two of them universities in Barcelona.

UCATx was a consortium of universities in Catalonia that used Open edX technology for providing MOOCs, supported by the CSUC. It closed in favour of the major platforms, like MíriadaX and Coursera.

Another consortium for MOOCs in Spain is UniMOOC, which was generated by the Institute of Economy of the Universidad de Alicante in 2012 and is addressed at entrepreneurs. The platform is also offered as educational platform (a service) for universities, training centres, teachers and private companies for implementing online learning. The Universidad de Alicante, the Universidad de Murcia, some organizations and foundations, as well as training centres and private companies are partners of UniMOOC that offer MOOCs within the platform. Professionals and institutions could also offer Webinars, training itineraries (group of courses) and premium courses (closed and with a fee) through UniMOOC. In 2020 the platform stop working but the course contents were published openly.

Institutional (O)ER repositories

As described in the introduction of the section Infrastructure, it is common that each university has its own institutional repository and, in addition, other spaces where specific kind of (O)ER are published; for instance, OCW, MOOCs or videos.

Some universities have institutional repositories where all or most of the (O)ER are grouped and centralized. For example, the institutional repository of the Universitat Jaume I based on Dspace 3.2 includes in its teaching materials' collection, OCW under CC BY-SA 3.0 license, MOOCs and other types of (O)ER. All these (O)ER are also indexed in MDX. The institutional repository of the UPC, also based on DSpace, includes the OCW (https://ocw.upc.edu/), as well as other teaching materials (books, exams and videos), under CC-BY 3.0 license for the metadata. The institutional repository of the Universidad Internacional de Andalucía (UNIA), based on DSpace 6.3, now includes also the OCW collection under CC BY-NC-ND 4.0 license. Also based on DSpace, the Universitat de Lleida includes OCW in the teaching materials' collection of its institutional repository (https://repositori.udl.cat). A different case is the Universidad Politécnica de Valencia (UPV), which has an integrated platform (the VLE, poliformaT), based on Sakai, that includes the links to the other repositories (institutional repository based on documents, two different types of video repositories and two different types of repositories of online courses). The UC3M Digital is the portal of the UC3M where all the university's open education initiatives (OCW, MiriadaX, Khan Academy Zero Courses, Youtube Edu, iTunes U) are gathered.

Regarding specific repositories:

OCW repositories. Some universities keep their own OCW repositories (under CC by-nc-sa license), e.g.:

- Universidad de Alicante: it was one of the ten foundational universities of the program in Spain and Ibero-America in 2007. In 2011, this university was named the first "Reference Site" by the OpenCourseWare Consortium due to its number of courses, variety of language and relevance of its contents. Since 2014 no new update is registered. The OCW-UA Office as part of the library services is in charge of the repository.
- Universidad de Salamanca: it had an OCW regulation for the OCW USAL repository.
- Universidad de Oviedo.

Other universities are still active in OCW and have some calls to support OCW creation (same license), e.g.:

- Universidad del País Vasco: it presents annual calls for OCW development and update (still active), within the services of eCampus (virtual campus service).
- Universidad de Cantabria: it has an annual call for the development of new OCW published by the Vice-Rectorate for Academic Planning and Teaching Staff with the support of the virtual campus unit and the centre of training in new technologies.
- Universidad Carlos III: as in the other cases, there are annual calls for promoting the development of OCW by faculty. The OCW-UC3M Office as part of the library services oversees the repository and the call.

MOOCs. Although most of the universities involved in MOOCs use mainly MíriadaX, some universities have their own MOOCs platforms; for instance, the UNED and the UPV, both using the Open EdX technology, or the Universidad de Granada, with an own developed MOOC platform.

Video channels. For instance, the UNIR has its own Youtube channel with (O)ER and its restricted TV UNIR with video-cast resources, lectures, presentations and open classes. The UNIA has its own Vimeo channel on teaching innovation. Similarly, the UPV has an open video platform, and another restricted platform for video-notes/lectures.

Other (O)ER virtual platforms. Some universities have an additional channel that use to publish (O)ER. For example, the Universidad de Murcia has its podcast channel in ivoox with both (O)ER and dissemination programs. The Universitat de Girona has a digital repository of audio and video based in DSpace, that includes (O)ER.

Institutional repositories. To show an example of the co-existence of diverse virtual spaces for (O)ER, UNIR has also its own institutional repository Re-UNIR, which includes learning materials and research outputs with CC 3.0 licenses, apart from the video channels previously mentioned. The Universitat de Girona has also an institutional repository for documents, which includes (O)ER.

Concerning actors involved, the management of (O)ER is mainly done by the libraries (84.9%), along with the technological/IT services (32.1%). Other actors are the teachers (28.3%), the virtual campus services (22.6%) and the educational innovation units (18.9%). In most of the cases, the library works together with one or more of the other services (Santos-Hermosa et al., 2019).

According to Santos-Hermosa et al. (2019), the standard used predominantly is Dublin Core (86.8%) and there is lower presence of the enriched Dublin Core (1.9%) and LOM (11.3%), which allow further educational description. 92.5% use the OAI-MHP protocol for their interoperability. These data confirm the observation of the repositories analysed: when they have information on the interoperability protocol that they are using, they mention OAI-OMH.

3.4 Quality of OER

Mechanisms of (O)ER quality

In general, each university with services supporting the development of (O)ER has institutional quality assurance mechanisms/guidelines and guides to support instructors in that task. In some cases, these guidelines are derived from the instructions for getting funding for the creation and publication of (O)ER.

Examples include:

Institutional criteria or guidelines for creating (O)ER.

For instance, the Institute of Educational Sciences (Faculty Training Unit) and the Area of Information and Communication systems (IT) of the UPV have published a guide called "Learning objects as resource for university teaching: criteria for its creation". The guide includes the definition of (O)ER in the context of the UPV, the steps to produce them, recommendations to create different types of (O)ER (such as slides, videos and text documents), and a metadata sheet and an evaluation sheet. The metadata sheet is based on the LOMv.1.0 metadata structure, which includes as categories a general descriptive part and the reference to the educational use. The evaluation sheet considers the characteristics of the (O)ER, its objectives, its contents and its metadata. The criteria should be fulfilled

by the (O)ER created within the Online Teaching Plan funding scheme of the UPV, and the quality of the materials is supported by the provision of multiple documents and templates for the development of (O)ER.

Another case is the Centre of Education and New Technologies (CENT) of the Universitat Jaume I, which has published two web guides for creating (O)ER, one for accessible (O)ER and another one for MOOCs.

The UNIA has an OCW in its VLE Moodle for faculty members regarding the preparation of OpenCourses for the institutional repository. UNIA instructors can find there the guidelines and templates related to the pedagogical guide for the content, rather than for the technical specifications.

The Review Committee of the UC3M developed a "Guide for the OCW Pedagogical Model" in order to help faculty members with the process of preparing materials and creating courses that would meet a suitable degree of quality (Méndez & Webster, 2015, p. 3). Furthermore, the guide includes the rubric with the evaluation criteria used by the Quality Group. Other provided guides by the OCW-UC3M are: a general guide for OCW authors, an editing guide of OCW courses for authors (for EduCommons, the platform of the OCW-UC3M), a guide for creating presentation videos, a powerpoint template for course materials, among other documents of interests for OCW authors.

Quality assurance of institutional repositories.

Some of the open access policies include a mention to the quality control of the repository. For instance, the UPV mentions that the quality of the contents will be guaranteed through quality standards for different types of contents. The UOC, in its open access policy, is committed to ensuring the integrity of the data and metadata introduced by the authors, and preserving and maintaining the permanent access to the deposited documents in the repository. Another similar example is the Universidad de Extremadura, who states that "(the institutional repository) will follow the international criteria and the quality of its contents will be ensured through the establishment of standards. A plan for the digital presentation that follows the international guidelines that guarantee the permanent access to the deposited documents will be developed" (Universidad de Extremadura, 2013, p. 3). Some OCW university platforms, for instance the OCW of the Universidad de Cantabria, mention that they review that the materials do not infringe third-party rights, that correct citations in the materials are added and correct licenses applied, before the materials are published.

Annual call for (O)ER funding.

In the case of the UJI, the annual call for MOOCs funding establishes that the authors are responsible for ensuring the academic quality of the materials, which in turn will be evaluated by the program commission. Another example is the Universidad del País Vasco in her call for OCW includes a guide for the creation of OCW within the university and the criteria for the evaluation of OCW courses. These criteria include consideration of: the teaching guide of the course, the extension and coherence of the course, the materials included, the activities and self-assessment tests, accessibility of the materials, information to the reference to material sources, and respect of the intellectual property of the resources. Materials should be published under a CC-BY-NC-SA license and be accessible without restrictions (no registration or login needed) in the platform OCW-UPV/EHU based on Moodle.

Similarly, the Universidad de Alicante defines the criteria of the MOOCs and NOOCs to be created by the faculty members: workload of 40 hours / 4-9 weeks (MOOCs) or 15-20 hours / 2-3 weeks (NOOCs), structure organised in modules, inclusion of resources (audiovisual, theoretical of support, and evaluation), incorporation of an introductory module, use of a communication channel, intellectual property (CC) and pedagogical quality (autonomous learning and diversity for presenting contents). Some of the commitments of the grant recipients are:

- To ensure a free participation in the course,
- The inclusion of the institutional identification, participating in the training activities for recipients (technical and methodological aspects, editing of audiovisual materials and functionalities of the technological platform),
- To publish the course materials in the institutional repository.
- To host the course, with free self-enrolment, in one of the following platforms: Moodle formación-UA (part of the institutional VLE), Google Course Builder-UA or MiríadaX. The participants are also allowed to host the course in other open internal or external platforms.

Peer review of (O)ER.

In the case of the UC3M, the quality assurance of OCWs includes a peer review assessment system (Méndez & Webster, 2015). A rubric for evaluating OCW courses with ten items (distribution of course contents, study materials, practice materials, self-assessment tests, self-learning format, bibliographic sources and information resources, accessibility of supplementary materials, adequacy of the pedagogical proposal, coherence of the proposal and clarity of the proposal) to be evaluated on a scale of 0 to 2, and in some cases 0 to 3, was developed (Méndez & Webster, 2015, pp. 8-9). For this process, faculty members that had already received an OCW award or mention were invited to be enlisted as reviewers and the institutional VLE Moodle was used to include the functionality of grading by rubric - instead of the UC3M-OCW based on the eduCommons platform (a Quality Assurance state is included but reviews based on the rubric were not possible). If the courses are not considered eligible for publication, the Review Committee proposes some recommendations to improve the materials.

We can also find quality assurance proposals based on autonomous communities' documents. For example, Rodríguez et al. (2013) present a proposal to evaluate MOOCs based on the Guide Afortic. This guide is a document developed by 8 out of 10 Andalusia universities (Working Group of the Virtual Andalusia Universities) in order to evaluate the quality of online programs in this autonomous community.

Institutional agents for (O)ER quality

Although university libraries have the major role in ensuring the quality of the institutional (O)ER infrastructures, especially the technical one (metadata, interoperability...), some other actors can also be mentioned.

As previously described, many universities have an annual call for promoting the creation of (O)ER by faculty members. This call usually counts with an evaluation commission, who evaluates the applications and, therefore, the quality of the proposed materials, and ensures criteria compliance during the funding period and (O)ER publication. For instance, in the case of the Universidad de Alicante, the evaluation commission of the annual call for the program PENSEM-ONLINE (program for blended and online learning training), which focuses on the creation of digital materials and online courses, includes the vice-rector of Educational Quality and Innovation, the vice-rector of Studies and Training, the director of the Institute of Educational Sciences (unit for faculty training), the director of the Quality Secretariat, the director of the Secretariat of Technological Resources, the director of the Further Education Centre, and the area of Support and Assistance to Users. In this same university, the participants in the call count with the Institute of Educational Sciences for the technological and pedagogical support for designing and developing the approved projects. This Institute also ensures the quality of the final product during its production. The Vice-rector of Campus and Technology (IT unit) collaborates in the guidance and support tasks for the use of the Moodle formación-UA and Google Course Builder-UA platforms.

The UC3M de Madrid of the OCW-UC3M project has a quality group for the project, whose objectives are to:

> *veil for the quality of the contents and the impact of the courses published on the UC3M-OCW site; determine the organizational criteria and the content structure to which the OCW courses have to adhere; and foster promotion of OCW courses and their relationship with the degree programs offered at UC3M. This group is composed of representatives of the following areas: graduate studies, postgraduate studies, quality issues, online education, OCW Office, and is coordinated by the Vice-Rector for Infrastructures and Environmental Affairs. The main tasks undertaken by this working group involve managing the annual call for proposals to be submitted by faculty to take part in the project, selecting the courses to be published on the OCW-UC3M site, overseeing the quality of the courses, and fostering faculty participation in the awards for excellence in OCW launched by the Open Education Consortium and Universia, the Spanish OCW consortium. [...] the OCW Office staff would be responsible for carrying out the formal technical review concerning aspects such as correct use of Creative Commons licenses, intellectual property rights, metadata, etc. [...] The Quality Group would undertake the review of the pedagogical aspects, for example the balance between the theoretical and practical content, the degree to which the course fosters self-learning, the clarity and coherence of the didactic proposal, etc. [...] A sub-committee was formed within*

> *the Quality Group that is composed of the Vice Deans for Quality at the Faculties of Social Sciences and Law, and Humanities, Communication and Library Sciences, and the Assistant Director for Quality at the School of Engineering. This Review Committee, coordinated by the Deputy Vice-Rector, is responsible for implementing the validation process of new OCW courses to determine whether they meet sufficient quality criteria to be published on the OCW site. (Méndez & Webster, 2015, p. 2-3)*

In the case of the Universidad del País Vasco, the evaluation of the OCW courses is done by three main actors: eCampus (the institutional digital teaching and learning unit) for the verification of compliance of the formal aspects, the corresponding Department for the scientific rigor of the proposal, and the University Commission of Teaching Evaluation for coherence, balance and clarity aspects.

4. Individual infrastructures for digital educational resources (micro level)

4.1 Questionnaire

The Spanish survey was designed ad hoc based on the four elements for the EduArc studies (Infrastructure, Quality, Policy and Change) related to the micro level, and was initially revised by three Spanish faculty members connected to the area of educational technology. All of them were experienced lecturers used to creating and working with OER; one of them was additionally an expert of survey design and validation. The survey was modified according to the suggested changes (e.g., clarification of some items in their formulation, revision of some scales, addition of some new subitem). The final version of the survey (in Spanish) can be found here.

During the 3rd week of January 2020, the survey was administered online via the online platform system supported by the University of Oldenburg based on Limesurvey and was open until the 5th of March 2020. The invitation to the survey was disseminated through personal contacts and social networks (Twitter, Facebook, Linkedin), and a request to disseminate the survey to academic staff was also sent to recognised Spanish university associations as G-9 and educational technology associations (EDUTEC and RUTE). In addition, this request was sent to study deans, so that they would disseminate the survey to their university faculty members. These diverse dissemination strategies were successful in covering in a comprehensive way the Spanish HE situation at the micro level (number of universities participating, disciplines, academic positions…). Also it was noticeable a high interest in the subject (O)ER on the part of specific individuals and groups. However, these strategies were also time-consuming and far beyond the coverage expected from the EduArc reports [8].

The survey had as objective to know the level of creation and use of (O)ER and their repositories of academic staff for teaching and learning. An explanation of what (O)ER were considered within the project was included. Information about the EduArc study and the information consent were included too.

The sections that formed part of the survey were:

- Basic data, such as the HE affiliation, academic position or field of knowledge.
- Use and creation of (O)ER: general aspects.
- Infrastructures of (O)ER.
- Quality of (O)ER and infrastructure.
- Measures of promotion for creating and using (O)ER and infrastructure.
- Policies and regulations on (O)ER and infrastructure.

Based on the national general data statistics on academic staff in the 2018/2019 academic year (120,383 for the total population), the representative sample size was calculated according to a 95% confidence level (N = 383).

Background data of the participants

The representative sample size was largely surpassed with 576 total answers obtained, from which 400 were full answers [9].

Out of the 576 academic staff that took part in the survey, 49.9% are female and 47.5% male (2.6% did not answer). Participating academic staff were affiliated to 64 universities (out of the 84 existing Spanish universities), though only 24 universities counted with at least 10 participating academic staff.

In terms of age, there were participants in each range without a clear majority. The lower percentage is located between 23 and 34 years old (9.7%). The other percentages are distributed as follows: 35-40 years old (13.6%), 41-46 years old (20.4%), 47-52 years old (22.2%), 53-58 years old (20%) and more than 59 years old (14.1%). Most the participants had more than 20 years of teaching experience (46%), and also more than 20 years of teaching seniority at their current institutions (36%). The 17.1% participants with between 1 and 3 years of teaching tenure at their current institution is to be highlighted as the second most common situation.

The most common academic positions of the participants were Adjunct Professor (nontenure, part-time) (20.4%) and Associate Professor (civil servant, tenured, full-time) (25.3%). The next most common academic rank is Associate Professor (not civil servant, tenured, full-time) (15.6%). Although all the disciplines were represented, most of the answers came from Social and Law Sciences (42%), followed far behind by Health Sciences (17.5%) and Engineering and Architecture (15.5%).

According to the academic position, 69.4% stated that they could decide on creating and reusing (O)ER, against the 23.6% that took decisions with other faculty members and 5.4% that could not take this decision because the (O)ER were given by the institution.

Use and creation of (O)ER

Almost half of the academic staff (45%) use mostly (O)ER that have Creative Commons licenses. From these Creative Commons licenses, most of them (60%) allow reusing (also commercially) and remixing.

The types of (O)ER that are most used are:

- Slide presentations (87.7%), (O)ER in text format (74.5%) and pictures (65.9%).
- Videos (48.4%) and assessment tests (43.3%) are in the second place.
- Other kinds of materials are used with less frequency (e.g., infographics) or even merely anecdotally (e.g., podcasts).

When asked about how they include (O)ER in their teaching, most of the participants stated that they use their institutional virtual learning platform, several use (O)ER in class without being incorporated in any virtual space (only used or provided in the face-to-face class) and few mention video spaces (and other virtual spaces). These results coincide with the meso level report done in the context of university OER in Spain (Santos-Hermosa et al., 2019).

Some of the quotations referring to those aspects are as follows:

> *"(O)ER are accessible through the institutional virtual platform. Some (O)ER are linked (e.g. doc drive, videos…), other are uploaded to the platform"*
>
> *"I used the (O)ER in class and I incorporate them, as students do, in the Moodle platform"*
>
> *"Generally, (O)ER without being incorporated in any digital space"*
>
> *"I create my own videos to use in my classes, which are shared on Youtube"*
>
> *"(I include (O)ER) in presence in the class, synchronously in distance learning, asynchronously through the university platform, in my Youtube channel and in my personal-professional blog"*

Some of the academic staff mention the co-creation of (O)ER by their students. For example:

> *"(O)ER are shared with the students through the virtual classroom in Moodle (b-learning). Students also share the created (O)ER (trying that they use these CC licenses, whenever possible) in the same platform"*

General information about the use and creation of (O)ER showed that it is a common practice for Spanish academic staff to use the institutional virtual learning platform to provide (O)ER to the students, many less participants mention open virtual spaces that would allow to share (O)ER beyond the classroom or the institution. On the other hand, the most used types of materials seem to be the ones that are associated to in-presence teaching situations.

OER Infrastructure

Concerning infrastructures, 64% of the participants stated that their university has one or more (O)ER repositories, but 27.4% were uncertain about this. In any case, most of the participants did not use the (O)ER that are in their institutional repositories (68%), did not publish their own (O)ER in them (50.6%) and ido not search for (O)ER in the institutional repositories (48%). On the other hand, they did not publish their (O)ER somewhere else (68.6%) and, if they did, they do not use Creative Commons licenses (59%).

As given reasons not to use the institutional (O)ER repositories, the most relevant one is that academic staff did not find (O)ER useful for their teaching (43.7%). However, other items that had a high presence are the lack of support mechanisms to use them (25.6%), the lack of any compensation for their use (21.1%) and the concern about the management of the (O)ER author rights (21.1%). Many participants stated under "Other reasons" that they were not aware of the existence of this kind of institutional repository (for (O)ER) or that they did not investigate them.

When asked if the (O)ER repositories are connected to other institutional systems, such as the learning management system, the intranet, etc., 45.6% stated that this integration exists, but a high number of academic staff were unsure (34%). Participants were also rather uncertain about the involvement of other external institutions in the support or maintenance of the institutional (O)ER repositories (56.4%). According to 58.2% of the participants, (O)ER repositories are relevant for the institution in terms of visibility and reputation.

Academic staff used institutional repositories in different ways but being the common ones as a place to store (and share) (O)ER – referring, in most of the cases, although not explicitly, to the institutional virtual learning platform. Several mentioned using them for searching (O)ER. Some examples of quotations follow:

> *"(I use them) to share my teaching notes with the students"*

> *"As a personalised repository of (O)ER for the students"*

> *"To store all the class materials and activities"*

> *"(I use them) when searching for useful contents for the students, basically highlighting the (O)ER that could be interesting for learning to the students"*

> *"Search for information, show examples for students of assignments and resources"*

Quality of (O)ER and infrastructure

In terms of quality of (O)ER, the participants valued the most the type of resource (text, video, audio, etc.) (55.1%), followed by the reputation of the author of the resource (50.8%) and its availability in the institutional repository (50.3%). Aspects such as the use of Creative Commons license, the inclusion of metadata, the adherence to international standards or the inclusion of some type of evaluation or comment about the quality of the resource were important for around 30% of the participants. Some of them mention the quality of the resource in terms of content and design as well as its pedagogical potential, for instance:

> *"Formal quality and content from the perspective of contributing to competences"*

"Usefulness of the resource to achieve student's learning"

"A good pedagogical justification of what it consists of and what it could serve from an exclusively educational point of view, that is to say, of a potential increase in learning results"

"Coherence and graphic quality related to the course content"

"Relationship to immediate teaching"

"The rigour of its content"

On the other hand, most of the participants stated that they did not know how mechanisms or procedures for ensuring the quality of repositories and (O)ER in their university work. Several of them mentioned that there are no (O)ER repositories in their institutions. Only few academic staff mentioned some institutional services; for example, the vice rectorate of digital campus, the teaching department, the course manager/coordinator or the author (teacher/s), the technological or informatics unit, the unit of educational advising, or the library. Some quotations that reflect these statements are as follows:

"It is self-publication, there are no mechanisms of evaluation or quality in the repository. The OCW project died, it was not followed up"

"I'm not talking about the case of my university, but in general; at my university the only repositories (as far as I know) are for theses and dissertations, and some library material (texts), but not that kind of OER you ask for"

"I know that there is a protocol and recommendations, such as how to use the Creative Commons license, but it is neither easy nor priority task for academic staff that we are also researchers"

"It is revised by the team of the Vice-rectorate of Digital Campus and Transmedia"

"(These are) functions of the area of the Library"

"The technicians in charge of the repositories supervise their classification and labelling, but not the quality of the resource content. Only those resources developed with technical support of the unit are usually subject to greater quality controls - in terms of content"

According to the participants, the actors with more influence in their universities to define the quality of (O)ER, their metadata and their repositories were mostly the same academic staff members that use them (41.2%), followed by the library service (38.7%), the virtual campus unit (34.8%), the technological or informatics unit (34.6%) and the academic staff that share a same course (33.5%).

Measures of promotion for creating and using (O)ER and infrastructure

Concerning promotion of change, academic staff were asked about which measures were applied in their universities to support academic staff to create (O)ER and their metadata. Many participants stated either that they did not know if there were any or that they did not exist. Among the options given in the questionnaire, the top ranked was technical support (42.2%), followed by training support (39.3%). Other open answers related to this question were the following:

"In some cases, support has been offered for creating knowledge pills and for creating resources to incorporate in MOOCs. Some initiative is supported by the teaching innovation program of the university"

"More stability in the workplace"

"Teaching dedication"

"Not many incentives, but some contributions are paid"

"I think there are economic and non-economic incentives, but I am not sure"

"Emails to encourage us to do it"

"It is recognised in accreditations but not in the University"

"They are valued but in short: they are made by teaching vocation and teaching conviction. They are not compensated financially, and it is very time consuming. It only produces personal and teacher satisfaction; in no case economic satisfaction, at least not at present"

"Now knowledge transfer is going to be promoted through the six-research periods. No doubt the picture will change for the better in that respect. People will be encouraged to spread the word about what they do and to participate in teaching development projects with valuable or at least successful technological media"

A few participants refer to institutional measures within their institutions, for instance:

- Through specific calls or calls for teaching development projects.
- Annual calls to write course handbooks.
- Award of teaching innovation of the social council.
- Call or program to produce (O)ER.
- Professional development, training courses.
- Guides to use the virtual campus.
- Funding for educational projects.
- Technical support for audiovisual production.
- Specific calls for creating MOOCs and NOOCs.
- Teaching evaluation and professorship accreditation.
- To be included in the working contract.
- Part of the plans for professional development.
- Certificates that could be used to ask for salary complements (quality complements).
- Online orientation/guidance.
- Existence of a centre for digital resources.
- Reduction in assigned teaching credits (teaching workload).
- Teaching recognition/acknowledgments.
- Agreements with other national and international centres.

Among these answers, some participants made some important points that connect to institutional procedures, conditions and relationships:

"In my case, digital educational resources are a prerequisite for teaching and, therefore, the creation, use, adaptation, reference to those resources is done in order to be able to teach the courses. Publishing the resources in a common university repository is another matter. The resources are and remain in the virtual classroom for at least 3 years - in my case - and serve as a reference to other instructors who teach the same course. But I do not know, or I have not used, if there is a repository with all the digital educational resources of the university, […] open and organised for all instructors. There are works and materials published in different sites online, but I do not know -may be- a reference repository where all the resources are together. If it exists, it lacks dissemination and coordination, which should be promoted so that we all contribute new resources there. But I emphasize the need to improve the working conditions of adjunct professors, since we already suffer from an excess of unpaid work. [...] If the contracts were more stable, if they were offered a growing opportunity for improvement, the committed adjunct professors could spend more time preparing and improving the educational resources they use and the university could accompany this process and demand that, but for that to happen, there's still a long way to go, unfortunately"

“My university's repository has only been functioning for a few years, it still lacks dissemination, awareness, human resources and time to consolidate itself as a tool for everyday use. That said, there is a big problem today with the availability of time for the work of the academic staff. There are more and more resources, more incentives, more quality, more management of all that, more teaching hours. The analysis of reality speaks for itself. Either more people are hired to carry out new sectors of activity, or this is going to collapse, especially since after the crisis, our universities have hired a large number of adjunct professors and positions for permanent full-time and civil servants’ professors have been frozen”

“(These measures) do not work properly, since the spent time in the bureaucratic procedures do not redeem the elaboration and publication of (O)ER”

"Among my colleagues there is a divisor line: pragmatically (it does not count for the accreditation) and idealists (it is ethically important)".

“At my university they hardly care about this. And certainly, NOBODY gets any support.”

“It is not actively promoted. It must be the faculty member's initiative and the only technical support offered is extremely limited in its conditions (there is only technical support to produce very short videos with a standard format similar to a class with slides). And there is no institutional resource repository, so it is impossible to know about other instructors' resources or to disseminate one's own”

“The University has a specific unit for the creation of digital educational resources, which works pretty well. It makes annual calls, and offers technologies for its production, as well as a series of annual courses. It takes into account the participation as a teaching merit, but not enough. And sometimes, it's a bit rigid: probably, due to the lack of staff, although their involvement is total. About teaching repositories, they have very little visibility in general, and its reuse is not encouraged: there is a general policy of helping to create your materials, but not to share them (it is more a particular initiative of academic staff, in this regard)”

Policies and regulations on (O)ER and infrastructure

Only 21.7% of the participants stated that there is an institutional explicit policy or regulations concerning the use and/or creation of (O)ER in their universities. Most of the participants were uncertain about this (61.7%). Slightly some more participants stated that there is an institutional implicit policy (23.7%) – against a majority that did not know (60.5%). Similarly, most of the academic staff (67.4%) were unsure about the existence of institutional policies connected to specific study programs or to departments/faculties. Only 14.8% were positive about this existence.

Most of the instructors were either not involved in the preparation of these institutional policies (36.3%) or uncertain about it (54.6%). Therefore, it could be considered that institutional policies with this regard, when exist, are mainly top-down in most of the Spanish universities, at least from the point of view of the academic staff. When participants were asked about academic staff being able to influence somehow those policies, 26.2% stated that they cannot influence explicit policies (a smaller percentage than lack of involvement in the preparation of the institutional policies) and more than before were unsure about it (57.8%).

Some quotations regarding this aspect are as follows:

“It is possible that institutional policies exist, but they are not applied, or they are not presented to the university community, or it is not an element that goes beyond the tasks of adjunct faculty"

“In my university there is a total lack of regulations and suitability for online teaching, which forces academic staff to self-manage and depend on their own knowledge and willingness so that the courses work properly"

"My opinion is that my university's digital resource repository policy is not systematic and clear. The creation and use of the resources (typically not open) mainly depend on the academic staff. The typical use of the resources is in the virtual campus courses. There is support for the creation of MOOCs. There is an institutional repository for the repository of student products (final degree project, master thesis, doctoral theses) and research products. There is a policy of support for teaching innovation, which sometimes refers to projects related to teaching resources"

"We receive documentation on privacy policies and use of the different resources that the university provides and then we do a compulsory test to check that we have read and assimilated the documentation"

"There is a secretariat of audiovisual resources that establishes the policy of the call"

"The distance between the rectorate and the faculties and departments is immense, even physically, and the bureaucracy is huge"

"There is a policy, but it will have to be improved and more widely disseminated. I do not believe that there is a lack of interest, on the contrary, but there is a lack of time and of more measures in the direction taken so that it becomes part of the culture of the institution. Among these measures are all those that facilitate and make it possible to use it among that part of the academic staff interested: time, space, incentives, recognition..."

No additional institutional policies or regulations were identified in the open answers, apart from the ones mentioned in the meso level. As was described above, most of the participants did not have knowledge about having this kind of policy.

Additional post-Covid-19 survey

Considering the educational emergency situation, some changes may had happened in the scenario described before. A new survey was delivered to the participants in the previous questionnaire that wanted to keep in contact regarding this study.

The structure of the questionnaire included a short version of the previous one with some reformulation related to the changes in their institutions and their individual use of creation of (O)ER related to infrastructure, quality, policy and change.

Out of the 150 faculty members that were invited to participate, only 46 submitted their answers (50% males and 50% females). Age ranges most frequent were 41-46 years old and 47-52 years old; in total: 47.8%. 43.5% of the participants had more than 20 years of teaching experience. Most frequent academic positions were Adjunct Professor (28.3%), Associate Professor (not civil servant, 21.7%), Associate Professor (civil servant, 17.4%) and Assistant Professor (13%). Disciplines most represented were Social Sciences and Law (41.3%), Engineering and Architecture (21.4%) and Arts and Humanities (17.4%).

Among the types of (O)ER that were offered as options in the original questionnaire, online questionnaires (68.9%) and videos (62.2%) were the ones with a higher increase of use/creation during Covid-19; to a lesser extent, the use of teaching text-based materials (instructions, class notes, activity guides) also experienced an increase (51.1%). The other types of (O)ER were used in general with the same frequency than before Covid-19.

Regarding the use of (O)ER platforms, most of the participants used the institutional virtual platform (usually Moodle) to support their teaching and include their (O)ER, which some of them were already using before. Some universities obtained MSTeams licenses or used more intensively the institutional video repository for teaching. Google Drive is mentioned by several faculty members. Tools mentioned by one or two faculty members in each case are Kahoot, Padlet, Socrative, Edmodo, Google Classroom, infographics and mind maps. A faculty member mentioned Youtube and

Vimeo to upload their own videos with restricted access for students. Another participant mentioned their own webpages to share their own (O)ER. A third participant mentioned Kaltura to record videos.

Although most of the participants state that the changes have been mostly quantitative instead of qualitative:

- A faculty member mentioned that in their institution there are now incentives for shared creation and use of (O)ER.
- Another participant stated that faculty members' awareness of the importance of uploading the used/created (O)ER in the institutional websites has increased. The fact that the (O)ER transparency, sharing (O)ER (and use of internal repositories), has been improved is mentioned by several faculty members.
- A third participant mentioned that they take advantage more often from the faculty professional development offer, and that to create (O)ER they needed pedagogical and technical support. The increase of (O)ER use and creation's competence by faculty members and the relevance of online training was mentioned by others too (not about sharing or the evaluation of (O)ER quality). A participation mentioned the institutional use of peer mentoring.
- A participant mentioned that their university has included as new elements for the (O)ER quality: short, clear, multiplatform, use of simple formats (inclusion). Another mentioned the work towards (O)ER quality of the pedagogical and technological support unit; some others mentioned a collaborative work between faculty members with this respect.

Most of the faculty members stated that there were no new (O)ER policies. In the cases where new regulations (or modifications of these ones) existed were mostly connected to data protection and copyright issues.

The results of these second questionnaire revealed an intensive institutional work (meso level) in terms of pedagogical and technological support and professional development training for digital teaching and use/creation of (O)ER, but mostly not specific new (O)ER policies.

At the macro level, new national initiatives appeared in order to create a community of exchange of online teaching and learning experiences and (O)ER:

- La universidad en casa (The university at home): originated by CRUE with the close collaboration of open universities such as UNED and the UOC
- Facultad cero (Faculty Zero)
- Collection teach and learn from home (EDULLAB)

Literature review

To supplement the answers from the survey, desk research connected to literature review was conducted. The literature is described and divided according to the different aspects investigated (infrastructure, quality, change), including non-exhaustive examples. Some of them come from the open answers at the end of the questionnaire where it was asked if the participants knew some OER infrastructures to share.

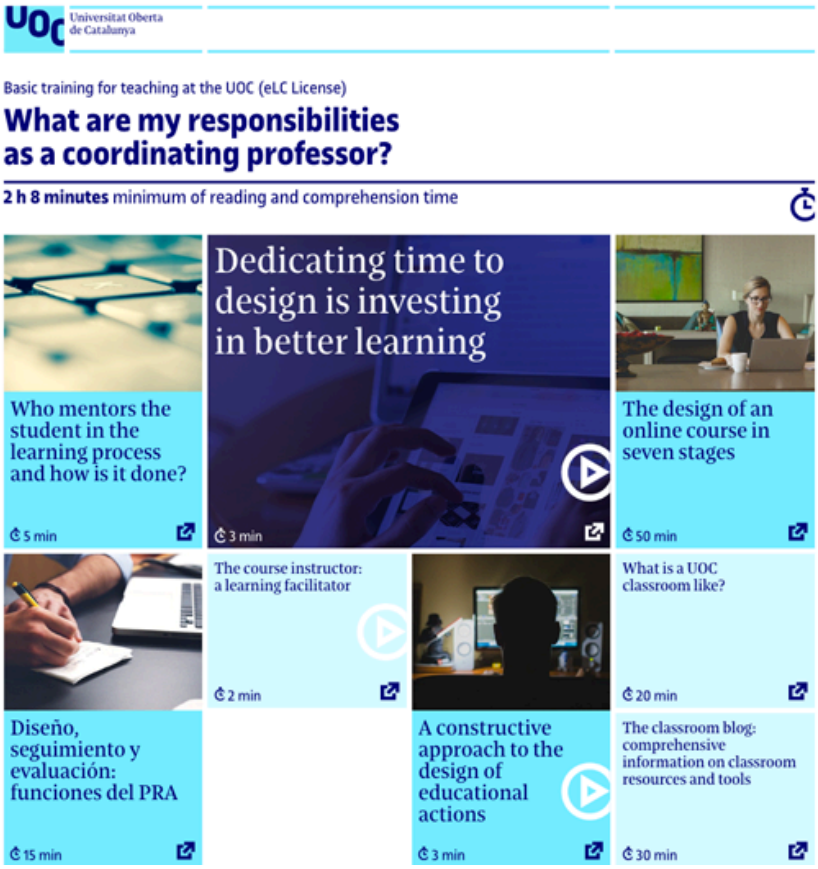
However, being policy rather an institutional aspect, no work was identified within that topic and, therefore, no section for policy is included. In the case of OER infrastructures, the connections with the institutional level are clear, and sometimes difficult to completely separate from the micro level.

4.2 OER Infrastructure

The UOC has developed an infrastructure related to teaching materials called NIU that consists of a curated content aggregator linked to the activities (Figure 1). In its mosaic-like structure, NIU lets students see what activity needs to be completed and the learning resources (UOC-created content, external resources and guidelines) provided to help them do so. No indications are provided about how these resources are shared in NIU.

Figure 1

Example of an NIU. Source.



Cacheiro-González and Rodrigo San Juan (2016) described an experience of creating audiovisual (O)ER by faculty staff and tutors at the UNED through an audiovisual platform that allows synchronous access to face-to-face video-classes with remote interaction with the participants. The instructors' recordings are classified according to different criteria (author, title, etc.) and are autonomously managed by the creators through a platform. Examples of videos created by instructors and tutors with this platform answer to different use scenarios according to the specific educational objectives: presentation of the general orientations of a course, orientation for the development of formative assessment activities, invitation to experts related to the topic of the training programmes.

Maina and Guàrdia (2013) described the process of developing an OER for a Master course in Education and ICT at the UOC by two faculty members within the role of experts in the discipline and responsible for teaching the course. The following tool functionalities for developing the OER were identified (an extended wiki):

- Content presentation (all the formats),
- Personalisation / accessibility (ensure universal access),
- Productivity (support individual and collaborative work),
- Social appreciation (allow students to express opinion),
- Exchange (offer possibilities to share),
- Monitoring (ease ways of getting information about content modifications),
- Portability (provide options for consultation and access), and
- Roles and privileges (allow giving permissions for reading and/or editing each segment of the OER).

Concerning the UOC's institutional repository, Santos-Hermosa (2019) noted that the repository recently includes four collections of continuous assessment activities, due to a pilot test run with the Faculty of Economics and Business with the support of the UOC Library. In this collaboration, the academic staff took the role of creators and pioneers in publishing this kind of resource, and librarians were responsible for assigning metadata and depositing them in the repository. These OER are available in open access and in two languages.

Martínez and Ramírez Sádaba (2013) stated that good results in terms of number of visits to the OCW of the University of Cantabria was due to the correct categorisation of contents through the metadata manager of the EduCommons platform. Each content that is uploaded to the platform is given metadata by the support unit of virtual teaching. Metadata included are name of the document, teacher, date, keywords, license and link to the used license. On the other hand, OER within the OCW are easy to find and use, since it is possible to search by discipline, study program, publication year, etc.

Different studies have addressed the MOOC infrastructures in different universities from the perspective of the designers and the administrators.

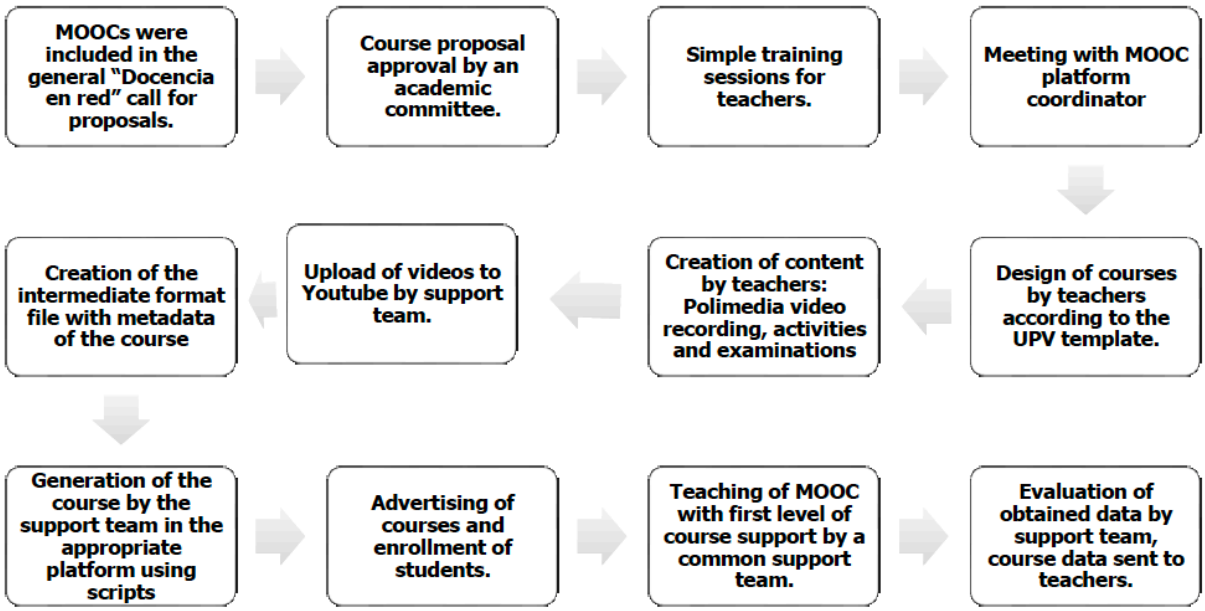
For example, Prendes Espinosa and Sánchez Vera (2014) presented their experience at the University of Murcia related to the design and production of four MOOCs taught through MíriadaX, funded by Universia in its first edition. The project was coordinated by the Unit of Innovation (Vice-rector of Studies) in collaboration with ATICA (Vice-rector of Economy and Infrastructures). The courses had more than 3000 registered students. The tools used in the MOOCs were: FAQ, forum, blog, wiki and Twitter (external tool). The evaluation of the MOOCs was done through an initial questionnaire, observation sheets and a final questionnaire. Students included as a way of improvement the promotion of interaction and community building, and not only individual work with the content. However, the use of the tools showed that students were more interested in the contents than in the interaction. Polemic was the certificate issuing, which was not possible at the end, due to the undefinition in the initiative MiriadaX. Over 10% of students finished the MOOCs, which made the MOOC experience a successful one.

Despujol et al. (2018) described the MOOC experience at the Polytechnic University of Valencia (UPV) from the technical and administrative points of view. This university was the European institution with more MOOC course runs done by December 2016. UPV currently has its own platform (upvx.es) based on openedX and is a member of edx.org, with 50 courses, 177 editions (by the date of the publication); before it was built on Google Course Builder and MiriadaX. The paper describes the institutional implementation during a period time of 5 complete academic periods (2012-2016). As a background it has to be considered that "UPV developed Polimedia, a system to record HD video learning objects using cheap audiovisual studios in a fast and straightforward way; as well as the program "Docencia en Red" that encourages and supports teachers that develop digital learning content and systematically assess its quality" (Despujol et al., 2018, p. 217). The general protocol of selection and implementation of MOOC at UPV in included in Figure 2.

The authors stated that the model is not self-sustainable for the University: the costs for verified certificates only cover the staff costs of the platform managers.

Figure 2

General Protocol of Selection & Implementation of MOOC at UPV (Despujol et al., 2018, p. 222).



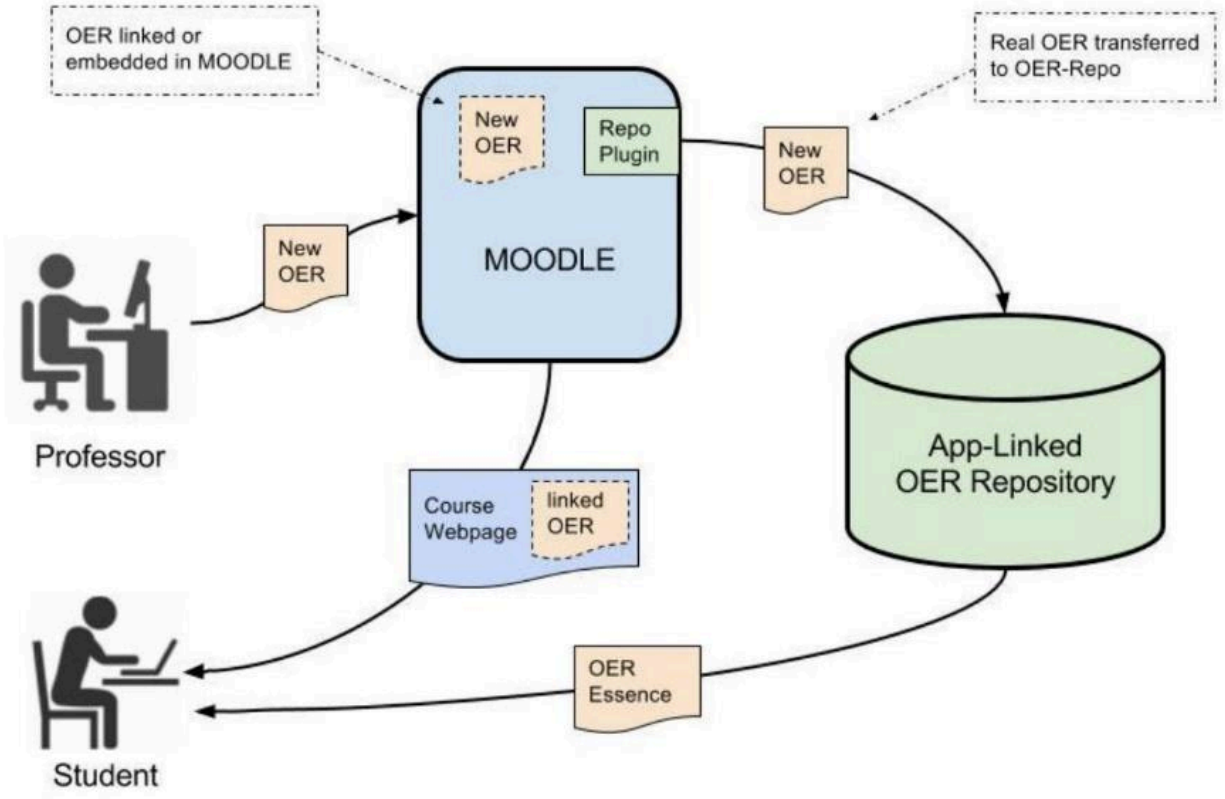
Fidalgo Blanco, Sein-Echaluce Lacleta, Borrás Gené and García Peñalvo (2014) presented the development and evaluation of the implementation of a MOOC with open software developed by the Polytechnic University of Madrid. The course was optional and part of a collaboration project between the Polytechnic University of Madrid and the Autonomous University of Barcelona. The OER of the course included instructor's videos, collaborator's videos, a wiki populated with OER by the participants, and a social network on Linkedin. The results from the student questionnaire showed that it is possible to integrate the academic training with a MOOC model, and a high positive perception of students about the MOOC and its resources was reached. Students participated in an active way in the learning community of the MOOC.

Morales et al. (2017, 2016) presented the design of a MOOC in the area of toxicology (pharmacy) at the University of Salamanca as part of a teaching development project, although with participation from European countries (implementation under the Erasmus+ program). The Spanish university was in charge of the development of two courses within that MOOC to be offered in MiriadaX. The materials included a presentation video, videos of specific topics, formative tests, a final test, supplementary texts and bibliography. The evaluation of the course by Salamanca university students was positive in terms of considering the use of a MOOC an innovative tool and in terms of usefulness for their own self-learning. Furthermore, and overall, the course promoted students' interest in the concrete aspects that were explained, and students appreciated the quality of the material and appealing and easy to use platform.

Despite being in the context of high school (students moving towards university), within the frame of the EU project Up2U [10], in which the University of Vigo was involved as the main actor in OER, an application-linked repository was designed to suggest a central repository playing the role of a central hub for curation (Otero et al., 2018) (Figure 3). This could be an interesting contribution within the frame of the EduArc project since the approach may be valid for any other OER initiative beyond the context in which Up2U takes place.

Figure 3

Application-Linked Repository workflow (project Up2U) (Otero et al., 2018).



4.3 Quality of OER

In the UNED experience described by Cacheiro-González and Rodrigo (2016), use indicators of the audiovisual repository (statistics) were, at least in part, the measure of quality for the infrastructure. These indicators include, e.g.:

- Number of users
- Number of visits to the video repository
- Number of different academic staff that record videos
- Evaluation of the audiovidual platform
- Number of videos in the audiovisual platform
- Number of open videos
- Number of staff trained in the audiovisual platform
- Evaluation of the online conference

According to the evaluations, the usability of the platform is very high and 92% of the tutors that repeat the use experience with the audiovisual platform manage to do a session without incidences. Most of the academic staff and tutors (aprox. 8,000 usual users) create and maintain the virtual sessions in an autonomous way.

Related to the OCW at the University of Cantabria, another reason for the positive results in terms of number of visits to their OCW was related to quality (Martínez & Ramírez Sádaba, 2013). Before uploading any OER, these resources must undergo a quality control. First, the support unit for virtual teaching talks with the academic staff to know their expectations about the course, while at the same time they receive an explanation about the characteristics of OCW and can pose any question they may have. After deciding the best way to publish the course (format), the support unit starts working with the OER, giving it homogeneity and improving all that can be improved. At the same time, the support unit deletes texts and pictures that could have problems of intellectual property and replaces them with alternative resources with copyleft. If the support unit does not find an alternative, it would be created in the

department. This is possible thanks to the existence of an OCW Department, formed by an OCW coordinator, a graphic designer, a multimedia programmer and a technical manager of platforms.

4.4 OER Change

Examples of change at this level are the initiatives of academic staff when designing, developing, implementing and evaluating teaching development projects in specific disciplines.

For example, the teaching development project based on a video series called Arqueoudima at the Distance University of Madrid (UDIMA, private open university) developed since 2014 (Casado Rigalt, 2018). It is an OER open to university students and professionals in the field (Archaeology) and includes two different video formats: video-lesson and video-interview. The project was born from the enthusiasm and confidence of a faculty member that knowledge should be shared and disseminated. In this line, the author conducted a questionnaire with HE instructors of Spain and from abroad (104 answers were from Spanish instructors) and showed that the acceptation of the audiovisual format by HE instructors is a slow and discontinuous process that is different in each discipline, despite general acceptance by university students. Many of the faculty members showed still scepticism towards the video as teaching resource, seeing it as a technological threat. The author remarked that fortunately the reception by academics of the use of audiovisual formats was increasingly improving.

A second example is the teaching development project based on the development and student use of multimedia resources (videos, tests, practical exercises, case studies, blogs, further readings…) at the Accounting Department from the School of Economics and Business Administration of the Complutense University of Madrid (Miñano et al., 2016). These (O)ER were included in the institutional virtual platform based on Moodle. Similar to the previous case, university students appreciated the multimedia materials as being very useful and motivating albeit complex.

In some cases, support units are key for change at universities. This is the case of the support unit of virtual teaching of the University of Cantabria (Martínez & Ramírez Sádaba, 2013), where the presence of this unit for teaching support in developing and sharing OCW is high. Each year the unit sends to each faculty member the results of the number of visits to their courses and delivers them a certificate of educational innovation, in which it is specified the origin and number of received visits. The instructor questionnaire about the satisfaction with their participation in OCW experiences showed a positive appreciation. 81% of the instructors received help and advice from the department, which was positively considered, and more than 60% stated that their OER improved after going through the department. 70% considered positive the remuneration associated to the publication in OCW. More than 70% said that they used OCW at class and online teaching at least occasionally, 12% always. Furthermore, 90% considered positively that universities publish OER.

5. Conclusion

While digitalisation at Spanish universities was advanced and the Covid-19 situation accelerated even more the digitalisation processes, it is still to be seen if those changes involve a real digital transformation in the future beyond individual practices and open access research, especially in the context of (O)ER infrastructures. Micro, meso and macro levels are clearly connected to each other's and need to be taken in consideration as a whole. A brief summary of these connections is described as follows.

Macro level data on the use and creation of (O)ER and repositories showed that libraries are the most relevant agents in terms of (O)ER infrastructures at the Spanish universities, and the duplicity of (O)ER in different repositories is a common factor. Although infrastructure is much more developed at the macro and meso level for research purposes, (O)ER have also its place – in some universities, even exclusive institutional repositories. Nevertheless, at the micro level, academic staff uses most often the institutional virtual learning platform to provide students with (O)ER – and these are usually not integrated with other systems in a way that share information -; fewer other systems that could involve sharing in the open.

In terms of (O)ER labelling, Spanish universities adhere to international standards and use standardised metadata for educational resources. However, academic staff (micro level) considers this important to a lesser extent, compared to the availability (and findability) of resources with content quality and suitable to their needs concerning discipline/field of knowledge.

Change is happening at the micro level mostly bottom-up, starting from enthusiastic and devoted academic staff, sometimes with economic and/or technical support from different institutional units (virtual campus, educational innovation, IT…), often linked to institutional calls for the creation of (O)ER. There are almost no measures in place beyond technical support and professional development training (meso level). On the other hand, when existing, policies are mostly top-down, largely with academic staff not being involved in the processes or even not being aware of them. This was reflected partially by the meso level results, where some of the highlighted policies included the co-participation of the educational community. Furthermore, an institutional situation in the Spanish university context that should be considered (meso level) is the high presence of adjunct professors, who are non-permanent, non-tenured instructors with a considerable workload and precarious work conditions. This issue seems important to highlight since it negatively affects the development and use of (O)ER at the micro level, in terms of limited time to devote to it (high teaching workload) and of lack of incentives to do it (no access to possible economic compensations in case they exist) – issue that was reflected in some of the questionnaire's answers.

As a concluding remark, the most prominent or unique aspects of the infrastructure for the dissemination of (O)ER in HE in Spain should be highlighted. These are the common use of institutional virtual learning platforms by academic staff (although usually not for sharing openly), the existence of institutional (O)ER repositories in some universities (in few more than one, with different type of (O)ER) and the management led by the university libraries concerning metadata and infrastructure for (O)ER. The landscape described in this book chapter shows potential for the development, improvement and promotion of (O)ER infrastructures in the Spanish HE, but there is a strong need for further macro and meso level measures (e.g., institutional strategies and policies, rewarding measures, support and training) to make this potential effective.

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[5] Link to the call is not accessible anymore.

[6] It should be acknowledged that changes in institutional infrastructures are likely to have happened, specially considering the Covid-19 situation.

[7] By the time of writing this report.

[8] Considering the high interest in the study results, selected results of this survey study were disseminated among the Spanish university community. If interested, please check (in Spanish):

- Marín, V. I. (2020). Uso de recursos educativos digitales y repositorios para la docencia universitaria española. En Colomo-Magaña, E., Sánchez-Rivas, E., Ruiz-Palmero, J. y Sánchez-Rodríguez, J., (Coords.), La tecnología como eje del cambio metodológico (pp. 975-978). Universidad de Málaga. (Libro de actas de Congreso EDUTEC 2020)

- Marín, V. I. (2021). Perspectivas del profesorado universitario español sobre el uso de recursos educativos digitales y repositorios de docencia. En J. Ruiz-Palmero, E. Sánchez-Rivas, E. Colomo-Magaña y J. Sánchez-Rodríguez (coords.), Innovación e investigación con tecnología educativa (pp. 175-187). Octaedro. (Versión extendida de la contribución al Congreso EDUTEC 2020)

[9] Acknowledgement: I want to specially thank all the faculty members that participated in the questionnaire and also to the study deans of the different faculties and universities that made this possible.

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8

Digital Transformation and Openness in the Turkish Higher Education System

Aras Bozkurt, Yasar Kondakci, & Cengiz Hakan Aydin

1. Introduction

This chapter introduces openness in education and open educational resources (OER) in Turkey. To better understand and conceptualize the Turkish case, there is a need to briefly introduce Turkish HE and how openness is perceived by Turkish Society. By 2021, the total population of Turkey is around 85 million and approximately 10% of its population (around 8 million) attends higher education (HE). HE in Turkey is delivered through face-to-face, distance, and open education modalities. In this context, it should be noted that due to Turkish regulations, there are distinct differences in the definition of distance education and open education. Accordingly, open education offers open admissions with minimal entry requirements and flexible learning opportunities (e.g., self-paced, attendance is not required), on the other hand, distance education offers partly flexible admissions (e.g., predefined entry requirements, attendance is required, students should pay for the courses). The demand for HE is high, but the number of accepted students is relatively low compared to the total demand. As such, open education is a viable solution for the Turkish HE system.

The idea of open education aims to mitigate inequity and social injustice, remove the barriers and democratize the education system (Tait, 2008, 2013; Taylor, 1990; Rumble, 2007). Inspired by the same notions and with a purpose to respond to social demand (Yildirim & Adnan, 2019), the first open education faculty was founded in 1981 (Kondakci et al., 2019). Currently, four state universities are delivering open education as dual-mode universities. That is to say, open education in HE has 40 years of experience and considering primary education, dating back to the early 1950s, open education has a 65-year history in Turkey (Bozkurt, 2017a, 2019).

Macro (National) level: Turkish HE strives for realizing digital transformation and most of the investments targets digital infrastructures. Higher Education Council (HEC) further supports openness related initiatives and targets to improve the digital literacy of HE students and academics. While the terms open access and OER are articulated in strategic planning documents, these efforts didn't echo much in practice due to low interest and awareness in the general public and scholarly circles.

Meso: The interest to open education and OER and OEP at the institutional level demonstrates an imbalanced distribution. At the HE level, while some universities show great efforts, the vast majority remain unconcerned with the openness movement in education. MOOCs, among open education initiatives, have drawn much attention (Aydin, 2017; Aydin & Kayabaş, 2018), but not many universities are motivated to open up their content through MOOCs. According to the Pelletier et al. (2021), “although cultural motives highlight the value of openness and sharing in social life, the requisite awareness in practices is absent in the Turkish HE landscape, which further hinders the adaptation of open educational practices (OEP) and open educational resources (OER). One of Turkish HE’s main challenges is to overcome the perception that “openly available” means poor quality” (p. 42). In addition to the negative perception of

open and free learning content, another reason might be the national free education policy. From primary to HE, education is free and funded publicly. As such, the need for OER and motivation for OEP is lower when compared to countries where education is difficult to afford.

Micro level: Regardless of top-down pressure to disseminate the OER and OEP, there is resistance from the shareholders in the micro level. Another bottleneck is openness related projects were not sustainable thus far. Besides, national policies aim to start the change from top to down, which can be an adverse strategy as openness is mostly related to the awareness and perceptions of individuals. Additionally, it can be argued that most of the HE institutions concentrated on the digital transformation process with a belief that ensuring access can promote openness.

2. Macro Level Digital Transformation

As explained in the above section, digital transformation is one of the ultimate goals of the Republic of Turkey. The project gained momentum by 2002 and many other developments such as eGovernment services, Vision 2023 Project, and the foundation of the Presidential Digital Transformation Office. As a response to these developments, HEC, the national level regulatory institution and individual HE institutions defined digital transformation as a strategic orientation in planning. The next sections cover the actions and processes regarding digital transformation at the national level.

THE VISION 2023: The Republic of Turkey identified the year 2023 as a symbolic turning point when the republic will celebrate its 100th anniversary. In this regard, "Turkey's Strategic Vision 2023" is defined as the roadmap to follow. A total of six macro themes are determined: International Relations, International Security, Internal Politics, Economy, Culture, and Education Science and Technology. Education, Science and Technology theme has the ability to affect educational policies. As a response to this national strategic project, important developments were witnessed. These developments and how they shaped eGovernment, eSociety and digital transformation efforts are briefly explained in the following sections.

2.1 eGovernment, eCitizenship and eSociety

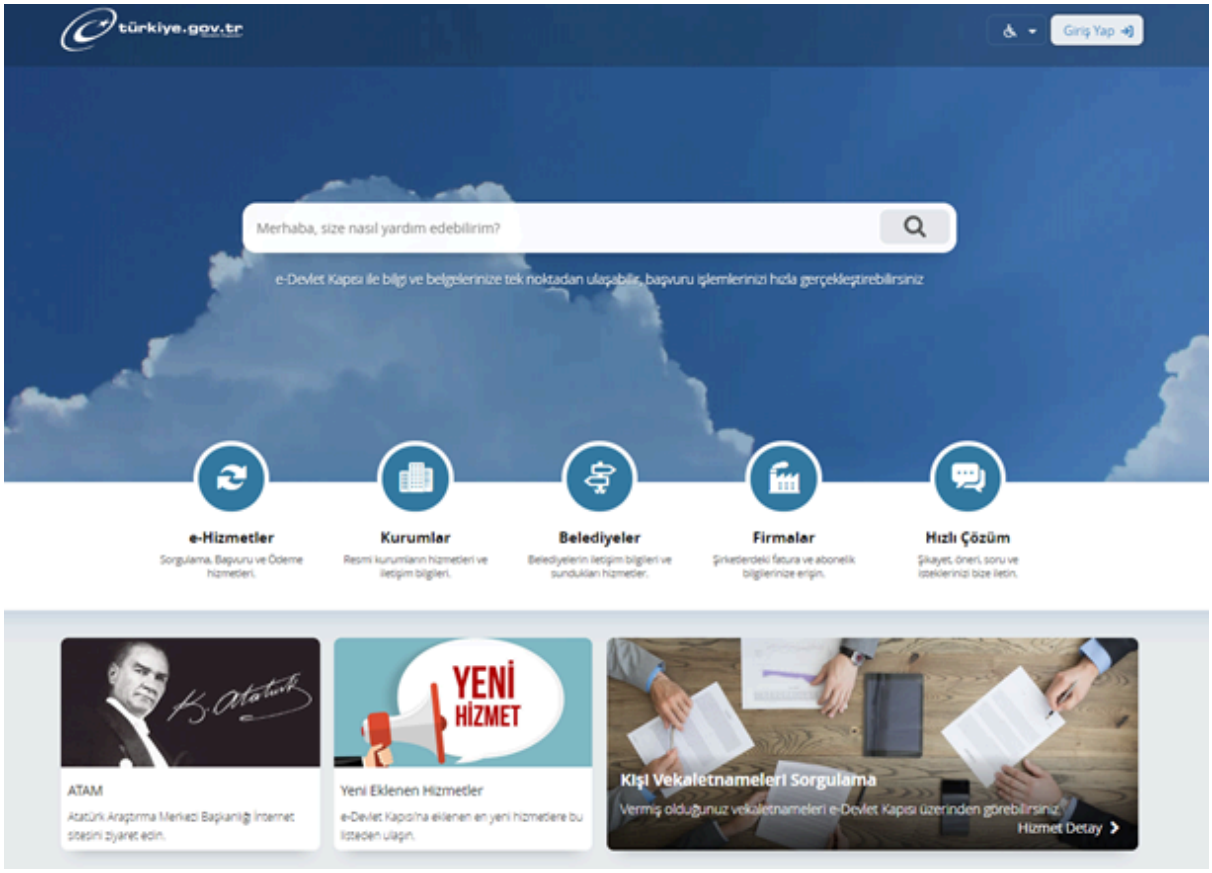
Though the idea of eCitizinship and eSociety dates back to 1972, the project was implemented by 2002 with MERNIS Project (Bozkurt, 2017). In this regard, the purpose of the project was to establish digital infrastructure to prepare the Republic of Turkey for eGovernment, eCitizenship and eSociety. The project enabled readiness for digital transformation and can be considered as a milestone in this perspective (Nüfus ve Vatandaşlık İşleri Genel Müdürlüğü, 2017a). One of the many aims of the project was to use information and communication technologies strategically to provide eGovernment services in almost all fields including education (Aktan, 2003; Kuran, 2001). Starting from 2002, each citizen was given a unique ID number and many eGovernment services provided through https://www.turkiye.gov.tr/ (Figure 1) including a wide range of HE Services.

2.2. Services provided by the HEC

HEC is the national level regulatory organization in Turkey. Having a centralized HE system, most of the critical functions related to financial and academic affairs are collected under the authority of HEC. As stated above, Turkey has one of the most populated HE systems in Europe. As a result, providing information about the HE system, ensuring that all stakeholders have equal access to information and services related to HE. Therefore, HEC puts the priority on digitalization of the functions of the Council.

Figure 1

eGovernment landing page



When examined, it can be seen that many universities have already integrated their student support services to eGovernment platform (e.g., enrolling, requesting documents etc.) and HEC also provided a number of services most of which are related to student affairs. One of the important services provided through eGovernment service is accessing the national thesis and dissertations database which will be explained in detail in the Macro Level, Infrastructure section.

HEC declared that 2019 will be a thematic year for digital transformation in Turkish HE. The purpose of the Digital Transformation is reported as to increase digital capacity to globally compete in HE ecology (YÖK, 2019a). In this context, the pilot project has been initiated in 8 state universities. The purpose of the project, on the first hand, is to increase the digital literacy of HE students and academics. Accordingly, a digital literacy online course designed and offered to all the students of those universities, and a MOOC on digital competencies, entitled Teaching and Learning at Higher Education in Digital Age for academics has been provided. It was further stated that the project will move forward with initiatives targeting “open access” and “open science” in Turkish HE. For this purpose, an open-access repository will be developed. To reach this purpose, the use of ORCID, to fully integrate the Turkish academics into the infrastructure, is required (YÖK, 2019b).

Figure 2

The list of digitalized functions of the HEC in Turkey

Higher Education Quality Council: In addition to the classic presentation of resources related to accreditation and quality assurance, the council provides a platform to manage quality assurance. The evaluation system is accessible to the authorized members. Besides, HEQC provides an e-learning platform for evaluator training. Finally, the publications (e.g., HEQC e-bulletin) of the council are accessible on the website of HEQC. The digital platform of HEQC is available here.

Higher Education Atlas: This digital platform is one of the most comprehensive platforms among all other platforms offered by the HEC. The Atlas aims at providing a comprehensive guide for students about studying undergraduate and associate degree programs in Turkey. This service is critical for students as they get a nationwide and comprehensive exam to access higher education. The students compete for a limited number of seats for highly demanded undergraduate programs. As a result, making the correct program in the correct university is highly critical to getting settled in an undergraduate or associate degree program. The Higher Education Atlas is available here.

Degree Recognition Digital Platform: Another digitized service is the degree recognition service for the degrees earned abroad. Turkish and foreign citizens may process their applications for recognition of their degrees under this digital platform. Besides, the platform provides a special space for forced immigrants whose countries are under political tension, conflict or occupation.

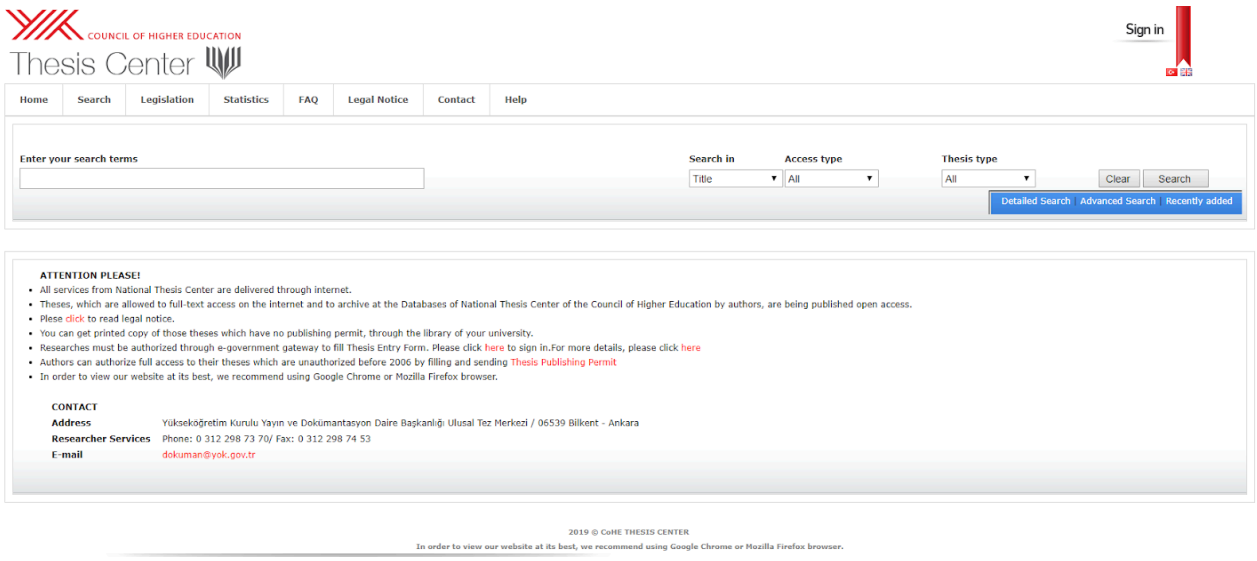
Higher Education Information Management System: In this platform, key data related to the number of students, key students characteristics (e.g., grade level of the students, international students, students with disability), distribution of the students across different universities), statistics of academic (e.g., distribution by title, distribution by field). Since the database is provided by the top authority on HE in Turkey, it provides the most accurate and up-to-date data on HE statistics in Turkey. The database for statistics on HE in Turkey can be accessed from here. However, a more comprehensive part of information system management is related to a platform that manages the performance data of academics in Turkey. The system is a complete performance assessment of academics in Turkey. Regardless of their individual institution, each academic staff member may enter performance data (e.g., publication data, project work, citation etc.) and get a performance score, which is remunerated or rewarded. The data from this platform can be transferred into each university's performance assessment system. The transferability of data between the national-level system and institutional systems enable the universities to apply their own performance measurement criteria and score the performance according to their own criteria. In that sense, the HE information system is a good example of the connection between national (macro-level) and mezzo level digital platforms.

Associate Professorship Application Management System: In Turkey earning the title of associate professorship requires an examination of a candidates file by a jury. The process is managed by the Interuniversity of Council, an autonomous body that manages key policies related to academic practices in Turkey. As part of the process, the candidates upload the file, which includes all performance items (e.g., publications, teaching, basic information) of the candidate and the jury members receive the file electronically. Once the jury members finish the assessment process, they submit their scores through the system.

National Thesis center: It is a database that can be accessed over the internet and provides access to all master's and doctoral theses prepared at the universities in Turkey (Figure 3). By 2018, it has become a mandatory act to publish thesis open access through the platform.

Figure 3

The landing page of thesis center.

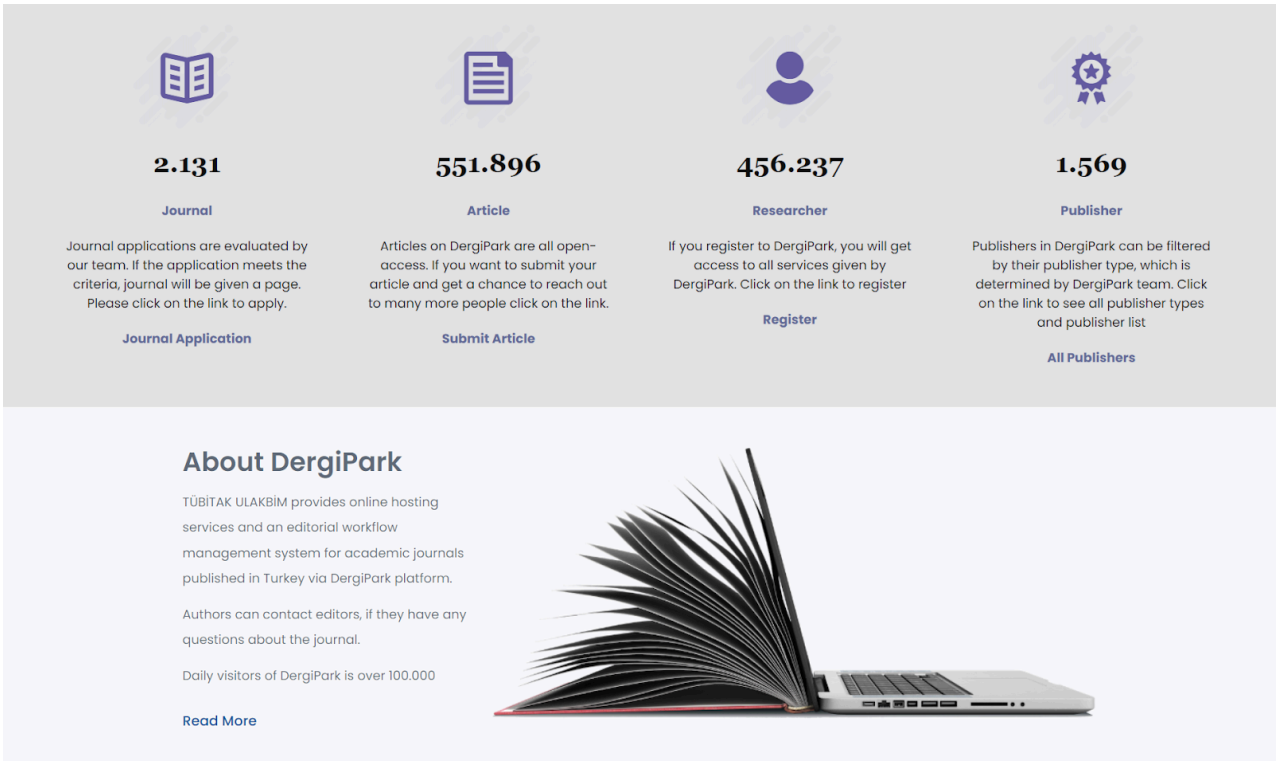


DergiPark Project: Started in September 2013, TÜBİTAK ULAKBİM provides online hosting services and an editorial workflow management system for academic journals published in Turkey via DergiPark platform (Figure 4). The aim of the project is to improve the quality and aid the development of academic publishing in Turkey in accordance with international standards, to enhance the visibility and usage of national academic journals worldwide, and to ensure the implementation of the ULAKBİM Journal Management System efficiently.

DergiPark has started offering services using Open Journal Systems (OJS) infrastructure initially. However, as the number of journals and users has increased in time, OJS has become inefficient. A new system compatible with new technologies has been developed, also taking user demands into consideration. This new system, ULAKBİM Journal Systems (UJS), enabling easier handling and faster workflow, has been put into service as of 2017 (DergiPark, 2019).

Figure 4

DergiPark landing page.



2.3. Services provided by the Ministry of Education

FATIH Project: This project is known as the action for “Enhancing Opportunities and Improving Technology” and FATIH refers to the Turkish acronym of the word. The project aims at widening access to quality education by improving the content and ensuring the access of every student to this content. Based on this aim project is built on six guiding principles: accessibility (providing services in different time and context), productivity (target-oriented tools, productive environment, and subjects for development), equality (granting access to all users), measurability (accurate measurement of process and outcomes), and quality (enhancing the quality of education). FATIH project has set ambitious goals toward improving hardware and software infrastructure. The project aims at providing VPN-broadband and high-speed access to every school; installing an interactive board and wired/wireless access into every classroom; providing EBA (Education Informatics Network) applications, cloud account, and sharing course notes to every teacher; EBA applications, cloud account, digital identity, sharing homework, and individual learning materials to every student. Despite these ambitious goals, the project falls short of its original targets. However, the project has evolved to modify its goals and add different dimensions into its scope.

Education Informatics Network: Another widely used digital platform in Turkey is known as EBA (Education Informatics Network). The Ministry of Education describes EBA as “Turkey’s digital education platform.” EBA provides digital courses, a digital material sharing platform, web-based applications, and foreign language content for students and teachers. EBA enables the users to share content (including texts and audio-visual materials). In that sense, EBA has certain social media functions. The applications are related to a wide variety of tools including games, experiments, puzzles, language learning, experiments, and information about projects.

2.4 Recap

Considering the economic, political, and demographic characteristics of the country, it can be argued that digitalization in Turkey reflects three main concerns. First of all, the political system and consequently the public administration structure clearly indicate that Turkey is a unitary republic, and every public service is developed and delivered at the top of the bureaucratic hierarchy. In other words, the administration (typically the ministries or presidential offices) is responsible for developing and delivering these services. As a result, the “macro-level” has a critical role in digitalization of services in Turkey. The mezo and micro levels will be as successful as the macro-level respond to the digitalization trends and develop digitalization services in their service functions. Both the Ministry of Education and HEC have proven that they are progressing towards fully digitalizing their functions. However, digitalization of the core practice, that is teaching, is not progressing as fast as digitalization of administrative functions. The second concern of digitalization in public services including education is related to serving the disadvantaged groups in the society. Low socio-economic status, women, rural areas, individuals with a disability are some of the key groups who are disadvantaged in their reach to and soliciting the public functions. Digitalization has the potential to mitigate the impact of their disadvantaged status by, first, levelling the knowledge needed to fully benefit from these services and providing access to the services. Both the Ministry of Education and HEC have demonstrated significant steps toward digitalization of their functions. However, there is still a way to go for fully digitalize education services. Third, the current economic decline can be seen both as a threat and an opportunity towards the aim of digitalization in education and the economy. The economic crisis may lead to postponing the investments for further digitalization. Besides, digitalization can be interpreted as a reason for downsizing in the economy and decreasing the labor force (e.g., teachers) in different sectors. However, digitalization should not mean downsizing the skills. The most critical point in relation to the job market is to carefully assess the impact of digitalization on critical skills and identify how digitalization is likely to impact employment patterns. In essence, digitalization should not be considered as another trend causing further social problems.

3. Digital Transformation Within Higher Education at Meso Level in Turkey

3.1. OER Policy

There have been, directly and indirectly,many attempts to shape policy and affect decision-makers in Turkish HE (Erginer & Dursun, 2005; Kalkınma Bakanlığı, 2013, 2014; MEB, 1982;) which were later mainly centered around the Turkish Presidency “Strategic Vision 2023” (Bozkurt, 2019a). The project mainly had 9 subcategories, one of which was “education, science, and technology”. While these attempts sounded perfect in theory, there were many fails in practice. One of the reasons for these failures, in the Turkish context, is decisions taken were not implemented by the authorities (Akıncı & Seferoğlu, 2010), and sustainable policies were not developed (Akıncı, Kurtoğlu & Seferoğlu, 2012). Though the HE institutions were the significant actors of the digital transformation (Yıldız Aybek, 2017), in ability to cooperate and collaborate with other shareholders (Balyer & Öz, 2018; Özmusul, 2012) and inefficiency to produce adaptive mechanisms to adopt the change can be considered as major reasons (Koral Gümüşoğlu, 2017; Taşkıran, 2017). Tough the awareness (Glahn, 2019; Rogers, 1962) and technology is significant in such processes (Akgün-Özbek, & Özkul, 2019; Fırat, 2016; Sözler, 2017; Telli, 2018); the ignorance of curricula (Coskun, 2015), future planning (Balyer, & Öz, 2018), transformation in mind settings and society lead such attempts to fail (Öztemel, 2018). The current state of the art is identified in many important institutional declarations (MEB, 2018; TÜBİTAK, 2014), however, apart from developing infrastructure (e.g., integration to e-Government Infrastructure) (Okur, 2019), they were unable to go beyond being written statements (Bozkurt, 2019a).

In Turkey, it is very difficult to talk about an overarching policy encompassing all digitalization activities in every institution. Part of the issue is related to the decentralized nature of the HE system and individual institutions’ autonomy. However, the Higher Education Law (code: 2547), draws a general framework for the policy of digitalization. Chapter 4, Article 12 states that HE institutions should produce, develop, use and extend educational technologies. As implied in the article, individual HE institutions (universities) are autonomous in developing their own strategies in different domains, including digitalization practice. For example, establishing the OpenMETU platform is based on this law. Besides, HEC Open Access and Institutional Archive Policy, METU’s Open Access, and Institutional Archive Policy, and the Directive on Receiving, Storing, and Accessing Electronic Copies of the Theses are the other legal basis for it. In addition to these initiatives, it has SHERPA/RoMEO database for publishing policies, SHERPA/JULIET for funders’ open access policies, and Creative Commons for copyrights. On the other hand, the university was specified OpenMETU’s policy, and it is;

> *It is of the strategic importance for our university to adopt the basic purposes of conducting high-level education and research in the fields of science and technology, and to present the scientific knowledge produced to the service of science. The scientific knowledge produced by our university must be freely accessible within the framework of ethics and laws because freedom of access to knowledge is a crucial support factor for all researchers to ensure that qualified knowledge and its products and services. In this context, OpenMETU aims to make the scientific knowledge that is produced in METU accessible.*

Also, under one of the decisions (2012/103) that was taken by The Scientific and Technological Research Council of Turkey facilitated the development of open digital course content at the undergraduate level.

One of the broadest digital transformation policy initiatives in HE was laid down in February 2019 by the HEC(HEC, 2019). As part of the digitalization policy initiated by HEC, a project will be implemented at eight Turkish public universities (Figure 6).

Figure 6

HEC Digital Transformation Project.

The project is planned to be broadened to cover other universities later on. As part of the project, HEC develops tools to increase the digital literacy of the academics and students. The policy envisages accomplishing “open access” and “open-science.” Establishing an infrastructure at universal standards which covers an open access archive is one of the targets of the policy. These infrastructures are aimed to be connected to the European Open Access infrastructure by widening the use of ORCID number, cooperating with the Turkish Scientific and Technological Research Council of Turkey (Bozkurt, 2019b).

For this purpose, the Turkish Scientific and Technological Research Council took the following steps about open access and open science in 2019,

- Adoption of TUBITAK Open Science policy,
- In open access activities, adoption of 2019 as a pilot year and 2020 as a transition year for compulsory policy implementation,
- Introducing open access /open data requirements in the second half of 2019 in the scope of the pilot program in Head of Research Support Program (ARDEB) in TUBITAK,
- Transition of aperta.ulakbilim.gov.tr (Institutional Archive and Research Data Management) system to live system where archives of articles and research data as a result of necessity
- Starting of the open data portal, acikveri.ulakbilim.gov.tr in 2019. The portal includes educational information on research data and management, and sample plans of research data management,
- Dissemination of TUBITAK Academic Archive.

Widening the use of LMS at universities is another major objective of the policy. Finally, enriching the course materials, digitalizing the materials, and granting open access to these materials is expressed as the major aim of the project (HEC, 2019).It is important to note that all eight public universities covered in the project are located in the eastern part of the country. These universities are Ağrı İbrahim Çeçen University, Bayburt University, Bingöl University, Iğdır University, Munzur University, Muş Alparslan University, Siirt University and Şırnak University (Figure 7). Some concrete steps to be taken by HEC on this project are as follows:

- Reporting of the studies conducted by universities and the number of publications in open academic archives based on the format that is determined by HEC on a semi-annual basis,
- Establishing a commission under the chairmanship of the rector/vice-rector responsible for open access and open science, and organizing awareness meetings for academics in order to establish an open ecosystem within the universities,
- Arrangement of Academic Incentive Regulation in order to encourage the publication in the open access journals and the production of open course materials
- Ensuring the participation of the relevant staff of the universities in the training meetings to be organized by HEC.

Figure 7

Institutional Participation to HEC Digital Transformation Project (Anadolu University eGazete, 2019).

Another noteworthy development that has been affected the digitalization of HE, especially at the management level is about the strategic planning movement. Its origin was based on an agreement between the Turkish Government and the World Bank, entitled Programmatic Financial and Public Sector Adjustment Loan Project in 2001 (World Bank, 2002). As a result of this project, a guidebook was prepared in 2003 for helping the administrators of the public institutions (including HE) understand and govern their institutions according to strategic plans as well as guiding them about how to prepare their plans (Presidential Department of Business and Strategic Management, 2019). The Public Financial Management and Control Law, another artifact of the project and issued at10 December 2003, required the strategic planning and management in every public (or state) institution, including universities and other HE institutions. After this legislation, several significant changes in organizational structure and the guidebook have been placed. For instance, in each HE institution, an independent department was established to coordinate and support the institutions' strategic management efforts and their financial resources as well as expenditures in 2006. Similarly, after several changes, separate guidebooks for various sectors were developed including one for the HE institutions in 2018, entitled the Strategic Planning Guide for Universities.

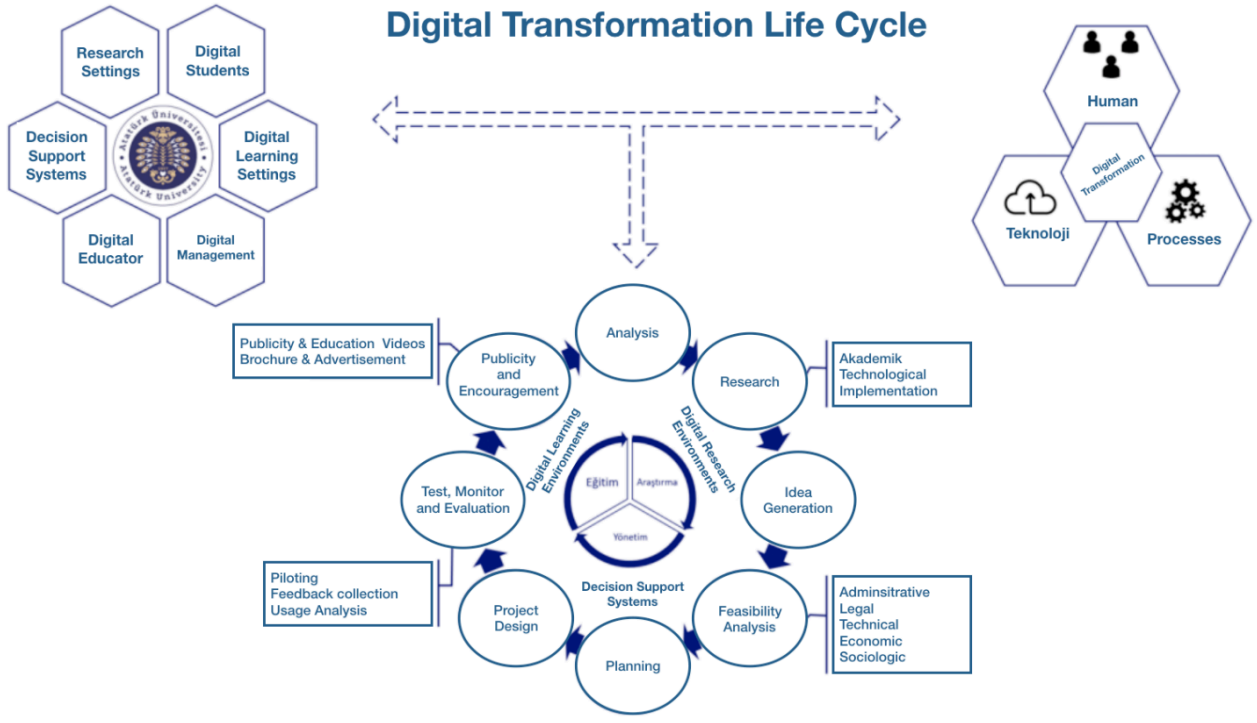
The importance of this movement regarding our report is about its nurturing effect on digitization of the management processes. In other words, the Strategic Management of Universities Movement acted as a catalyst to increase the use of digital technologies and resources to plan, manage, monitor, and evaluate the management processes in HE institutions. The Sakarya University Information System (SABIS) can be given as one of the exemplary implementations.

Another exemplary implementation can be found in the Erzurum Ataturk University. The university has launched an initiative, called e-Service Gate (e-Hizmet Kapısı) which shares almost the same goal of the SABIS. Both SABIS and e-Service Gate were elaborated in the following sections of this report, but we would like to express again that developments in the management of HE institutions have been creating a need for digitization.

In addition to the aforementioned developments, Erzurum Atatürk University has also initiated another project to address the digital transformation of the University and as an attempt to support the HEC Digital Transformation Project. The university established an office that intended to facilitate, manage, and monitor every digitization process in the University. The scope of the Digital Transformation and Software Office was identified as conducting research, development, and dissemination activities on effective integration of digital technologies into education, research and development, social contribution, and governance processes. The office also wants to be the reference point of digital transformation in HE institutions. As can be seen in Figure 8, the Office developed a Digital Transformation Life Cycle. The Office has been implementing several projects in the line of the Life Cycle. Digital Literacy Core Course, Digital Exhibition, Course Information System, Collaborative Research Platform, e-Books, Student Clubs Portal, Artificial Intelligence, and Robotic Coding Studio are among these projects. The Digital Literacy Core Course project intends to help students improve their digital literacy skills. The course proposes to give students the ability to produce digital content, to provide information about digital education and research opportunities, and to enable the use of these digital opportunities to develop lifelong learning skills. E-Books project, on the other hand, can be considered as an OER project that focuses on transferring the academic works of the faculty members into digital resources (Atatürk University, 2019).

Figure 8

Atatürk University Digital Transformation Life Cycle



In short, it can be stated that while there were strategies for digital transformation and, partly for open up education movement, these efforts did not reach expected outcomes because decisions were taken from central organizations, such as HEC, and HE institutions have adopted these strategies not because they were needed because they were required by a higher organization. Besides, most of the efforts were technology-centric practices, and unfortunately, critical issues such as the transformation of society, learners, faculty members, and most importantly mind settings

were a secondary concern (Bozkurt et al., 2021). Another problem with these ideal, but unsuccessful attempts is the way that decisions were taken. Accordingly, it can be claimed that these decisions were taken by a small, privileged group (e.g., HEC members) and therefore decisions taken were not echoed in many layers of HE.

3.2. OER Change

In Turkish HE institutions and many of the state institutions, strategic planning is a regular practice, however, their efficiency is questionable. It is for sure that academic strategies are essential for future projections in the Turkish HE System (Erdem, 2015) and when examined, it can be seen that Turkish HE institutions mostly focused on training human resources and their institutional mission statements are based on generic universal values (Özdemir, 2011) and lack in bringing tangible missions, especially in terms of triggering change supporting opening up education movement. When their visions were examined, it is found that most of the Turkish HE institutions prefer focusing on research rather than presenting diverse visions with diverse roles (Özdem, 2011). It is for sure that variables such as the young Turkish population and expectancy in increasing student numbers in HE shape HE institutions' missions and visions (Kavak, 2011a). However, it should be further noted that the state of the art in missions and visions is positive for private universities while it is a bit problematic for state universities (Eren, Orhan, & Dönmez). There is competition between state and private universities with expected positive outcomes (Kavak, 2011b), however, there is still a lot to do for sustainable success (Ayten, 2016) and it is still vague how the competition would affect the digital transformation.

When three state universities examined that deliver education through open education faculties (Anadolu, Atatürk, and İstanbul Universities),it is seen that out of around 7 million students by 2018, "the 3.5million ODL students constitute around 50% of the overall HE population, or 4% of the overall country population" (Table 1) (Bozkurt, 2019c, p. 41). Interestingly, when the mission and vision statements of these universities were examined, it is seen that these three universities, similar to Özdem's (2011) findings, fail to provide tangible statements, except Anadolu University, which indicates the importance of lifelong learning.

Table 1

Open Universities in Turkey and Their Student Numbers by 2018.

	Associate's			Bachelor's			Overall			
	Male	Female	Total	Male	Female	Total	Male	Female	Total	
University									*f*	%
Anadolu	630046	745791	1375837	1059454	735331	1794785	1689500	1481122	3170622	88.4
Atatürk	88653	121329	209982	23447	31512	54959	112100	152841	264941	7.4
Istanbul	18988	31817	50805	44751	55097	99848	63739	86914	150653	4.2
Total	737687	898937	1636624	1127652	821940	1949592	1865339	1720877	3586216	100.0

Although the digital infrastructures in Turkey are at their infancy, the infrastructures presented in detail in the following sections, and the quality assurance system have impacted the behaviors at the institutional level. The universities invested in their LMSs, digitalized their electronic documentation systems, digitalized the data processing on academic performance. Although standardization and assessment of the standards are not at the desired levels, various (internal and external) mechanisms are applied to assess the standards of the practices. As a result, Turkish universities progress towards ensuring access of their students to digital resources (e.g., e-books, e-resources), improve the quality of their teaching and learning processes through LMS applications, save time and financial resources in digital documentation.

These platforms aim to be beneficial for the community and worldwide. All of them are free of charge. Such a portrait highlights the opportunity for more accessible educational resources which give students more active roles for their own learning process. Within some policies which are in the Law of Higher Education, Higher Education Quality Assurance System, and the Higher Education Quality Council of Turkey Law No. 2547 on HE, these platforms launched

and serve sustainable qualified content. Besides, HEC, Scientific and Technological Research Council of Turkey, the Ministry of Industry and Technology can be actors that determine policies. Bilgeİş, for instance, was specified a goal that will be reached as a strategy. On the other hand, Anadolu University, which launched Akadema, put some strategies about Akadema, but not any strategies found for AtademiX. However, Digital Transformation and Software Office, ensuring that AtademiX continues its activities again is aimed. After these MOOC platforms, open courseware was subject to review. As an example, METU's open course platform can be given. METU example represents other universities' platforms, but it is more compatible with leading ones. For example, it has a membership with OEC, the award from them, and Creative Common License. Also, OpenMETU has some purposes for change. Firstly, the academic archive and open access system should have international standards like Open Archive Initiative (OAI), Registry of Open Access Repositories (ROAR), Registry of Open Access Repositories Mandatory Archiving Policies (ROARMAP), Dspace, Directory of Open Access Repositories (DOAR), Open Education Consortium (OEC) etc. Secondly, METU's national and international prestige will be increased. Also, making a great contribution to the development of national and international cooperation with the help of scientific communication is the final purpose. Finally, for the digitalization of HE, AVESIS was examined. However, this platform is not related to courses. Academic data are collected and categorized within it. It is commonly used by most universities in Turkey.

To sum up, it can be claimed that investing in digital infrastructures (e.g., LMS) is considered as an indicator of the change and strategic planning and, in a panoramic view, not considered as an indicator for developing digital infrastructures for the use of OER initiatives. The problem is that Turkish HE suffers from awareness of OERs and strategic planning is operation from top to bottom and therefore the strategic plans are now welcomed with wide participation. Such a view results in resistance from the shareholders in the bottom layers that put Turkish HE in a vicious cycle. As explained in the previous section, there were some efforts to foster OER and OER-related issues, however, there isn't a mechanism to regulate, measure, and control these efforts. According to Bozkurt (2019b), TÜBİTAK has funded some OER related projects thus far and it can be claimed that TÜBİTAK is more effective than HEC.

3.3.OER Infrastructure

There is almost no shared infrastructure for the digitization of HE in Turkey, and each initiative explained below offers its own infrastructure to disseminate the (O)ERs. In this part of the report, we used some sort of a developmental approach and classified the initiatives under four movements: open courseware movement, MOOC movement, campus systems movement, and distance education centers movement.

Open Courseware Movement

OER is defined "as teaching, learning and research materials that make use of appropriate tools, such as open licensing, to permit their free reuse, continuous improvement and repurposing by others for educational purposes" (Orr, Rimini, & Van Damme, 2015). The focus of it is taking original work from others and making it adapted and producing repurposed learning resources. Inspired by the values of openness philosophy, OERs have liberal licensing like Creative Commons that enable this process (Orr et. al., 2015).

Open Courseware Project can be shown as one of the few examples of the initiatives that offered shared infrastructure for the dissemination of OERs in Turkey. It was launched in 2006 with the initiative of the Turkish Academy of Sciences (Baysal, Çakır & Toplu, 2015; Kursun, 2011; TÜBA, 2012; Özkul, 2007; Yazıcı, Özkul & Çagıltay, 2008). The initial infrastructure was largely a replication of the MIT's Open Courseware (OCW) initiative. The Turkish version of OCW aimed at opening the entire course content to the access of the students. The content included syllabus, presentations, audio-visual materials, project work, homework, readings, and examinations. Although the initial initiative was owned and run by the TUBA, around 45 universities contributed to the OCW of Turkey, and the initiative received funds from the State Personal Development Agency of Turkey. The four major goals were identified for the OCW in Turkey: (1) to increase the number of open educational sources in Turkish, (2) to enrich course materials for students, (3) to provide a source enabling comparing and enriching their courses for academics, (4) to develop a source available to anyone who wishes to advance his/her knowledge on the topic. In 2010 the Turkish OCW evolved into a new phase and signed an

agreement for translation and copyright for 25 courses besides 30 courses developed entirely by Turkish scholars. Besides, 45 universities signed an agreement on supporting the OCW initiative as a requirement of the National Open Courseware Consortium (UADMK). During 2007-2012, course materials belonging to 85 courses in varying fields were developed for the TUBA's OCW project. The site is still open to the public and active, but unfortunately, no development or update has been provided since late 2013 because of bureaucratic reasons. According to the latest figures accessed (up to May 2015), approximately 1.2 million individual users accessed these course materials. Additionally, as technological infrastructure, an open-source learning management system (LMS), Moodle, was adapted and has been used since the beginning. More information can be found at acikders.tuba.org.tr. However, as reported by Al and Madran (2013), the project did not reach its full potential because of the low public interest, inefficiency to encourage faculty members and unsustainable policies.

Along with TUBA's OCW Project, several universities also invested in institutional OCW projects and some of them still continue their initiatives (Figure 9). Middle East Technical University (ocw.metu.edu.tr), Ankara University (acikders.ankara.edu.tr), and Hacettepe University (acikders.hacettepe.edu.tr), for example, have shown more advocacy to the OCW movement in Turkey. These institutions and almost all the other participant universities have the same infrastructure. In order to present an example of it, METU's Open Courseware (METU OCW) system is elaborated: METU OCW is a free and open educational resource for faculty, students, and self-learners throughout the world. METU OCW can be valuable whether you're a student looking for some extra help, a faculty member trying to prepare a new course, or someone interested in learning more about a subject that interests you. METU OCW does not grant credits or degrees and does not provide access to faculty. METU OCW gives you open access to the materials used in a variety of courses. Now, materials related to 143 courses from different departments are published in the portal. These courses are mainly in English and related to a variety of areas, including aerospace engineering, architecture, cognitive science, etc. The most visited courses are Multimedia Design and Development, Serious Games and Simulations: Theories and Applications, The Technique of Mechanic, Academic Oral Presentation Skills, and Probability and Random Variables. The total page view recorded is 324,788 since October 2015. These viewers access educational resources from all around the world, but the top access ratios belong to Turkey and the US. All the course materials presented are licensed with Creative Commons Attribution Non-Commercial-Share Alike License. Also, the platform is a member of the Open Education Consortium (OEC) and UADMK. In 2016, OEC gave the Outstanding Site Award that is of the branch of Open Education Excellence. The Turkish Informatics Association (TBD) which is the pioneering movement of the "civil community" that tries to disseminate "the culture of informatics" by the members from all levels of the society gave The Best Education Site Award in 2011. Also, it was considered to give the first prize in the e-education category in 2013. In addition to these, the Open Education for Excellence Multimedia Course award in 2011, and the Open Education for Excellence Outstanding Site award in 2016 were given by OEC.

As mentioned above a big majority of the HE institutions, especially those that signed the UADMK agreement, have also initiated their own OCW, openly shared many course materials but had sustainability problems, and except a few indicated above ended in a couple of years. For instance, Anadolu University's Yunus Emre: New Generation Learning Portal is an interesting case about size and sustainability. Anadolu University has decided to open up its course materials designed and developed for its distance students to the public via a new custom-made online learning platform (content management system, CMS), entitled as Yunus Emre, a historical poet, and philosopher, materialized with the motto of "what you share is yours, not what you save". More than six million users accessed the course materials related to 167 courses between 2008-2013. Due to the lack of a formal feedback system (no data collected), it is difficult to assess the impact of the project. However, an increase in the number of participants to the University's e-certificate programs was observed after launching the Yunus Emre portal. One can infer that the project served well to achieve one of the goals of the project: introducing Anadolu University's distance programs. On the other hand, all these materials were only open access materials (reuse) and it was not possible to remix, revise, retain, and redistribute (please refer to Wiley & Hilton, 2018). Owing to the digital transformation project initiated in 2014, the Yunus Emre Portal was closed temporarily for technological infrastructure improvement. However, later a similar project gained more attention and the Yunus Emre was ended.

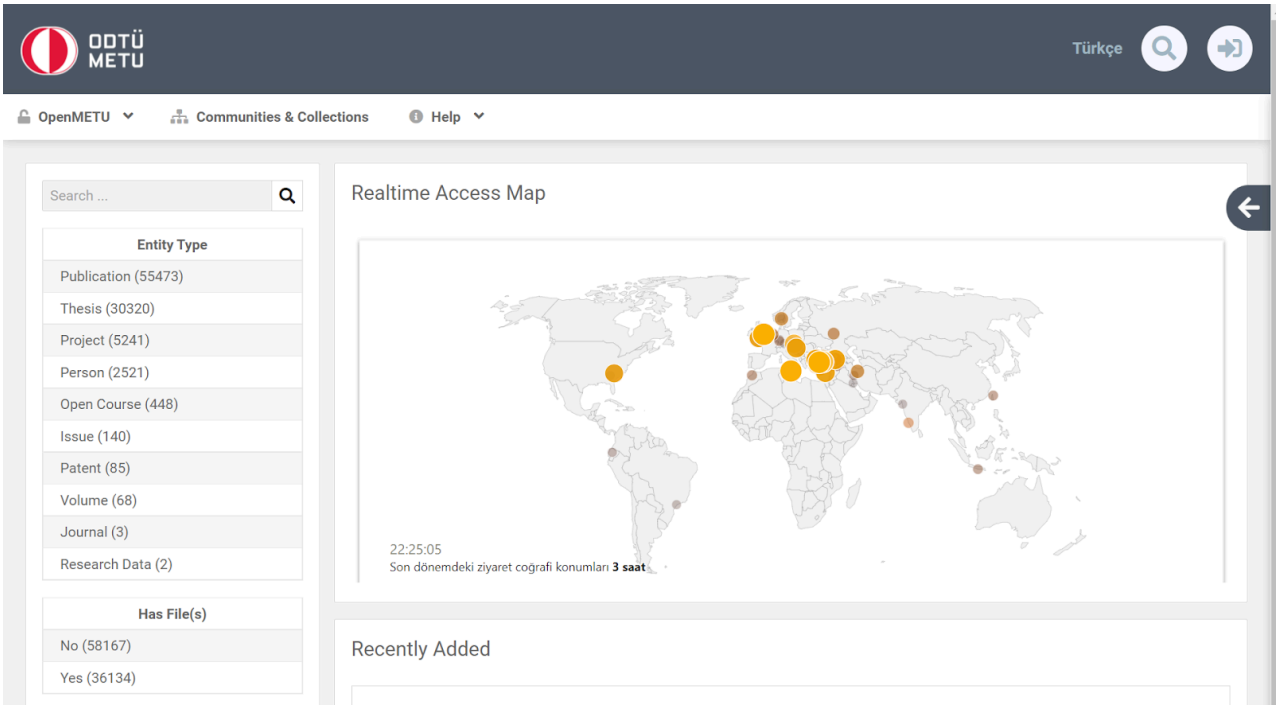
Figure 9

TÜBA Open CourseWare Project.

It is important that scientific knowledge be accessible for other researchers, within the ethical framework, for scientific progress. Therefore, METU was established OpenMETU with the idea that open access systems can serve one of the basic purposes of universities which makes it easy to produce new things and services with new knowledge at national/international levels. METU aims to access scientific knowledge by the Internet without financial limitations, legal barriers, and technical restrictions with this platform. METU Graduate Electronic Thesis Archive was established in 2003 by the Head of the University Library. After that, all master's and doctoral dissertations have been accessible. It is the first open-access system in this area in Turkey. OpenMETU is the new version of this platform (Figure 10). It is an institutional academic archive that also includes research data, software products, articles, book chapters, conference proceedings, and presentations without subject limitation. Users can search what they are looking for based on their subjects, time, author, title. Scientific literature can be read, saved, copied, printed, indexed, given the link to full text, transferred as data to software, and it can be used for every legal purpose. It ensures free research outputs and publishing, uploading, and downloading. Also, fair use, recognition, and visibility of a study, rate of citation, and scientific communication will be provided. In those days, funders expect that authors should publish their studies on open access platforms, so OpenMETU can ensure this at the institutional level. While everyone can upload course material on OCW of METU, in OpenMETU, just students and other members of METU can upload their academic works. SHERPA/RoMEO and SHERPA/JULIET databases are used. Also, Open Researcher and Contributor ID (ORCID) is the sustainable digital definer that supports automatic connection within a person's professional activities is used in this platform. On the other hand, members' open access data is licensed by Creative Commons. OpenMETU system has coordination with international open-access systems like OAI-PMH protocol, Open Education Consortium, and OpenAIRE, and is connected with the European Open Science Cloud (EOSC).

Figure 10

OpenMETU infrastructure at METU



MOOCs Movement

Massive Open Online Course began for the first time in 2008 with two researchers, George Siemens and Stephen Downes, launching the "Connectivism and Connective Knowledge (CCK08)" course online at their universities. Thousands of people followed the course free and without credit (Aydemir, Çelik, Kurşun, & Karaman, 2018). EdX, Coursera, Futurelearn, Udacity, Udemy, and Fun are very popular portals across the world. MOOCs are courses designed for large numbers of participants, that can be accessed by anyone anywhere as long as they have an internet connection, are open to everyone without entry qualifications, and offer a full/complete course experience online for free (OpenupEd, 2014). OER and MOOCs are both related to general policies, but there have some general differences: (1) Use of the term "open": In reference to OER, it means free to access and free to reuse, revise, etc. while in MOOC, it just means free to access and free to use. (2) Form of resource: OER is not a specific educational tool, and it can be many things even a full learning course, but MOOCs are designed just as full courses, which means discussions and assessment tools also are integrated. (3) Audience: In OER, the focus is on teachers who will use the adapted resources or incorporate OER into their own learning environment. However, in MOOCs, there are ready-to-go courses for learners (Orr et al.2015). Following the global trends in MOOCs, some local initiatives were launched in Turkey (Aydin, 2017; Bozkurt et al, 2021). In terms of the jointly created infrastructures for the dissemination of MOOCs, no success story can be told in Turkey. However, HE institutions with deep experiences in distance education have been playing important roles in the dissemination of the MOOCs movement in Turkey. AKADEMA platform of Anadolu University, AtademiX of Atatürk University, and Bilgeİş of Middle East Technical University are among the major MOOCs initiatives. In this part of the report, we would like to briefly introduce these initiatives.

Bilgeİş forms one of the earlier examples of MOOC portals in Turkey. It was established in 2015 by Middle East Technical University (METU) with the support of the European Union (EU) and the Turkish Government. The project originally aims to serve the in-service training needs of employees in the private and public sectors. However, the fact that the project does put any limitations on university students makes it relevant to the digitalization of the formal HE. The project is coordinated by the Middle East Technical University (METU) and the Turkish Ministry of Labor and Social Security and the European Union. Bilgeİş project aims to (i) contribute orientation skills of employers and employees; (ii) support labor market that has coherency with technology; (iii) increase capacity of employees and employers about the usage of Information and Communication Technologies (ICT). Within this frame, in the 5 pilot cities of Turkey, (Ankara, İstanbul, İzmir, Eskişehir, and Gaziantep), universities, chambers of commerce, and industry, continuing education centers, organized industrial zones in these cities were identified as stakeholders and these institutions signed a

cooperation protocol. During the development of the portal, the in-service needs of employees and employers in pilot cities were analyzed, and in order to meet these needs, initially, 100 online courses for professional development of employees in various fields were developed and opened up to the use of employees and students. The MOOCs cover various topics, including graphic design, website development, software development, digital photograph, human resource management, etc. In addition to the online materials, various meetings such as conferences, seminars, and workshops are planned as part of the project in order to make the project more sustainable. Besides, in order to ensure sustainability, the courses are updated on the basis of stakeholder feedback. When the participants complete the course successfully, they get a certificate from the Middle East Technical University. According to recent data, Bilgeİş has reached around 130.000 users. Of the users, 4300 of them are employers, 39.652 are employees, and the rest consist of students and non-workers. Bilgeİş also uses a customized version of an open-source LMS, Moodle. One of the reasons for this preference might be the project coordinators' familiarity with this technological infrastructure.

Anadolu University's AKADEMA platform is another widely used infrastructure in the MOOCs movement in Turkey. AKADEMA was initiated as a social responsibility project by Anadolu University. The main objective of the project was to provide learning environments and materials to anyone of any age and to provide them with a structured learning experience to support lifelong learning processes. As a product of Anadolu University's long-lasting experience in Open Education, this platform includes courses in which everyone can acquire knowledge, skills, and attitudes free of charge without any prerequisites. There are supervised and self-paced courses under AKADEMA. The participants have access to all course content in both course types anytime and anywhere. In the self-paced courses, it is possible to communicate with the instructor at predetermined date intervals. Those who successfully complete the courses are given a certificate of completion signed by the Rector of Anadolu University. Self-paced courses are considered to be successful in order to fulfill the tasks expected from the participants between the course start and end dates. On the other hand, in individual courses, there is no communication with the instructor. Course Completion Documents are delivered to the participants electronically. Participants can access the content of these courses at any time and learn by themselves. On the contrary of supervised courses, participants are not given a Certificate of Completion. In 2017, new courses in different categories were opened. The number of categories increased to 13 and the total number of courses increased to 58. Also, 47705 participants registered for the ACADEMA. A total of 1192 Course Completion Certificates were given. Until 2019, the university's LMS used in regular distance courses, Blackboard, was used to offer these courses but later an open-source learning management system, Canvas, was put in use. New courses opened in different categories again. The total number of categories increased to 14 and the total number of courses increased to 80. These 14 categories are research and evaluation, instrument training, language education, science and technology, fine arts, law, personal development, music, health, sports, social sciences, education, management and economy, and special education.

AtademiX is the first enterprise free course platform of quickly spreading the MOOC movement in 2015. It is founded with ATAUZEM's, Erzurum Ataturk University's distance education center, technical infrastructure. The first lectures of the project were Introduction to Ottoman Turkish, Introduction to Arabic, and Introduction to Biostatistics. In the following periods, it is planned to offer courses for different interest groups in various fields including Nuclear Energy, Criminology, Crisis Management to Graphic Design, Skin Care to Strategic Management. The courses are given by Atatürk University faculty members as well as field experts from different institutions and organizations through AtademiX. Course categories at AtademiX are collected under 4 topics which are "Public Training," "Sectoral Training," "Academic Training," and "Senior Academic Training." The courses are taught on the Internet by the use of various course materials and exercises. Course materials include lecture notes, presentations, interactive videos, discussion forums, assignments, and end-of-class projects in order to support active participation. In addition, thanks to the sync, live lessons that cover a significant part of the courses, individuals have the opportunity to interact with the course instructors and other individuals taking the course. These courses are open to everyone who wants to have different levels of education. The lectures are open to participants from all over the world and can take place in the same class with participants from different cities of the world. In addition, the participants benefit from the knowledge and experience of prominent people in respective fields. AtademiX has a mobile-compatible interface, so students are able to follow the lessons with their mobile devices as well as computers. Participants who registered AtademiX are from all provinces of Turkey. The majority of the participants (X=32%) are in Erzurum followed by İstanbul (8%) and Ankara (6%)

(Aydemir, Bingöl, Çelik, Karapınar, Karaman, & Kurşun, 2016). The level of education of the participants varies. Of the participants, 1.5% hold primary and secondary education degrees, 7% associate, 42% undergraduate, and 46% graduate degrees. A total of 4872 participants enrolled in 13 courses offered at AtademiX, and approximately 650 people were awarded online attendance certificates (Aydemir, et al., 2016). Ottoman Turkish was the most registered course with 1205 people (24.73%) while the Public Health Education course was given the highest number of participation certificates(317; 48.77%). In addition, it was found that the highest attendance was accomplished for public courses (46.78%) followed by senior academic (26.46%), academic (15.72%), and sectoral (11.04%) courses (Aydemir, et al., 2016). An online certificate is offered to the participants when they met the accomplishment the criteria. AtademiX is one of the members of Open Education Europa. Within the scope of Digital Transformation and Software Office contribute to the sustainability of AtademiX. Open Education Faculty and Computer Science Research and Application Center of Ataturk University actively contribute to the AtademiX. As a technological infrastructure, AtademiX is also using Moodle.

Along with Akadema, BilgeIs, and Atademix, there is a relatively small-scale number of other MOOC initiatives in various institutions. For instance, Yaşar University, a foundation (private) HE institution located in Izmir, has transformed all of its core courses to MOOCs and presented them to the public in a new portal entitled Hayatboyu (lifelong) (hayatboyu.yasar.edu.tr). Yaşar University uses the OpenEdX platform for this initiative. Currently, the University offers 20 courses in various topics including augmented reality, design thinking, project management, ethics, aesthetics, semiotics, technology and society, scientific research, and so forth. Some of these courses (7 out of 20) are in English while all the others are in Turkish (Yaşar University, 2019). According to the project coordinator, by the end of 2019, there were more than 5000 registered users in these self-paced courses (Aydin, 2019).

Another MOOCs project was initiated by Sakarya University which also uses the OpenEdX Platform to offer open online courses. The project is entitled SAUX (stands for Sakarya University Extended) and currently, seven courses have been created and presented to the learners. More information can be found at saux.sakarya.edu.tr.

On the other hand, another state university, Hacettepe University, has launched a project that also included MOOC offerings. The LIFE (LIbraries for Everyone) Program was launched by Hacettepe University Technopolis Technology Transfer Center with funding from the Bill & Melinda Gates Foundation. The program is implemented at the libraries administered by local governments and aims to support the technology infrastructure to enable citizens' access to basic computer and internet facilities; to facilitate their use of internet-based services such as e-government and e-municipality services; and to offer free training to citizens at these public libraries to assist them to acquire the necessary ICT use skills. For the impactful delivery of these services to citizens, the program also aims to train the staff of the municipal public libraries not only in ICT skills but also in subjects of librarianship for their professional development, so that they can offer library services in a more effective manner. One of the major work packages of the project proposes the design and delivery of MOOCs in various topics. This part of the LIFE project is called as Academy in which there are 18 active and 9 archived courses (Herkes İçin Kütüphane, 2019).

Along with the HE institutions, some other public and private institutions are also offering small-scale MOOCs. For instance, the Information Technology and Communications Authority (BTK) is a government agency that was established for the purpose of regulating and supervising the telecommunications sector. BTK has launched an initiative, entitled BTK Akademi, to support the safe use of communication technologies, especially the Internet. Quite a number of online self-paced courses are being offered in this portal to any who would like to learn. The courses mainly focus on communication technologies, including Blockchain, Cellular systems, R Coding, Coding with Scratch, Screen Dependence, etc. (BTK Akademi, 2019).

Another example was launched in 2017 by a couple of entrepreneurs, intended to create a Coursera-like environment in Turkey, entitled as UniversitePlus. Currently, they collaborate with three major universities (Bosporus University, Yildiz Technical University, and Yeditepe University) to offer 46 courses. According to their website, nearly 40000 learners are actively taking their courses (UniversitePlus, 2019).

Campus Systems Movement

A campus system refers to integrated technological systems that help all stakeholders (faculty members, administrators, staff, learners, etc.) increase the effectiveness and efficiency of the main functions of the institution. In other words, it means digitizing or using digital technologies in every main function of a HE institution: education, research and development, social responsibility, and governance. All the subsystems in a campus system talk to (communicate) each other easily, and nowadays they learn from their experiences (machine learning).

Although the use of online or offline systems for various functions at a university has been in place for years, integration of these systems and embedding machine learning and artificial intelligence components as a campus system is relatively new for Turkey. Nowadays, all the HE institutions are trying to adopt systems that can be integrated into their existing campus system, or changing their whole old systems into new campus systems.

Campus system movement might not seem like a topic related to OERs. But these systems are the technological infrastructures that foster the dissemination and use of OERs. So, in this part of the report, we would like to describe the developments in the major subsystems of a campus system in Turkey: Learning management system (LMS), electronic document management system (EDMS), academic data management system (ADMS), and some other specialized ones.

Learning Management System (LMS)

When meso level digitalization practices are examined, it can be observed that most of the HE organizations adopted Learning Management Systems (LMS) in order to facilitate digitalization of teaching and learning practices. During the first years, individual HE institutions developed or adapted their own infrastructures to offer an online presence to their courses and the faculty members. But later, some adopted commercial international LMSs, some started to use Turkey oriented commercial LMSs, and some others preferred the open source LMSs.

The Middle East Technical University, for example, built its own online tool to manage teaching and learning processes during the earlier days and provided online space for each course offered by the university. The course list was automatically retrieved from the registrar's office, and faculty members were able to upload their course materials as well as manage their course routines including attendance and grading. Nevertheless, the portal became inefficient in the face of growing demand and increasing workload in a very short time. As a result, METU adopted an open-source LMS system, modified and added certain components to the existing structure in order to manage the teaching and learning process. This LMS doesn't only offer the same functions as the previous one but also some others such as plagiarism check.

Anadolu University, on the other hand, which accommodates nearly half of the HE students in Turkey, decided to use Blackboard, a commercial product, after many years of using a content management system, developed in-house based on the needs of its distance learners and the instructional strategy employed in distance education programs (self-paced study with traditional media). Anadolu University's preference for Blackboard was related to the intent of shifting its self-paced instructional strategy to a guided study that included more digitized education and more opportunities for learners to interact with each other and the instructors. However, due to technical problems encountered to meet the needs of a million students and the costs, Anadolu decided to use a custom LMS during the beginning of 2019 and developed one in-house based-on previous experiences in content management systems. Known as Anadolum e-Kampus, the new LMS is capable of delivering any type of learning content and specifically designed for the individualized learning experience. Another salient feature of the e-Kampus is it provides all its services through Web and mobile technologies. In contrast to generic LMSs, e-Kampus provides many accessibility options for learners with special needs and benefits from AI-based technologies to enhance learning experiences and provide individualized learning opportunities.

Electronic Document Management System (EDMS)

This system is not directly related to teaching and learning, and it is not limited to HE. The EDMS can be considered an effective tool to manage bureaucratic processes. Like in the case of other digital services, EDMS helps institutions to

save from printing and ensure fast and precise formal communication in public organizations, including universities. Another advantage of EDMS, these services are controlled by a central authority and all state institutions use these services for an integrated and effective bureaucratic process. Besides, signing any document through EDMSs is ensured through digital signatures which provides a complete digital bureaucratic experience.

Academic Data Management System (ADMS)

On the other hand, Academic Data Management System is a software system that includes the academic performance management model developed for the purpose of taking inventory of academic activities, measuring and evaluating the performances of institutions, units, departments, and people, and creating a sustainable quality assurance system. Several products, such as AVESIS, a Turkey oriented for-profit company, are available in the market. ADMS, which is basically a performance management system, includes various useful tools in addition to its features that are compatible with the purposes outlined above. ADMS is expected to contribute to the promotion of the human resources potential and administrative practices of our university in addition to the facilities that it will provide to faculty members such as preparing a resume file in different formats and printable. ADMS is a very common platform in Turkey and currently, 28 universities are using the platform. ADMS software system is based on the Balanced Scorecard Performance Management Model. In this context, providing personal web pages for researchers, pursuing resume, project obligations, and project outputs of researchers within the scope of Scientific Research Projects (BAP), academic performance evaluations, academic incentive allowance processes, production of institutional evaluation reports, determination of assignment and promotion criteria and university ranking data for applications such as entrepreneurial and innovative university indexes. As of today, studies are being carried out in order to transfer the information of the researchers existing in various systems to ADMS, and the system will be put into use in the near future. In this context, researchers' publications in the ISI Web of Science (WOS) Database have been questioned and transferred to their personal areas in the ADMS system. Also, researchers are expected to activate the publication records transferred to the ADMS System. Academic Incentive applications for the articles added to the ADMS System via WOS services. It can be validated through ADMS connection without the need to submit an additional proof document. A publication introduced in AVESIS periodically is scanned on SCOPUS, ISI-WEB of SCIENCE, and PUBMED. This helped that possible citations matched with the author and added their profile.

Digital Infrastructure for Auxiliary Services

Many universities adapted specialized digital tools for specific purposes to be able to increase the effectiveness and efficiency of their services. For example, the Middle East Technical University (METU) developed its own course syllabus development and course syllabus management portal. The course syllabus portal provides guidelines on how to write course objectives and course learning outcomes. The portal enables storing the Syllabi as well, which facilitates retrieval of the syllabus in several different forms. As a result, the university has been able to save from printing and distributing syllabus. Besides, the portal brought a standard to syllabus development practices. Since the syllabus program requires to fill exactly the same components, all of the course syllabi pose the same sections.

Another example can be given from Anadolu University. Accordingly, with a specific focus on open and distance learners, from enrollment to course delivery, and services after graduation are all provided through an infrastructure that recognizes its user through their national IDs. Compete course enrollment system, student support system, bureau automation system (Anadolu has more than 120 bureaus, or administrative local offices, all around Turkey and also in some other countries), inventory tracking system, and so forth.

SABIS, on the other hand, is a campus system designed and developed in-house by Sakarya University. It is actually like a shell that integrates all kinds of systems in the university, including learning management, personnel management, library, project management, student information, knowledge management, performance management, budget management, etc., and enables easy communication among these subsystems as well as easy access to all these services. Due to its responsive design, it can be used in any device and operating system. So that it supports any time anywhere access to the services. It also supports various languages. SABIS is also designed in a way to support the requirements and implementation of the Bologna Process which makes it vulnerable especially for those institutions that seek external evaluation and accreditation. It supports the accreditation process for the whole university or a single

faculty or a program or a center. In line with the mission, vision, and strategies, SABIS enables all units affiliated to the organization to determine their objectives and activities, to monitor the status of the objectives and to evaluate the results of these plans, to improve strategic plans, and also to take measures against conditions that may change in the strategic plan (Kocabıçak, 2018).

A similar initiative was launched by Erzurum Ataturk University just recently (December 2019). The e-Service Gate is also a shell system that brings all the subsystems of the university together and integrates with each other. It intends not only to increase the usage and accessibility of these services but also to secure easy communication among these subsystems. Additionally, the initiative addresses data protection and safety requirements and concerns. According to the university administrators, the system will soon be open to all the other stakeholders (rather than just students, academic and administrative staff) to be able to ensure transparency and accountability in the university, to measure and monitor the social contribution of the university, and to increase the visibility of the quality and variety of the services provided by the University. They also claim that the e-Service Gate is an important step in corporate cyber security measures that allow the management of user information and passwords in a more secure manner in line with the 2016/12 Circular on the protection of personal data and information and communication security measures (Ataturk University, 2019).

Distance Education Centers Movement

One other widely used popular service is online master's degree programs delivered through Distance Education Centers in many HE institutions in Turkey (Table 2). Accordingly, by 2018, there were a total of 39.236 students in these programs. However, some concerns should be articulated which are also related to other issues such as policy, quality, and change. When they first emerged, they were perceived as a change agent, on the other hand, the change winds could not go beyond using LMSs and many offered programs suffer from quality mostly because of insufficient quality assurance and accreditation mechanisms.

Another bottleneck that is observed is the common compulsory courses that are available nearly in all programs. In order to reduce cost, human resources, logistics, and some other operations, many courses are delivered by Distance Education centers. However, as in the case of delivering master programs through distance education, the quality is low while the quantity (number of universities delivering these courses) is rather high.

Table 2

Total number of students in Turkish HE (See Master program students' numbers > Distance education [eLearning/Paid]).

	Total number of students in 2018					
	Male		Female		Total	
	f	%	*f*	%	*f*	%
Overall	4047302	53.5	3513069	46.5	7560371	100.0
Associate's	1424366	18.8	1344391	17.8	2768757	36.6
• *Formal education (F2F/Free)*	451531	6.0	323945	4.3	775476	10.3
• *Formal education (F2F/Paid)*	214158	2.8	106787	1.4	320945	4.2
• *Distance education (e-learning/Paid)*	20990	0.3	14722	0.2	35712	0.5
• *Open education (Free)*	737687	9.8	898937	11.9	1636624	21.6
Bachelor's	2292542	30.3	1949299	25.8	4241841	56.1
• *Formal education (F2F/Free)*	903108	11.9	932084	12.3	1835192	24.3
• *Formal education (F2F/Paid)*	250119	3.3	178885	2.4	429004	5.7
• *Distance education (e-learning/Paid)*	11663	0.2	16390	0.2	28053	0.4
• *Open education (Free)*	1127652	14.9	821940	10.9	1949592	25.8
Master's	275781	3.6	178892	2.4	454673	6.0
• *Formal education (F2F/Free)*	224644	3.0	168085	2.2	392729	5.2
• *Formal education (F2F/Paid)*	30779	0.4	8457	0.1	39236	0.5
• *Distance education (e-learning/Paid)*	20358	0.3	2350	0.0	22708	0.3
Doctorate	54613	0.7	40487	0.5	95100	1.3
• *Formal education (F2F/Free)*	54613	0.7	40487	0.5	95100	1.3

In short, there are efforts to establish digital infrastructures, these efforts aim to integrate HE institutions to the central networks, such as eGovernment services. These efforts mainly host students support services. OER related platforms such as MOOCs are independent and there isn't a jointly established initiative. Because currently there aren't institutional OER repositories, there isn't a communication and information exchange observed. The biggest so-called OER repository is HEC's thesis database, however, it is only accessible through login and operates through eGovernments infrastructure. The earlier attempts to establish an OER repository are failed and there are only independent fewer institutional efforts:

- UADMK
- ODTÜ
- Ankara Üniversitesi
- Ege Üniversitesi
- Başkent Üniversitesi
- Hacettepe Üniversitesi

3.4. Quality of OER

Developing policies to improve the quality of HE has become an important agenda item for many countries. The issue of improving and securing quality in HE has become one of the main concerns in Turkey as well. The studies and recommendations made in the Bologna process were published in the European Quality Assurance Association in Higher Education (ENQA) report titled Principles and Standards of Quality Assurance in the European Higher Education Area, which was published in 2005. In Turkey, the quality assurance studies in HE carried out so far have not produced concrete results on digital platforms yet. The widespread approach was limited to the preparation of annual reports, which did not include any strategy and largely determined the state of the universities.

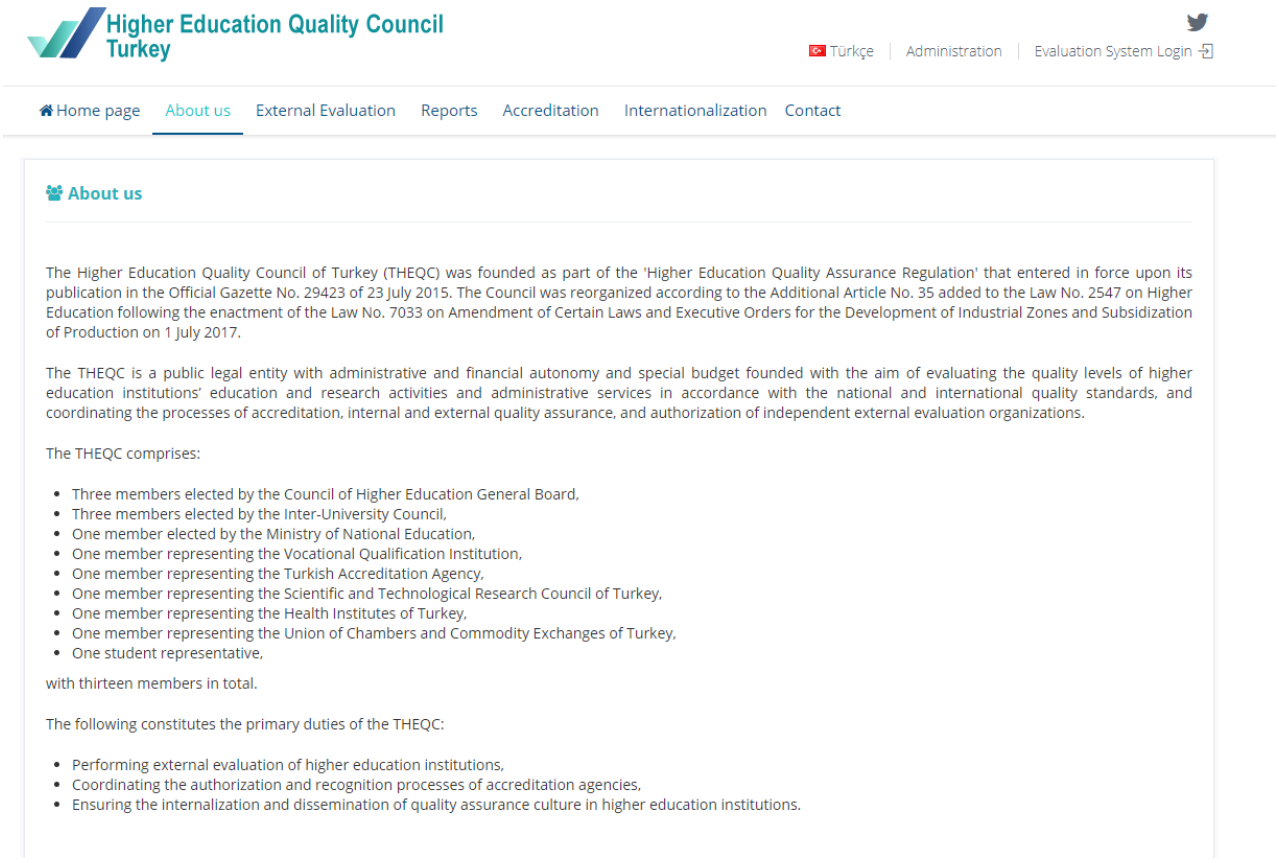
Especially after the Bologna Process in 2001 as a result of the need for restructuring the HE system and alignment with the European Union legislation, there were some efforts to provide quality assurance in Turkish HE(Koral Gümüşoğlu, Toprak & Şakar, 2019; Toprak & Şakar, 2019). For instance, integration to the European Credit Transfer System (ECTS)

and providing diploma supplements can be given as examples. After a long while, HEC established the HE Quality Board in 2015 (Figure 11) (YOKAK, 2019) and efforts on quality assurance gained momentum. Currently, there are 12 evaluation and accreditation agencies that examine programs in Turkish HE. These agencies can be listed as followings (Toprak & Şakar, 2019) :

- Association for Evaluation and Accreditation of Engineering Programs-MÜDEK
- Association For Evaluation And Accreditation Of Medical Education Programs-TEPDAD
- Science, Literature, Faculty of Science and Letters, Faculty of Languages, History and Geography Curriculum Programs Assesments and Accreditation Assocciation-FEDEK
- Association for Evaluation and Accreditation of Educational Institutions and Programs of Veterinary Medicine-VEDEK
- Evaluation and Accreditation Association for Teaching Programs-EPDAD
- Association for Evaluation and Accreditation of Nursing Programs-HEPDAK
- Communication Education Evaluation and Accreditation Board-İLEDAK
- Health Sciences Education Programs Evaluation and Accreditation Association-SABAK
- Tourism Education Evaluation and Accreditation Board–TURAK
- Evaluation and Accreditation Association for Programs in the Faculties of Pharmacy-ECZAKDER
- Turkish Psychological Association
- Theological Studies Accreditation Agency-İAA

Figure 11

HEC Quality Council



In Turkey, the quality assurance systems at HE level are regulated by the HEC's Higher Education Quality Council (HECQ). Although this is a national-level quality assurance body, the policy and practices of this council directly applies to the individual HE organizations. HECQ applies two quality assurance mechanisms: self-assessment (internal

assessment) and external assessments. It is very difficult to find a clear focus on quality assurance systems for digital resources, while there are items that indirectly apply to the quality assurance of digital resources. For example, “accessibility” forms an important criterion in the internal quality assurance of individual HE organizations in Turkey. Therefore, the universities are obliged to ensure access of all of the students to available databases and the National Academic License for Electronic Resources (EKUAL) and Turkish Academic Network and Information Center (ULAKBIM). Access to digital services is largely regulated by individual libraries of HE institutions. Likewise, in the external evaluation system of HEQC similar understanding applies to an external evaluation committee. Accessibility to educational resources is an important assessment criterion is an important criterion. As a result, students’ access to academic materials, databases, and learning resources is a major concern of every university in Turkey and the way how the criterion is assessed is similar at every university (HEQC, 2019). For example, Anadolu University’s quality assurance mechanism is based on the Higher Education Quality Assurance System and the Higher Education Quality Council of Turkey Law No. 2547 on HE, Additional Article 35 (18/6/2017-7033/18 art.). Higher Education Quality Assurance System sets out the principles that regard the authorization of independent external evaluation institutions, accreditation processes, and internal-external quality assurance of education and research activities as well as administrative services of HE institutions.

On the other hand, the digitalization of HE takes an important part in METU’s 2018-2022 strategic plan which was prepared in 2017. In the situation analysis part, it was stated that studies on determining the educational objectives and program outcomes of the undergraduate programs have been completed and necessary information has been entered into the METU Syllabus program. The same structure has been nearly completed for graduate programs and studies are still ongoing. ODTUClass (LMS), a Moodle-based teaching management system, is used in all courses at METU. As of 2016, 69% of the faculty members and 83% of the students use the program within the scope of 5,371 courses that were opened in the ODTUClass program. Open Course Material (ocw.metu.edu.tr) currently offers 143 courses and serves an average of 4.500 visitors per month. Also, the digitalization of education highlights the sectoral tendency analysis part. Increasing the accessibility of open course materials to knowledge in the field of education by distance education; Spreading online learning and mobile applications rapidly in learning, and growing expectations that technologies such as smart boards will be widely used in HE were identified. Therefore, in the strategic plan, METU attributes importance to effective science communication and open access in sharing knowledge with society and the world as a strategic priority. In this context, some strategies were defined under the objectives and goals. For example, Objective 5 states that develop and implement educational policies to educate competent graduates with creative, innovative, and leadership characteristics. Under this objective, dissemination of innovative teaching methods, measurement and evaluation methods and the use of instructional technologies, production, and sharing of instructional materials was developed as a goal. OpenMETU was effectuated on the 2nd of December,2019, and it has lots of policies that regulate operation. For example, the rights of every stakeholder are described very deeply. Also, it is compatible with the OAI-PHM protocol, OEC, and OpenAIRE, and it has a connection with EOSC.

3.5 Recap

As it has mentioned at the beginning of this report, one might expect more initiatives at the macro level since the Turkish educational system at all levels is quite centralized. However, analyses of the current implementations and developments have shown that more initiatives regarding digital transformation in the Turkish HE system can be observed at the institutional, or micro level. A similar assumption can be made about the joint initiatives because of the collectivist cultural characteristics of Turkey. But, except for the National Open Courseware Consortium that did not last long, no significant joint initiatives for dissemination of OERs have been noticed, yet. However, as stated above, individual institutions, especially those that have historically a long tradition in open and distance learning as well as educational technology, have been voluntarily taking action to create and disseminate (O)ERs and working on transferring their systems into a more digitized structure.

In terms of infrastructure, we have identified four movements: open courseware movement, MOOCs movement, campus systems movement, and distance education centers movement. There are a few sustainable initiatives and a couple of noteworthy but unsustainable ones in each movement. For instance, TUBA’s Turkish OCW portal still receives a lot of internet traffic although the project is not active, and no improvements or updates are provided. However, a few

universities continue to offer OCW in their institutions, such as METU, Ankara University, and Hacettepe University. A similar trend is observed in other movements too. It was noteworthy that a big majority of these initiatives use either similar open-source solutions or create their custom ones. But no effort has been put in place to establish a link or interaction among these similar initiatives.

In terms of policy, it was quite disappointing that only a few institutions have some sort of written policies for digital transformation. Ataturk University, for instance, established an office directly working with the rectorate to lead the change in the institution. Also, the newly established OpenMETU portal has clear policies, and they are all stated on the website which is open.metu.edu.tr under the Open Science Policy and Frequently Asked Questions parts. On the other hand, the HEC initiated a digital transformation project following Vision 2023. As a part of this project, 9 universities, located in the eastern part of the country and have limited resources, were asked to participate in the pilot face of the project. The faculty members and the students are required to take online courses to improve their technology skills. Anadolu University's infrastructure was used during this project. The project coordinators are currently focusing on a policy paper to share with all the HE institutions in Turkey.

Increasing the quality of HE has been one of the major goals of the HEC. The Higher Education Quality Council (HECQ) was established some years ago under HEC and became an independent agency soon after. This agency regulates the quality processes in Turkey. The agency follows a similar evaluation and monitoring process as European Universities Association (EUA); provides guidance and recommendations for the improvement of quality of all kinds of services, including internal quality assurance systems, education, research and development, social support, and governance. So, we can say that HECQ, to some extent, does monitor the (O)ERs offerings of the HE institutions and the digital transformation processes although the evaluators are not directly required to investigate these offerings and processes. In terms of the institutional level, every institution has its own quality assurance processes for their (O)ER offerings in one way or another. However, these processes are not well documented and hard to learn from outside.

In terms of change, it is slow, and the strategy is mainly a top-down approach. In other words, all the HE institutions are trying to digitize their processes and services; but due to lack of experience, shortage of vendors, insufficient technological infrastructure, shortage of time to invest in change, and some other reasons, the improvement is not as it is expected. Also, the research shows that there is an awareness issue among faculty members toward digitizing and sharing their experiences. That might be why the projects are usually initiated by the administrators of the HE institutions rather than professors or instructors or learners.

All of these limitations and challenges directly affect HE institutions' digitalization. Also, HE institutions that do not have sufficient vision have slow adoption of this transformation. Some other main reasons for this are; unaware of the changes in their competitors and new competitive methods, inadequacy in developing their methods with new technologies, staying slow in catching up with new technologies, having concerns and skepticism about the reliability and sustainability of digital services, having no enough information about the new student profile, and strict corporate policies can be considered (Taşkıran, 2017).

In sum, we have observed some significant developments which are based on HEC and Scientific and Technological Research Council of Turkey, and Vision 2023 policies, and support of the European Union and the Turkish Ministry of Labor and Social Security at an institutional level for digitization and dissemination of (O)ERs than the macro level.

4. Awareness, Creation, Use, and Dissemination of OERs in Turkey
Micro-Level Developments

4.1. Infrastructure

In Turkey, although there is increasingly growing awareness among individual faculty members about finding, using, creating, licensing, and sharing (O)ERs, there are several infrastructures for the dissemination of OER among faculty

members. The National Thesis and Dissertation Center, institutional library services, social academic networks, and the Higher Education Council's Courses Platform (YOK Dersler), which was created as a reaction to the Coronavirus Pandemic, are among the major infrastructures at the micro-level.

National Thesis and Dissertation Centre

It is a database that can be accessed over the internet and provides access to all master's and doctoral theses prepared at the universities in Turkey. By 2018, it has become a mandatory act to publish thesis open access through the platform. At the individual level, the national thesis center can be regarded as a change agent in terms of promoting open access and being a role model for universities.

Institutional library services and OER repositories

The OER repositories are usually supervised by library services at the institutional level and individuals' contributions to these services require signing up for these services. As a matter of fact, many (so-called) OER repositories do not function fully. That is, the content that can be uploaded is usually restricted to publication types (e.g., conference proceedings and pre-print versions of the publications). Such an organizational structure confines OER only to its members, which prevents the dissemination of OER in a broader sense.

One of the biggest challenges of OER related library services and repositories is the copyright policy. While there have been many efforts to promote the use of Creative Commons (Holt & Madran, 2014), it can be claimed that these efforts did not make the expected impact. As is, they operate on the basis of copyright/copyleft policies which we consider as a dilemma in terms of opening up education.

Another initiative that can be mentioned is TÜBİTAK's DergiPark (JournalPark) infrastructure. DergiPark is a ScholarOne or Open Journal System (OJS) like academic journal management infrastructure for journals issued in Turkey. It is considered that DergiPark infrastructure is one of the good and organized examples of OER. DergiPark (n.d.) explains its purposes as followings:

- to improve the quality and aid the development of academic publishing in Turkey in accordance with international standards,
- to enhance the visibility and usage of national academic journals worldwide,
- to ensure the implementation of the ULAKBİM Journal Management System efficiently.

The promise of DergiPark is the way it hosts journals. As of now, although every journal published in DergiPark has a separate domain name and outlook, all journals use the same infrastructure. In order to benefit from DergiPark services, each journal must stick to an open access policy and adopt a Creative Commons license. In this regard, individual contributions to journals, such as articles or reviews, are published as an OER.

Social academic networks

OER-related activities in Turkey at the micro-level can be significantly related to open scholarship and are generally referred to as network-based activities (Veletsianos & Kimmons, 2012). In this context, the use of academic social networks is an example that can be examined at the micro-level.

In the context of OER and OEP at the micro-level, individual-level practices are mostly related to participating in academic and social networks, and these networks are, in many cases, perceived as the process of creating an online identity. The main tendency to use these academic social networks (e.g., ResearchGate, Academia, Publons, etc.) is the inability and incapability of local structures, for instance, at the institutional level. In this regard, in the context of Turkish HE, academic social networks are often used to increase the widespread effect of academic studies and to provide visibility in online environments. In other words, because sharing, promoting, and disseminating OER is limited to a few institutional repositories, and these are, interestingly, confined to only institutional access (they usually require identification even if they are OER repositories), academic social networks are very popular in Turkish HE.

Academic social networks such as Academia and ResearchGate are used for the purpose of networking and collaborating with other academics (Muscanell & Utz, 2017) and further used to make the content open access by respecting their rights. Many scholars in Turkey have the belief that making open access educational content, if not OER, is sharing them in academic social networks. In many cases, copyright issues are bypassed by publicly sharing pre-print copies of the publications, and, frequently, copyright issues are violated (Ovadia, 2014). In a sense, such an approach eliminates options with financial necessities for gold access and green access (Lovett, Rathemacher, Boukari & Lang, 2017). Though the copyrights of the openly shared publications are held by journals, researchers publish their full-text studies on academic social networking platforms because they either are not aware or do not take into account this issue (Jamali, 2017). In Turkey, the case is not different from what Jamali (2017) reported. As well as reasons reported in the related literature, lack of awareness and the gap in providing such services through institutional means can be considered as the main reason behind this scene.

YÖK Dersleri (HEC Courses) Platform

After the first wave of the COVID-19 pandemic, the HEC decided to support all the HE institutions by opening up the course materials of the major open and distance learning (ODL) providers (Anadolu University, İstanbul University, and Erzurum Ataturk University). The materials consisted of printable textbooks and some videos. They were all specifically designed and produced for distance learners. A website, entitled YÖK Dersleri (HEC Courses, yokdersleri.yok.gov.tr) was built including search and browsing opportunities. Later, another University, METU, also shared its OpenCourseWare (OCW) materials (video lectures) in this portal.

HEC just recently shared a guidebook about how the HE institutions can adapt technology-based or -enhanced learning into their regular programs and courses during and after the pandemic (HEC, 2020a). In this guidebook, HEC, for the first time, mentioned that they would like to transform the YOK Dersleri Platform into an OER repository and encouraged all the instructors and professors to share their course materials, as well as their online courses as MOOCs in this platform. Although this encouragement was only a verbal invitation and nothing more, it can be considered as an important step for increasing awareness. In this guidebook, HEC also provided a series of guidelines and recommendations concerning different aspects of educational processes in the Universities, and how the universities can implement online distance education, blended learning, hybrid learning, and technology-enhanced learning.

YOK Dersleri Platform currently provides access to hundreds of textbooks and lecture videos, quite a number of which are related to social, educational, administrative sciences, and humanities while some are related to health, engineering, science fields.

Overall outlook

In all, it can be concluded that there is low awareness regarding the philosophy of openness and there are varieties in the way Turkish scholars perceive openness. Though there are many recent initiatives to promote OER and open access, it is generally related to quality-related issues which hinder the development of OER in Turkey. However, it should be noted that within the scope of digital transformation in education (Taşkıran, 2017) and eGovernment (Bozkurt, 2017b), the ideas of establishing open academic repositories at international standards at all universities and giving priority to open access and open scholarship (HEC, 2019) have increasingly been embraced by the universities.

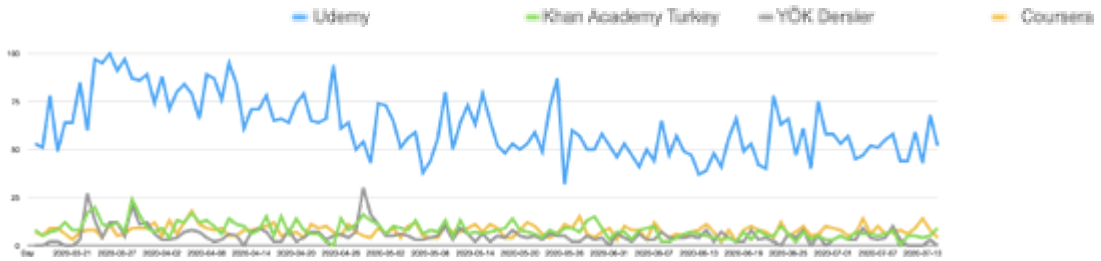
The awareness of OER is lower than expected and currently available OER repositories need to be improved in many aspects (Bozkurt, 2019b; Erdem-Aydın & Aydın, 2019). First, there is a need to develop policies and walkthroughs to catch quality standards, widen their scope, and make them compatible with international counterparts. Currently, while there is an eGovernments infrastructure that connects many services, the library services, and OER repositories are incapable of operating among similar services. By 2020, such efforts are initiated by public entities (mostly by HECand with rare examples from individual universities) and commercial entities demonstrate less interest because, most probably, they don't consider this area that they can make a profit. As explained earlier, there is a tendency to associate openness and OER related concepts with low quality. Such a perception in academic circles at individual and institutional levels curtails the developments of OER in Turkey. Such an outlook directs faculty members and researchers to use academic social networks as if they are OER repositories.

In the Turkish HE System, one of the most properly functioning OER repositories is DergiPark infrastructure. However, despite all its promises and potential, the type of OER is limited to only scholarly publications (e.g., articles, reviews, editorials, etc.). It can be argued that an initiative at the macro, national level serves well for the individual, macro level. PowerPoint presentations and lecture notes are widely used OERs in Turkey. Educators at universities integrate any educational materials into their teaching materials because, generally, library services provide access to these materials by institutional subscription. It can be stated that this is an ill-structured vision because, at an individual level, educators are not encouraged to produce and share OER, in contrast, they are encouraged to use institutional subscribed services.

Moreover, although we cannot provide any scientific evidence, our personal observations showed that during the Coronavirus period, Udemy and Khan Academy Turkey as well as the YÖK Dersleri Website (elaborated above) were the most frequently used educational resource repositories. The Google statistics also support this observation (Figure 12).

Figure 12

The most frequently used OERs during the Coronavirus Pandemic



The infrastructure for OER in Turkey has been settled at the micro-level by individual universities. However, the users of these infrastructures are the individual academics. Before COVID-19 the use of infrastructure by academics has increased very sharply. For example, at the METU, the use of LMS infrastructure there were around 500-1000 entries (students and academics). After the COVID-19 measures, 1619 academic staff members and 24734 students have been actively using the LMS system. In May 2020, 1,258,823 sessions were opened by the academics of METU.

4.2 Quality of OER

At the micro-level, individual instructors and professors are responsible for the quality of the resources they provide to their students in their courses. One of the major issues concerning OERs and resources, in general, is copyrights. The current Law of Intellectual and Artistic Property Rights (Code: 6698) has been revised by adding articles 33rd 34th to the Law. These articles are related to the use of resources created by others. According to these articles, as long as the creators are cited the resources can be used for not-for-profit educational processes. However, especially in article33, it was clearly indicated that these can be used in face-to-face educational processes but nothing about open and distance learning. Evidently, there is a shortage of clear legislation about copyrights for educational use of different resources. This legal gap creates hesitation among individuals in sharing their resources in open context. This situation can be considered as a barrier to the dissemination of OERs in Turkey.

Another trend that can also be considered as a barrier for OERs is the administrators' tendency to use their own brand and resources. We, as ODL experts, have been consulting several HE institutions to help them implement remote education successfully since the beginning of March 2020. During this consulting process, we tried to encourage the university administrators for the usage of available resources in the courses as well as in faculty training. However, they resisted using those created by other institutions or faculty members of other institutions because they felt that it wouldn't be appropriate for their reputation and brand. So, they preferred the resources created by their own staff. This was directly mentioned in the personal conversations with almost all the administrators in quite a number of institutions. One can easily relate this situation with the severely competitive structure of the Turkish Education System at all levels including HE. In short, the administrators' hesitation for use of OERs created by others can also be considered as a barrier to the dissemination of OERs and OEPs in Turkey.

Given this fact, quality assurance of OER practices at micro-level functions according to traditional measures in which the individual university and the HEC play the prime function. Although these checks do not reflect quality assurance in conventional understanding, the interventions and measures of individual universities aim at ensuring that the academics fulfill their OER practices according to certain standards. For example, during the ongoing pandemic, the HEC issued several circulars in order to regulate the delivery of online courses. In one of the circulars, HEC identified the principles of conducting online examinations.

On the other hand, as it has mentioned in the earlier section of this chapter, Anadolu University's AKADEMA Platform presents around 120 MOOCs to Turkish speaking audiences at no cost. In almost all the courses a guided study approach is employed that requires interaction with real instructors. The instructors are required to create their own course materials (educational resources) and to license them with Creative Commons' Attribution-ShareAlike 3.0 License (CC BY-SA 3.0). Anyone can access these resources anytime without registering for the courses. In order to secure the quality of these courses, AKADEMA staff uses the OpenupEd Quality Label assessment tool, developed based on EADTU's (European Association for Distance Teaching Universities) E-xellence Label, learner satisfaction surveys, and a few other criteria. The instructors can also use the same resources for self-assessment of their courses. They also receive the results of the assessments and are asked to revise their materials and processes if necessary (AKADEMA, 2020).

Besides these and the THEQC's "Distance Education Working Group", which was elaborated below under the Macro Level Update, no other quality implementations were able to be observed.

4.3 OER Policy

As we stated in macro and meso level reports Turkey possesses a centralized HE system. The governance of the Turkish HE system has been further centralized by the regulation which authorized the president of the state as the ultimate authority in appointing the rectors of the university, which by-passed the university in absolute terms. As a result, like in the case of other critical issues in HE, the issue of OER relies extensively on the decisions of the HEC. As a consequence, the policy formation largely remains to HEC and the president of the state. During the ongoing COVID-19 crisis the measures against the crisis in HE have largely been shaped by the HEC. These measures may sound reasonable given the fact the majority of the universities have not institutionalized their practices. However, interventions in the details (e.g., how to conduct online exams) curb the creativity of the universities, particularly those which have the capacity to be innovative in their measures in OER practices.

During the ongoing pandemic, the HEC has been developing tactics rather than entire policies to institutionalize OER in Turkey. The initial reaction of HEC to the pandemic was to suspend face-to-face classes. However, for a one-week period, the HEC banned delivering the courses remotely. Nevertheless, after one week the same authority ordered the universities to shift into remote teaching for all of the classes. The instructional and assessment strategies were left to the universities. So, each preferred a different approach: a large number of them preferred synchronous online learning and online exams, some text-based traditional open education and assignments, some mixture of all, and so forth. In late May, the HEC decided to end the semester through remote teaching, even for the exams. These decisions indicate the fact that the key authority regulating HE, including OER, in Turkey follows an emergent approach for policy formation.

As it has mentioned above, HEC is willing to transform the YOK Dersleri Platform into an OER repository (Üstün et al., 2021). This intention was announced in the latest guidebook HEC shared (2020a). However, no policy paper was issued, or action was taken.

4.4 OER Change

Based on our observations we argue that the change in the mindsets of the HE administrators, professors, and staff as well as other stakeholders towards advancements in creating, using and sharing of the educational resources openly has been very slow. The copyright issues, shortage of training and support for faculty members, shortage of time and digital skills, lack of incentives (external motivators) as well as the shortage of awareness about the importance and

potential of OERs can be listed as the major barriers for the advancement and dissemination of OERs in micro-level in Turkey. The same list of barriers with slight differences can be given for the institutional level.

On the other hand, there are several changes happening we would like to report. First, some institutions, like Anadolu University, have been working on several incentives for the dissemination of openness among faculty members. Anadolu has announced at the end of 2019 that starting June 2020, it will give at least 50 percent more points to each article or book or any scientific work published in open access journals or resources. For instance, if one professor prefers to publish his work in an open-access journal indexed by SSCI/SCI will get 150 points instead of 100 (Anadolu University, 2020). The main purpose behind this incentive is simply to support the openness movement.

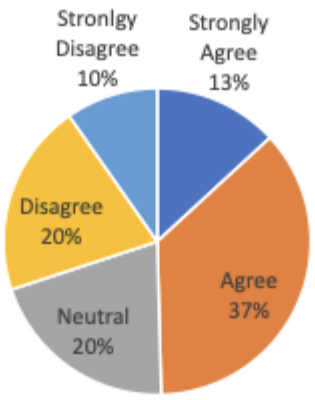
The second change we observed is about the increasing use of social media along with academic social networks among the faculty members to share or promote their publications. Twitter, LinkedIn, Facebook, Instagram, WhatsApp, and personal blogs are the most frequently used ones. These posts in social media definitely help the dissemination of educational resources. An increasing number of professors, even those with limited digital skills, are joining this trend. However, some argue that those who post very often and use some of the marketing tools to promote their posts from the academic integrity and ethics perspective, it seems that these posts help the dissemination of some educational resources openly.

The third change is related to the use of online academic databases provided by the ULAKBIM (the Turkish Academic Network and Information Center) of TUBITAK. ULAKBIM has initiated a project to provide access to the major online databases. The project, entitled EKUAL, helps all the HE institutions, their faculty members, researchers, staff, and students access these globally well-known databases. Although no statistics were found, our personal observations show that an increasing number of people are using these databases on campus or remotely.

The fourth change, although doesn't directly relate to OERs, has just recently occurred as a consequence of the Coronavirus Pandemic. The rapid transition to distance education uncovered the need for quality support services for faculty members and students. The results of a survey study (Aydin, in review) conducted in three different HE institutions located in 3 different provinces in Turkey support this need for quality faculty and student support. Two questionnaires were developed based on the EDUCAUSE DIY Survey Kit: Remote Work and Learning Experiences administered to faculty members and students separately. One of the close-ended items in the questionnaires was about the support services. A large number of the faculty members (86 percent of the total 417 professors) stated that they received satisfactory support at the right time period (Figure 13).

Figure 13

Faculty member responses to the item related to their satisfaction with the support they received



One of the major themes derived during the analysis of the participants' answers to the open-ended question regarding how to improve online distance education in their institution was about the need for constant, flexible, on-time, on-

demand faculty support. One of the participants' responses (from the institution located in Eskisehir) was in a way summarizes what many others indicated in their answers:

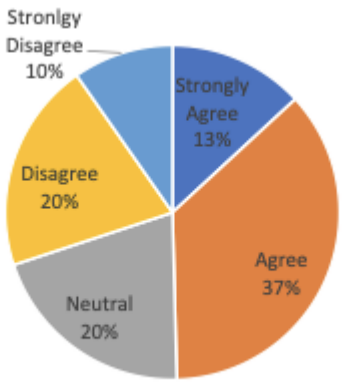
I wish we had some more experience in the technology we have to use now before the Virus [Covid-19]. Also, I regretted that I did not pay attention to distance education before. I always tried to stay away from distance education and believed that it was not really an education. But now I know that it can be as successful as what we do in class, but still it is up to us [as instructors]. Not me but many colleagues still do not know how to teach with technology. We need to learn the technology and also educational ways, or specific online pedagogy to use this technology. However, we do not have time. So, we need help. … Center tries to help us but there are only … [a few] staff and I am ashamed to ask them all the time. There is a need for more structured and formal training and support…

On the other hand, half of the students (50 percent of the total 2224) the students either agree or strongly agree that they received satisfactory support during the remote learning (Figure 14) and similarly one of the themes reached after the analysis of the open-ended question was the support.

As has mentioned above, these results have supported the need for better faculty and student support systems, and as a result, the HEC asked all the HE institutions in Turkey to establish or enrich their Distance Education Centers (UZEMs). Now, almost all the institutions have these centers and try to employ qualified staff.

Figure 14

Student responses to the item related to their satisfaction with the support they received



In brief, change is a long and slow process in Turkey but the pandemic we are going through has definitely been working as a catalyst for the change towards the creation, use, and dissemination of OERs.

5. Coronavirus Period Update for Macro and Meso Levels

5.1 Introduction

During the first couple of weeks, all HE institutions could not do anything except closing all the facilities and sending students, academic and administrative staff home. During the beginning of the pandemic, even the HEC has announced that no distance education will be provided. However, shortly after the first wave of the pandemic, HEC declared the use of distance education strategies to complete the courses. Those who have appropriate technological infrastructure and human resources started to offer online courses starting March 23 while many others just provided some video and text-based materials and assignments via different means (WhatsApp, Web sites, Blogs, email, regular mail) to their students. At the same time, a considerable number of the HE institutions discovered the Zoom, a Web Conferencing tool. In April and May 2020, they offered 40 minutes long synchronous sessions to their students. In general, almost all used the assignments as the major assessment tool. However, those institutions with sufficient technological

infrastructure tried online exams. Although we cannot provide any scientific evidence, our personal observations showed that during this period, Udemy and Khan Academy Turkey as well as the YÖK Dersleri Website (elaborated below) were the most frequently used educational resource repositories.

The following section summarizes what happened countrywide (macro), regional and institutional levels (meso) during the Covid-19 lockdown period in Turkey.

5.2 Macro Level

5.2.1 OER Infrastructure

As has mentioned above, after the first wave of the COVID-19 shock, the HEC has decided to support all the HE institutions by opening up the course materials (those specifically designed and produced for the distance learners) of the major open and distance learning (ODL) providers (Anadolu University, İstanbul University, and Erzurum Ataturk University). The materials are mostly text-based and some video-based, and specifically designed and produced for the distance learners of these ODL providers. A website, entitled YÖK Dersleri (yokdersleri.yok.gov.tr) was built including search and browsing opportunities. Later, another University, METU, also shared its OpenCourseWare (OCW) materials in this portal.

On the other hand, a large number of HE institutions did not have any or sufficient educational delivery infrastructure. A few institutions did have almost nothing; a few others employed internationally known cloud-based LMSs (Blackboard, Desire2Learn, etc.) and Web Conferencing tools (Collaborate, Adobe Connect, etc.); an increasing number of them preferred the Turkey based companies' cloud LMSs (Advancity's ALMS, Vedubox) and a Turkish Web Conferencing tool (Perculus); some others were using the open-source learning management systems (Moodle, Canvas, etc.) along with Web Conferencing tools (BigBlueButton, OpenMeetings, etc.); and finally just a couple of them utilized their own in-house produced LMSs (Anadolu University's eKampus). However, almost all, except those with a background in providing online learning services to a large number of students and those who preferred cloud-based LMSs, experienced technical problems during the first weeks of the lockdown. Later, they improved their bandwidth and server capacities. Also, some decided to use more than one LMS and Web Conferencing tools for their emergency remote teaching. This flexibility and improvements in the infrastructure helped to overcome the problems.

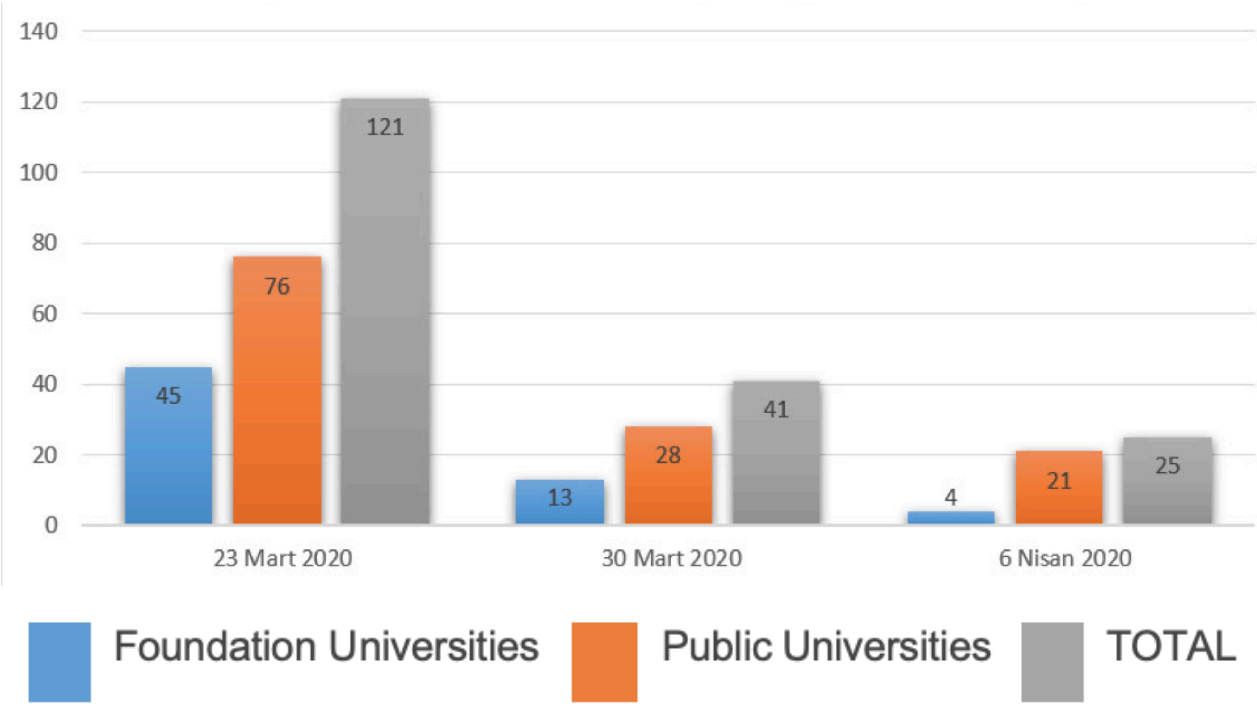
It might be worth mentioning a Turkish company's success during this period. Advancity (2020) was established as a startup in Sakarya University's technology development park by a small group of young entrepreneurs in 1999 and since 2004 focused solely on providing online learning infrastructure to the HE institutions. They first developed their Web Conferencing tool for synchronous online learning, Perculus in 2005 and later in 2010 their LMS, entitled ALMS. Currently, they are serving 70 HE institutions (Advancity, 2020) out of 207 totals in the country and around 800.000 students. In a personal conversation with its CEO (2020, May 23), Cem Atacik expressed that they were also not ready for a huge demand, and during the first weeks they had some difficulties in meeting the demands of their client institutions. They even had to reject some of the new customers (not only in HE but also in K12 institutions) to be able to meet their current customers' needs and expectations. Synchronous sessions, as well as online exam demands, were the most difficult ones for them due to the fact that these features created a tremendous data load to the servers and the software. However, he thinks that they did a good job and according to their own customer satisfaction survey results, a great deal of the HE institutions (almost 80 percent) they serve are quite satisfied. Advancity has plans to establish sort of an OERs environment integrated into the LMS and Web conferencing tool, where professors, institutions will be able to share their course materials with others who are using the same infrastructure.

The most extensive report on academics' use of OER infrastructure in Turkey was reported by HEC (HEC, 2020b). In May, the HEC of Turkey issued a circular ordering the completion of all academic activities (teaching and evaluation) through online infrastructure and the COVID-19 crisis. The HEC reported the performance of 127 public universities and 62 foundation (de facto private university) universities in online teaching. The order of the HEC to complete the academic year with distance education practices has tested the already existing infrastructures of the universities. According to the data retrieved from the universities in Turkey, 121 universities (64%), (76 public, 45 private) adopted the distance teaching (remote teaching) practices on March 23, 2020. The remaining 41 (41%) universities (28 public, and

13 private) universities adapted the remote teaching practices on March 30, 2020 (Figure 15). Although these remote teaching practices which started in the last week of March cannot be categorized as totally OER practices, they tested the infrastructures reported in Macro and meso level reports. Although quality is a very important concern, the fast shift of the universities to remote teaching indicates the capacity of the infrastructures.

Figure 15

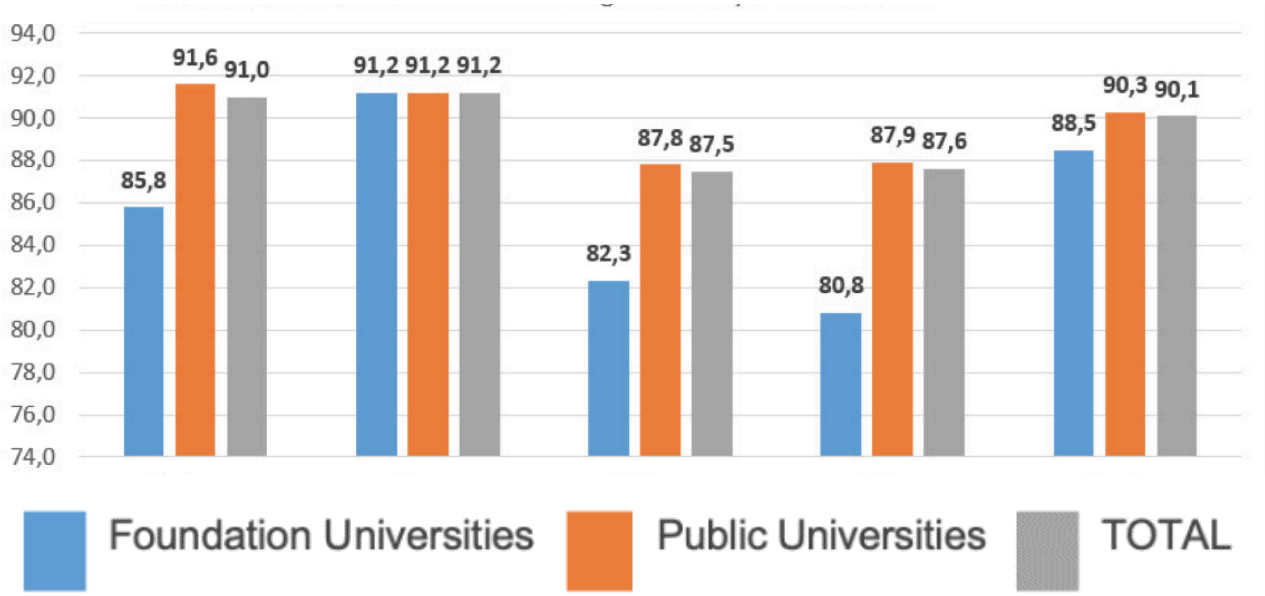
The transition of Turkish universities to online teaching during COVID-19 crisis



The transition of the universities into remote teaching has been reflected upon the number of courses taught by remote teaching practices. Before suspending the in-class, face-to-face teaching in Turkey there were 736,341 courses taught in Turkish universities. After suspending face-to-face teaching Turkish academics offered 663,808 (90,1%) courses in associate degree programs, undergraduate programs, and graduate programs remotely through their universities online and distance education infrastructure (Figure 16). It is important to note that the performance of public universities in offering courses as part of their remote learning practices

Figure 16

Rate of courses transited from face-to-face into remote teaching during COVID-19 crisis



According to the data retrieved by the HEC from individual universities, academics tend to adapt distance teaching for courses classified as "theoretical" courses. The distinction between theoretical and practical courses reflects the thinking that some subjects lend themselves to remote learning while others do not. This distinction is one of the major arguments of the academics in resisting remote teaching (this group of academics initially postponed some part of the courses to accelerated summer semester; however, later on the HEC announced that there will not be an accelerated semester as such). According to HEC data, almost the entire theoretical courses (99,2%) and the great majority of the practical courses (89%) were delivered through remote teaching.

According to HEC data of the total number of courses at the HE level in Turkey, 22% of them were delivered through synchronized teaching. In private universities, this ratio is 53,2% while in public universities the ratio is 29,1%. Interestingly, courses at the graduate level the ratio of synchronized teaching is 50,1% while for associate degree and undergraduate programs it is 22,1% and 17,8% respectively.

When the distribution of remotely taught courses into the discipline of study is considered, social sciences take the lead in remote teaching (91%), followed by basic and natural sciences (78%), engineering (77%). Remote teaching was lowest in health sciences (54%).

According to the same report of HEC, the most challenging part of remote teaching during the pandemic was related to the measurement and evaluation. The reports of the individual academics indicated that during the pandemic they shifted from the traditional in-class exams into homework (90,5%) and/or project (83,1%) based evaluation.

Since the transition into remote teaching was very sharp, it initially caused ambivalent feelings and attitudes on the part of the academics. Limited knowledge and lack of experience in remote teaching were two main causes of resistance on the part of academics. In order to ensure the readiness of the academics the universities provided technical support and short online training. These trainings were provided by the universities' units which are responsible for remote and online teaching and learning.

The final part of the HEC's report is related to the online student support services provided by the universities. During the unfolding pandemic the universities get in contact with their students through traditional media (e.g., SMS and e-mail) (95%). However, some universities went beyond traditional media and provided technical support (91%) and instituted a unit for online contact/communication (70%) with the students. Finally, although it is not covered in the report, some of the universities attempted to provide internet services and hardware for their students in order to ensure just remote teaching for all of their students.

The remote teaching experience during the Pandemic in Turkey will have implications to extend and deepen OER in the country. We anticipate that at the national level the HEC will initiate new policies, programs, and practices for OER, while at the institutional level the universities will increase their investment in OER. For example, an increasing number of universities will re-define their structures to open distance education centers, allocate more resources to these centers and shift some of the teaching and training to these centers.

Another interesting development was observed in K12 education. Before the pandemic, EBA (Educational Informatics Network) of the Ministry of National Education (MoNE), an educational resources platform, was already established and in use by the students, teachers, administrators, and parents. The MoNE announced on March 12, 2020, that all the schools will be closed for at least two weeks, and during this period distance education courses will be provided via EBA starting 23 March 2020. At the same time, they also introduced three state TV channels dedicated to offering educational TV programs related to almost all the courses in every grade level. TV was preferred because not every student in public schools was able to access a computer (laptop, notebook, desktop, tablet, etc.) and the Internet. Through these channels, the MoNE tried to offer K12 education to millions of students. At the same time, in late April, the MoNE had an agreement with Zoom and started to offer synchronous lectures in some grade levels. Every day, thousands of sessions were offered to millions of students by the students' own teachers. This could be one of the largest centralized synchronous session offerings in the world.

5.2.2 Quality of OER

During the pandemic, no quality measures were set or looked for since the emergency situation required easy and fast actions to meet the educational needs of the learners. However, the HEC was working on a guide and it (July 2020) shared its first version with directors of the distance education centers (UZEM) about reopening of HE institutions after the pandemic, which mainly focuses on how distance education, blended or hybrid learning can be implemented in the educational processes. It also included a few parts about the quality of the learning processes but not the quality of the resources.

On the other hand, Turkey established the Turkish Higher Education Quality Council (THEQC) in 2015 in order to evaluate the quality of academic and administrative processes in Turkish HE organizations. The THEQC is an autonomous body and empowered both financially and administratively in order to fulfill its mission in guiding HE institutions in their quality processes. The THEQC has been accredited by the European Association for Quality Assurance in Higher Education (ENQA), an umbrella organization that represents quality assurance organizations from the European Higher Education Area (EHEA) member states and work closely with the Asia Pacific Quality Network (APQN), the International Network for Quality Assurance Agencies in Higher Education (INQAAHE), a world-wide association of 300+ organizations active in the theory and practice of quality assurance in higher education, the Council for Higher Education Accreditation (CHEA) of USA, and the Asia-Pacific Quality Network (APQN). The THEQC has three types of activities: external evaluation of HE institutions, the authorization and recognition processes of accreditation agencies, internalization and dissemination of quality assurance culture in HE institutions (THEQC, 2020a).

The THEQC has developed a set of standards and a rubric to evaluate the HE institutions. However, those standards and the rubric do not include any specific section or any note about open and distance learning as well as OERs or OEPs. Except one part of the rubric includes criteria for the quality of the materials provided to the students in their courses.

The English version of the rubric can be accessed here. In other words, the THEQC does not have a different section or focus on OER, considers OERs like conventional ERs, and apply the same evaluation criteria in evaluating these resources. However, during the pandemic, the THEQC has also focused on online distance education and formed a "Distance Education Working Group" as of 27 March 2020 to be able to guide HE institutions on the components. The working group identified six main components of quality distance education (THEQC, 2020b):

- Distance Education Policy
- Infrastructure and Accessibility
- Competencies
- Learning and Teaching Processes
- Professional Human Resources and Support Services
- Information Security and Ethical Aspects

Along with these components, the working group has also revised the evidence that the institutions applied for accreditation or evaluation can present in their Institutional Self-Evaluation Report Writing Guide. No accreditation or evaluation has been conducted yet according to this revised version of the Guide and the rubric, but accreditation of 13 universities as well as 59 revisits are scheduled to be conducted in late 2020. During these accreditation and evaluation processes, the external evaluators will be using the revised versions and looking for how effectively the HE institutions implemented the ODL. Still, no specific focus on the quality of OERs will be given during these evaluations.

5.2.3 OER Policy

It is difficult to claim that there are broad policy initiatives on open education and OERs or OEPs before the Coronavirus pandemic except for the Principles and Procedures for Distance Education in HE Institutions Act (HEC, 20.02.2014) and Open Higher Education Regulation (06.11.1982 Resmî Gazete #: 17860). This period created awareness about this shortage of policy papers. In conclusion, the HEC's Distance Education Working group, an informal group formed by some experts from different universities working on distance education offerings of their institutions started to be more active in developing policies compared to the prior to the Coronavirus period. Before they were only responsible for examining the new distance education program proposals and reporting their recommendations to the HEC but during the Coronavirus lockdown, they also tried to develop some policy papers to be able to help the universities. HEC's one of first policy papers, the "Pandemic Period Distance Education Applications RoadMap", was issued on March 18, 2020, indicating that the Universities can offer online, open and distance education to complete the semester and use alternative assessments (HEC, 2020a). Later, in April and May, the HEC issued several policies concerning disabled students, academic calendar, final exams, and so forth. One of these policies allowed the institutions to offer 10 to 40 percent of the courses in a program completely online. This might increase the integration and widespread usage of OERs and MOOCs into formal education programs. Lately, in July 2020, the HEC started to work on a guide and shared its first version with directors of the distance education centers (UZEM) about the reopening of HE institutions after the pandemic. In this guide, the HEC provides a series of guidelines and recommendations concerning different aspects of educational processes in the Universities. One part of this guide mentions the HEC's plan for transforming the YÖK Dersleri Platform into an OERs Platform and encourages the institutions to share their resources and the massive open online courses via this platform (HEC, 2020a).

5.2.4 OER Change

Although the pandemic is still unfolding, the HEC, the government agency that takes all the decisions related to HE in Turkey, has already changed a great deal of its previous decisions. For instance, the HEC was not allowing the institutions to offer online education in the fields of science, health, and other applied sciences but the emergency remote education has shown that it is possible to teach online in these fields too. So, the HEC now encourages innovative use of technology in these fields as well as all the others.

Additionally, the need for quality learning materials during the pandemic also created an awareness about the educational resources in Turkish. That was possibly why the HEC included its plan to transform the YÖK Dersleri Platform into an OER Platform. However, there are still several gray areas in this policy paper, such as copyright issues, technological infrastructure, procedures to create and deliver the OERs.

5.3 Meso Level

5.3.1 Infrastructure

As mentioned above, a large number of HE institutions did not have any or sufficient educational delivery infrastructure and the resources to be used in their online courses. In terms of delivery, each institution tried to utilize different alternatives:

- A few didn't have any LMS or any other technological solutions,
- A few others employed internationally known cloud-based LMSs (Blackboard, Desire2Learn, etc.) and Web Conferencing tools (Collaborate, Adobe Connect, etc.),
- Almost one-third of the institutions preferred Turkish third-party solutions (Advancity's ALMS and their Web Conferencing tool, Perculus),
- Some others employed the open-source LMSs (Moodle, Canvas, etc.) along with Web Conferencing tools (BigBlueButton, OpenMeetings, etc.),
- Just a couple of them utilized their own in-house produced LMSs (Anadolu University's eKampus).

Each alternative and each institution had to deal with varying issues and a few common ones, especially during the first weeks of the lockdown in March. For instance, low bandwidth, access to the internet (students, professors), insufficient server setup, problems in customization, heavy simultaneous asynchronous sessions were the major common problems in terms of technological infrastructure. After a while, a big majority has chosen to collaborate with available vendors to be able to cope with these difficulties and also due to lack of skilled technical support staff in their institutions and legal barriers to employing these kinds of staff.

On the other hand, Anadolu University has initiated a technological infrastructure project to be able to help those institutions that do not have any LMS or those who were having difficulties in their LMSs. Anadolu University has been using Canvas and BigBlueButton successfully for years for its face-to-face (on-campus) courses, graduate courses, and certificate programs. With this experience, Anadolu collaborated with the Information Technologies and Communications Agency (BTK), a state institution focusing on the regulation of electronic communications systems in the country. Anadolu set up the same LMS and Web Conferencing tool into BTK's servers and used their internet infrastructure. Anadolu also provided the look and feel customization, and technical support as well as training to the universities that use this system. Since April 2020, around 10 universities have successfully been using Anadolu's this service at no cost, completely free (mergen.btk.gov.tr).

In terms of educational resources, our observations and personal interviews with the available faculty members and administrators have revealed that many institutions let the individual instructors and professors choose the resources they provided to the students. Besides, a great deal of them preferred the materials they had been using in their face-to-face courses, mainly textbooks, presentations, study notes, worksheets, etc. Some prepared their own videos (mostly lectures) by using their mobile devices and Web conferencing tools. A few used Khan Academy Turkey, YouTUBE videos, and the online articles and books provided by ULAKBIM (a state agency established to build Internet and other online services to the universities). On the other hand, only a few institutions provided support for their faculty to create learning materials, mostly videos and texts. But no promotion or encouragement for opening up all these resources was observed.

5.3.2 Quality of OER

Same as macro-level in institutional or regional level no quality measures were set for the educational resources as well as processes due to the need for immediate actions during the pandemic.

5.3.3 OER Change

Our observations have shown that pandemics helped develop awareness at the meso level, too. Institutions have been trying to take actions to improve their technological infrastructure as well as to train their faculty members about finding, creating, and using quality educational resources. The administrators of the HE institutions have initiated

projects to improve their servers, LMSs, Web conferencing tools, and so on; have been looking for experienced experts in instructional design, distance education, assessment, and evaluation to employ; have started to offer online training sessions throughout the summer to improve their professors' knowledge and skills in online teaching and use of digital tools.

5.4 Summary for Coronavirus Period

This report presents digital educational architectures at micro, meso, and macro levels in the Turkish context. At the macro level, both public and private sectors have developed sound policies and practices in order to digitalize their functions. The e-government initiative defines a standard in the digitalization of public services in Turkey. Particularly the policies and structures at a national level are critical in terms of empowering strategies and practices at meso and micro levels. Parallel to the e-government initiative, the HEC has accelerated the digitalization of its functions. The macro-level is critical in setting the digitalization ecology in the country. However, it is difficult to argue that digitalization at the macro level follows similar lines of progress at the meso and micro levels. This is particularly evident in HE and the digitalization of teaching functions at HE institutions. Different universities in Turkey instituted different structures and progress at different levels in the digitalization of their teaching functions. While the Turkish context has a long tradition in open education and digital educational architectures, it was seen that the experience gained is imbalanced. For instance, while some universities have expertise and experience in this regard, some others mostly ignored these aspects and there is a large gap among the universities in terms of digitalization of their functions. At the national, macro level, there is a top-down approach and this strategy hampers the adaptation and widespread use of digital educational architectures which is multiplied with the resistance due to the lack of awareness. The centralized and top-down approach ensures every HE institution has the basic infrastructure. However, the similitude of the entire system curbs the innovative capacities of individual universities. As a result, in the Turkish HE system, only a few universities were able to prove advanced digitalization in HE. Besides, the imbalance between HE institutions in their digitalization practices has negative repercussions on the disadvantaged segments of society. Although digitalization is conceptualized as a social justice tool mitigating the impact of their disadvantaged status these groups have limited access to these infrastructures.

As reported in the meso level on the digitalization of Turkish HE, there is a limited number of joint digitization initiatives at this level. Given the fact that meso level joint initiatives are limited, Turkey needs to progress further at the meso level in the digitalization of HE in order to create an integrated OER ecology. The National Open Courseware Consortium is one of the unique joint initiatives for the dissemination of OERs in Turkey. Instead of joint initiatives, individual institutions, particularly those that have a long tradition in open and distance learning, progressed more in OER than the others. The open courseware movement, MOOCs movement, campus systems movement, and distance education centers movement are the key meso level initiatives for OER in the TurkishHE context. Interestingly, meso level OER initiatives are organized by national-level public organizations such as HEC and the Scientific and Technological Research Council of Turkey.

At the micro-level, there are many infrastructures that are facilitated by central authorities, but they do not specifically adopt the OER/OEP strategy. The most common digitalization infrastructure is the learning management system (LMS). Each institution customizes an LMS according to their own characteristics. These infrastructures mostly serve for storing and delivering educational content. In addition to the LMS, another common infrastructure is the distance education centers of the universities.

Over the last 5 years, with the introduction of faculty performance appraisal and incentive payment for faculty members at public universities, the HECestablished a digital infrastructure in order to evaluate and score the performance of the faculty members. Subsequently, several universities established their own parallel systems which facilitated the transfer of data between micro-level systems (at university level) and macro-level systems (Higher Education Council). This system can be considered as a key digital mechanism connecting two levels in Turkish HE. However, Turkish faculty members prefer to store their academic outputs (books, articles, etc.) in international databases in order to promote these outputs. Many social academic networks (e.g., ResearchGate, Academia, Publons, etc.) fill the gap stemming from the incapability of central structures.

The quality of OER is one of the weakest dimensions in OER practices in Turkey. Unfortunately, there is not a sustainable and institutionalized quality assurance system exclusively for OER at any level. Even the existing quality assurance systems do not possess a separate quality assurance for OER in Turkey. As a result, there is an urgent need for an overarching quality assurance system working at micro, meso, and macro levels for OER in Turkey.

Change and adaptation of OER practices by faculty have been very slow in Turkey as there has not been a clear incentive system or imperative for adopting OER practices. Until now, the micro-level adaptation of digitalization in HE has been progressing on the will of the individual faculty members. Besides, it is important to note that at universities that instituted a culture of OER, the faculty exhibited an intrinsic motivation towards OER. However, at the majority of the universities, such culture has not been evidenced yet.

Overall, the OER and digitalization in HE in Turkey has been very slow and not integrated at macro, meso, and micro levels. However, the unfolding COVID-19 crisis has created an opportunity for advancing digitalization in HE at the macro, meso, and micro levels. It is important to stress that the digital transformation of Turkish HE will not be limited to building certain infrastructures but establishing more full-degree programs at undergraduate and graduate levels. Hence, the recent COVID-19 crisis can be considered as an external catalyst that triggers change and transformation. One peril that may hinder the realization of this opportunity is that students, academics, and academic leaders are espoused to certain weak or bad OER practices under emergency remote teaching. Associating digitalization and OER practices with emergency remote teaching may lead to developing a certain level of resentment towards OER.

6. Overall Conclusion

Turkey has a considerably young and large population, and education has still been seen as one of the major ways of escaping poverty and having a decent living standard. So, an ever-increasing demand for HE has been observed for decades. With more than 200 public and private universities, the Turkish HE education system tries to respond to this demand. Those institutions offering open education, especially Anadolu University's open education system with its approximately 1 million students, have been a solution for this demand. One may easily infer that openness has a critical role in Turkish HE, yet efforts to forge the open education system are needed.

By the second decade of the millennium, the Turkish HE system has made great progress in realizing digital transformation. However, openness is a multifaceted concept, and limiting its capacity to only access solutions can hinder the progress and success of openness in education initiatives.

The negative perception against open education, OER and OEP stand as one of the greatest challenges of the Turkish HE system and further imply that there need to be projects to raise awareness, encourage institutions and motivate individuals.

It is very difficult to observe a systematic program aiming at widening the use of OER. We believe that Turkey needs a sound policy orchestrating the actions for introducing infrastructure, quality, and change at macro, meso, and micro levels. In other words, we see the need for an overarching policy to enrich OER and ensure the effective use of OER. The key target of the policy should be enabling different systems at micro, meso, and macro levels to communicate with each other. Currently, there are infrastructures introduced at meso and macro levels. As we reported at micro-level above, the national level regulatory body, the HEC has introduced the YÖK Dersleri Platform; however, this platform has not gained the momentum to accomplish an integration of the different infrastructures yet. Besides, although they are not common, there are certain infrastructures developed by individual academics within the framework of self-standing projects. Accomplishing a connection and convergence among these infrastructures will be an important step towards enriching the OER and widening its use across the country. While investing in OER it is important to invest in the human resources to run the infrastructures as well as the hardware. In Turkey, prioritizing the hardware and underestimating the role of the human side is very common in public policies. However, both at macro and meso levels locating talents and ensuring that each institution and individual user (typically individual academics) receive necessary support is an important step towards widening the use of OER.

When it comes to quality, the case is not quite different from structure and change. The surveys and analyses that we conducted within the framework of this study show that the current quality frameworks employed at the HE level in Turkey do not recognize OER. In other words, OER does not have any visibility against quality assurance processes employed in Turkish HE organizations. Interestingly, although Turkey possesses a centralized HE system and an autonomous quality assurance system, OER is not recognized as an item for assessment within the framework of quality assurance.

Finally, a key challenge is that a national-level policy is expected to handle attitude change at macro, meso, and micro levels towards OER. Although the COVID-19 accelerated the engagement of the universities, academics, and students with OER, the cool stance towards OER at meso and micro levels is very evident. This reception towards open education practices is not peculiar to the Turkish context. In several different countries, we witness the limited reception of virtual courses (Amirault & Visser, 2010) and online distance programs (Sadykova, 2012). However, in the Turkish context, the misconceptualization of and poor practice of open education augmented the detachment of individual academics and students with OER. It is also important to note that the flagship universities of the country have traditionally put a distance between themselves and open education practices. As we stated in our report at micro, meso, and macro levels, this is largely related to a misunderstanding of the philosophy of openness and the way Turkish scholars and universities perceive openness. As a result, we believe that the overarching policy that we propose should encompass a set of actions to accomplish first a mindset change on the meaning, philosophy, and practices of OER. Building the skills of the academic leaders, academics, and students to build key skills to operate under digitalization and openness would be an important step towards widening the use of OER. Skills such as networked learning, active self-regulated learner skills, media, and digital literacy, autonomy-driven learning, interactive and collaborative learning in an authentic international environment, and open-mindedness are some of the key skills (Rajagopal et al., 2020) that Turkish academic leaders, academics, and students need to build for more effective use of OER.

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8. Appendices

Appendix 1: Turkish Higher Education System

The basic structure of the Turkish National Education System consists of stages of non-compulsory pre-school education; compulsory primary (elementary and middle school) and secondary (high school) education; and higher education. Primary education begins at the age of 5.5 (66 months), lasts eight years and comprises elementary and middle school education, four years each. Secondary education is also four years and divided into two categories as "General High School Education" and " Vocational and Technical High School Education". The entry into these categories is through composite scores obtained from a centralized exam for secondary schools.

The higher education system in Turkey is managed by the HEC which is an autonomous public body responsible for the planning, coordination, governance, and supervision of higher education within the provisions set forth in the Constitution of the Turkish Republic and the Higher Education Law. Both state and non-profit foundation universities are founded by law and subjected to the Higher Education Law and to the regulations enacted in accordance with it.

Higher education in Turkey comprises all post-secondary higher education programmes, consisting of short, first, second, and third cycle degrees in terms of the terminology of the Bologna Process. The structure of Turkish higher education degrees is based on a two-tier system, except for dentistry, pharmacy, medicine and veterinary medicine programmes which have a one-tier system. The duration of these one-tier programmes is five years (300 ECTS) except for medicine which lasts six years (360 ECTS). The qualifications in these one -tier programmes are equivalent to the first cycle (bachelor's) plus second cycle (master's) degree. Undergraduate level of study consists of short cycle (associate's [önlisans]) and first cycle (bachelor's [lisans]) degrees which are awarded after successful completion of full-time two-year (120 ECTS) and four-year (240 ECTS) study programmes, respectively.

Graduate level of study consists of second cycle (master's [yüksek lisans]) and third cycle (doctorate [doktora]) degree programmes. The second cycle is divided into two sub-types named as master without a thesis and master with a thesis. Master programmes without thesis require 60 to 90 ECTS credits and consist of courses and a semester project. 60 ECTS non-thesis master programmes are exceptional and exist in a few disciplines. The master programmes with a thesis require 90 to 120 ECTS credits, which consists of courses, a seminar, and a thesis. Third cycle (doctorate) degree programmes are completed having earned a minimum of 180 ECTS credits, which consists of completion of courses,

passing a proficiency examination and a doctoral thesis. Specialization in medicine, accepted as equivalent to third cycle programmes are carried out within the faculties of medicine, university hospitals and the training hospitals operated by the Ministry of Health.

Universities consist of graduate schools (Institutes) offering second cycle (master's) and third cycle (doctorate) degree programmes, faculties offering first cycle (bachelor's degree) programmes, four-year higher schools offering first cycle (bachelor's) degree programmes with a vocational emphasis and two-year vocational schools offering short cycle (associate's) degree programmes of a strictly vocational nature.

Since 2003, first cycle degree holders may apply directly to third cycle (doctorate) programmes if their performance at the first cycle degree level is exceptionally high and their national central Graduate Education Entrance Examination score is also high, and their application is approved. For these students, theoretical part of the programmes requires additional courses of 60 ECTS credits.

Admission of national students to short and first cycle degree programmes is centralized and based on a nationwide one/two-stage examination(s) conducted by an autonomous public body (Assessment, Selection and Placement Centre [Öğrenci Seçme Yerleştirme Merkezi: ÖSYM]). Candidates gain access to institutions of higher education based on their composite scores consisting of the scores on the selection examination and their high school grade point averages. Admission to graduate programmes is directly conducted by the higher education institutions (HEIs) within the frameworks of the publicly available national and institutional regulations. Admission of foreign students to programmes at all levels of higher education can be done by direct applications of candidates to HEIs based on publicly available national and institutional regulations.

The Turkish National Qualifications Framework for Higher Education (TYYÇ: Türkiye Yükseköğretim Yeterlilikler Çerçevesi): The National Qualifications Framework for Higher Education in Turkey developed with reference to the QF for European Higher Education Area and the EQF for lifelong learning was adopted by the HEC in 2010. The framework has been developed as a part of a single national qualifications framework, which would eventually consists of 8 level national framework covering all levels of educations on completion of the ongoing work at the national level, in which the higher education levels lie on levels between 5 to 8. The levels of the TYYÇ with reference to the European overarching qualifications frameworks as well as that to ECTS credits and student workload are shown below.

* The national credit system is based on contact hours (i.e. theoretical or practical hours per week). 1.0 credit stands for each hour of lecture a week and 0.5 credit stands for each hour of laboratory or practical a week.

The basic structure of the Turkish National Education System consists of non-compulsory pre-school education, compulsory primary (elementary and middle school) and secondary (high school) education, and higher education. Primary education begins at the age of 5.5 (66 months), lasts eight years and involves four years each of elementary and middle school education. Secondary education is also four years but is divided into two categories, "General High School Education" and " Vocational and Technical High School Education". Entry into these categories is based on composite scores obtained from a centralized exam for secondary schools.

The higher education system in Turkey is managed by the Council of Higher Education (CoHE [Yükseköğretim Kurulu: YÖK]), an autonomous public body responsible for the planning, coordination, governance and supervision of higher education within the provisions set forth in the Constitution of the Turkish Republic and the Higher Education Law. Both state and non-profit foundation universities are established on the basis of law and subjected to the Higher Education Law and to the regulations enacted in accordance with it.

Higher education in Turkey includes all post-secondary higher education programs, which consist of short, first, second, and third cycle degrees, in terms of the terminology of the Bologna Process. The structure of Turkish higher education degrees is based on a two-tier system, except for dentistry, pharmacy, medicine and veterinary medicine programs, which have a one-tier system. The duration of these one-tier programs is five years (300 ECTS), except for medicine, which lasts six years (360 ECTS). The qualifications in these one -tier programs are equivalent to the first cycle (bachelor's) plus second cycle (master's) degree. Undergraduate level of study consists of short cycle (associate's [önlisans]) and first cycle (bachelor's [lisans]) degrees which are awarded after successful completion of full-time two-year (120 ECTS) and four-year (240 ECTS) study programs, respectively.

Graduate level of study consists of second cycle (master's [yüksek lisans]) and third cycle (doctorate [doktora]) degree programs. The second cycle is divided into two sub-types, namely, master's without thesis and master's with thesis. Master's programs without thesis require 60 to 90 ECTS credits and consist of courses and a semester project. The 60 ECTS non-thesis master programs are exceptional and exist in only a few disciplines. The master's programs with a thesis require 90 to 120 ECTS credits, which includes courses, a seminar, and a thesis. Third cycle (doctorate) degree programs are completed after having earned a minimum of 180 ECTS credits, which consists of completion of courses, passing a proficiency examination and a doctoral thesis. Specialization in medicine, which is accepted as equivalent to third cycle programs, is carried out within the faculties of medicine, university hospitals and the training hospitals operated by the Ministry of Health.

Universities consist of graduate schools (Institutes) offering second cycle (master's) and third cycle (doctorate) degree programs, faculties offering first cycle (bachelor's degree) programs, four-year higher schools offering first cycle (bachelor's) degree programs with a vocational emphasis and two-year vocational schools offering short cycle (associate's) degree programs of a strictly vocational nature.

Since 2003, first cycle degree holders may apply directly to third cycle (doctorate) programs if their performance at the first cycle degree level is exceptionally high, their national central Graduate Education Entrance Examination score is also high, and their application is approved. For these students, the theoretical part of the programs requires additional courses of 60 ECTS credits.

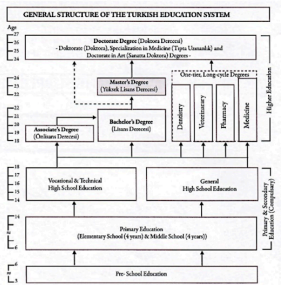
Admission of national students to short and first cycle degree programs is centralized and based on a nationwide one/two-stage examination(s) conducted by an autonomous public body (Assessment, Selection and Placement Center [Öğrenci Seçme Yerleştirme Merkezi: ÖSYM]). Candidates gain access to institutions of higher education based on their composite scores, which consist of their scores on the selection examination and their high school grade point averages. Admission to graduate programs is directly conducted by the higher education institutions (HEIs) within the frameworks of the publicly available national and institutional regulations. Admission of foreign students to programs at all levels of higher education can be done by direct applications of candidates to HEIs based on publicly available national and institutional regulations.

The Turkish National Qualifications Framework for Higher Education (TYYÇ: Türkiye Yükseköğretim Yeterlilikler Çerçevesi): The National Qualifications Framework for Higher Education in Turkey, developed in reference to the QF for European Higher Education Area and the EQF for lifelong learning, was adopted by the CoHE in 2010. The framework has been developed as part of a single national qualification framework, which would eventually consist of an 8-level national framework covering all levels of educations on completion of the ongoing work at the national level, in which the higher education levels lie on levels between 5 to 8. The levels of the TYYÇ corresponding to the European overarching qualifications framework, as well as to ECTS credits and student workload, are shown below.

* The national credit system is based on contact hours (i.e. theoretical or practical hours per week). 1.0 credit stands for each hour of lecture per week, while 0.5 credit stands for each hour of laboratory work or practicum per week.

TYYÇ LEVELS, QUALIFICATIONS TYPES AND ECTS CREDITS

Higher Education Levels/Cycles			AWARDS/ DEGREES	LENGTH (Year)	TOTAL ECTS CREDITS (Year x 60 ECTS)	TOTAL STUDENT WORKLOAD (h) (1 ECTS=25-30h)
QF-EHEA	EQF-LLL	TYYÇ LEVELS				
3	8	8	Doctorate Specialization in Medicine Doctorate in Art	3 (min.)	180 (min.)	4.500 -5.400
2	7	7	Master's Degree	1 - 2	60 -120	1.500 -3.600
1	6	6	Bachelor's Degree	4	240	6.000 - 7.200
Short Cycle	5	5	Associate's Degree	2	120	3.000 - 3.600



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Part III

International Comparison

Macro Level: The Situation at the National or Federal Level

Meso Level: The Situation at the Institutional Level

Micro Level: The Situation at the Level of Teaching and Learning

Conclusions of the International Comparison

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1

Macro Level: The Situation at the National or Federal Level

[1]

The macro level refers to the national and province/state level. Depending on the political structure of each country, it could be that national or province/state levels are more or less relevant in order to understand better the different elements in this level per each aspect: infrastructure (I, central-decentral), quality (Q, national standards), policy (P, national policies) and change (C, national planning, funding).

The research questions posed at the macro level are the following:

- I: How can a national or statewide (technical) infrastructure for the dissemination of (O)ER be described (repositories, hubs…)? What is the technological and technical set-up behind it (meta data standards, host servers etc.) and how is it maintained? What is the relation between public and commercial entities involved (if there are)?
- Q: Do national standards exist with regard to (O)ER and their creation, dissemination and quality assurance? Who are the actors involved in setting and assuring them? How do they relate and adhere to international elearning standards and specifications?
- P: What national or state-wide policies are currently being discussed or are in place with regard to digital infrastructures and their implementation? Which actors are involved?
- C: How is change (in terms of funding, managing and promoting the infrastructure) promoted on the national level? Who drives change on this level (universities, governments, commercial entities…)?

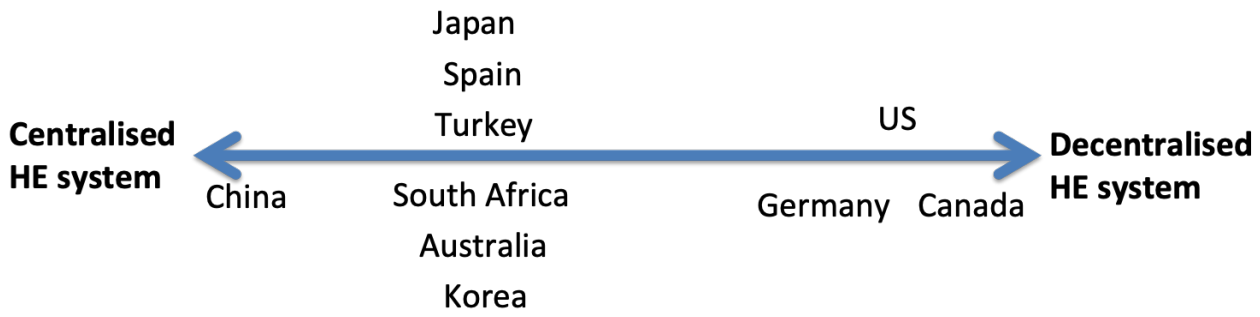
1.1 Infrastructure

(O)ER infrastructures according to degree of centralization of HE systems

In order to understand the HEI (O)ER infrastructure (or their lack thereof), the level of political structure centralization can be examined, as this also influences the structure of the HEIs (see Figure 1) [2].

Figure 1

Spectrum Centralized HE system-Decentralized HE system.



At the national or state level, countries with a highly decentralized HE system do not have (O)ER infrastructures or have underdeveloped infrastructures at the macro level, as is the case in Germany and Canada, as education is a mandate of the provinces and not of the national government of the country.

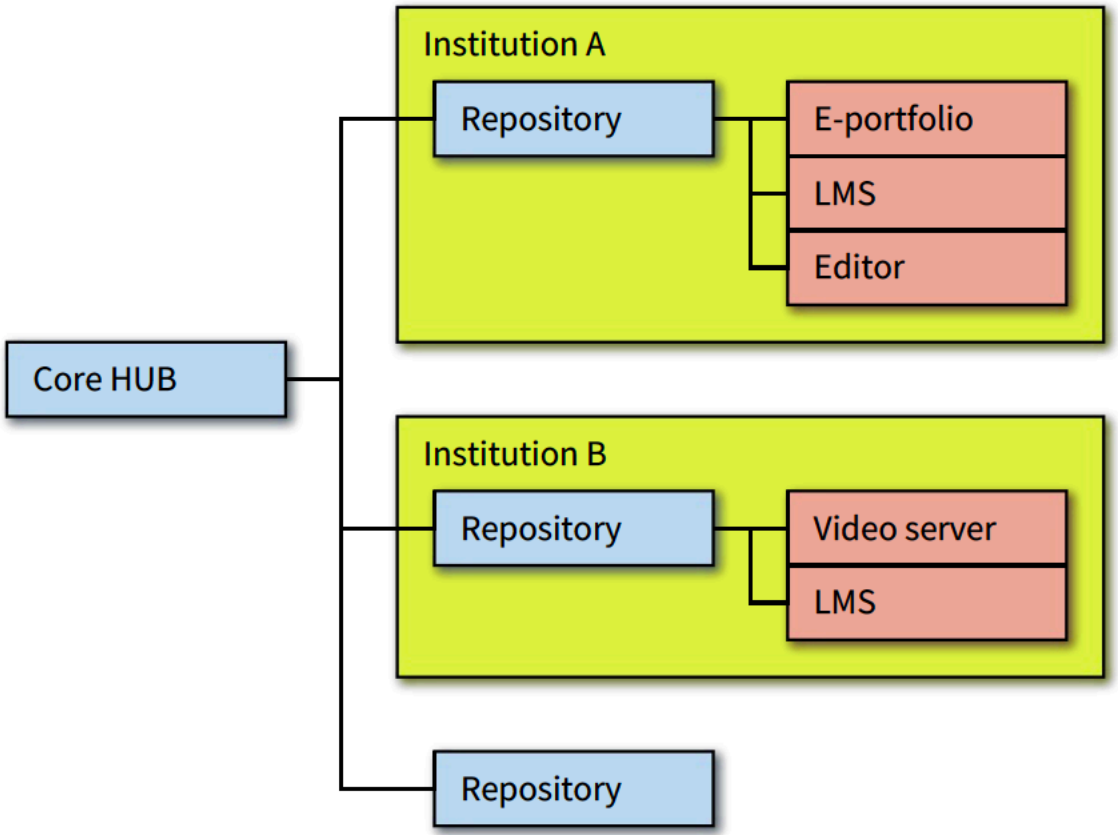
For example, the province of British Columbia (Canada), has developed the BCCampus, which supports numerous educational technology and open learning initiatives and innovations, and BCNET, which facilitates the use of shared services across the post-secondary education sector (e.g., access to Kaltura, Moodle, etc.). The Canadian province of Ontario has as meta-infrastructure ORION as provincial research and education network, and counts with the e-Campus Ontario with 90% of its institutions offering e-Learning.

In the case of the US, initiatives are also highly decentralized and collaboration between provinces about infrastructure happens, but without a national coordination. Examples include the Utah Open Courseware, the Galileo Open Learning Materials or the North Carolina Open Learning Object Repository. Open Syllabus is an interesting initiative hosted by American Assembly (a non-profit public policy institute at Columbia University in New York) and funded by the Hewlett Foundation and other groups that is harvesting data regarding the syllabus of university courses. Platforms arising from individual or company initiatives are used nation-wide (and worldwide). This strategy does not correspond to initiatives from provinces, but rather from individuals or companies, and allows copyright for hosted (O)ER to be maintained as a private good in the US. Examples are iTunes U, Coursera and edX for MOOCs.

In Germany, where many provinces have developed or are developing their own repositories, the creation of parallel structures and the potentially lack of interoperability have become evident. A possible solution is the one proposed by EduArc of creating a hub for all of them (see Figure 2), which is also mentioned in the OER Feasibility Study (Blees et al., 2016). In this study it is highlighted that a national repository is unlikely to happen, but rather a disseminated system exchanging OER information. The White Paper on OER (Deimann et al., 2015) follows along the same lines with some hypotheses that may have high impact possibilities: a (government supported) OER infrastructure is highly unlikely to happen as well as a joint platform for materials, but province or national level OER platforms is highly likely to happen (in fact, it is already under development). Other hypotheses are that Learning Management Systems (LMS) will have interfaces with the OER repository (medium-term likelihood) and that there will be an agreement and timely implementation of OER metadata standards (low likelihood).

Figure 2

Proposed hub of repositories in EduArc (Kerres, Hölterhof, Scharnberg & Schröder, 2019).



Other countries, such as South Africa, state that there is no plan for such national infrastructure, even though they manifest interest on having one due to its potential value in raising the awareness of OER is noted. This potential value of OER, but at the same time lack of awareness, also is observable in Turkey (Kursun, 2011).

Many countries with a rather centralized HE system have national infrastructures, but most of them are not specifically targeted at HE or (O)ER. In the case of Turkey, an unified government system has been developed, which includes the Higher Education Quality Council, the Higher Education Atlas, the Degree Recognition Digital Platform, the Higher Education Information Management System, the National Thesis Center and the Journal Park Project, but it is not directly connected to (O)ER. In 2019-20, Australia is further developing the Unique Student Identifier Service for all HE students, including a tertiary learning repository, but it is not available yet.

There are some exceptions in the countries with a more HE centralized system, where meta-infrastructures can also be found (provision of connectivity services, eduroam, private networks, databases, etc.). For instance, in Spain, RedIRIS provides advanced communication services to the national scientific community and universities (meta-infrastructure). In addition, the Foundation for Science and Technology (FECYT), which is a public agency managed by the Ministry of Economic Affairs and Competition, has developed a national infrastructure to harvest institutional repositories, thematic repositories, journal portals and open access journals (RECOLECTA), which will be described later.

Similarly, South Korea and Japan have their own national providers for meta-infrastructure: the Korea Education Network (KREN), which uses since 2011 a commercial service but receives funds from the government and the universities, and the National Institute of Informatics, respectively. Both countries have also their own national MOOCs and OCWs. In addition, South Korea universities across ten regions have Centers for Teaching and Learning to develop and disseminate educational resources and support the faculty and students since 2000.

The China Education and Research Network (CERNET) is the meta-infrastructure of Chinese HEIs. Chinas has the National e-Learning Resources Center operated by the Open University of China, and the Chinese University MOOC (CUM) that curates and provides MOOCs developed by Chinese universities, and it is operated by the NetEase-Internet technology company and Higher Education Press.

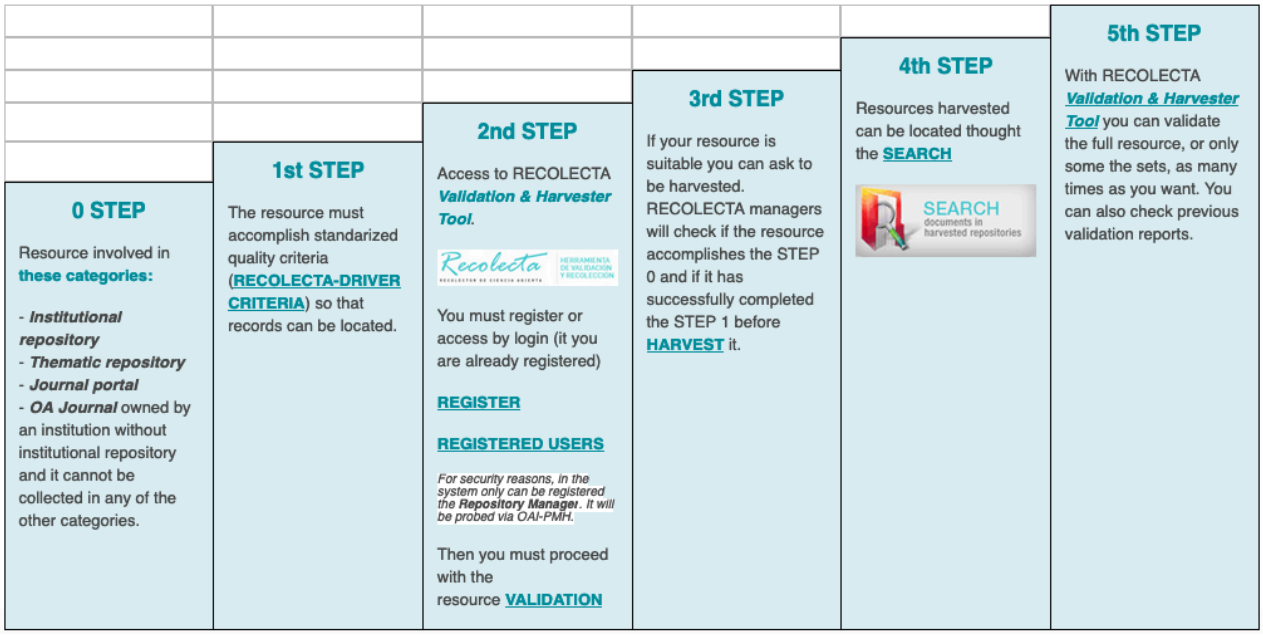
AARNet is a not-for-profit National Research and Education Network that provides the meta-infrastructure of universities and schools in Australia.

As in the report of Germany is noted, whilst the quantity of OER and the discourse surrounding them has proliferated over the past decade, metadata and interoperability still constitute challenges. This is not only a situation of countries where no national (O)ER infrastructures exist or where (O)ER infrastructures do exist but are underdeveloped; it also applies to the countries where there is some kind of national infrastructure. For instance, in a study on the status of digital repositories in Spain and the quality of its metadata, the need for improving this situation is asserted (Medrano, Figuerola & Berrocal, 2012). In this case, national quality standards in adherence to international standards (addressed in the section Quality) and the development of a hub (RECOLECTA) have been developed as a possible solution.

RECOLECTA (Figure 3) is aimed at creating a nationwide infrastructure of Spanish Open Access scientific repositories, which also include educational resources. The RECOLECTA-DRIVER Criteria includes two levels of interoperability: one is the syntactic use of OAI-PMH (Open Archives Initiative-Protocol Metadata Harvesting), which ensures the resource to be harvested correctly, and the second one, the semantic use of OAI_DC vocabularies.

Figure 4

Joining for harvesting process in RECOLECTA.



Public and private infrastructures for production of (O)ER

In terms of (O)ER production, which involves (O)ER initiatives and repositories available (see Figure 5), most countries have embraced OCW and MOOCs, which are considered two of the most popular OER initiatives in HE. The US, South Korea and China are high producers of OER, whereas countries such as Japan and Germany are producing less OER at the national level. Furthermore, Canada and the US are considered the OER pioneers, and many of their initiatives have been popularised and replicated in other countries. Examples are the Canadian Connectivism and Connective Knowledge MOOC (2008) and the popular US MIT Open Courseware (2001) or the Stanford Coursera MOOCs (2011). MIT's EdX and Stanford University's private spinoff company Coursera are by far the largest providers of MOOCs in the US. Some other initiatives have been already mentioned before.

Figure 5

Spectrum Low production of (O)ERs - High production of (O)ERs.

In South Korea and Japan, MOOCs and OCW have been/are being developed; however, OER production in South Korea is much higher than in Japan. The Japan OCW and JMOOC are two membership-based consortia (79 members with 140 courses, 4 private companies as providers) without governmental support. This could explain the differences in OER development and sharing compared to South Korea, where the main actors in OER infrastructure are two organizations funded by the Ministry of Education: the Korea Education and Research Information Service (KERIS), which is in charge of developing, managing and evaluating research products and OER for HEI; and the National Institute for Lifelong Education (NILE), which is hosting and developing K-MOOCs. KERIS has developed and managed 13,000 KOCW and 2,300 videos since 2007, and NILE manages K-MOOCs since 2015 (with over 80 universities and 500 courses in 2018).

China is very much focused on the development of MOOCs (often called "top or high quality open courses" or "State-benchmarking Open Courses") through its own national repository of educational resources for all educational levels and other centralized platforms, for example, the national repository mostly focused on MOOCs (iCourse) or the CUM. China Open Resources for Education (CORE) was the initiative that replicated the MIT Open Courseware in China in 2003. All the repositories are operated (to a lesser or greater degree) by organisations that are affiliated with the Ministry of Education.

In Spain, OCW-Universia[3] unified different Spanish university OCW under the same infrastructure and, 44 Spanish universities published 1,331 OCW courses on their institutional sites between 2007 and 2011, many of them now not available any more or gone for MOOCs (Aranzadi, 2011; Frías-Navarro, Monterde-i-Bort, Pascual-Soler, Badenes-Ribera & Pascual-Mengual, 2014; Martín, González, & Ruiz, 2015; Oliver, Hernández-Leo, Daza, Martín, & Albó, 2014). Many Spanish universities use MiríadaX, a platform for Iberoamerican MOOCs, supported by the private telecommunications company Telefónica Learning Services (Oliver et al., 2014; Oliver Riera, Hernández Leo, & Albó Pérez, 2015), for developing and hosting them. A private and for profit platform to offer courses is Tutellus.

Along the same lines, in the context of the Turkish Academy of Sciences (TUBA) OCW Project a total of 80 courses were developed between 2010 and 2011 in Turkey. Despite the large-scale implementations, it is noted that OER movement is still in awareness stage in Turkey.

Even though innovative digital practices permeate the HE sector in Canada (e.g., MOOCs and Desire2Learn are Canadian innovations), there is a general belief that the sector must engage in radical transformation to remain relevant and successfully respond to the needs and pressures of a digital society (Bates, 2019b). Furthermore, the lack of national oversight could be a major reason why this country seems to be rather an exception in the full adoption of these OER initiatives, and especially of OCWs. Across the Pacific Ocean, Australia has made some move toward national repositories. Although not a national (O)ER repository as such, the Learning & Teaching repository houses OER materials from projects funded by the Australian Government between 1994 and 2018 and is run by the consortium Open Universities Australia (7 public universities and 14 other HE providers) that offers online degrees on a fee-paying basis. The Learning & Teaching repository currently has 694 projects and 1,119 resources with CC BY-SA licenses. Derived from the Open Education Licensing (OEL) research project[4], housed in the repository, the OEL Toolkit is a decision tree system that was developed to support the use and development of OER in the Australian HE sector.

A final remark in this section is that, when developing (O)ER, the issue regarding (O)ER licenses arises as a topic of discussion, especially in countries like South Africa, US and South Korea. In Turkey, a big majority of the educators hesitate to digitize and share due to intellectual copyrights.

1.2 Quality

National quality frameworks for (O)ER infrastructure

Most of the ten countries under investigation do not have any official national standards or quality frameworks specifically for (O)ER and their infrastructure (creation, dissemination, quality assurance); this has been predominantly an issue left to institutions or even to individual faculty members.

For instance, South Africa highlights that individual institutions where OER are placed in a repository have their own quality assurance and these institutions rely on authors' own pride of publication. Similarly, in Japan the quality of OER is left to the hands of the individual universities, although some researchers have developed a quality checklist for OER at the individual level.

Remarkable is the Open Learning Policy Framework (DHET, 2017) of South Africa that refers to funding for infrastructure support and quality measure for sustainable OER, but there is no quality assurance measure in place at this stage.

Despite not existing national quality frameworks for (O)ER and their infrastructure, some of the countries highlight:

- Quality assurance procedures in HE in general (system and program accreditation, not related to OER). For example, the Australian Quality Framework, the Ontario Universities Council on Quality Assurance (Canada), the Higher Education Quality Council (Turkey), the six US Council for Higher Education Accreditation (CHEA)-recognized regional accrediting organizations, or the German Accreditation Council.
- Checklists, guidelines or evaluation guides related to OER:

In Spain, for example, the working group on repositories of the Network of Spanish University Libraries (REBIUN) is currently developing a guide for the evaluation of educational repositories, and it has produced multiple studies and reports on the status of the Spanish digital university repositories.

Likewise, Australia has developed different guidelines related to (O)ER such as the Feasibility Protocol, to assist HEI to make informed decisions on the adoption of OER and OEP at various levels; alongside Supporting OER engagement at Australian Universities, which provides advice on intellectual property rights, copyright and policy; the F.A.I.R. Policy Statement based on international metadata standards, which stresses the need to ensure the Australian research output data remains Findable, Accessible, Interoperable and Reusable; and the Benchmarks for Technology Enhanced Learning (TEL), to assist institutions to improve TEL quality.

In South Korea, KERIS has developed "A Guidebook for Digital Content Development and Management" (2017) to ensure the acceptable quality of online resources and OCW that are shared among the universities or open to the public, evaluate open digital content and online courses developed under the projects funded by the Ministry of Education, and to provide best practices. There are also official documents such as the "Guidelines for K-MOOC Development and Management" by NILE for edX (the MOOC platform for K-MOOCs) (NILE, 2016), which help guide KOCW and K-MOOC development.

Derived from the (scientific) discussion, Mayrberger, Zawacki-Richter and Müskens (2018), and Zawacki-Richter and Mayrberger (2017) made a first attempt for the German case to first outline existing approaches to quality of OER and to then develop tentative projections on how an institution-specific quality assurance approach could potentially look like in the context of the Hamburg Open Online University (HOOU). Although arguing that this institutional endeavor most likely does not or cannot result in a German quality model of OER, Zawacki-Richter and Mayrberger (2017) proposed derived quality dimensions of OER.

Quality actors

The actors involved in OER quality are diverse, depending on the country, however governments, agencies, librarians and other working groups are usually involved.

For example, in the case of Australia, the following actors are mentioned: the Tertiary education quality and Standards Agency, the Australian Government Office for Learning and Teaching (no longer in existence), Universities Australia, the Council of Australian University Librarians, the F.A.I.R. Statement Working Group, and the Australasian Council on Open, Distance and e-Learning.

The case of the US is unique, since many digital education organizations are involved in defining quality for (O)ER, such as Quality Matters or the Online Learning Consortium (OLC), Educause, the Association for the Advancement of Computing in Education (AACE) and the Association for Educational Communications and Technology (AECT).

On the other hand, in Spain an Association for Standardization (public entity with business representation) exists, but the working group on repositories of REBIUN (librarians) and the working group on trends in educational resources and quality criteria in new learning environments of CRUE (universities) are also relevant actors in the quality of (O)ER.

Alternatively, public agencies are deeply involved in OER quality in South Korea and China.

National quality standards for (O)ER

South Korea, Japan, China and Spain highlight own technical standards for (O)ER metadata quality.

The JPCOAR schema is a new metadata standard developed by the Japan Consortium for Open Access Repository (JPCOAR) and has been applied to the content creation of the institutional repositories and focuses on interoperability with established international metadata standards (OpenAIRE, Dublin Core, etc.).

Considering educational metadata schemes and components such as Dublin Core or DC Education and IEEE LTSC LOM, KERIS has introduced the Korea Education Metadata (KEM) standards with nine categories (general, life cycle, metaMetadata, technical, educational, rights, relations, annotation, classification) since 2005 and applied them to the development of educational resources. KOCW applies all categories of KEM3.0 but one (annotation). The Centers for Teaching and Learning collect and manage e-Learning courses and other digital materials following KEM3.0.

In China, in 1999, the Ministry of Education decided to establish the Modern Distance Education Resources Committee (MDERC) and its Expert Panel with the aim to drive the construction of modern distance education resources and assure their quality. In May 2000, MDERC issued Technical Specifications for Modern Distance Education Resources Construction (TSMDERC) (trial version) (MDERC, 2000). This standard focuses on the guidelines for resource developers, production requirements, and functions of the management system, rather than on the data structure of the software system. Parts of the specifications draw on Learning Object Metadata (LOM) model by IEEE LTSC (Learning Technology Standards Committee). However, TSMDERC is not mandatory, nor is it a national standard in the proper sense of the term; rather, it is an association standard. Similar to TSMDERC are the Technical Specifications for State-benchmarking Shared Courses Construction (TSSSCC). In addition to these association standards, there are also national standards in relation to educational digitalization in China. Chinese E-Learning Technology Standardization Committee (CELTSC) has developed dozens of national standards ranging from general guidelines to learning resource, learner, learning environment, education management information, multimedia instruction environment, virtual experiment, learning tool as well as e-textbook and e-schoolbag. Up to December 2018, CELTSC has developed 46 national standards and 12 association standards on educational digitalization (Xin, 2018) (still not compulsory).

In the case of Spain, the Spanish Association for Standardization has developed the UNE 71361:2010 for standardized labeling of digital educational resources based on LOM of LTSC. As in China, it is rather an association standard than a national standard. It includes a list of categories for this labeling and a descriptive table with the different elements of the aggregated and simple data that belong to each category with its corresponding definition. Based on the international validated and accepted standardization initiative LOM of the LTSC created within IEEE, LOM-ES was developed as a metadata schema that considers and satisfies the specific needs of the Spanish educational community. The basic structure of LOM-ES is based on the nine original categories of LOM v1.0 and has being modified in some of the elements (INTEF et a., 2010).

On the other hand, there is a case of development of standard for (O)ER content quality, though not specific for HE: the Spanish (non-binding) UNE 71362:2017 for the quality of digital educational materials. Through this standard different dimensions of the quality of (O)ER are defined; in other words, (O)ER should be evaluated considering their didactic effectiveness, technological effectiveness, and their effectiveness regarding accessibility (Table 1).

Table 1

Quality criteria for digital educational materials (Standard UNE 71632). Sources: adapted from Fernández-Pampillón Cesteros (2017, p.2).

Dimensions		
Didactic effectiveness	**Technological effectiveness**	**Effectiveness regarding accessibility**
Didactic description (didactic value and didactic coherence)	Format and design	Structure of the learning scenario
Quality of the contents	Reusability	Navigation
Ability to generate learning	Portability	Operability
Adaptability	Robustness: technical stability	Accessibility of audiovisual content
Interactivity		Accessibility of text content
Motivation		

Table 1. Quality criteria for digital educational materials (Standard UNE 71632). Sources: adapted from Fernández-Pampillón Cesteros (2017, p.2).

In the creation of the Standard UNE 71632, teaching and learning, technology, accessibility and educational experts from the academic sector, the business sector and the public administration were involved. It provides guidelines to define and assess the quality of digital educational materials quantitatively and qualitatively (Fernández-Pampillón Cesteros, 2017). Fifty-six national and international quality models formed the basis for the first version of the quality model of the standard. The standard defines a digital educational material of quality as being effective from the didactic perspective -good academic results are obtained when the materials are used with reasonable teacher or student effort or dedication-, technological view -simple, reliable, and transparent use-, and accessibility point of view -ease of access and use by any individual, with or without disabilities- (Fernández-Pampillón Cesteros, 2017, p.1). The UNE 71632 norm offers quality indicators to be scored and a rubric to guide this score and guidelines to help the assessment.

We would like to refer here also to the quality criteria of RECOLECTA (Figure 4), as part of national quality standards related to open access resources. The guide for the evaluation of institutional repositories of research is based on international criteria, being the main reference OpenAIRE (Open Access Infrastructure for Research in Europe), and aims at ensuring interoperability of all the open access resources and a quality access to their contents (FECYT, RECOLECTA, CRUE, & REBIUN, 2014). Though this guide is focused on institutional repositories of research, some guidelines may be also applicable to digital educational materials deposited sometimes in those institutional repositories.

It defines 53 evaluation criteria of the repositories, regarding visibility -through its presence in national and international directories and of a normalized name-, policies, legal aspects -regarding intellectual property of the contents distributed-, metadata - metadata characteristics and format that the documents should have-, interoperability, logs and statistics, and security, authenticity and data integrity (FECYT et al., 2014).

While some of those criteria are basic and should be performed, others are just recommended. All have closed answers with values Yes or No to evaluate if the repository complies them or not.

Concerning metadata evaluation criteria, there are some rules that should be applied in order to be harvested in RECOLECTA (FECYT et al., 2014):

- Using the metadata format OAI-DC.
- All the items have the field title (dc:title), description (dc:description) and type of publication (dc:type). This latter has to be assigned according to the type of documents and vocabulary OpenAIRE (European directive) with the document version.
- All the items have the field publication date (dc:date) and it is presented in the established format (norm ISO 8601 - AAAA-MM-DD).
- All the items have the field authors' rights (dc:rights) and information of the level of access, according to vocabulary of types OpenAire.
- All the items have the field author (dc:creator), a field of format (dc:format) according to the registered list of IANA (types of media of Internet- types MIME).
- All the items have the field language (dc:language) according to the established vocabulary (ISO 639-3).
- All the items have the field identification (dc:identifier).
- There exists an indexation policy known by the authors where it is established: language used, keywords, etc.
- Some system of normalized classification is applied (e.g. CDU, UNESCO).
- The metadata exportation is allowed in other format than Dublin Core Simple.
- Some format of technical and/or conservation metadata is used.

1.3 Policy

National and province policies, working papers

As previously mentioned, a country's political structure strongly influences the (lack of) (O)ER infrastructure development. In the case of decentralized countries, there are rather non-binding recommendations published by different actors (e.g. US, Germany), whereas in centralized countries (e.g. South Africa, China) laws and regulations define policies regarding (O)ER infrastructures.

Therefore, in this section we should consider again the Figure 2 (centralized/decentralized HE system), to understand the existence of national/provinces policies or just working papers as recommendations for policy.

The case of China seems to be the clearest example of having developed national policies on digital transformation with its roots in the law of education (Action Plan for invigorating Education towards the 21st Century, 1998), coinciding with the high degree of centralization of its HE system. The Action Plan, Decision, 2019 Outline o China's National Plan for Medium and Long-term Education Reform and Development (2010-2020) devotes a full chapter to the acceleration of digital transformation, including developing and using high quality educational resources on a greater scale. The Ten-Year development plan for educational digitalization (2011-2020) aims at implementing the outline of that overall strategy with action plans and guarantee measures. The current action plans, the Action Plan for Educational Digitalization 2.0, and the Education Modernization 2035 Initiative, point towards the acceleration of digitalization in education, including the development of digital educational resources, and especially, MOOCs, with digital transformation being one of the 10 strategic priorities for education modernization.

On the other hand, an action plan has rarely been developed or provided the necessary follow-through or funding in Japan. For example, the e-Japan Strategy is the foremost official policy concerning the national-level ICT strategies, which also includes HE, that concretely promotes policy and financial support for the creation of faculties for training of high-level data scientists and financial support for university reform, but promotion of digital content creation and distribution is kept for K-12. Whilst the Grand Plan for Japanese Higher Education 2040 highlights the importance of using ICT to improve teaching and learning in HE, it does not establish follow-up plans or support.

In South Korea, the e-Campus Vision for Higher Education (2002) is the HE specific comprehensive digital transformation strategy at the national level to promote the use of ICT. This policy has derived in the Korean government support in the establishment and implementation of 1) e-Learning support centers in the universities across 10 different regions of the country, as well as funded collaborative content development among the universities

located within the same region (Centers for Teaching and Learning), 2) the Integrated Administration and Finance System for Universities, and 3) the Crowd-based Integrated Academic Affairs' System, which will be linked to the Universities' Resources Management System in 2020.

In Turkey, Vision 2023 Framework is regarded as the national roadmap with six macro themes, of which one of them is Education, Science and Technology, which has the ability to affect the educational policies. The services provided by the Council of HE as national level regulatory organization of HE are one of the affected by the political regulation; e.g., integration of student support services to eGovernment platform or the HEC Digital Transformation Project. One of the actions taken within this Framework was the HE Council's (HEC) Digital Transformation Project that intended to support and assist the Turkish HE institutions to complete their digital transformation processes. As the first step in this project, MOOCs-like courses that focused on improvement of digital skills of the faculty members and students were developed and piloted in nine Turkish universities.

In the case of some mid- and all highly-decentralised countries, mostly working papers that aim to influence national/province policy exist; there is no national educational policy. For instance, in Spain, which is organized in a centralized political way, and has national education and HE laws, universities are given a degree of autonomy to organize themselves by creating and proposing study programs according to the established rules. However, most of the working papers come from national actors. To highlight are "Towards an open university. Recommendations for the Spanish University System", which deals with open government, open data and open access of the universities and poses some best practices from different Spanish universities (CRUE, 2014); and "ICT 360º, Digital Transformation at the University" (Cabrero et al., 2017) and "UniversiTIC 2017. The Analysis of ICT in Spanish Universities" (Gómez Ortega, 2017) outline the trends regarding digital transformation at the universities and propose strategic lines of action.

In the case of Australia, provinces have the power to legislate on education, but the national government dominates HE policy. Nevertheless, the Australian Government currently has no explicit OER or OEP policies, framework or regulation for use in HE (Bossu & Stagg, 2018; Stagg et al., 2018), which has affected widespread ongoing adoption, aside from a few project-based initiatives, most of which have since been discontinued. At the province level, the Tasmanian Adult Learning Strategy 2019-2022 focuses on lifelong learning and improving literacy, numeracy and digital literacy, with Phase 2 exploring the development of an online portal/repository. The Western Australian government undertook the first audit of regional telecommunications infrastructure in 2017, and the Northern Territory government has funded The Centre for Appropriate Technology to install 27 mobile hotspots.

On the other hand, the national government of South Africa has developed several policies where OER are referred to (Open Learning Policy and Framework in 2017, White Paper on Post School Education and Training in 2014, Policy for the Provision of distance education in South African universities in 2014, Copyright amendment bill in 2017, E-education policy in 2014 and Operation Phakisa in 2015), but there is no overarching digital infrastructure policy with regard to OER in HE.

Interestingly enough, (O)ER are a featured part of the country HE strategy for enabling and broadening access to HE in Turkey, where the number of university students number has been increasing in recent years, and in South Africa, where access is a matter of discussion (DHET, 2014a; 2014b; 2017). Especially in the case of South Africa, education is considered as part of freedom and a political tool for change. In fact, it has been during many years a tool used to sustain and perpetuate inequality as part of the influence of colonialism and apartheid, which has to be considered carefully when taking into account (O)ER. The White Paper on Post School Education and Training (2014) in South Africa has as its main focus the transformation of the HE system to address those inequalities.

Given the lack of a central educational agency, the Council of Ministers of Education in Canada (CMEC) serves as an overarching body for the discussion of common interests and provides a forum to discuss policy issues, a mechanism through which to undertake activities, projects and initiatives in areas of mutual interest, a means by which to consult and cooperate with national education organizations and the national government, and an instrument to represent the education interests of the provinces internationally. Among the CMEC's priorities in HE, there are HE and the labor market, access and affordability, student transition, sustainability and accountability, and postsecondary learning

outcomes (2016). The province of British Columbia (BC) includes education as a major focus in its 2018/19- 2021/22 strategic plan, describing “investment in education” as “investment in our future.” With regard to post K-12 education, the government of BC notes that students should be provided with “the tools and information they need to find the right career path”. Important to this endeavor is the effort to make education more affordable.

Similarly, in Germany, the Standing Conference of Ministers of Education and Cultural Affairs (KMK) and the German national government elaborate recommendations that aim at the development of policies in the field of digital transformation; for instance and respectively, the strategy papers "Education in the Digital World" (KMK, 2016) and "Shaping digitalization" (Bundesregierung, 2018). In the first recommendation, the provinces promulgate, from their perspective, a joint understanding on the role, challenges and measures to be taken in order to ensure appropriate education on all levels in the context of digital transformation and mention 10 areas of action and development. The first one refers to OER to mention the need of clarifying legislation and providing basic financial means, and the need for inter-institutional cooperation by developing joint infrastructure; it is remarked that digital transformation is a national endeavor. When talking about HE, the latter German policy document mentions enabling digitalization and the development of digital research infrastructures. Apart from this, 13 of 15 German provinces currently have digital agendas that include HE and the prominence of ideas is to strengthen the province HE system and foster inter-institutional cooperation, infrastructures are still addressed at the province-level.

The federal government in the US has developed the National Education Technology Plan (2017) and the initiative GoOpen, which aims to use OER to transform teaching and learning, but leaves the participation up to individual states and institutions. However, other actors/bodies are more relevant in terms of policy (see Actors and bodies). Decision-makers in the US are not only decentralized by states, but also by markets.

In the other countries, some general laws and regulations regarding open access and government, especially related to scientific dissemination works, are available (e.g., "Open Access Dissemination" in Spain, since 2011; "Declaration of Open Government" in Australia in 2010 and "Australian Government Open Access and Licensing Framework" -no longer in existence), which could also be connected to (O)ER and their infrastructures.

Actors and bodies

Actors at this macro level are mainly national and/or province governments and funding bodies. In the case of countries with highly centralized HE systems, main actors are the national government (e.g., China, South Africa, Turkey), whereas in countries with the lowest degree of centralized HE systems, provinces are usually more relevant (e.g., Canada, US, Germany). In any case, we can find other institutions and groups involved with the policy for (O)ER and its infrastructures.

For instance, Australia includes as policy actors: the Office of the Australian Information Commissioner, Innovation and Science Australia, the National Copyright Unit, Infrastructure Australia, Australian Digital Council, Australian Technology Network of Universities and the Business Council of Australia.

In the case of Spain, the CRUE (universities), the REBIUN (librarians), the FECYT (public agency for the promotion of science) and the CEOE (business sector) are involved.

South Korea has as main actors the two public agencies that were mentioned in previous sections (KERIS and NILE). In Japan, policy support for private sector donations is currently being discussed.

In the US, apart from the province level policies (for online education and digital education resources), the education organizations (regional and digital organizations), the individual faculty members, the ICT start-up models, and foundations (Hewlett, Gates, Open Society Foundation) are the real actors (for policy and change).

In Germany, apart from the top-to-bottom province level policies too, there are also diverse bodies that influence policy bottom-to-top. Apart from the Hochschulforum Digitalisierung (HFD) as independent national platform and driver of the discourse and policy on HE in the digital age, there are province networks that influence each province policy. For example, ELAN e.V. in Lower Saxony, or the DH-NRW in North Rhine-Westphalia.

1.4 Change

Initiatives to promote change

The most relevant action for the promotion of (O)ER and their infrastructures at the macro level consists of national digital strategies (involving investment/budget from respective Ministries or Departments of Education) or national funding initiatives, which were mentioned for all countries except Japan [5], whether they have a rather centralized or decentralized structure. These are not usually just focused on (O)ER and their infrastructure, but digital education aspects are highlighted. In the case of the US, the federal government does have funding bodies for academic research, and special educational funding initiatives, but it does not provide operational funding for education at any level.

For example, the Canadian national funding agency SSHRC (the Social Science and Humanities Research Council) provides generous funding for projects in national competitions, and digital educational initiatives are especially considered. National government spearheads these kinds of initiatives and provides national support for some aspects in the provinces. For instance, this support is mentioned to be available in Ontario for some university research, student assistance, and some programs (Canadian studies, literacy training, and international education).

In Spain, the Ministry of Science, Innovation and Universities announces annually calls for R&D projects oriented to the society challenges focused on contributing to the solution to social, economical and technological problems in mainstream way; one of its main topics is "Digital economy, society and culture".

In Germany, there are large-scale tenders promoted by the national government (Federal Ministry of Education and Research, the BMBF) as part of the cluster Research in digital higher education. The 2016 tender funded 20 projects related to OER (Mayrberger, 2018). Current tenders have rather a broader focus within digital higher education such as trends and new paradigms, innovation and discipline-based use of technology.

South Korea has several funding schemes for HEI digital transformation, which is also an evaluation criterion of HEI, and budget from the Ministry of Education includes special funds for blended learning universities, entrepreneurship efforts by universities and globalization of HE.

The national government of Australia is investing in Australia's National Research Infrastructure to 2028-29.

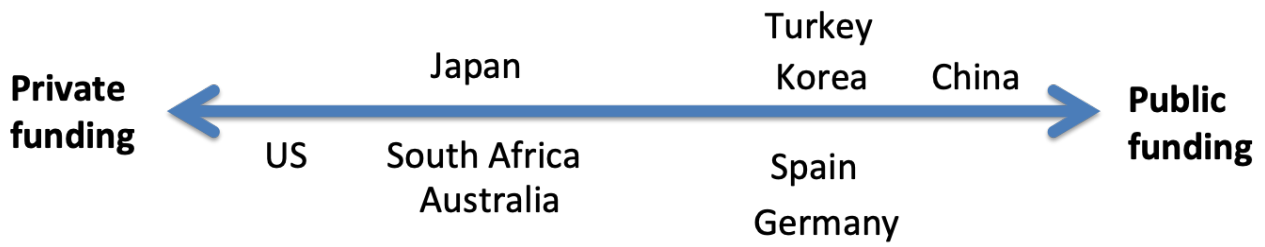
In South Africa, the National Treasury dedicates and channels public funding for OER. Another measure includes Teaching Development Grants (funded by the South African Department of Higher Education and Training) will be used to encourage collaborative development and use of OER, and the Policy allows for the sharing of OER with other countries especially when these are released under an open license that permits adaptation.

China includes in its digital transformation strategies investment for OER initiatives, and especially for the creation, development and sharing of MOOCs. Though China's highly centralized HE system and funds coming from the State Council, enterprises, institutions, public organizations and individuals are encouraged to invest in HE.

Some of the countries under investigation also have private funding initiatives, with private institutions particularly involved in (O)ER initiatives in specific countries (see Figure 5).

Figure 5

Spectrum Private funding - public funding.



Crucially, private foundations have been an important source for funding (O)ER initiatives in the US. In particular, the Hewlett Foundation [6] has contributed over $70 million to open education initiatives and continues to provide strong support. Other foundations include are the Gates Foundation and the Open Society Foundation. However, individuals starting companies (like TeacherTube) and organizations (like Khan Academy) have also initiated what some might consider open education.

The growth and development of these initiatives calls into debate what counts as open education. Figure 6 indicates a possible spectrum of open education in the United States.

Figure 6

Spectrum of Open Education in the US.

At the left end of the spectrum is the definition of open from the Open Knowledge Foundation, which involves the ability to use, reuse and redistribute content freely. Next are practices and resources where the data or content can be used at no immediate financial cost, but the user is knowingly or unknowingly giving the organization or company personal user data. The adage for this approach is: “If the product is free, the product is you”. The visible product -educational content – is free. But behind the scenes, the real product is user data, which providers can then sell for commercial purposes. At the far end of the spectrum, the product is initially financially free, but the user has to eventually pay for premium services (e.g. credentials for MOOCs). There may even be user data collected that is shared for commercial purposes.

Google and Microsoft have been particularly interested in South African education. In addition, it is remarked that even though guidelines and a vision have been put forward in the Open Learning Policy in South Africa, change in terms of driving an open philosophy in education as foreseen by various policies and frameworks, has not yet materialized.

At the right end of the spectrum, for instance in South Korea, policy and funding for venture entrepreneurship efforts of HEIs is to be currently highlighted.

In the case of Spain, companies such as Vodafone or foundations like the one from the BBVA bank have been offering private funding for projects related to digital transformation at the universities (though not specifically on (O)ER). Academic networks and organizations have also been offering modest funds for one-year projects, prizes or awards for the creation of (O)ER (in the past, OCW; and now MOOCs).

Additionally to public and private funding initiatives in Spain, the creation (and teaching) of (O)ERs/MOOCs is regarded as a complementary merit for university teacher accreditations by the National Agency of Evaluation of the Quality and Accreditation (ANECA).

Honorable titles and funding in the form of online course subsidies are also available for the development of MOOCs in China (the so-called State-benchmarking Open Courses).

Agents for change

Agents at this level are mostly national and provincial governments (their ministries in charge of funding and investment on digital infrastructure, especially in HEI) (e.g. Spain, South Korea, Germany, China), national funding agencies (e.g. Canada) and private organizations (e.g. US). However, other bodies could also be involved, depending on the country.

In Australia, the macro level agents for change are government, university and industry bodies. One major agent for change in Australia is Infrastructure Australia (IA), which is an independent statutory body that audits Australia's infrastructure needs, developing 15 year rolling plans to identify state and national priorities. Another is Innovation and Science Australia, which is an advisory board to the Australian Government, providing recommendations on innovation, research and science. The Australian Digital Council was developed in 2018 to help foster across-government collaboration on data and digital transformation, and includes ministers from each province. The Australian Technology Network of Universities (ATN) is a consortium of four research-intensive universities (University of Technology Sydney, RMIT University, University of South Australia and Curtin University), which educates 20% of Australian university students. ATN has a particular focus on industry collaboration, with over 18,000 industry partnerships, and one of its prime objectives is to influence government policy formation. The Business Council of Australia is also heavily invested in improving post-secondary education and skills. The Australasian Open Access Strategy Group (AOASG) advocates for Open and Fair Australasian research and is supported by 19 Australian universities, alongside eight New Zealand institutions and two affiliate organizations.

In the case of British Columbia (Canada), the Open Learning Agency, Thompson Rivers Open University and Royal Roads University are leading digital transformation in HE in the last 30 years.

In the case of Germany, the Hochschulforum Digitalisierung (HFD) is an important think tank, advisory body and actor that promotes policy-practice-research dialogue. It provides impetus for change at the national level, along with national funding, although the execution of projects is through provinces and institutions. Two other community-platforms relevant for the promotion of change in the field of OER are OERinfo, which is focused on fostering broader visibility of OER and reaching out to new target groups, and the OER World Map, which is aimed at providing the most complete and comprehensive picture of the global OER movement.

Although there are agents for change at the macro level, change has been reported to happen mostly at the other levels in the majority of countries. For instance, change especially occurs at the institutional level in South Africa, Japan, Australia, Turkey[7] and Spain; and at the micro level (led by individual faculty members) in the US and Japan, but also in Australia. In the case of Canada and Germany, agents for change are mostly located at the provincial level. In the case of Turkey, it seems that a "ceremonial change" is often happening, which means that there are general policies but then there is the individual vision and the institutional vision.

Exceptions include China[8] and South Korea, where change happens mainly at the national level, due to the political structure of those countries.

[1] A reduced version of this chapter has been published in the following reference: Marín, V. I., Bond, M., Zawacki-Richter, O., Aydin, C. H., Bedenlier, S., Bozkurt, A., Conrad, D., Jung, I., Kondakci, Y., Prinsloo, P., Qayyum, A., Roberts, J., Sangrà, A., Slagter van Tryon, P. J., Veletsianos, G., & Xiao, J. (2020). A Comparative Study of National Infrastructures for Digital (Open) Educational Resources in Higher Education. *Open Praxis, 12*(2), 241–256. https://edtechbooks.org/-tMNo

[2] Although we describe here the level of centralization of HEIs, we are referring to the political structure of the countries, which influences the structure of the HE systems.

[3] Universia is a higher education network supported by the Santander Bank formed by 1,341 universities of 23 Iberoamerican countries (79 universities in Spain).

[4] A joint research and development project undertaken by Swinburne University of Technology and the University of Tasmania in 2015/16.

[5] Japan rarely provides funding for HEI digital transformation related to (O)ER.

[6] Philanthropic arm of the early computer and information technology William Hewlett.

[7] Although Turkey has a highly centralized system, the change, or initiatives regarding OER come from public institutions that have a long history of open education, such as Anadolu, Ataturk and METU.

[8] Change in China also happens at the meso and micro levels in China, although compared to the Government, the other forces are far less significant.

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2

Meso Level: The Situation at the Institutional Level

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The meso level looks at the institutional level; in other words, at the higher education institutions. The same aspects as in the macro level were analyzed, with different focuses: infrastructure (I, federal, regional networks), quality (Q, institutional quality assurance), policy (P, regulatory frameworks) and change (C, strategy, organization, professional development).

The research questions posed at the meso level are as follows:

- I: How can regional networks or consortia be described that establish or jointly create infrastructures for the dissemination of (O)ER, are there subject-based platforms in place? How does communication and exchange occur between repositories, servers, e.g. how are these mediated between macro, meso and micro level? What is the relation between public and commercial entities involved (if there are)?
- Q: Which kinds of institutional quality assurance mechanisms exist and how are they operated? Who are the actors involved in setting and assuring them? How do they relate and adhere to international e-learning standards and specifications?
- P: What kind of regulatory frameworks exists within which HEIs operate? Which actors are involved?
- C: How does institutional strategic planning occur with regard to digital infrastructures? Which approaches are being used (top-down or bottom-up) to foster change regarding the digital infrastructure?

In this section we use some examples (concrete universities) to illustrate the aspects regarding infrastructure, quality, policy and change. Some of the better examples in this report for (O)ER infrastructure, policy, quality and/or change are shown as follows (see Table 1):

Table 1

Examples per country at the meso level.

Countries	Example 1	Example 2	Example 3
Australia	University of Wollongong (public research university)	University of Technology Sydney (UTS) (public research university)	-
Canada	University of Windsor (Ontario) (public comprehensive university)	University of British Columbia (BC) (top public research university)	-
China	Peking University (PKU) (top public research university)	Tsinghua University (top public research university)	Beijing Normal University (BNU) (top public research university)
Germany	University of Duisburg-Essen (NRW) (large public university)	University of Hamburg (top large public university)	-

Countries	Example 1	Example 2	Example 3
Japan	University of Tokyo (UTokyo) (top, public university)	University H (UH) (large public university)	International Christian University (ICU) (small, private liberal arts college)
South Africa	University of Cape Town (UCT) (public research university)	University of South Africa (Unisa) (the largest open distance education university)	-
South Korea	Seoul National University (SNU) (top public university)	C University (CU) (large private university)	-
Spain	International University of La Rioja (UNIR) (private open university)	University Jaume I (public university)	University Carlos III of Madrid (UC3M) (top public university)
Turkey	Atatürk University (public open university)	Anadolu University (top, large public open university)	Middle East Technical University (METU) (public technical university)

Although most of the work in which the meso level report is, as well as in the macro level, based on desk research, some country reports included other methods: (casual) interviews / inquiries (Canada, South Korea, Japan, Spain, Australia, South Africa), survey (Australia) and content analysis of digitalization plans (China, Germany, Australia, Spain).

1.1 Infrastructure

In terms of institutional infrastructures, we can identify different situations. A common one is the existence of independent (O)ER infrastructures per each university, especially institutional (O)ER repositories. This happens in all the countries, although not in all the universities of each country (see examples in Table 2). In some cases, the individual institutional infrastructures mainly addressed research outputs and not (O)ER as understood in this report; for instance, in Australia, Canada (not in the Table) and South Africa. In China, the use of third-party (O)ER infrastructure seems to be more common.

Table 2

Examples of individual institutional (O)ER infrastructures in each country.

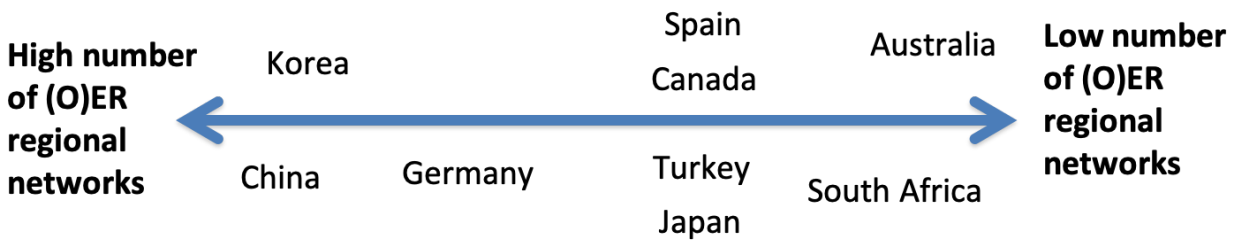
Countries	Examples of institutional (O)ER infrastructures
Australia	• OpenPractice at University of Southern Queensland (OCW)
Germany	• OpenRUB (University of Bochum) • OER an der Universität Duisburg-Essen • Offenen FernUni Hagen
Japan	• UTokyo OCW • ICU OCW

Countries	Examples of institutional (O)ER infrastructures
Turkey	Institutional (O)ER repositories: • METU: OCW, OpenMETU (only for students and faculty), MOOCs (Bigels) • Anadolu University: MOOCs (AKADEMA), Yunus Emre: New Generation Learning Portal • Ataturk University: MOOCs (AtademiX, private provider)
South Africa	• Unisa Open (outside of the institutional repository) • OpenUCT
South Korea	• SNU OCW and K-MOOCs
Spain	• Universitat Jaume I: OCW, MOOCs and other (O)ER, also indexed in MDX Integrated (O)ER infrastructures: • PoliformaT (UPV): LMS Sakai, two video repositories (an open platform and a restricted one for students and faculty) and two repositories for online courses (Open EdX) • UC3M Digital: OCW, MiriadaX courses, Khan Academy Zero Courses, Youtube Edu, iTunesU

Some of the countries count with a higher to lower number of (O)ER regional networks or consortia that build upon a common infrastructure (see Figure 1). Prominently China, but also South Korea, are highlighted as having higher numbers of consortia. Also, Germany has shared infrastructures for (O)ER regional networks almost in every federal state and other (O)ER consortia that go beyond the states. On the other hand, countries such as Spain, Turkey, Canada and Japan have some (O)ER consortia, but their focus is rather on individual institutional (O)ER infrastructures (if any). (O)ER consortia in South Africa, and to lesser extent in Australia too, are based on a few international networks rather than national interinstitutional infrastructures.

Figure 1

Spectrum High-Low number of (O)ER regional networks.



In the following sections, the countries' regional networks and consortia, as well as the communication and exchange systems between infrastructures are detailed.

Regional Networks and Consortia

From high to low number of (O)ER shared infrastructures, we describe the situation for each country.

In China, the cooperation between HEIs and cooperation between HEIs and research institutes, the business sectors and/or other institutions is encouraged in The Higher Education Law and the Ministry of Education's Action Plan for Educational Digitalization 2.0 (MOE, 2018) aiming at establishing an integrated 'Internet Plus Education' mega-platform to integrate public educational resource platforms and support systems of various sorts and at various levels with the aim of building a public system of national digital educational resources. One of the proposed actions is cooperation between HEIs and other social sectors in developing top quality MOOCs (MOE, 2018). Despite consistent support from

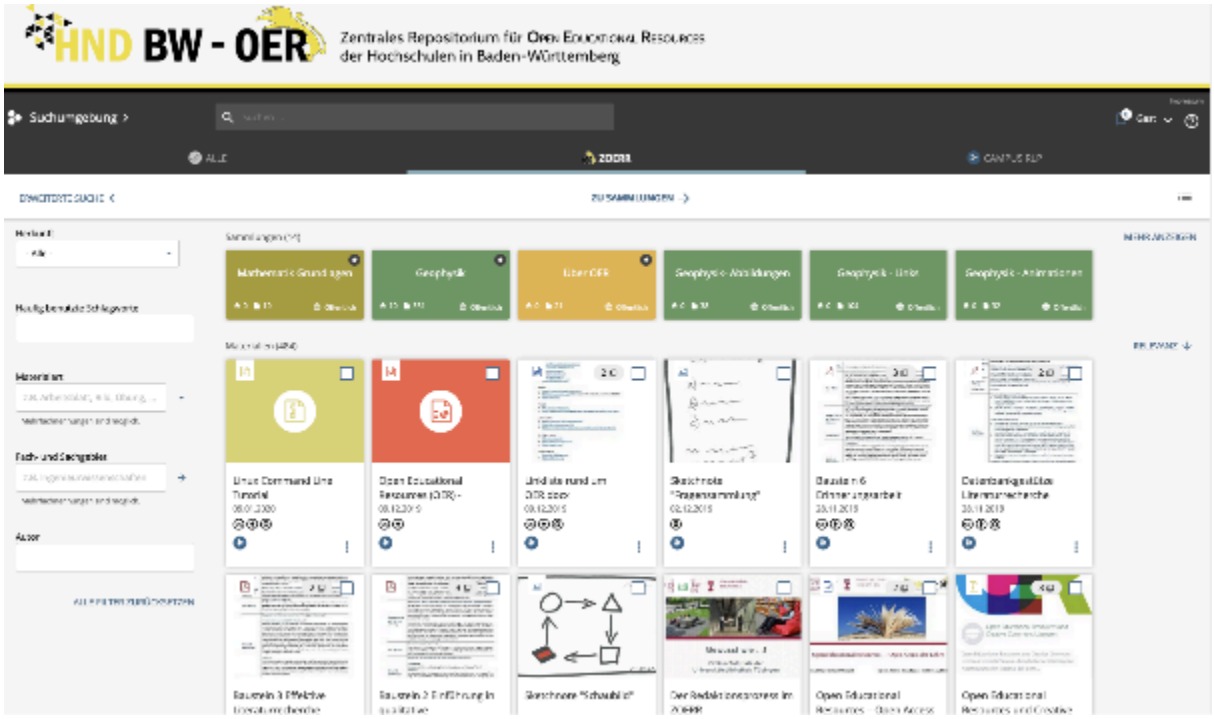
the Central Government, a more effective mechanism is needed to ensure the sustainability of joint efforts, according to Dong et al. (2017). Cooperation in educational resource development and sharing is also influenced by relevant factors. For example, in terms of policy support, recognition and transfer of credits acquired from learning open or sharable educational resources, appraisal of the quality of these educational resources, accreditation of the operation of their platforms, and protection of copyrights, among other things, should be institutionalized (Hu, et al., 2015). Some examples of Chinese shared (O)ER infrastructure are CNMOOC (Top Chinese University MOOC Alliance, open, non-profit, cooperative educational platform, with 101 partner institutions, including 92 universities and nine other institutions), UOOC (Alliance of local universities in China, with 125 member institutions, open for their students) and WEMOOC (with 132 member institutions). In addition to CNMOOC, UOOC and WEMOOC, there are several Chinese regional/alliance platforms which are hosted by the provider CNMOOC. Some of these regional platforms are hosted on the website of MOE's Higher Education Press. Some other alliance platforms are hosted by a digital technology company on its course platform – Zhihuishu (Wisdom Tree). In addition to these alliances, there are also examples of subject-based partnerships in China, which are hosted by CNMOOC, iCourse and Zhihuishu; for example, within the computer science (e.g. China HEI Computer Education MOOC Alliance), library science (Library and Library Science Online Course Alliance), mathematics (China HEI Mathematical Modeling Course Center), music (Huaxia Yuefu Music Online Course Union, foreign trade (Foreign Trade Vocational Education MOOC Alliance), medicine (Traditional Chinese Medicine HEI Course Sharing Alliance) or foreign studies (China MOOCs for Foreign Studies).

As in China, OER and open education are considered a key strategy for national competitiveness in HE in South Korea. As such, and apart from KERIS and NILE as the two government-funded organisations for OER, there are different partnerships and consortia involving HE institutions in different regions of the country. For instance, a) the partnership between the World Bank's Open Learning Campus and Seoul National University, Seoul Metropolitan Government and Korea Development Institute to offer online courses and video lectures; b) the partnership between Korea's National Digital Library of Congress and Creative Commons Korea to provide open licensing to their content; c) the e-Learning Cluster as example of collaboration between e-Learning Support Centres of 50 HEIs, e-learning companies and research institutes in the Southeast region to develop online content related to Korean cultural studies for university credit and vocational training content for lifelong education; d) the KCU consortium has over 80 member HEIs and its infrastructures is managed by a commercial company; e) the ACU-OCW as a Korean government-funded ASEAN Cyber University Project to develop a collection of OER in English in various formats targeting the ASEAN member countries; or f) the Seoul's "A Shared University" initiative, a shared platform where 57 universities of Seoul share courses, educational resources, and co-develop and provide MOOCs.

Next to the Asian countries, Germany counts with several (O)ER consortia that include shared infrastructures. Many of the different federal states have developed their shared OER repositories for HE, and others are in process of developing them. Among the federal states with advanced examples of (O)ER shared infrastructure, many of which derived from cooperation projects, NRW and BW stand out (Gilch et al., 2019, pp. 240). Some interinstitutional consortia in NRW are, for example, NRW Digitale Hochschule, a cooperation association of 42 HE institutions and the NRW Ministry of Culture and Science that aims at establishing a shared infrastructure in NRW for digital transformation. Within this network, the development of a Landesportal DH.NRW is planned and some of the current projects and funding lines are involved with the HE digital infrastructure for OER in NRW, e.g. OER-Content.NRW [1] . Another example is digiLL, a cooperation for pre-service teacher training between 7 universities. The learning modules are created in the infrastructure of each university (each LMS), then reviewed and received feedback before being shared in the digiLL repository. Similarly targeting a platform and reusable, open contents, is the project "DIGI-KOMP.NRW" from a consortium of various NRW HEIs that aims to provide study materials for beginning and first year students in order to close gaps in knowledge between school and HE. In the case of BW, we can highlight the HE Network Digitisation of Teaching Baden-Württemberg for the cooperative further development of digitally supported university teaching. One of the thematic groups of the network is OER. Another thematic group of the network that relates to EduArc is "cooperative e-Learning insfrastructures", which aims at the further development of the IT infrastructure required for the digitisation of teaching by using cross-university synergies and creating cooperative approaches. Among the projects the network develops, the development of a central OER-repository for all universities in BW as a service of the university library of Tübingen (Central repository for OER of the universities in BW- ZOERR, see Figure 2) stands out.

Figure 2

ZOERR portal



Other examples outside NRW and BW are the Virtual University Bavaria (VHB) in the state of Bayern, a cooperation with shared online courses between a network of 9 universities, 17 universities of applied sciences and 4 other HE institutions in Bayern; and the HOOU consortia, which offers online courses and materials in HE created by HE institutions located in Hamburg.

Consortia in countries with a lower number of (O)ER shared institutional infrastructures (Japan, Turkey, Canada and Spain) are described next.

In the case of Japan, there are only a few examples of consortia for OER at the institutional level, which were also addressed in the macro level (JOCW and JMOOC). JOCW is a consortium developed in collaboration with the MIT and the top six universities in Japan, with 13 regular member institutions and 7 associate member institutions [2]. JMOOC operates as a corporation with over 80 member institutions including universities, private companies and academic and professional associations. JMOOC is a multiplatform consisting of four platforms: Gacco, OpenLearning Japan, Fisdom and OUJ MOOC, whereas only the latter is from a university (Open University Japan) and the others are private providers. Most of the JMOOC member universities use Gacco or OpenLearning Japan; and the commercial sector uses Fisdom. Commercial entities are active members of JMOOC and participate in the creation and delivery of MOOCs in collaboration with universities and academic associations.

As in Japan, there is almost no shared infrastructure for the digitization of HE in Turkey. As was mentioned in the macro level report, the OCW Project can be shown as one of the few examples of the initiatives that offered shared infrastructure for dissemination of OERs in Turkey (45 universities participated). Another example was launched in 2017 by a couple of entrepreneurs, intended to create a Coursera like environment in Turkey, entitled as UniversitePlus. Currently they collaborate with three major universities.

Canada shows a similar case. The provinces analyzed have own isolated (O)ER consortia initiatives within the province (eCampusOntario in Ontario and Open Textbooks in BC), even though not all HEIs in those provinces are involved. What is most remarkable in Canada is the consortium of libraries, which are better connected in terms of (O)ER than HEIs. eCampusOntario is the most inclusive collaboration and largest, most over-arching and ambitious OER resource in

Ontario. It aims at implementing and maintaining digital access projects, developing and implementing metadata strategies, and digital curation and OER development and promotion. It is managed by a government-appointed board and provides educators and learners access to over 250 free and openly-licensed educational resources by hosting its Open Library in collaboration with BCcampus. One recent OER project of BCcampus worth mentioning is the open homework system; in addition, BCcampus is evaluating open source options for hosting and developing an open source system for use in the province.

In the case of Spain, the HE network Universia had a major role in the past in promoting the project OCW in Spain, as mentioned before in the macro level report. Another HE network related to (O)ER is the G-9, which shares a virtual learning platform based on Moodle where elective courses for students and professional development courses for teachers are offered for free from any of the 9 universities involved in the network. HE consortia related to sharing (O)ER repositories at the institutional level that are worth mentioned are: MDX and UniMOOC. MDX (Materials Docents en Xarxa) is an (O)ER cooperative repository supported by the Consortia of University Services of Catalonia (CSUC) and shared by 9 Catalan universities and a Valencian university with the aim of increasing the visibility and promotion of the teaching production of the participating institutions, of contributing to educational innovation and the free access to knowledge. UniMOOC is a MOOC platform addressed at offering online learning to entrepreneurs. Two universities, some organizations and foundations, as well as training centers and private companies are partners of UniMOOC. Before the international MOOC platforms MiriadaX and Coursera, UCATx was a consortium of universities in Catalonia that used Open edX technology for providing MOOCs.

In Australia, a several HEI have partnerships with other international organizations or institutions on OER creation and storage. The only inter-institutional alliance in Australian HE found is the Open Textbook Initiative, a joint effort between 6 universities. The 'Find a textbook' facility of the initiative, enables academics to search within the catalogues of the institutions. The international organizations with partnerships with Australian HE include the MIT Open Education Consortium, OpenLearn, FutureLearn, OER Foundation, WikiEducator/WikiResearcher, OER University, Community College Consortium for OER, College Open Textbooks Community, OpenDOAR, Flat World and OER World Map.

In South Africa, most repositories are individual university-based. An exception is the OERTerm Bank, hosted by UCT and derived from the collaboration between the South African Department of Higher Education and Training, the University of Pretoria and UCT. Some initiatives are based on the general context of Africa and involve HEIs in South Africa, e.g. UCT or the University of Pretoria with OER Africa, University of Fort Hare, Unisa and University of Pretoria with Teacher Education in Sub Saharan Africa (TESSA) (initiative started by the Open University, UK). Some of those initiatives developed subject-based repositories (medicine in the African Health OER Network within OER Africa; teacher education in TESSA).

Communication and exchange

In this section, technical communication and exchange structures between infrastructures are addressed per each country. We have to note that most of the countries do not have them.

For instance, in Japan, where the infrastructure of JOCW and JMOOC is decentralised, JOCW HEIs members have established and maintained their own server and platform and created their portal linked to the website of JOCW; but there is no communication and exchange structures between the servers and repositories of the member institutions in JMOOC; the homepage offers just a course search function across the platforms.

In the case of Turkey, most efforts of connecting major sub-systems of a campus system have been focused on integrating HEIs to the central network (eGovernment services and students support services); OER related platforms such as MOOCs are independent and there is not a jointly established infrastructure. However, some digital systems and repositories in HEI in Turkey are compatible with the OAI-PHM protocol, OEC and OpenAIRE, and have a connection with EOSC (e.g., OpenMETU of METU).

Similarly, in Canada there are no communication and exchange systems as such. As rather an exception, via an ongoing effort between eCampusOntario and Ryerson University in Toronto, the Open Library is integrated with the publishing

infrastructure. eCampusOntario also supports “enhancements to the PressbooksEDU platform, including the integration of H5P interactive content, version tracking, and cloning support” (Open Library, n.d.). However, there is no infrastructure collaboration happening between BCCampus and eCampusOntario. Instead, processes seem to be shared between the two (e.g., open textbook review processes).

The case of South Africa is similar to the previous situations described. However, it is interesting to note a study in the UCT. In a project funded by the Shuttleworth Foundation (the Opening Scholarship project), the researchers discovered the existence of many shared materials as well as the lack of their visibility due to the absence of metadata. Therefore, they decided “... from the outset that the planned [OER] directory should operate as a portal for accessing content rather than hosting content, as initial investigations showed that most teaching materials at UCT were already online” (Hodgkinson-Williams et al, 2013, p. 36) [3] .

On the other hand, countries with a higher number of interinstitutional consortia have some examples of communication and exchange structures.

In China, an integrated system with systematic coordination of general administration and learning and teaching support is seen as a solution to digitalization. The iCourse platform was created to host all the institutional top-quality video open and shared courses, and some universities were also expected to create an aggregator linking to their own course (e.g. PKU).

The Digital Jingshi portal at BNU provides an institutional example of integrated infrastructure. It provides unified access to all online information and resources and provides a single gate for releasing and sharing university information, and access any service. Building on BNU’s previous systems, such as IPv6 and digital libraries, a unified Service Center for Educational Resources (shown in Figure 3) has been established within the Digital Jingshi portal, in order to provide different groups of users with high-quality learning resources, including online courses, teaching courseware, and scientific and technical literature. The Service Center for Educational Resources supports massive retrieval, storage, publishing, uploading and downloading of various types of digital files, thus effectively promoting the co-construction and sharing of high-quality educational resources.

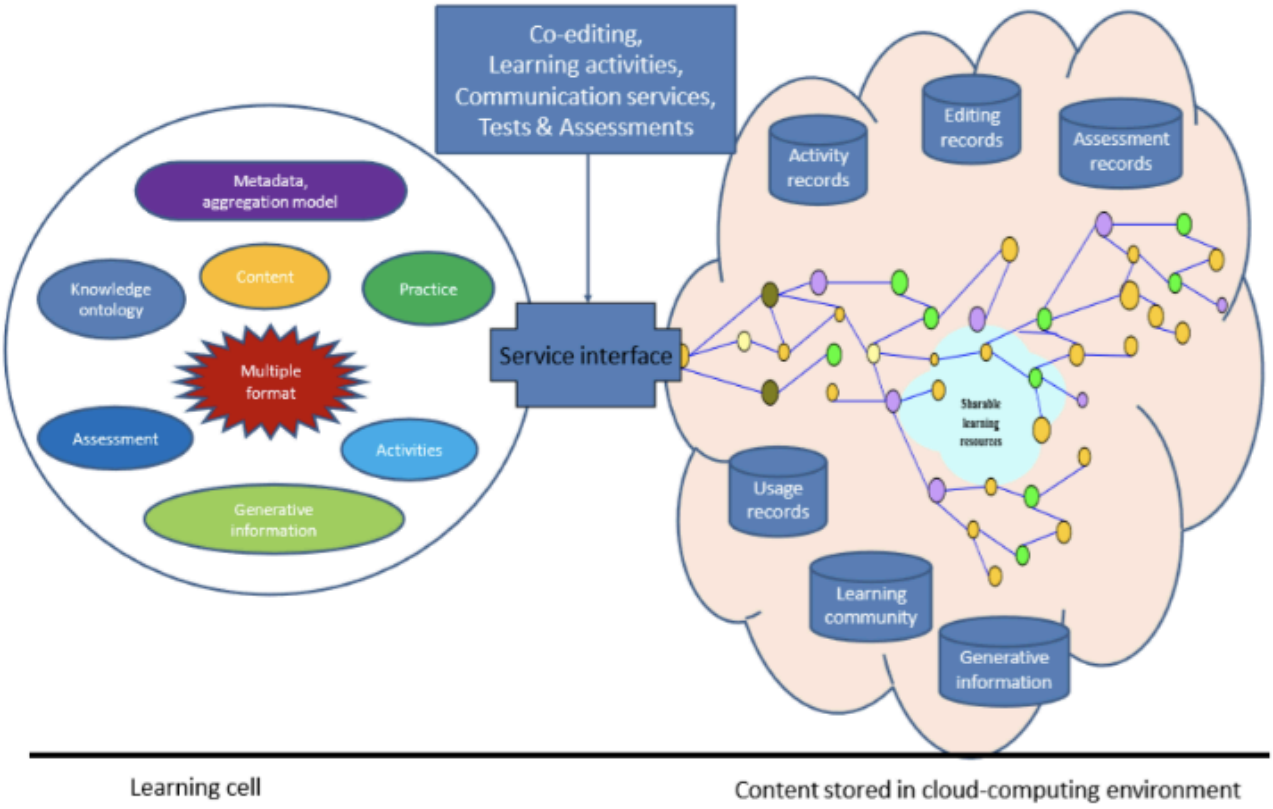
Figure 3

Digital Jingshi portal at BNU.

Another example is BNU, which has independently developed the learning system 'Learning Cell Knowledge Community' (LCKC), which includes six modules: learning cell, knowledge group, knowledge cloud, learning tool, learning community, and personal space (Yang, Yu & Zhang, 2013). Using the learning object model, the concept of a learning cell implies that a learning resource is open, generative, evolvable, connected, cohesive, intelligent, adaptive and social (Yu, Yang & Cheng, 2009). The core functions of the LCKC include the creation of learning cells, collaborative editing, interpersonal network construction and sharing, a collaborative creation of knowledge ontology, community learning and interaction, personal knowledge maps, intelligent recommendations, and personalized learning (Beijing Normal University, 2020). On the LCKC platform, a learning resource can be created independently or co-developed by connecting to a personalized knowledge network, which contains metadata, aggregation models, knowledge ontology, learning content, learning assessments, learning activities, generative information, learning service interfaces and other resources (see Figure 4). Metadata is used to describe the attributes of learning cells, so that they can be easily categorized, indexed and shared (Yu, Yang, Cheng & Wang, 2015). To ensure the security of data revision a content version management function is implemented in the LCKC (Yu, Duan & Cui, 2019).

Figure 4

The cloud storage model for ubiquitous learning resources (LCKC).

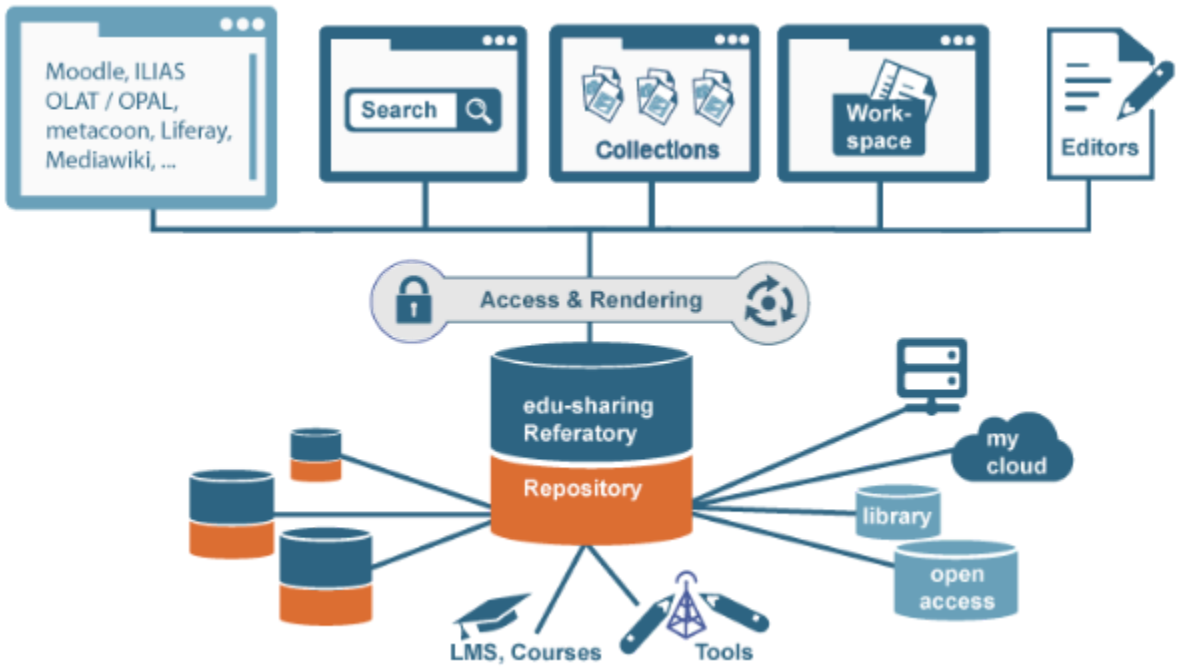


In the case of South Korea, KERIS works as a centralised infrastructure for KOCW for universities and other organisations (e.g. public organisations and commercial companies). KERIS manages the courses and integrates a search engine to search by academic field and by theme, but these are created by the institutions. The institutions are also the ones that upload the courses to the KOCW platform and disseminate them via each institution's course information sharing system or KOCW content server. Upon request to KERIS, the institutions can have a module for collecting real-time course usage data. On the other hand, NILE operates infrastructure for K-MOOCs based on edX, including the LMS, the course development tool (Studio) and the data management tool (insights). The K-MOOC server is linked to the national Online Lifelong Learner Portal server and the Academic Credit Banking System.

In Germany, there are mostly no mechanisms for communication and exchange between institutional infrastructures. Edu-sharing is an exception. It is an open source solution coordinated as a consortium that connects OER repositories (co-operative creation, management and usage of learning objects) between HE institutions in different federal states involved. There are four networked installations, among which three universities are involved (Bauhaus Universität Weimar, FernUniversität and Universität Leipzig). Non-commercial and commercial institutions are invited to apply for a fee-based membership in the edu-sharing association. It is based on the Alfresco document management system and offers interfaces to systems such as Moodle, ILIAS, OLAT and MediaWiki, as well as content items as SCORM-courses, QTI-compliant tests and drills, and H5P-objects, being each repository still an independent content-pool (see Figure 5). The authors acknowledged that "the main difficulty in acquiring users lies in the fact that our main target group are not individuals but educational institutions that recognise the benefits of cross-institutional sharing of educational experience and cooperative development of scholarly content. [...] We have also good chances that edu-sharing be adopted as part of the e-learning infrastructure for the universities in Thuringia, Germany, and we are optimistic that ongoing negotiations with several other German universities will end positively" (Klebl, Krämer & Zobel, 2010, p.949-950).

Figure 5

Architecture of edu-sharing.



ZOERR is an OER repository based on edu-sharing and the html pages for the OER include metadata in a LRMI format, so that they would be easier to find through search engines. One of its main current goals is to connect with other OER repositories, in order to use the same access and reach a broader offer of OER. In a first phase, the Virtual Campus Rheinland-Pfalz (Campus RLP) is being connected.

In Spain, a high percentage of teaching materials in open access and the common practice of duplicate publication of OER and incompatibility among institutional platforms (virtual campus and open repositories) and external platforms (Youtube, Slideshare, Issuu) is highlighted (Santos-Hermosa et al., 2019). Some universities have integrated platforms that include the different institutional (O)ER spaces, but these are usually only linked, without systems of communication and exchange between platforms. For the case of (O)ER repositories, open access policies apply. The commitments include the coordination with institutions of the university system in order to allow national (e.g. RECOLECTA) and international (e.g. DRIVER) academic and research production collectors to collect the produced knowledge by the universities and give access to it. This implies the use of standard protocols of exchange of metadata

(e.g. OAI-PMH, Dublin Core). According to Santos-Hermosa et al. (2019), 92.5% of the universities use the OAI-MHP protocol for their interoperability For example, the open access policy of the UOC (2010) highlights the use of OAI-PMH, OAI-ORE and SWORD as standard metadata exchange protocols. As a concrete example, MdX is based on DSpace and uses the interoperability protocol OAI to share (O)ER metadata between the partner institutions. The basic metadata collected per item is as follows (see Figure 6):

Figure 6

(O)ER Metadata in MdX.

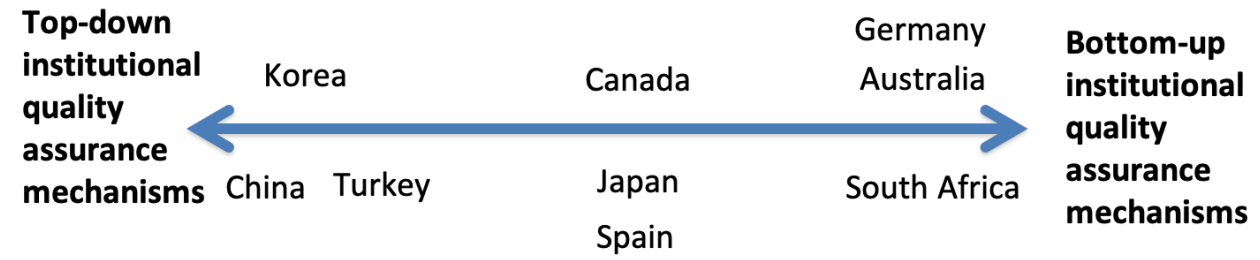
dc.contributor.author	Universitat de Barcelona. CRAI
dc.date	2016-10-10T17:18:31Z
dc.date	2016-10-10T17:18:31Z
dc.date	2018-09-26
dc.date.accessioned	2019-10-22T03:26:49Z
dc.date.available	2019-10-22T03:26:49Z
dc.date.issued	2019-10-22T03:26:49Z
dc.identifier.uri	http://hdl.handle.net/2445/68287
dc.format	3 min.
dc.format	video/mp4
dc.language.iso	cat
dc.rights	cc-by (c) Universitat de Barcelona. CRAI, 2016
dc.rights	info:eu-repo/semantics/openAccess
dc.rights	http://creativecommons.org/licenses/by/3.0/es/
dc.subject	Formació d'usuaris
dc.subject	Universitat de Barcelona. CRAI
dc.subject	Universitat de Barcelona. CRAI Unitat de Serveis a Usuaris
dc.subject	CRAI Audiovisual
dc.title	Com accedir als recursos electrònics: revistes, llibres i bases de dades [vídeo]. Curs 2018-19
dc.type	info:eu-repo/semantics/other

1.2 Quality

Concerning quality at the institutional level, we can distinguish between: a) countries with (binding) top-down institutional quality assurance mechanisms for (O)ER derived from national regulations such as China, South Korea and Turkey; b) countries with HEI with their own independent institutional guidelines for (O)ER quality assurance mechanisms (Japan, Spain, Canada), and c) countries with basically non-existent institutional (O)ER quality assurance processes, which are left up to the individuals (Germany, Australia, South Africa) (bottom-up approach) (see Figure 7).

Figure 7

Spectrum Approaches in institutional quality assurance mechanisms.



Institutional quality assurance mechanisms

Starting with the countries in group a), all interinstitutional alliances/platforms in China have their quality assurance mechanisms. These regulations derive from the MOE, which also considers carefully the quality assurance of the "Top-quality Courses" projects based on an 'annual self-review form' to report improvements in each course within five years, and has a committee to review the annual self-review forms with regard to the course proposals[4]. As an example, UOOC has established relevant rules and regulations to ensure its successful and effective operation, including Charter of UOOC Alliance, Regulations on UOOC Alliance Construction and Operation, and Regulations on Quality Assurance and Mutual Recognition of Credits from UOOC MOOCs. UOOC members have also to follow UOOC Rules for MOOC Production, which covers identification of courses to be developed as MOOCs, course production, course uploading, organization of instruction, and quality assurance mechanism with an attachment detailing technical specifications for creating a video lecture. WEMOOC also puts Regulations on Course Quality Assurance in place to guide course development, management of instructional quality, quality evaluation, and research. China HEI Computer Education MOOC Alliance issued its Guidelines on Course Development and has three committees in relation to quality assurance, namely Training Committee, Quality Specification Committee and Course Development Committee, each of which has to obey their respective rules and regulations. Overall, the quality assurance measures of individual institutions may have nuances, varying slightly one way or another, but the core is basically the same (for example, Jilin University, Tonghua Normal University or Yanbian University).

In Korea, individual universities commonly set up their own quality assurance mechanisms for OER, but these are based on KERIS' centralized quality assurance system and guidebook for KOCW, and the NILE's standardized quality assurance mechanism and guidelines for K-MOOCs. Both government organisms (KERIS and NILE) are in charge of evaluating institutional KOCW and KMOOCs respectively. In the case of NILE, the two-stage evaluation (design and testing) is conducted by a team of both internal and external content experts and educational technologists. The existence of an institutional quality assurance mechanism for OER is one of the Ministry of Education evaluation criteria of universities. In addition, a plan for quality assurance is included as an important criterion for funding K-MOOCs during the initial MOOC selection stage. In addition, Korean universities have faculty manuals to ensure that university teachers would create and publish quality (O)ER, being used as quality assurance guidelines for (O)ER development and management. As an institutional example, SNU's Centre of Teaching and Learning (CLT) developed internal evaluation criteria for OCW and other types of OER like MOOC and formed the Content Quality Management Committee, who is responsible for quality assurance of the university's OER. The CTL has also developed a faculty manual in both Korean and English to help its faculty members to design, develop and utilize the online course management system linked to the academic management system, and also offers periodic faculty development sessions.

In Turkey, the issue of improving and securing quality in HE has become one of the main concerns. However, the quality assurance studies in HE carried out so far have not produced concrete results within the field of (O)ER yet. In Turkey, the quality assurance systems at HE level are regulated by the HEC's Higher Education Quality Council (HECQ). Although this is a national level quality assurance mechanism, the policy and practices of this council directly applies to the individual higher education organizations. HECQ applies two quality assurance mechanisms: self-assessment (internal assessment) and external assessments. "Accessibility" (to (O)ER) forms an important criterion in the internal quality assurance of individual HE organizations in Turkey. For example, Anadolu University's quality assurance mechanism is based on Higher Education Quality Assurance System, which sets out the principles that regards to the authorization of

independent external evaluation institutions, accreditation processes, and internal-external quality assurance of education and research activities as well as administrative services of HEIs.

Among countries in b), we found cases in which own institutional quality mechanisms have been developed.

Unlike China, Korea and Turkey, there are no common quality assurance guidelines or criteria in Japan. Each member institution of JOCW and/or JMOOC is responsible for setting up its own quality assurance system. JMOOC has a committee consisting of three experts in instructional design and online learning from the universities to oversee the quality of MOOCs and examine if the courses fulfil the quality standards as a MOOC. This committee evaluates the course development plans (optionally) submitted by the universities in advance against a set of (internal) quality assurance criteria - this could be helpful to get funding from JMOOC. As an institutional example, UH's Center for Open Education uses a set of key performance indicators related to well-established instructional design strategies for online courses for creating and implementing OCW and other OER. Another example is ICU, who does not have institutional level quality assurance guidelines or criteria for creating its OCW. In this case, its CTL contacts individual faculty members (known to be good teachers) across different disciplines to develop some of their class sessions as OCW. The CTL offers also a faculty development program that includes the integration of various types of OER in their class. On the other hand, some small-scale consortia have developed their own set of quality assurance guidelines in order to share online courses. For example, a consortium of Shikoku's five national universities developed the "Instructional Design Guidelines for Common Online Courses" to be applied in efficient online course development in those five member universities (Nemoto, Takahashi, & Takeoka, 2015; Takahashi, 2018).

As in Japan, each university in Spain with services supporting the development of (O)ER has institutional quality assurance mechanisms/guidelines and guides to support faculty in that task. In some cases, these guidelines are derived from the to get funding for the creation and publication of (O)ER. For instance, the Institute of Educational Sciences (Faculty Training Unit) and the Area of Information and Communication systems (IT) of the Universitat Politècnica de València (UPV) have published a guide called "Learning objects as resource for university teaching: criteria for its creation". The criteria should be fulfilled by the (O)ER created within the Online Teaching Plan funding scheme of the UPV, and the quality of the materials is supported by the provision of multiple documents and templates for the development of (O)ER.

Another example is the Universidad de Alicante, which defines the criteria of the MOOCs and NOOCs to be created by the faculty members based on the call for OER funding: workload of 40 hours / 4-9 weeks (MOOCs) or 15-20 hours / 2-3 weeks (NOOCs), structure organized in modules, inclusion of resources (audiovisual, theoretical of support, and evaluation), incorporation of an introductory module, use of a communication channel, intellectual property (CC) and pedagogical quality (autonomous learning and diversity for presenting contents). Among the commitments of the beneficiaries are to publish the course materials in the institutional repository and host the course, with free self-enrolment, in one of the following platforms: Moodle formación-UA (part of the institutional VLE), Google Course Builder-UA or MiríadaX. The participants are also allowed to host the course in other open internal or external platforms. Another interesting case is the UC3M, which has a Review Committee that has developed a "Guide for the OCW Pedagogical Model" in order to help faculty with the process of preparing materials and creating courses that would meet a suitable degree of quality (Méndez & Webster, 2015, p. 3). Furthermore, the guide includes the rubric with the evaluation criteria used by the Quality Group. Additionally, the UC3M quality assurance of OCWs includes a peer review assessment system (Méndez & Webster, 2015). A rubric for evaluating OCW courses with ten items (distribution of course contents, study materials, practice materials, self-assessment tests, self-learning format, bibliographic sources and information resources, accessibility of supplementary materials, adequacy of the didactic proposal, coherence of the didactic proposal and clarity of the didactic proposal) to be evaluated on a scale of 0 to 2, and in some cases 0 to 3, was developed (Méndez & Webster, 2015, pp. 8-9). For this process, faculty that had already received an OCW award or mention were contacted to invite them to be enlisted as reviewers and the institutional platform was used to include the functionality of grading by rubric. In this sense, we can highlight both top-down and bottom-up approaches, depending on institutions.

Considering the provinces of Ontario and British Columbia in Canada, quality assurance processes are rather guided by recommendations and guidelines than by institutional mechanisms. In Ontario, the learning platform implemented in 24 publicly funded colleges OntarioLearn named Quality Matters™ as their indication of providing internationally recognized quality assurance tools and processes to evaluate design of online courses. On the other hand, the Postsecondary Education Quality Assessment Board (PEQAB) provides oversight to postsecondary institutions' digitization and has developed standards (including for (O)ER) to assess institutional capacity to offer blended and online courses. Closer to the (O)ER product (and subsequent use), colleges and the universities each have their own individual quality services. At the institutional level in BC, there are likely processes and instruments used for evaluating (O)ER quality. These include internal checklists, but also checklists provided by external organizations like Quality Course Teaching & Instructional Practice from the OLC Quality Scorecard Suite.

Finally, we address the countries in c), which have rather bottom-up institutional quality assurance mechanisms.

In Australia, the quality assurance processes for the creation of OER in HEI can be described as sparse at best. In a previous study (Bossu, Brown, & Bull, 2012), poor quality of OER was identified as a serious problem, and a subsequent article (Stagg et al., 2018) found that no Australian university had a quality assurance framework for OER. The study based on a survey conducted by the expert show that this situation was still current, with most of the participants stating either that quality assurance is up to individual members of faculty (academic self-assurance) or that quality assurance processes are non-existent; some others indicated that some department or faculties have quality assurance processes for OER. When existent, apart from individual academics, actors involved often in quality assurance processes of OER involve the library services; less cases refer to specific committees for review, the OER review by Canvas Support Team, the copyright officer and teams for educational innovation and digital services. Open textbook initiatives seem to follow strict quality assurance processes based on the university's press standard editorial processes.

Along the lines of Australia, South Africa does not count with institutional quality assurance processes for (O)ER and, therefore, the responsibility of the accuracy of the resources should be taken by the academic author, following the "pride-of-authorship" model.

Actors involved in institutional quality assurance

In China, the higher positions in the institutions are deeply involved in ensuring institutional (O)ER quality assurance, following MOE's and Departments of Education's regulations, according to a top-down approach. A concrete case is the Tsinghua University. To make sure that professors put maximum effort into course design, the project management for implementing the 'Top-quality Courses' Project took place under a system of unified planning, carried out by the university's Office of Academic Affairs, focusing on designing instructor-led courses, as supported by professional and technical staff at the university (Yang & Duan, 2008). The Office of Academic Affairs was responsible for the selection of 'Top-quality Courses' and the organization and management of the courses, and the instructors were in charge of the actual design of the courses. The e-Learning Center provided technical support for the entire process. During the implementation period, a professional R&D team was also created, which included researchers from the Department of Educational Technology, as well as those specializing in the area of media art design and media production, and program designers, etc. (Yang & Duan, 2008).

Similarly, South Korea follows a top-down approach, where the CTL of each university are the responsible for ensuring (O)ER quality at the institutional level, following national guidelines. In Turkey, there is also present a top-down approach, in which the top management of the universities is in charge of institutional (O)ER quality assurance, considering national policies.

In the case of Japan, each member institution of JOCW and/or JMOOC is responsible for setting up its own quality assurance system. Some universities have centres similar to the CTLs in Korea, which are the responsible of ensuring (O)ER quality assurance at the institutional level (e.g. UH's Center for Open Education). However, others depend on bottom-up approaches.

There is a similar situation in Spain, where each university sets up guidelines for ensuring (O)ER quality. Nevertheless, in terms of ensuring the quality of institutional (O)ER infrastructures (metadata, interoperability…), university libraries have a major role. Other actors involved in the (O)ER quality assurance in terms of pedagogical quality are the evaluation commissions of the annual calls for promoting the creation of (O)ER by faculty members. These commissions evaluate the applications and, therefore, the quality of the proposed materials, and ensure criteria compliance during the funding period and (O)ER publication. For instance, in the case of the Universidad de Alicante, the evaluation commission of the annual call for the creation of digital materials and online courses includes the vice-rector of Educational Quality and Innovation, the vice-rector of Studies and Training, the director of the Institute of Educational Sciences, the director of the Quality Secretariat, the director of the Secretariat of Technological Resources, the director of the Further Education Centre, and the area of Support and Assistance to Users. Technological and pedagogical support is offered by those services to faculty for approved projects, to ensure the quality of the final product during their production. In the case of the UC3M, the main quality actor in OER is the quality group for the OCW-UC3M project. This group is composed of representatives of the areas of graduate studies, postgraduate studies, quality issues, online education, OCW Office, and is coordinated by the Vice-Rector for Infrastructures and Environmental Affairs. The group is in charge of managing the annual call for OCW, selecting the OCW to be published in the institutional site, overseeing the quality of the course and fostering faculty participation in the OCW awards. Therefore, we can find institutional examples with both types of approaches to institutional quality assurance.

Institutional adherence to international e-learning standards

As mentioned in the macro level, in China there are not mandatory association and national standards in place for (O)ER development, and evaluation indicators as criteria for reviewing and awarding honorable titles to high quality educational resources issued by MOE. For example, MOE's Evaluation Indicators for HEI State-benchmarking Courses, Technical Specifications for State-benchmarking Shared Courses Construction, and Evaluation Indicators for State-benchmarking Shared Courses (Undergraduate Level). Despite the fact that rubrics of this kind are for the purpose of evaluation and prize-awarding, individual institutions tend to stick to these criteria in their development of (O)ER. Institutionally speaking, many Chinese colleges and universities develop and implement their own specifications, standards, guidelines or regulations in their digitalization process. For example, South China University of Technology (SCUT) issued Specifications for Online Course Development, which provides detailed guidelines and (technical) requirements.

In Korea, KERIS guidelines for the development of OER do not follow a particular regional or international quality assurance standards. Instead, they integrate key quality assurance criteria for various standards and suggest common quality assurance guidelines. They also recommend OER developers to follow the Korean Web Content Accessibility Guidelines 2.1, which are developed based on international standards. Similarly, NILE guidelines, based on edX's course development guidelines, require MOOC developers to follow the same web content accessibility guidelines. OER should be created following the Korea Educational Metadata standard. Similarly, in Japan JMOOC's quality assurance guidelines do not follow any international e-learning or OER standards specifically, but they are created based on instructional design principles.

In Spain, the standard used predominantly at the institutional university (O)ER repositories is Dublin Core (86.8%) and there is lower presence of the enriched Dublin Core (1.9%) and LOM (11.3%), which allow more educational description according to (Santos-Hermosa et al., 2019). For example, the faculty guide for creating OER by the UPV includes a metadata sheet based on the LOMv.1.0 metadata structure, which includes as categories a general descriptive part and the reference to the educational use and an evaluation sheet.

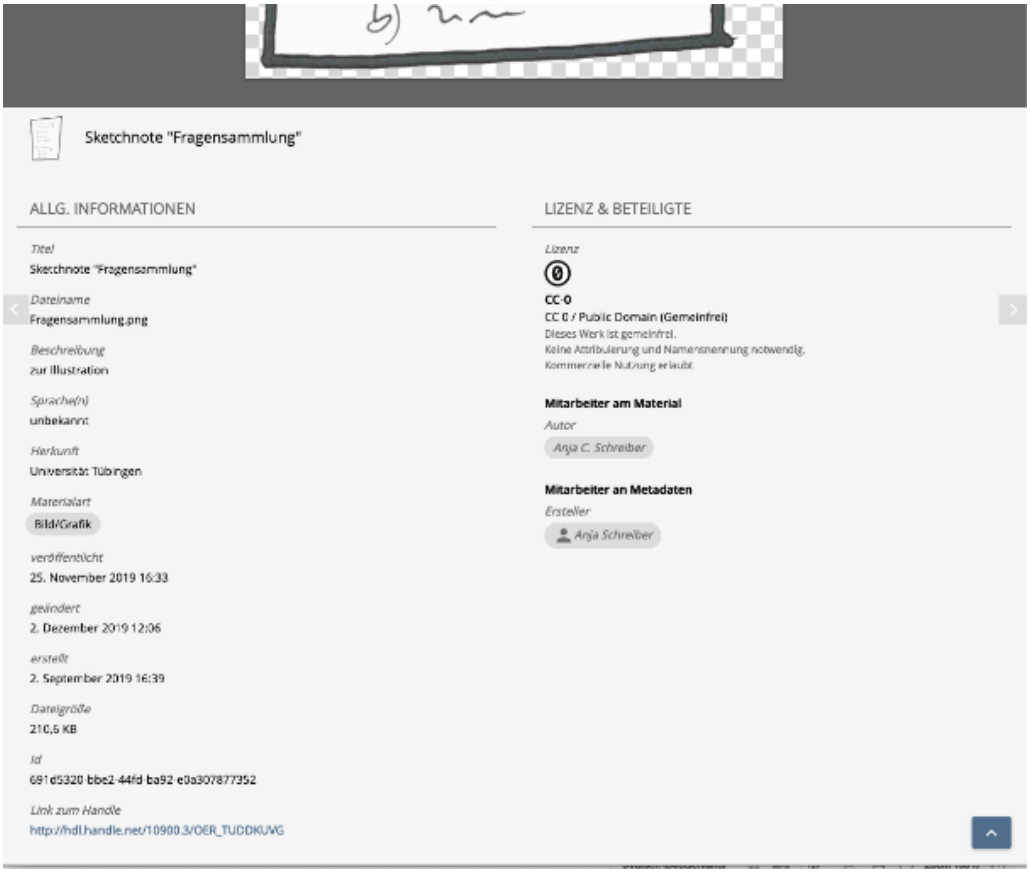
In Canada, there is not a single metadata standard that is actually the standard, despite existing many different metadata schemas. Library catalogues tend to use standard schema, such as the Library of Congress Subject Headings, and while some institutional repositories might use a variation on that, the headings are not necessarily consistent from one institutional repository to another. In addition to there being differences in the terms that are assigned to a particular item, some repositories take indexing seriously and assign multiple metadata terms to describe

each item, whereas others will only have one or two terms assigned to each entry. This difference can impact the findability of resources.

In Germany, the topic of metadata or the underlying and necessary infrastructures remain issues that are not prominently addressed or that laymen's attention is directed to. However, some examples of references to metadata in (O)ER repositories can be cited. For instance, as metadata specifications at HOOU, the Learning Resource Metadata Intiative (LRMI) is cited and described as important in learning offers (courses) to be able to use the OER in other contexts. In the case of Edu-sharing, it supports arbitrary metadata sets such as LOM and Dublin Core. In ZOERR, the following metadata are included as information on each OER (Figure 8):

Figure 8

Metadata in (O)ER available via ZOERR



In South Africa, the case of UCT should be remarked. With the Metadata and Information Architecture Policy (2012) of the UCT guidance on managing "metadata and its application to information assets and services to improve the governance, interoperability, retrievability, re-use, storage optimisation, structure and classification of information assets and services" is provided (p. 2). The Policy also states that "All content objects generated, managed and published by the University of Cape Town and its direct affiliates must be tagged and stored with sufficient metadata" (p. 5). Where applicable "metadata should support re-use and interoperability of content between content management systems and content publication media" (p. 5).

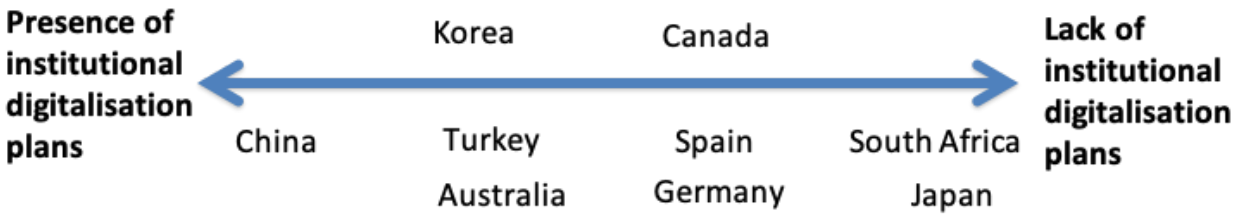
1.3 Policy

Concerning policy at the institutional level, we can distinguish between (see Figure 9): a) top-down policies for (O)ER derived from national regulations such as China; b) countries with HEI in which the policies are defined mostly by the university leadership positions (South Korea, Turkey, Australia); c) countries with HEI with policies mostly by the

university leadership positions, but co-designed with the educational community to some degree (Germany, Spain, Canada) and c) countries with basically non-existent institutional (O)ER policies (Japan, South Africa).

Figure 9

Spectrum Presence-Lack of institutional digitalization plans (considering inclusion of reference to (O)ER).



Although not common, some HEI have even their own OER policies (in Germany, Spain and Australia).

Regulatory frameworks

In China, given that educational digitalization is a national strategy, all HEIs are assumed to have their own digitalization plans or measures accordingly to be in line with the national digitalization strategy. Most of these institutional strategies concede an overwhelming importance attached to administration, management and support services. Considering the 75 universities which are directly under MOE, innovation in instructional models and in modes of learning are specifically mentioned in the institutional digitalization strategies of 18 universities although as many as 74 universities specify their targets for instructional innovation elsewhere in their development plans. Staff capacity building, inter-university collaboration in resource sharing and instruction, as well as credit recognition and transfer are also specifically mentioned in the digitalization strategies of some universities. Only seven universities' joint development efforts are concerning inter-institutional development of digital educational resources and 26 universities mention inter-institutional sharing of digital educational resources in their 13th Five-Year (2016-2020) Development Plans. As for sharing, slightly over one-third of the universities have plans to promote inter-institutional sharing of digital educational resources. In the remaining two-thirds of the cases (47 universities) where sharing is not concerning (O)ER, sharing is more often intra-institutional, rather than inter-institutional. For example, Renmin University of China (RUC)'s digitalization strategy includes the establishment of an agile, smart, open, and sharable digital environment that is intended to (1) explore IT-based approaches to inter-university cooperation; (2) develop an inter-university, joint accreditation system with the aim of integrated management of inter-university users; and (3) increasingly share library resources, courseware, and online courses among universities, innovate inter-university online instruction models, and explore mechanisms for credit accreditation, recognition and transfer among universities (RUC, 2016).

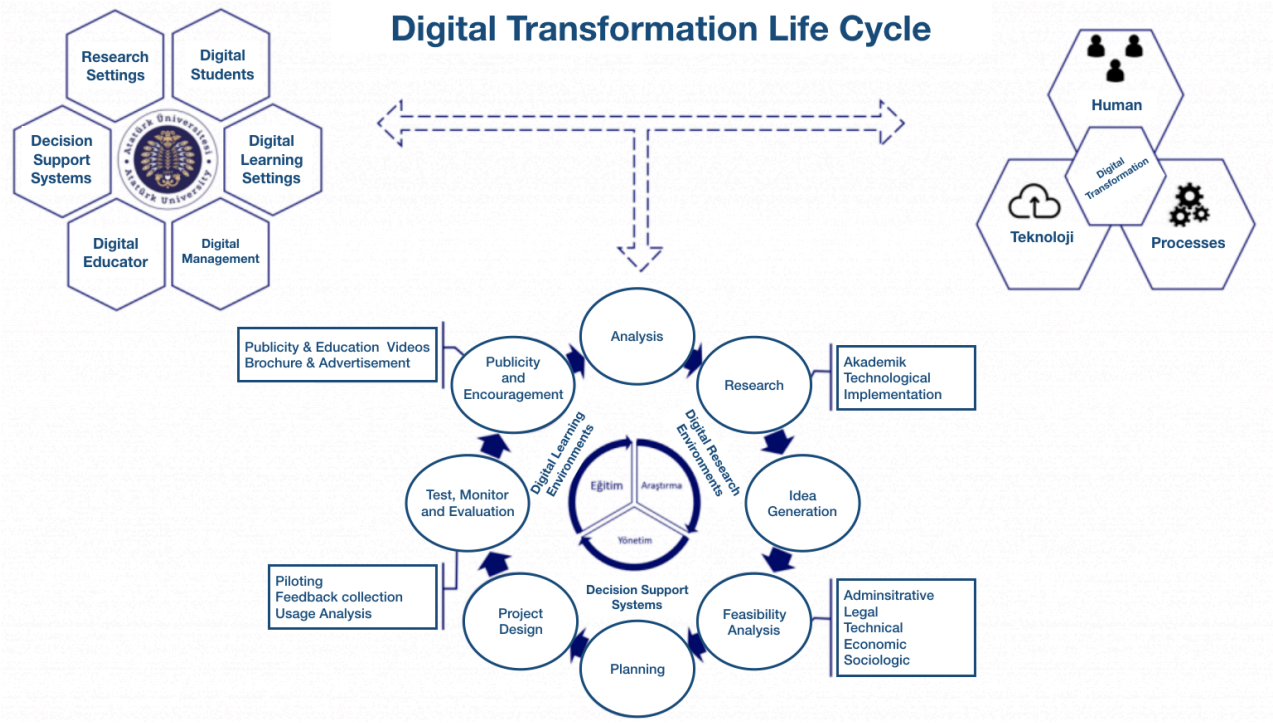
In Korea, each university develops its own policy on the development and uses of (O)ER and has its office of Academic Affairs & Information & Computer Centres at the institutional level, which are involved in the development of the institutional strategy for digitalization, and its Centre for Teaching and Learning (CTL) at the operational level, supporting teachers and developing, sharing and evaluating OER. For instance, SNU has three different policy frameworks for (O)ER selection and management: a) for internal courses, b) for K-MOOCs, and c) for global MOOCs (edX). In the case a) the CTL receives applications from faculty members and selects courses considering its capacity to support (O)ER development. For b) the CTL receives applications from faculty members and selects courses with a stricter procedure than before, because the courses will be open to the public and represent the university. Finally, for c) the CTL selects a few courses from internal online courses and K-MOOCs and revises them to use them as edX courses, based on the degree to which they represent the quality of the university's education and the learner satisfaction.

In Turkey, the Higher Education Law draws a general framework for the policy of towards digitalization. The Law states that HEIs should produce, develop, use and extend educational technologies and implies that individual HEI are autonomous in developing their own strategies in different domains, including digitalization practice. Under one of the decisions (2012/103) that was taken by The Scientific and Technological Research Council, the development of open

digital course content at the undergraduate level was facilitated. However, only a few institutions have written policies for digital transformation. Ataturk University, for instance, established an office that directly works with the rectorate to lead the change in the institution. Also, newly established OpenMETU portal has clear policies on its side. On the other hand, Erzurum Atatürk University has also initiated another project to address the digital transformation of the University, which includes the establishment of the Digital Transformation and Software Office (DD Yaz). This office was identified as conducting research, development and dissemination activities on effective integration of digital technologies into education, research and development, social contribution, and governance processes. The office also wants to be the reference point of digital transformation in HE institutions (see Figure 10). The Office has been implementing several projects in the line of this Life Cycle, related to OER are Digital Literacy Course and e-Books project. Digital Literacy Core Course intends to help students improve their digital literacy skills and the E-Books project, on the other hand, can be considered as an OER project that focuses on transferring the academic works of the faculty members into digital resources (Atatürk University, 2019).

Figure 10

Atatürk University Digital Transformation Life Cycle.



In Australia, nine universities (21%) have a current digitalization or information technology strategy document, one university is currently revising their digitalization strategy, one has a Digital Literacy Framework, two have blended learning strategies, one university has a Library Strategic Plan relating to OER, and one university includes digitalization within their Learning & Teaching Plan. 55% of institutions explicitly mentioning maximising engagement with OER in their digitalization strategies. In their national audit of Australian HEIs and OEP strategies in 2016, Stagg et al. (2018) found that no Australian university had an open licensing policy, open assessment, or a quality assurance framework to support OEP, with only 37.5% of institutions having an open access policy. A mere 25% of institutions had an OER and/or OEP policy and 15% had OER/OEP guidelines, despite 65% of institutions using or making OER available. In a survey with 28 answers, from members of 14 different institutions from every Australian state except for Western Australia and Tasmania, participants were asked to rank how committed their institution is to use OER. 14.29% said that their institution is very committed, 35.71% that it is partially committed, 7.14% that their HEI is not committed at all, and 21.43% were unsure. One person indicated that OER practices have been incorporated in their institution's current strategic plan, the 10.71% indicated that their institution has no plans to consider OER practice in future strategic plans,

and the 14.29% indicated that their institution will incorporate OER practice into their future strategic plans. These results are far lower than results obtained in 2014 (Bossu et al., 2014). However, the universities do come together at the national level, to help drive policy and change forwards together. Universities Australia, for example, "make submissions, develop policy across the sector, represent Australia's universities on government and industry-appointed bodies and partner with university sectors in other countries to enable bilateral and global collaborations". In the 2016 policy document Keep it Clever, Australia's weakening position in the World Economic Forum Global Competitiveness Index was highlighted, alongside the need to strengthen digital literacy, provide flexible, online courses to support lifelong learning, and increased federal funding to support innovation and entrepreneurship. The potential of OER to support this, however, was not made (Stagg et al., 2018). At the moment, OER policy making is largely occurring through library staff and/or the university executive committee, with some institutions involving academics, although many respondents were unsure.

In the case of Germany, four federal states have their strategy for digitalization in HE (Bavaria, Baden-Württemberg, Thuringia and Saxony) and others are developing their strategy (e.g. Lower Saxony). Most of the regulations regarding digitalization in HE are proposed by and for the universities, based on the federal state's digitalization strategy, when available. According to Gilch et al. (2019, p. 66), 13.6% of the German HEIs in the study (n = 110) have already designed a strategy or a concept for the digitalization in their institution during the three last years (2016, 2017 and 2018) and 40.9% are working on it. Therefore, only a few cases of institutional strategies of digitalization are available, and even less address OER concretely (for these, see below in OER policies). For example, in its "Teaching policy for teaching and learning with digital formats", the University of Stuttgart makes reference to the digital transformation and the added value that digital media and educational technology can have for teaching and learning. The document includes a passage on "Fostering OER", which encourages both the integration of quality-assured, externally created open contents into the university's teaching as well as instructors developing openly licenced content to provide to others. The university also stresses its involvement with inter-institutional structures and networks in the field of promotiong and creating open educational materials. An example of combined development between university leadership, faculty and students is the Plan of the University of Oldenburg (2016), which proposes digitalization in the context of three thematic areas: research-based learning (through the support of individual and collaboration tools), teacher training (media competence, media education as cross topic and development of digital materials) and open university, further education and equal opportunities (flexibility of learning offer, development and use of OER and promotion of digital supported recognition processes).

Similarly, in Spain only few universities have developed or are developing digital strategies and plans to boost the digital transformation of the institutions. For example, as to July 2019, the Universidad de Murcia presented its Digital Strategy that includes five strategic lines and 20 objectives: transform users in ambassadors, build alliances that improve the university's competitiveness, transform data into managed assets, innovate through agile and intelligent experimentation and adapt the value proposition before it is too late. From this strategy a Digital Transformation Plan and with the collaboration of the educational community, who can send ideas, will be developed to give place to operational plans (e.g. the Digital Education Plan) with concrete actions. Another case is the Universitat Jaume I, which started a co-participative process with the educational community for the design of the digital plan in 2018. The Digital Education Plan, published in March 2020, points out four work lines: digital competence (of students, faculty members and staff), digital and online learning (which includes the development of (O)ER), digital transfer and research, and the digital processes and services. Although only a few universities were found to start moving towards the development (and implementation) of a digital strategy plan that includes (O)ER at the institutional level, many of them include strategic lines related to digitalization within their institutional strategic plans (e.g. the International University of Andalucia or the UC3M. On the other hand, the mention to OER is visible in 16 universities open access policies (out of 27 with OA policies) and there are some OER specific policies (these will be referred in the section OER policies). However, most of the universities do not have a specific policy for OER in their open access policies, as this kind of resources do not have any special consideration from the institution or because the policies were created thinking in research, not in teaching and learning. Nevertheless, Santos-Hermosa et al. (2019) point out the fact that several universities (30%) are planning to develop new strategies to correct this situation and to foster OER publication, through

support calls with publication incentives; mostly as part of institutional digitalization strategies that the universities have developed.

As in Germany and Spain, in the provinces of BC and Ontario in Canada just a few universities have a digital planning framework. In 2019, Waterloo University (Ontario) addressed the question "What can HEIs do structurally to improve the uptake of OER and OEP?". The result was the document "A Place for Policy: The Role of Policy in Supporting Open Educational Resources and Practices at Ontario's Colleges and Universities". In it, they itemized a list of OER policies in place and identified Ontario's University of Windsor as the most progressive noting these developments there: a) the university's tenure and promotion guidelines allow departments some freedom to establish department-level guidelines, allowing at least one unit at the university to include the use and development of OER, b) the university's Senate passed a motion in 2016 advocating the use of free and open course materials in order to reduce costs to students, and c) the university has established an Office of Open Learning that supports the development and use of OER/P. Other Ontario institutions – Cambrian College, Queen's University, and Ryerson University – are mentioned as being "active" in the "OER/P space, though often without formal, governance-driven policies in place to guide their work" (Skidmore & Provida, 2019). Digitization efforts and policies are pronounced in BC, which vary by institution depending on institutions' aims and goals. For instance, since 2013 the University of British Columbia has invested in providing institutional support for faculty to enhance their courses with technology. At the institutional level, UBC formed a partnership with edX. Kwantlen Polytechnic University, on the other hand, has been a forerunner in the development of Zero-Textbook Cost degrees in the country, launching degrees that rely on a combination of open textbooks and library resources. Its new strategic plan notes that the University will "expand innovation in teaching, learning, and curriculum" as a specific goal, hoping to support educators in their classroom innovation efforts.

In Japan, as most OER initiatives are self-funded for a limited period and often are led by individual faculty members, institutional level OER policy development and changes are considered to be difficult or unnecessary. Therefore, institutional strategic plans for (O)ER are rarely developed and only a few HEI have developed their policies. For example, at UH, the institutional strategic plan for digital transformation is usually included in the university's strategy report which is developed every few years. The most recent comprehensive future strategy report was prepared in 2014 and includes the promotion of open education with a great emphasis on "large-scale introduction of education employing ICT" to enhance UH's teaching and learning environment. On the other hand, the JMOOC consortia has a set of policies for the development of MOOCs: a) in principle, MOOCs shall be developed in Japanese, b) in principle, MOOC content shall be provided and designed by full-time faculty members recommended by member HEIs, c) a MOOC shall be shorter than a 15 week-based university course, d) a minimum lecture unit shall be set at 10 minutes, and d) to sign up for each MOOC, a learner needs to provide their email address, password, nickname, and real name. To a learner who completed the course requirements, a course completion certificate will be issued under the name of the course instructor.

In South Africa, there is no "institutional policy that mandates that educational materials produced with public funds be openly licensed" (Hoosen & Butcher, 2019, p. 22). Some HE policies are supportive of academics and senior students who want to publish their work as OER, but there is not the same expectation to publish (O)ER as there is to publish research. Another factor to consider is that academics are already sanctioned to reuse copyrighted materials for teaching purposes and are not really required to engage with OER. An exceptional case is UCT, which is the only public HEI that "automatically assigns to the author(s) the copyright" with regard to "scholarly and literary publications" as well as course materials, "with the provision that UCT retains a perpetual, royalty-free, non- exclusive licence to use, copy and adapt such materials within UCT for the purposes of teaching and or research" (Intellectual Property Policy, UCT, 2011, p. 14). The UCT Open Access Policy (2014) "does not mandate that academics share their teaching and learning materials as OER, but simply encourages them to do so, as is befitting in a collegial cultural environment" (Cox & Trotter, 2016, p. 153). On the other hand, Unisa Intellectual Property Policy (2012) states that Unisa is the owner of all intellectual property created by members of the staff within the normal course and scope of their employment (Unisa, 2012). According to Cox and Trotter (2017a), this means that Unisa possesses the copyright over the lecturer's developed materials and maintains the management of the creation side of OER adoption. The Unisa policy does however make provision for the individual lecturers to petition their relevant tuition committees in order that they may

make their own creations available as OER. Cox and Trotter (2016, p. 25) found in their research that "while this appeal mechanism does not appear to be well advertised, it does offer an opening for some lecture-led OER". The 2014 strategy document [5] made recommendations that the policy on licensing of Unisa intellectual assets needs to be developed and an OER strategy was designed (which has not been implemented, described below).

Open Education policies

In Germany, the Strategy for Digitisation in Teaching and Learning of the University of Duisburg-Essen (2017) has as goals: assuring teachers with high-quality support in expanding their e-learning activities, enabling regular feedbacks, further improving quality of learning or promoting networking. UDE has developed an OER platform as a repository for the University, which is part of the UDE' strategy for digitalization in studies and teaching, in collaborative design and implementation with the Digital Library Department of the University Library and the Learning Technologies Division of the Centre for Media and Information Services. Another case is the strategy for digitalization related to OER in HAW Hamburg, which concretely addresses OER in the objective connected to digitization in teaching, learning and continuing education: "HAW Hamburg also promotes the education of its students for a global digitized world of life and work in the spirit of Open Education". In December 2019, the Hochschule Reutlingen was the first HE institution in BW and in Germany in publishing an own OER policy. This policy encourages the teaching members of the University to use OER and to publish their own teaching and learning materials as OER. The Central OER Repository of the Universities of the State of Baden-Württemberg (ZOERR) is recommended as the preferred place for publication. Contact for OER at Hochschule Reutlingen is the University Library.

In Spain, three related-open education policies are highlighted (UOC, UNIR and UC3M). The UOC's Open Knowledge Plan (2019) shows a path to follow to reach a fully open institution: from teaching to research; from publication to dissemination, to reach by 2030. The Open Knowledge Plan establishes 6 main work areas (UOC, 2019), among which open learning is included. The teaching materials are to be published first under copyright during a specific time period; after this, they are published with Creative Commons licenses. The intention within this work area according to the Plan is to move from a closed model with OER as an exception by default towards an open model with possibility to make exceptions in copyright. It is clearly stated at this point in the Plan that there is an intention of commitment towards OER. Later in the document, it is also stated that the use of open platforms as open knowledge spaces and open management, including the promotion of the use of open source software, will be promoted (Universitat Oberta de Catalunya, 2019, p. 22). Another example is the UNIR's Open Education policy (UNIR, n.d.), published by the Research Institute for Innovation & Technology in Education, specifies that the institution's vision towards Open Education is focused on every form (OER, data, research results, policy, licensing, technology and content authoring) to reach by 2020. The strategic priorities of the policy are five: 1) increase the amount of UNIR resources released as OER, 2) integrate existing OER as appropriate into UNIR courses, 3) support the creation of OER as academic resources, 4) develop an open access approach for UNIR research data, and 5) contribute to the awareness of open education into society and the academic community at large. The UNIR policy refers also to sustainability as key activity, along with networking and dissemination. Collaboration with national and international partners to ensure the correct implementation of the policy are mentioned, including the support of the UNESCO Chair on eLearning and the ICDE Chair on Open Education Resources. A third example is the UC3M, which includes the fundamental guidelines of open education as part of the university's philosophy (Vida Fernández & Webster, 2014).

In Australia two cases of HE policies stand out in terms of OER reference: the University of Wollongong and the UTS. The University of Wollongong digitalization strategy (University of Wollongong, 2015) has explicitly made Open Learning a priority, including: 1) developing a policy on MOOC quality, an international MOOC platform, and focus on MOOC development and maintenance; 2) creating an open Graduate Certificate in International Studies on OERu and online postgraduate courses; 3) at least one faculty conducting an OER textbook pilot; 4) reviewing in teams to consider how in-course use of MOOCs might support students in their learning and reduce costs; and 5) Managing Open Education to maintain a repository of resources on the University YouTube channel and encouraging the creation and reuse of OER videos by faculty members. The UTS does not currently have a specific digitalization plan; however, an email response revealed that they do have a targeted strategy to openness along four domains (open education, open research, open platforms and community engagement), aligned to a key imperative within their 2027 Strategy of "transforming to a

lifetime of learning". Open education includes: a) the promotion and support for integration of OER into learning design; b) the support in relation to copyright provided via dedicated staff, as well as online tools and resources; and c) publishing OER (through UTS ePress) and distribution through global databases (e.g. Khan Academy). Open platforms include the leadership in the use of Open Source platforms (e.g. DSpace) and the UTS Open learning platform providing a range of free online courses to the public via micro credential study, alongside core curriculum.

In South Africa, Unisa Open is the only OER strategy, published in 2014. This strategy was developed to guide the university in terms of its use of OER, licensing of teaching and learning materials, as well as the management of its own intellectual property. It was set up as a special project in the office of the Pro-Vice Chancellor and was developed in order to align the university with the imperatives of the South African White Paper for Post-School Education and training in South Africa (2014). The 2014 Unisa strategy document focused on 5 strategies: 1) the development of an effective management system for intellectual property; 2) the establishment of an open licensing framework; 3) the systematic integration of high quality, available OER as appropriate into courses and their subsequent release for use by others; 4) the contribution to the global OER repository of resources; and 5) the evaluation and review of institutional policies to incorporate OER values and processes. The 2014 strategy was further developed in 2017 by the Centre for Professional Development (CPD) and approved by Unisa senate [6]. According to Alice Goodwin-Davey from the CPD (Goodwin-Davey, 2017), the 2017 OER strategy supports the following: a) development of an effective in-house strategy for openness at Unisa, b) systematic integration of high quality available OERs into Unisa courses, c) uality Assured, targeted, open Unisa courses as contributions to the global OER repository of resources, d) contributions to the global OER repository of researchers, and e) Integrated campuses with other HE institutions.

Institutional agents based on cases

In China, all universities have an office of digitalization management, aka Office of Informatization if translated literally from Chinese, and/or computing / IT / network / educational technology center, in charge of digital transformation affairs. Individual universities may vary, to some extent, in governance and support structures for digitalization transformation, including educational resource development. Nevertheless, the big picture should be rather similar among public colleges and universities. In the process of developing MOOCs, many different actors, including university administrators, academics, educational technologists, instructional designers etc., knowingly and unknowingly played a role in shaping policy and designing MOOCs (Zhang, Sziegat, Perris & Zhou, 2019). For example, PKU has an Office of Informatization to manage institution-wide digitalization processes, including (1) implementing national laws, rules, regulations and policies and formulating the university's policies, regulations and standards in relation to digitalization, (2) making and carrying out institutional plans for digitalization processes, (3) coordinating and managing institutional funds for digital construction, (4) overseeing the construction of digital projects.

In Korea, several committees and teams are involved during the process of establishing and implementing policies related to (O)ER development and use. However, the CTL usually play an important or decisive role. For example, in SNU, CTL works with the Curriculum Committee in making decisions on CTL activities following the policy directions of the university. Within CTL, three teams work closely together to implement such decisions: 1) Instructional Team, responsible for the design, development and management of online content and online courses together with faculty members and TAs, 2) Development Team, who produces high quality online content and courses often in collaboration with external e-learning companies, and 3) Planning & Support Team, who manages the selection and planning process for online contents and courses, communicates with NILE regarding K-MOOCs and edX on edX courses, evaluates and approves digital contents developed by the Development Team and external companies, manages internal online courses and supports the Instructional Team. In the case of C University, CTL, positioned under the Office of Academic Affairs, is responsible for the development, delivery and evaluation of CU's online courses, OCW, MOOCs and other educational resources, and teaching and learning support. For its activities, CTL's Committee for Teaching and Learning, consisting of CTL director and team leader and a few faculty members from different departments, sets up relevant policies.

Just like in the case of SNU in Korea, large research universities in Japan usually have a dedicated center or office for digital transformation at the university level. This office develops and implements the institutional strategic plans for

digital transformation. For example, the Open Education Centre of the University H as a university-wide organization under the Institute for the Advancement of Higher education of the university, makes policies and action plans related to instructional design, the development and production of (O)ER and MOOCs, learning platforms, and copyrights. Another example is ICU, where a policy to promote the use of the university LMS has been established with other universities in Japan and other countries integrating various formats of (O)ER (university project “Top Global University Project”). In the case of UTokyo, the Information Technology Center (ITC) is responsible for campus-wide digital transformation in terms of infrastructure, while the development, maintenance and implementation of MOOCs and OCW are handled as “Special Educational Activities” and are managed by Center for Research and Development of Higher Education (CRDHE).

In Spain, institutional agents involved in (O)ER policy are related to the groups involved in the development of digitalization plans. As an exceptional case, the UC3M has the multidisciplinary working group MaREA, which is devoted to define policies and strategies for creating, managing and disseminating quality (O)ER and is composed of professors who are specialists in Intellectual Property Rights, Open Access and OERs and interactive technologies, as well as members of the Library and Communications and Computing Service (Malo de Molina, 2013).

In Canada, Ontario university libraries are rather connected and involved in OER policy, which is included as part of the White Paper Ontario Council of University Libraries (2017). Similarly, in BC, libraries are involved but often include mention of open access and not to OER (e.g., open access policies in Simon Fraser University and University of British Columbia).

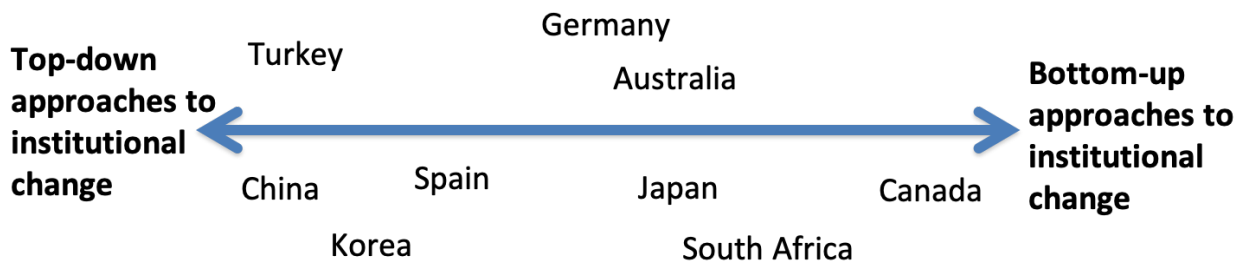
1.4 Change

Institutional change includes both top-down and bottom-up approaches, depending on the country, and sometimes even on the HEIs (see Figure 11). Clear institutional top-down approaches are followed in China, Korea, Turkey and to, some extent, Spain. In China and Korea, the government policies impact directly on university evaluations and various OER funding calls are derived from those policies. In Turkey, projects are usually initiated by the administrators of HE institutions rather than by the faculty members. Similar to Korea, most of the Spanish universities promote the use of OER infrastructures through institutional grants and prizes. Bottom-up approaches are common in Canada, where OER are not institutional mandated. Similarly, in South Africa, a bottom-up approach to institutional change is the standard.

A mixture of top-down and bottom-up approaches is shown in the case of Germany, Japan, Australia and South Africa, to different extents. In Germany, a predominant top-down approach can be observed deriving from funding schemes and strategies of digitalization of each federal state and HEIs. However, many bottom-up approaches are recognisable based on the involvement of local and federal organisations. In the case of Japan, a top-down approach is relevant but a bottom-up approach to institutional change is the standard, since most initiatives are self-funded for a limited period and often led by individual faculty members. This situation is similar in Australia. In South Africa, there are mostly universities with a bottom-up approach, although some exceptions are available.

Figure 11

Spectrum Top-down to Bottom-up approaches to institutional change.



Institutional strategic planning

In China, the calls for MOOC proposals from universities – derived from national policies and plans - offer an understanding of in what ways universities recruit or encourage their faculty members to offer MOOCs for free. As different universities seem to have very similar regulations, the majority of these documents are to some extent similar, with only minor variations - except in the case of PKU. The majority of universities followed a typical, routine procedure: first, the Office of Educational Affairs acted under the authority of the university leadership office and disseminated calls for MOOCs via emails and through internal/external websites, and second, the university called for MOOC proposals in a way that compelled attentiveness from potential course-creators, underlined the importance of the activity, and imposed restrictions on the process. The use of modal verbs in the calls, such as 'should,' 'must,' and 'need, reflect demands to make sure that the proposed MOOCs were selected, designed, and implemented in such a manner as to ensure a high quality and a high impact worldwide. In contrast, PKU took a different strategy to encouraging its faculty members to offer MOOCs. Few prerequisite qualifications were required; instead, the university 'welcome[d] all teachers to participate in the development of MOOCs', and stated that 'currently there is no restriction on teachers' qualification or course type' (Peking University, 2014, Official Document). Nevertheless, this is not to say that PKU did not intend to review the proposed MOOC offerings. Furthermore, quality assurance formed a part of the process of implementing MOOCs, e.g. offering technical support, and recruiting active and experienced instructors to provide tutorials.

Another popular measure in China was the call for "micro-teaching" competitions among universities (MOE, 2012) and a national university micro-teaching competition platform was created to curate all of the micro-course resources. The users of these resources can also rate them on the platform. Also, different universities have created their own micro-courses platform to host courses (e.g. Central South University). Taking Jianghan University as an example, in which the leading MOOC working group made the design and implementation of micro-courses compulsory as a way to push professors to get involved in this process. Also, universities encourage faculty member to participate by providing training for participations and recognizing 18 hours of training credits for annual evaluation. Those who win the first prize are awarded 'Outstanding' in the annual teaching quality assessment.

In Turkey, online master's degree programs delivered through Distance Education Centers in HE institutions first emerged as part of institutional strategic planning as a change agent. However, the change winds could not go beyond using LMS and many offered programs suffer from quality mostly because of insufficient quality assurance and accreditation mechanisms. Individual institutions, especially those that have historically a long tradition in open and distance learning as well as educational technology, have been voluntarily taking action to create and disseminate (O)ERs and working on transferring their systems into a more digitized structure. Therefore, it can be claimed that investing in digital infrastructures is considered as an indicator of the change and strategic planning and, in a panoramic view, do not consider developing digital infrastructures for the use of OER initiatives. Turkish HEIs suffer from lack of awareness on OERs and strategic planning is operated from top-bottom from administrators of the HEIs and, therefore, the strategic plans are not welcomed with a wide participation.

In Korea, in general, HEIs first analyze the national policies and university evaluation guidelines and then create the institutional strategic plans accordingly at the top leadership level. Then, various committees and offices (e.g., Curriculum Committee, Student Association, Center for Teaching and Learning, Career Development Center, etc.) develop action strategies to realize the institutional plans in collaboration with the educational community (stakeholders), which is commonly practiced and encouraged. In particular, the policy and guidelines of the university evaluation, which is carried out by an evaluation team consisting of experts from academia and practical fields whom are appointed by the MOE, is considered to be vital as the evaluation result is directly linked to the MOE's funding decisions (faculty evaluation and promotion). Key national policies affecting institutional strategic planning include the promotion of industry-university cooperation and the introduction of a flexible education system (K-MOOCs [7]). As an example, in the SNU, based on the president's vision and the university's long- and short-term development plans, the Office of Information System and Technology (IS&T) develops and implements SNU's institutional strategic plan for digital transformation. SNU's digital transformation plan entitled 'SNU Information Integrated Development Plan' is developed every three years by IS&T in collaboration with other offices such as CTL (Office of Academic Affairs), Main

Library, Office of General Affairs, and Office of Research Affairs. Like SNU, CH also adopts a top-down approach. Considering the national policies discussed above and the university's long- and short-term development plans, the Information & Computer Center (ICC) develops and carries out an institutional strategic plan for digital transformation every few years.

In Spain, institutional strategic planning connected to funding (call for OCW, MOOCs and other OER projects) is also important for change at the meso level. This funding is usually connected to the digital plans or university' strategy. For example, the Universitat Jaume I has an annual call for the elaboration and publication of OER in the teaching collection "Sapientia" (manuals) and in the OCW of the university (multimedia courses) and another one to support the elaboration and teaching of MOOCs. In its institutional strategic plan 2015-2020, the UPV includes as a strategic project the elaboration, dissemination, visibility and accessibility of information and results, which with regard to (O)ER, includes: 1) the production of digital contents, 2) the organisation of digital contents in the institutional repository, and 3) the promotion of MOOCs. The university has created the Online Teaching Plan (Plan de Docencia en Red), in order to incentivise teachers to create digital and reusable educational materials and publish them in the institutional repository. This Plan includes an annual call and an annual prize for acknowledging best quality and use of the produced materials in the previous call. A further example is the Institute of Educational Sciences of the Universidad de Alicante, which offers an annual call to support teaching development projects for the promotion of blended and online teaching, including support to university teachers for the development of MOOCs and NOOCs, and support for the faculties to develop blended and online teaching and learning processes in the official study programs of the university. As in other universities, the UC3M offers an annual call for the development of OCW for faculty. The OCW office of the university devised a system to provide teaching staff with the necessary resources for DIY course production, such as induction sessions, eduCommons (CMS) Workshops, Help Desk (e-mail, telephone, face-to-face), as well as manuals and reference guides (Webster & Pardo, 2011). Formal recognition in the form of certificates or authorship acknowledgment is also a recurrent way of promoting change. For instance, the funding calls of the Universidad de Alicante include the certification of having conducted the teaching development project.

Change in Australia is largely shaped by government policy and target setting, although this has been focused on open research and open research data. Institutional strategic planning is only being undertaken through digitalization strategies to a small extent, with 27% of institutions having a publicly accessible policy document. Whilst other institutions do include digital infrastructure within Learning and Teaching policies or their institution strategic plans, some of these are not publicly available, which makes it difficult to gain an accurate understanding of institutional strategic planning. On the other hand, funding to support the development of OER at the institutional level is rare (Stagg et al., 2018), although there are a couple of notable exceptions. For instance, the University of Southern Queensland funded an Open Textbook Grant Scheme in 2015, later renamed the Open Educational Practice Staff Scholarship Scheme (Stagg & Partridge, 2019). The focus was on building professional networks and facilitating communities of practice, alongside producing OER. Another example is the University of Wollongong, as previously mentioned, who have explicitly made the creation of open access textbooks a priority in their strategic plan. Nevertheless, the HEI survey indicated that change regarding digital infrastructure is largely occurring through bottom-up approaches, including a strong push from library staff and through teaching and learning communities of practice. Initiatives that are occurring at Australian HEIs concerning promoting OER change include: dedicated library staff to consolidating OER information and resources, providing increased library services to connect academics and educators about OERs, providing OER materials in the institutional repository, providing online courses for Open University, or a work group collaborating across the institution to raise awareness and promote creation and reuse of OER.

In Germany, change within the states is effected mainly through two measures, following rather a top-down approach: the strategies for digitalization developed in each federal state and increasingly across each HEI are a top-down approach to impulse further HE change and concrete measures are fostered through funding schemes that allow for project-based initiatives and structural implementation at the institutional level. Whilst change, in the sense of providing a policy frame and funding, is primarily effected in a top-down manner on the state-level, the extent to which this translates into practice is thoroughly dependent on the individual HEIs. As the report by Gilch et al. (2019) shows, HEI have picked up the impetus to digitalize - especially in the area of teaching with 18.8% of institutions having a digital

teaching strategy in place and 50.9% working on it (n=112). In regard to developing and drafting digitalization strategies, this push is most likely affected by a great extent through institutions participating in the peer to peer coaching for strategy development in the context of the Hochschulforum Digitalisierung. This is an example in which a national initiative has somewhat "skipped" the state level and has directly infused individual institutions. On the state level, all the federal ministries of science and culture offer funding for institutional projects that propose innovative teaching and learning concepts that may include OER approaches (e.g. fellowships for digital teaching). Institutional strategic planning related to OER promotion (change) is the wide-institutional projects developed within the frame of funding derived from the digitalization strategy. For instance, with the intention to foster integration and implementation of digitalization into the main functions of HEIs, extended funding in NRW includes technical infrastructure - OER and the establishment of a state-wide e-learning portal are in the focus here. Another common institutional measure is the establishment of digitalization professorships at universities that receive additional support from the Volkswagen Foundation.

In Japan, in many cases, a university's strategic planning regarding digital transformation at the institutional level happens via the university's future plan presented by its president or a reform committee. Naturally, a top-down approach is prevalent across HEIs in Japan in bringing about institutional-level changes including those related to (O)ER. Japanese universities are likely to reflect the government policies in their future plan and vision, but not likely to develop specific action plans and allocate human and financial resources to implement such policies (Suzuki, 2009). Two policy directions are to create and deliver 'diverse and flexible education programs' (JMOOCs) to broaden learning opportunities using advanced technologies and sharing educational resources. However, a noticeable lack of funding is present in the case of OER, which is often indicated as a critical issue for their sustainable development. Aoki (2011) points out two funding issues related to OER in Japan: the inexistence of private foundations that support OER movements, and the government more likely supporting individual researchers instead of HEIs. Even if the government funds the institutions, funding ends in a few years and OER projects tend to stop there or disappear. One UH project titled Nucla-hokkaido is an example case: the consortium of seven national universities in Hokkaido has developed and shared MOOCs for their liberal arts education. Other problems are related to Japanese traditional culture of teaching and learning, the lack of positioning OER as an integral part of HE and a lack of skilled ICT personnel and support organizations within a university (Jung & Lee, 2015; Funamori, 2017). While UTokyo and UH employ a top-down approach combined with a bottom-up approach to developing and implementing strategic plans with regard to digital transformation, ICU as a small private liberal arts college where government subsidy is only a small part of its budget, often takes a bottom-up approach in making such decisions. At ICU, the process to make decisions on institutional strategic planning with regard to digital infrastructure is somewhat simpler than that of UTokyo and UH. ICU's CTL plans which infrastructure ICU needs to establish for its education and services and applies for the special budget from the university.

In South Africa, Hoosen and Butcher (2019) found that the "adoption of OER is increasing at universities where either the institution or individual educators are able to attract funding from international donors and government to support OER initiatives" (p. 33). Examples of such are, the University of Cape Town (UCT), where OER initiatives are financially supported from funds in the office of the Vice-Chancellor and institutional seed funding for the development of a MOOC. The UCT's Centre for Innovation in Learning and Teaching (CILT) "has been able to attract donor funding each year from 2007 to date in order to pursue an OER and Open Educational Practices (OEP) agenda" (Hoosen & Butcher, 2019, p. 33). The South African Department of Higher Education and Training (DHET) also supports cross-institutional OER development activities (such as the OER Term Bank). Some UCT initiatives are the Opening Scholarship project (2007-2009) funded by the Shuttleworth Foundation, the OER UCT project (2009-2010), the UCT Vice-chancellor's OER Adaption Project (2012-2014), the Canadian International Development Research Centre (IDRC)-funded Research on OER for Development (ROER4D) project (2013-2017) and the current Digital Online Textbooks for Development (DOT4D) project (2018-2020), which is also funded by the IDRC. In addition to these projects, UCT has also funded the development of MOOCs and UCT's Vice-Chancellor's OER Student Adaptation project provided funds for senior students for each Faculty to work with lecturers to make existing learning and teaching materials available as OER (p. 151).

In Canada, change is not institution- mandated; it is not large-scale or policy-driven. When it occurs in the area of digitization, it is individually initiated or, at best, program-initiated, usually led by an onboard faculty member. In his recent reports examining the digital learning landscape in Canada, Bates (2019c) notes that the majority of institutions have an online learning strategy and most of them see online learning as a strategic priority. To support such efforts, faculty are often provided opportunities for professional development through centers of teaching, learning and innovation and with awards and grants for a variety of changemaking activities (e.g., teaching and learning excellence in Royal Roads University; OER grants, at the University of Victoria, and funds, at the University of British Columbia). Professional learning also frequently occurs on an ad hoc basis as well, with faculty seeking professional development as needed and on-demand, either through institutional resources or through resources outside the institution (e.g., Twitter chats, offerings through eCampus Ontario, etc.) and it is delivered through workshops, talks, newsletters, and in some cases through a variety of media such as podcasts. Finally, a variety of bottom-up initiatives invariably exist across BC institutions, driven by faculty members, individual programs, and students [8].

Agents for institutional change based on cases

In some of the countries analysed (Spain, Canada and Australia), university libraries play a relevant role in institutional change related to (O)ER infrastructures. However, there are also present a number of other minor agents in those cases, and major roles in the other countries.

In Spain, the library services and staff were reported as the most important change agent at the universities (Santos-Hermosa et al., 2019) (84.9%) along with the technological/IT services (32.1%). Other actors are the teachers (28.3%), the virtual campus services (22.6%) and the educational innovation units (18.9%). In most of the cases, the library works together with one or more of the other services (Santos-Hermosa et al., 2019). An example of these other agents is the Centre of Education and New Technologies (CENT) of the Universitat Jaume I, which offers university teacher training and support to use the institutional LMS and multimedia tools. Support for creating the multimedia materials is offered within the OER and the MOOC calls. Another example is ULLmedia, which is responsible for producing promo videos, informative videos, and educational videos for the University of La Laguna, as well as for offering advice on how to prepare scripts and audiovisual materials, and how to successfully share content across the network. Technical support is offered by the multimedia service of the university ((O)ER production and intellectual property counselling). The teaching vice rector offers support to the participants regarding the organisation, content structure, technical and methodological aspects of the MOOCs through its technical support units. As an exceptional case, the UC3M has the UTEID (Unit for Educational Technology and Innovative Teaching as an important working group related to OER as institutional agent for change (Malo de Molina, 2013). The unit is integrated in the Library Service with support from the IT service and the Undergraduate Academic Support, to “a) support faculty in creating (O)ER, using new educational technology, and protecting, preserving and disseminating these resources; b) evaluate platforms and tools for course design, content creation and student evaluation” (Vida Fernández & Webster, 2014, p. 147). Other minor change agents at the meso level are the Group 9 of Universities. The G-9 is a non-profit association formed by nine Spanish public universities that has as objective the promotion of collaboration between the universities that belong to the group, in terms of teaching and research activities and services. The teaching activities include the development of training courses for students and university teachers in a shared platform. Beyond this interinstitutional agent, an institutional project that stands out in the field of (O)ER is Open Educators Factory (UNIR), which explores how to transform university educators from “agents of resistance” into “agents of change” for Open Education. As part of the project, a platform to allow university educators to self-assess their capacity and level of development in terms of Open Education and to provide them with some guidelines to further adopt openness in all dimensions of their activities has been developed.

In Canada, institutional change is promoted prominently by institutional libraries and many digitization projects are based on them. For example, the OER Toolkit (hosted by Ontario TechLibrary), which allows searching various pages for OER, has been developed by Colleges Libraries Ontario and the Ontario Colleges Library Service in collaboration with the Institute for the Study of Knowledge Management in Education. In addition, some organizations are initiating collaborative mechanisms that should encourage change (e.g. eCampusOntario in Ontario and BCCampus in BC). For instance, BCCampus is involved in open education changemaking efforts related to the Open Homework Systems

project and the Open Textbooks project, and Learning and Teaching changemaking efforts which involve a set of courses designed to help instructors facilitate powerful learning experiences. Significantly, efforts surrounding openness have been encouraged by advocates at the institutional level. These individuals are often faculty, but a vibrant student advocacy body also exists that has launched public advocacy campaigns (e.g., University of Victoria's student society efforts centering around a social media campaign called #textbookBroke). On the other hand, the majority of HEIs, if not all, provide guides and resources to support faculty and staff towards digitization efforts. Some institutions provide guides and resources to support openness. These efforts are often supported by Centers for Teaching and Learning. Typically, these centers also share information to support individuals in sharing OER (e.g. University of British Columbia).

In Australia, institutional libraries are leading the way in terms of developing and using (O)ER infrastructures in some universities, while in others they play no role or act more of a support function to academics, that provide "advice and is business process owner for repository systems", or that they "are involved in this process and host the Creative Commons". As part of the library, the copyright team and copyright officer play a role in advising on open licensing and copyright of OER in the universities where they exist. Liaison librarians can advise on the use of OERs in teaching. Some university consortia have an important role as institutional agents for change in (O)ER. Three universities are part of the Open Education Consortium and five offer online courses through OERu. As an example of strategy to openness, the UTS includes community engagement by being actively involved with the Council of Australian University Librarians in relation to FAIR principles and ongoing research and advocacy e.g. national repository infrastructure, cost of Open Access, and by being leader in the negotiation and implementation of transformational agreements.

In Japan, although individuals are usually the main actors for change in (O)ER at the institutional level, centers for teaching and learning (CTL) (if existent) are also relevant institutional actors for change for (O)ER. For example, in the case of the UTokyo, the Center for Research and Development of Higher Education (CRDHE) is in charge of the development and delivery of (O)ER, as well as of building an innovative university-wide educational infrastructure utilizing ICT. Specific projects include: a) online education (UTokyo OCW and UTokyo OCWx, MOOCs in Coursera and edX, TodaiTV), b) faculty development (workshops for and online training teaching staff, online training on interactive teaching), c) educational information (informational website on instructional design and teaching, UTokyo course catalog navigation system, UTokyo event navigation system). CRDHE plays the role of coordinator in developing and implementing MOOCs and OCW by working closely with UTokyo faculty and special project team members, and external forces. In the case of the ICU, CTL offers various means of support for faculty and students. It organizes and runs a series of faculty development programs. Upon completing this 10-week flipped and blended learning program, the participants experience effective applications of video lectures in flipped and blended learning and come to understand the effective use of OER and ICT for their classes. ICU's CTL is also responsible for the creation and dissemination of (O)ER. It supports faculty members in creating OCW and producing digital content for their courses. In the case of UH, the Information Initiative Center (IIC) is responsible for university-wide digital transformation with a focus on research. It consists of seven divisions to accomplish these tasks, among which two are related to (O)ER: the Digital Content Research Division, which focuses on research and development on digital content storage, processing, disseminating and utilizing and their applications; and the Media Education & Research Division, which focuses on research and development on ICT use in education and support, e-system design, open education and their applications. Upon receiving a large grant from MEXT in 2013, IIC's Media Education & Research Division created OEC and allocated resources necessary for the development and dissemination of OER including OCW and MOOCs. Since then, OEC has led open education initiatives such UH OCW, ACE open courses and UH MOOCs. Most of the decisions at the operational level are made by the director and staff of OEC in close collaboration with faculty members who engage in UH's OCE and MOOC creation.

In Korea, the CTL at the universities are the main agents for change in (O)ER in a top-down approach. The following policies present in Korean universities are the main elements of institutional change: a) promoting and institutionalizing various ways of utilizing online courses and contents in the university courses through faculty development programs and academic associations' conferences and seminars (participation is recognised and rewarded for promotion and evaluation), b) supporting a collaborative relationship building or a consortium building with other universities and

award different types of degrees and certifications to MOOC learners (via inducing new lines of MOOC funding), and c) linking MOOCs to the national Academic Credit Bank System. However, some universities consider also a bottom-up approach to meet the emerging needs of student groups, departments and offices (e.g., CU). Actors involved in CU's (O)ER development and dissemination include CTL's two teams: 1) Teaching & Learning Support Team, responsible for CU's overall planning on teaching and learning including (O)ER development, evaluation studies on various teaching and learning strategies and other teaching and learning support activities, and 2) E-Learning Support Team, responsible for the development and management of CU's online content and courses and K-MOOCs, as well for offering ICT/e-class training sessions, digital material development workshops for faculty and TAs, among other. In the case of SNU, while IS&T oversees the university level digital transformation and digital infrastructure (including hardware, software and network), CTL focuses on informatization in education by developing and implementing strategic planning for the development, management and support for online learning and (O)ER creation and use. While following the Headquarters (IS&T)' plans and guidelines, CTL can make requests to IS&T to change or improve digital infrastructure and the university plans that are needed for its tasks related to online learning and (O)ER. This part could be considered as a bottom-up approach.

In China, universities typically assign multiple roles to instructors: being responsible for online lecturing, participating in the development and implementation of MOOCs, and being 'challengers' who are willing to try new things and are seeking change. In the view of those who offer MOOCs, they participate in MOOCs as a result of their own personal interest, rather than simply being influenced by their university. Universities 'provide' funding/technological support, 'encourage/guide' teachers to participate in the development of MOOCs, and 'implement/launch' the registration of MOOCs. By doing this, the universities' central offices play an important role in regard to initiating MOOC activities, supporting the process and deciding who will provide an MOOC and what to offer. Chinese universities usually count with faculty manuals to help in the process of developing (O)ER. When it comes to development of (O)ER, it tends to be a multi-department endeavor. For example, PKU establishes its Instruction Steering Committee for Online Education whose responsibilities include organizing and developing open online courses as well as coordinating the sharing of these resources both intra-institutionally and inter-institutionally. Its Center for Excellence in Teaching and Learning, which is a unit of the Department of Educational Affairs, is to provide professional training and technical support such as video production and editing to their open online course teams, as well as cooperate both intra-institutionally and inter-institutionally in supporting faculty to develop digital educational resources (PKU, 2018). In some universities, the computing/IT centers may play a role in the development of educational resources (e.g. Tsinghua University).

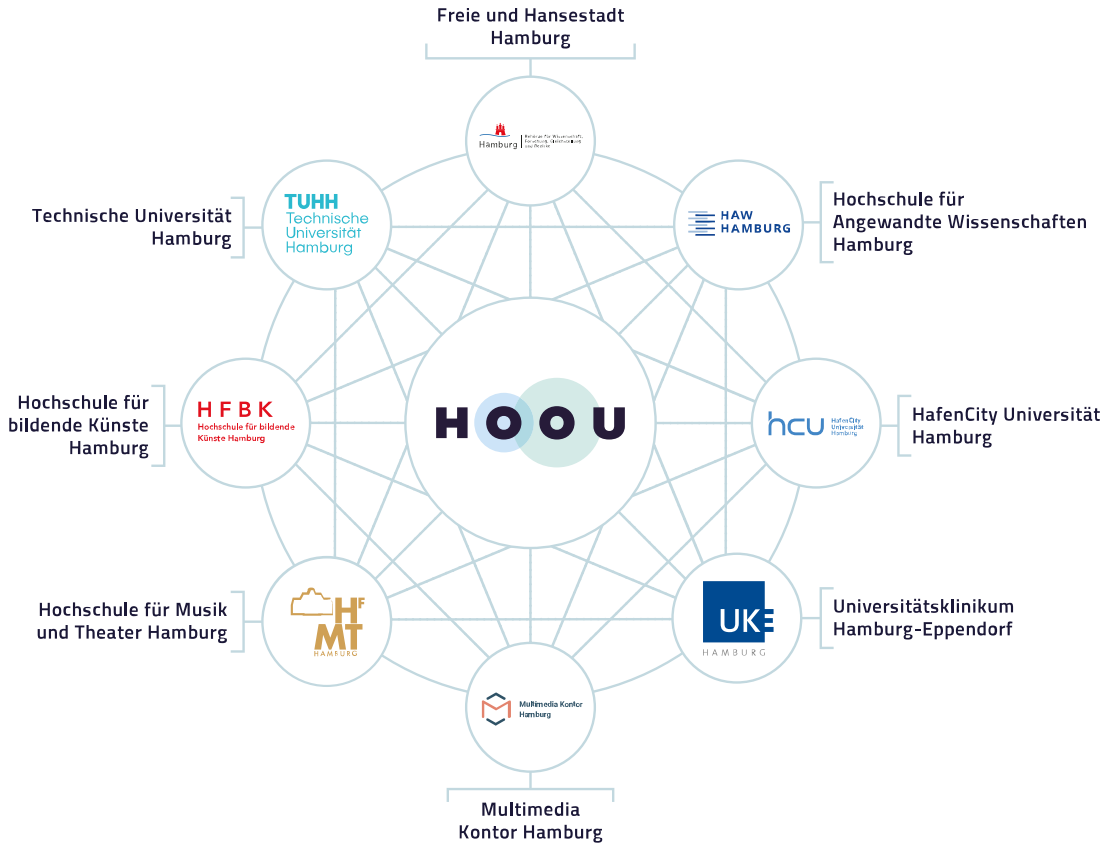
In Germany, the bottom-top approaches include the involvement both of the HEIs and different province organizations for change in (O)ER. For example, the Baden-Württemberg University Network for the Digitization of Teaching is an association of Baden-Württemberg's state universities for the cooperative further development of digitally supported university teaching and it is one of the main actors in the context of OER in BW. As a service for the network, a central OER repository has been developed, ZOERR, which is hosted at the library at the University of Tübingen. It also hosts one working group on OER, the intention of which is to disseminate information on OER amongst HEI in the state, train educators as well as discussing quality assurance issues of OER and ways to facilitate OER creation and production. Under the Baden-Wurttemberg University Network for the Digitization of Teaching, one project addresses the establishment and (non)usage of OER repositories, including questions of how to involve instructors and incentivize OER production and usage. In the course of this project, meta data and ease of use of repositiories are also considered. In Lower Saxony, many universities work together as members of the ELAN e.V. (E-Learning Academic Network), which is considered a change actor and infrastructure provider for the improvement of the quality of technology-enhanced teaching, and also a platform for exchange and cooperation for the distribution and facilitation of information. Other important associations for digital HE infrastructure are eCULT+ and Stud.IP e.V.. Examples of interinstitutional projects that have put OER at the table in HE are MOIN – Multiplicators for OER in Lower Saxony, OpERA (OER in the academic further education: open universities) and Teach4TU (OER training and a learning space to discuss and try out different technologies and ideas for teaching and learning for TU university teachers). Out of the 70 existing HEI in NRW, 42 have joined forces via the network Digitale Hochschule NRW (DH-NRW) and work towards the aim of fostering digitalization among the institutions across the state and also to permeate institutional structures, including teaching and learning, and HE management. The DH NRW constitutes an umbrella for both a range of projects as well as forms a platform for

exchange and networking. For instance, the project “Development of annotation, review and incentive concepts for OER repositories with special consideration of university scenarios”, which aims at providing recommendations for the design, implementation and incentive systems for use of OER repositories for university teaching. Key factors to be considered in this context are a pronounced demand orientation and user-friendliness, a practice-relevant metadata concept, quality assurance via peer review procedures as well as a functioning social infrastructure ("user community") and embedding in other formats (such as face-to-face workshops). Another key agent for change is the University College in Hamburg, as central organisational unit of the University of Hamburg. Different OER-related projects are, for instance (Universität Hamburg, 2019a; 2019b): Synergies for teaching and learning through OER” (SynLLOER), HOOU@UHH (creation of OERs for different disciplines of the Hamburger universities), openLab at the Digital University College (UK Digital) or eManual Ancient History (2017-2019), among others. The HOOU interuniversity project is a key actor in the development and implementation of OER in Hamburg (see Figure 12). The special feature of the HOOU concept lies in the desire to create a digital space in which students, teachers and the interested public can meet in order to collaborate on interdisciplinary, cross-university projects with academic demands.

University libraries and research centres are also considered important actors to cooperate with universities in terms of integrating information competence in the study plans. For example, in NRW, the Scientific library center of the state of North Rhine-Westfalia assumes a prominent role in regard to provision and further development of digital infrastructures.

Figure 12

The HOOU consortium. Source: https://www.hoou.de/f/hoou-de



In Turkey, in practice change towards the use of (O)ER infrastructures comes from faculty. For example, Open Education Faculty and Computer Science Research and Application Center of Ataturk University actively contribute to the AtademiX MOOC platform. However, there are some exceptions, such as the HEC with the Digital Transformation project, in which an academic incentive regulation was arranged in order to encourage the production of open course materials and the participation of the relevant staff of the universities in the training meetings was ensured.

In South Africa, there are diverse institutional approaches to institutional change. In the case of the UCT, individual lecturers' agency plays a much more important motivating role for change than policy - the latter being regarded as "merely a hygienic factor" (Cox & Trotter, 2016, p. 158). As such, institutional culture is more important than policy in motivating academics to engage with OER (Cox & Trotter 2016). "The behaviour and judgment of peers acts as a powerful mechanism in shaping academics' own beliefs and pursuits" (Cox & Trotter 2016, p. 156) and the pressures of publishing in scholarly peer-reviewed journals in the context of the institutional and individual researcher prestige economy, partially explains "the relatively low levels of OER contribution at the university" (Cox & Trotter, 2016, p. 156). On the other extreme, Unisa utilises a top-down, hierarchical approach and the agency of the academics is controlled by the tightly-defined policies. In their study, Cox and Trotter (2017a) suggest that the institutional culture at Unisa is a demotivating factor for the uptake of OER for the staff in that they would have to deviate from their usual practices. Academic staff at Unisa are however, encouraged to make use of existing OER in their teaching. This is demonstrated through the Unisa library, which through their Library Guides, offers comprehensive information on OERs and guidelines for the academic staff on how to find suitable material for use in their teaching practices. The Centre for Professional Development at Unisa has been charged with providing capacity building for staff in OER and offers face to face workshops, roadshows and a free online course for staff who are interested in learning more about OERs (Goodwin-Davey, 2017).

[*] A reduced version of this chapter has been published in the following reference: Marín, V. I., Zawacki Richter, O., Aydin, C.H., Bedenlier, S., Bond, M., Bozkurt, A., Conrad, D., Jung, I., Kondakci, Y., Prinsloo, P., Roberts, J., Veletsianos, G., Xiao, J., & Zhang, J. (2022a). Institutional Measures for Supporting OER in Higher Education: An International Case Based Study. *Open Education Studies, 4(1),* 310-321. https://edtechbooks.org/-hoGg

[1] Previous work includes OER-Content.NRW for the integration of institutional LMS and different repositories.
[2] As of July 2018.

[3] Although it was planned that UCT OpenContent would generally not host resources, but rather act as a directory, in order to reduce duplication and to maximise the use of existing infrastructure (emphasis added), the current reality is that it is a standard institutional (O)ER repository.

[4] However, since more universities and disciplines were constantly required to enter the competition to have their courses awarded with the 'Top-quality Courses' status, the state invested less funds per course, resulting in the quality of the courses being threatened.

[5] Email from K. de Hart to P. Prinsloo and J. Roberts 19 November 2019.

[6] Email from O. Mashile to P. Prinsloo and J. Roberts 20 November 2019.

[7] Related to K-MOOCs two further policies have been introduced: the offering of MOOCs through smart learning environments (development of K-MOOC mobile apps) and the development and sharing of MOOCs with other countries (English development of MOOCs).

[8] Contact North – Contact Nord features a Pockets of Innovation project which aims to highlight innovative projects in the country. The organization highlights projects across Ontario and across the country (e.g., a project at the Justice Institute of British Columbia).

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3

Micro Level: The Situation at the Level of Teaching and Learning

[1]

The micro level looks at the teaching and learning level; in other words, at the faculty members. The same aspects as in the previous levels were analyzed, with different focuses: infrastructure (I, local environment), quality (Q, quality of (O)ER), policy (P, local policies) and change (C, incentives, support).

The research questions posed at the micro level are as follows:

- I: How do teachers know about and use the existing local infrastructures? Which infrastructures / working environments (e.g., tools, platforms) do teachers prefer to use to create and edit (O)ER? Which types of (O)ER do teachers prefer to use in their teaching? Which functionalities would be helpful for teachers to edit their own or others' (O)ER and/or for collaborative work?
- Q: Which aspects do teachers use to define the quality of (O)ER and their infrastructures? Are teachers involved in defining quality of (O)ER and their infrastructures? Are teachers aware of how institutional quality procedures related to (O)ER work and who is in charge of them?
- P: Are there policies specific to certain study programs or departments or schools? Are teachers involved in policy making? Are teachers aware of institutional policies related to (O)ER?
- C: How are teachers involved in the technical and informational aspect of creating (O)ER and advancing the infrastructures? Are teachers being supported in the technical-informational aspects of (O)ER material creation? How? (e.g. incentives, support) How do teachers integrate external (O)ER into their own (O)ER? What changes do teachers make to their own and external (O)ER? With whom, where and how do teachers share (O)ER?

Although most of the work in which the micro level report is, as well as in the previous levels, based on desk research, some country reports included other methods: survey (Spain, Germany, Australia), personal interviews (Canada, China, Turkey).

Personal interviews were designed in a semi-structured form, following the research questions for the micro level that were provided in the protocol of the project. The number of interviews varied from one country to another (China, n=3; Canada, n=8; Turkey, n=5).

In the case of the surveys conducted within the framework of this microlevel study, we include the main characteristics as follows (Table 1):

Table 1

Characteristics of the surveys conducted by the COER experts.

Countries	Data collection	Number of participants	Characteristics of the sample (survey)
Australia	1.Email for university vice-chancellors (28.10.2019) 2. Survey (13.11.2019-31.01.2020)	41 full responses, 29 partial responses	- Library professionals (n = 24, 34.29%), educators (n = 10, 14.29%), researchers and senior managers (n = 6 each, 8.57%) - Working at their institution for eight or more years (n = 30, 42.86%), 20% (n = 14) working there for less than two years. - Faculty most represented was Library Services (38.57%, n = 27), followed by Education (n = 8, 11.43%) and Health & Welfare (n = 6, 8.57%) - From 22 different HE institutions
Germany	Survey: 30.09.2020-31.10.2020	76 full responses, 49 partial responses	- Research Associate (36%), Full-time Lecturer (regular and term contracts) (27%) and Professor (25%) - Years of teaching experience: > 20 (27.6%), 12-15 (22.4%), 4-7 (22.4%) - Most represented disciplines were Humanities (34.2%), Mathematics/Natural Sciences (26.3%) and Law, Economics and Social Sciences (15.8%) - 46% female and 35% male (3% did not answer) - HE institutions in the federal state of Lower Saxony
Spain	1.Survey (27.01.2020-05.03.2020) 2. Survey COVID-19 (24.08.2020-16.09.2020)	400 full answers, 176 partial answers (1) 46 full answers (2, reflect the proportions of 1 in terms of characteristics of the sample, participants that voluntarily gave their contact details in 1)	- Adjunct Professor (nontenure, part-time) (20.4%), Associate Professor (civil servant, tenured, full-time) (25.3%), Associate Professor (not civil servant, tenured, full-time) (15.6%). - > 20 years of teaching experience (46%), > 20 years of teaching seniority at their current institutions (36%). 17.1% participants between 1 and 3 years of teaching tenure at their current institution - All the disciplines were represented, Social and Law Sciences (42%), Health Sciences (17.5%) and Engineering and Architecture (15.5%). - 49.9% female and 47.5% male (2.6% did not answer) - 23- 34 years old (9.7%), 35-40 years old (13.6%), 41-46 years old (20.4%), 47-52 years old (22.2%), 53-58 years old (20%) and more than 59 years old (14.1%) - From 64 universities (out of 84) - Representative sample

Method

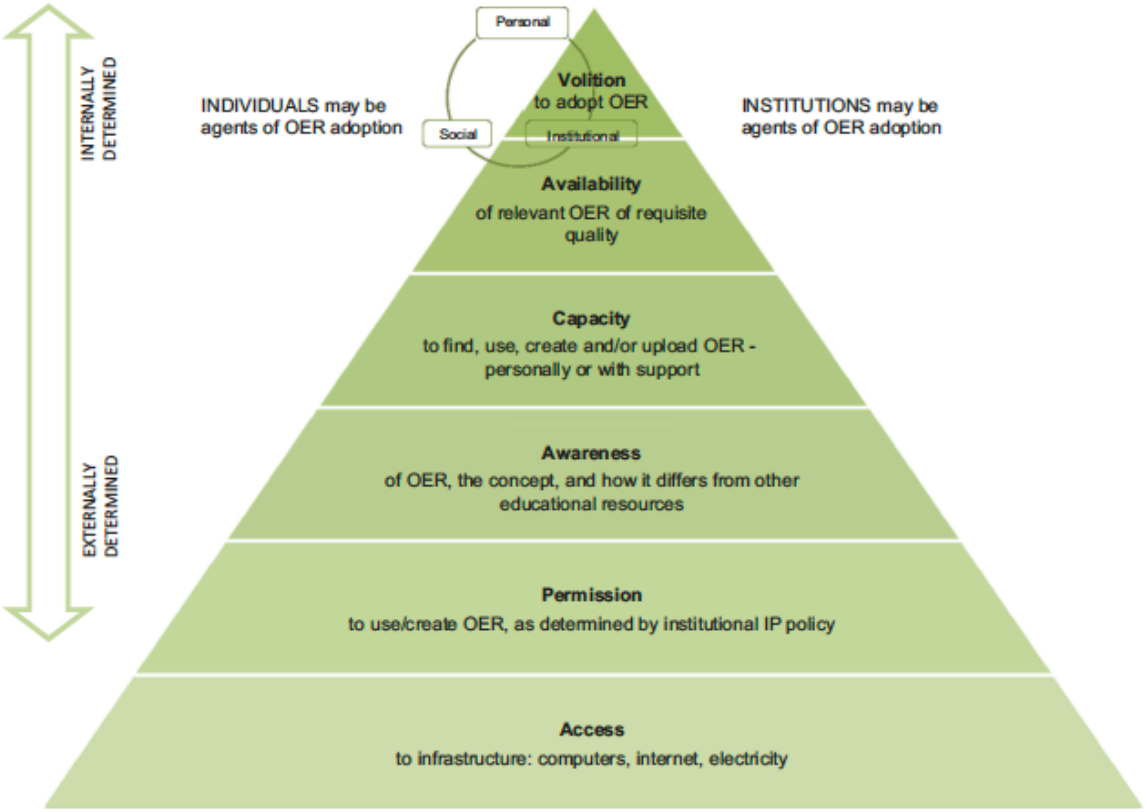
As in the previous levels, a comparative multicase study was conducted based on the COER experts' reports (Yin, 2009). Quantitative and qualitative data from the reports were then analysed through thematic coding with MAXQDA2020 in several iterations (Miles, Huberman & Saldaña, 2014).

In a first iteration, the data were categorized into main codes based on the four elements of the reports described in the research questions (Infrastructure, Policy, Quality and Change). In a second iteration, the OER Adoption Pyramid (Cox & Trotter, 2017b) was integrated as a way of understanding some of the elements, especially concerning awareness, capacity, availability and volition. In a third phase of coding, codes and subcodes were added based on inductive coding and using the above mentioned two frameworks. A last phase of coding involved the revision of some codes and subcodes according to the literature that has explored faculty's perceptions about OER (e.g., Baas et al., 2019; Belikov & Bodily, 2016; Cox & Trotter, 2017b), as well as renaming codes for more concretion and deleting redundant codes.

The number of passages that correspond to each code are marked with "n". The same report could have more than one passage related to a code.

Figure 1

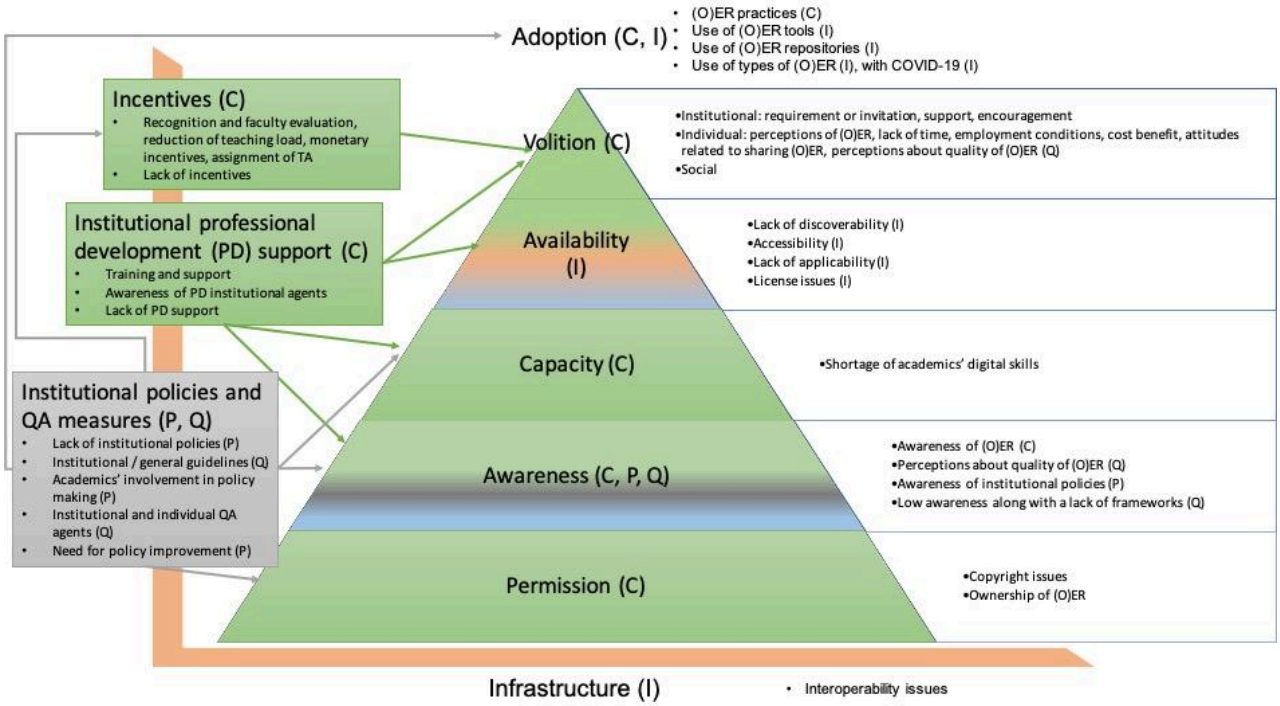
The OER adoption pyramid (Cox & Trotter, 2017b, p. 155).



This process resulted in an enhanced model that combines the OER Adoption Pyramid and the four elements of the EduArc research at the micro level based on data from the international reports. Therefore, the enhanced model provides a broader view to the previous literature focusing exclusively on one institution or country (see Figure 19). In the figure the different codes and subcodes are depicted.

Figure 2

Enhanced OER adoption pyramid combined with infrastructure, policy, quality and change (differentiation in parenthesis and with colours).



We present the results according to the four elements of the project and to the concrete research questions, including information that connects to this new model.

1.1 Infrastructure

At this level, we considered the perceptions and use of lecturers with regard the (O)ER (institutional) infrastructure and (O)ER.

Academics' use and perceptions about (O)ER infrastructures

(O)ER tools (n=12) that were commonly used by academics in most of the countries studied included, to different degrees, video creation tools and presentation tools (slides). For instance, in South Korea, video production and editing tools such as xinics' Everlec and iMaxSoft' Lecture Space were most widely used to create (O)ER. In Japan, Kaltura and Powerpoint were often used to create video lectures, and tools such as Kahoot and mentimeter to promote interactive online teaching. In China, PowerPoint was found as the most popular (O)ER tool by academics at the Northwest Normal University (71%), and only a few used other advanced technologies as Authorware or Flash (Li, 2015). In Spain, MSTeams and the institutional repository were commonly mentioned in the survey conducted by the COER expert, several faculty members also referred to Google Drive, and just a few referred to tools such as Kaltura, their own webpage, Kahoot, Padlet, Socrative, Edmodo, Google Classroom, infographics tools and mind map tools.

In Turkey, a large number of educators used Youtube and Vimeo to share their videos; and in addition, Anadolu educators had Anadolu University's AKADEMA as the only Turkish platform actively allowing educators to share their materials (MOOC), which is going to open up to other educators outside Anadolu and to publish other OER in video, text or audio formats. With the COVID-19, Turkish educators used usually either web conferencing tools, Powerpoint presentations with narrations or screen recording to create their videos. In Spain, a participant in the survey mentioned Youtube and Vimeo to upload their own videos with restricted access for students, but the most common used tool was the institutional virtual learning environment. In Canada, respondent D stated that her department was negotiating with a publisher to create open, digital texts.

The use of (O)ER repositories (n=20) varied in each country. In Canada, one of the interviewees (respondent B) highlighted eCampus Ontario as a fairly good source of resources. Also, some interviewees used social media for

evidence of new and relevant materials (respondent B) or searched for materials on SlideShare (respondent D). In China, in a survey study of 246 faculty members from Chongqing, Hebei, Beijing, Jiangsu and other cities, most (O)ER we reported to be localised on the Internet by the academics, instead of using specific repositories for that purpose (Xu, 2011). In Japan, in the study by Jung, Ho and Suzuki (2013), faculty used Youtube as educational content (53.3%) but none of the Japanese faculty members had created video lectures and uploaded them to Youtube. In Spain, faculty members reported on the survey to use institutional repositories in different ways but being the common ones as a place to store (and share) (O)ER – referring, in most of the cases, although not explicitly, to the institutional virtual learning platform; also, several mentioned using them for searching (O)ER. However, many participants were not aware of the existence of this kind of institutional repository or they did not visit them. Similarly, a high percentage of the German faculty participants in the survey did not know about the existence of (O)ER repositories in their institutions (36.8%) and if they aware of them, many did not use (O)ER from them (54%), searched for (O)ER in them (55.3%), neither published in them (43.4%) or in non-institutional repositories (86.8%). Along these lines, a general lack of knowledge about tools and repositories was identified in Australia, but some survey participants mentioned FutureLearn as the non-institutional platform that they were most using (12.86%, n=9) to house their OER and other short courses, followed by OpenLearn and OpenDOAR, MIT Open Education Consortium, OER Foundation, OERu, the OER World Map and WikiEducator. If an educator wanted to house their OER in a repository outside of the institution, the repository must enable the content to be open, reusable and shareable, as well as preferably to be licensed under Creative Commons (Stevens, Bradbury, & Hutley, 2017). In South Africa, all teaching materials (outside of prescribed textbooks) were available on the institutional LMS. In Turkey, Udemy, Khan Academy Turkey and HEC's YOK Dersleri Platform were the most frequently used OERs by academics, especially with the COVID-19.

On the other hand, several challenges were identified in some countries in this sense. Thus, in South Africa, the lack of adequate infrastructure to assist and support the use and creation of OER was the barrier with the highest response (de Hart, Chetty & Archer, 2015). In Turkey, many (so-called) OER repositories do not function fully, which means that the content that can be uploaded are usually restricted to publication types (e.g., conference proceedings and pre-print versions of the publications) and confines them only to the own institutional members, which prevents the dissemination of OER in a broader sense.

Types of (O)ER preferred by academics

Concerning types of (O)ER (n=14), concrete kind of resources were common across the countries, especially videos and presentations. For example, in Turkey, videos, presentations, PDF or Word versions of lecture notes were among the most preferred (O)ER. In the case of Korea, many instructors develop and use visual materials, such as PPT, PPT-based audio/video lectures, and other freely available videos on Youtube, Ted Talks, MOOCs, etc. In Canada, most OER reported to use in the study by Hayman (2018a) in Ontario were Youtube videos (79%), web links (83%) and OER articles (55%); and one of the interviewees in the study by the COER expert (respondent D) mentioned using open materials in the form of presentation slides and videos. In Spain, most popular (O)ER formats reported by participants in the survey were slide presentations (87.7%), (O)ER in text format (74.5%) and pictures (65.9%); but videos (48.4%) and assessment tests (43.3%) received a high degree of use too. In Australia, learning objects were the most preferred type of resource used in teaching and learning (72%), followed by module sections (28%) (Bossu, Brown, & Bull, 2014); in another study, websites were the most utilised from of OER for both teaching and learning (Bossu, 2015a). In addition, educators preferred to use OER that requires little modification, for example freely available videos such as TedX talks and YouTube clips (Kandlbinder & Chelliah, 2015). As specific institutional cases, more than half the lecturers of large classes at the University of Technology Sydney "do not create any additional materials beyond the lecture recordings" (Kandlbinder, 2015, p. 1) and educators at Swinburne University reported creating videos and MOOCs as OER (Swinburne Commons, 2015). In Japan, OCW was often mentioned as one of the most popular OER among faculty members (Shigeta et al., 2017). In China, the top three frequently used digital resources were multimedia, e-learning materials and instructional resources (Xu, 2011). In a later study with Chinese academics from the Northwest Normal University (Li, 2015), most interviewees used text, images, audio, animations and videos in their daily teaching. Image processing technology was used by 92%, 69% used audio processing technology, and only a few faculty members used video or animation technology. In a study in which 603 courses from 14 Chinese MOOC platforms were analyzed, 266

(44.11%) were identified as recorded lectures given in classrooms. Animation, Khan's style, discussion and interviews were rarely used in MOOCs, accounting for less than 4% across 603 courses (Zheng, Li, & Chen, 2015).

Some of the reports specify some differences in the types of (O)ER used by academics with the COVID-19 (n=6). For instance, Japanese instructors most frequently used (O)ER that were created by them as written materials, figures and tables followed by printed/e-textbooks or books. A few instructors used online materials offered by Open University UK and Creative Commons. Among the video materials used, 48% were instructor-created, 47% YouTube, and 20% were from other sources (e.g., Ted Talk, MIT OCW, OUUK, NHK, edX, IU library's Academic Video Online, etc.), according to a survey with 82 faculty members by ICU's CTL. In South Korea, over 32% of the academics used self-created video lectures, and over 22% offered task-based online lectures (multiple answers allowed) in a survey with 716 faculty members at SNU (Park, 2020). In Turkey, the majority OER created were in videos (usually created by web conferencing tools, some as PowerPoint Presentations with narrations or as screen recordings), presentations and lecture notes of the professors. In Spain, online questionnaires (68.9%) and videos (62.2%) were the ones with a higher increase of use/creation with the COVID-19 compared to the previous answers; to a lesser extent, the use of teaching text-based materials (instructions, class notes, activity guides) also experienced an increase (51.1%). In Germany, resources based on text (64.5%), presentation slides (84.2%), images (72.4%) and infographics (51.3%) were most strongly reported to be used often and always, followed by videos (43.4%). In China, and in particular at Peking University, academics mostly adopted live streaming, accounting for 50% of the total number of courses, whereas most of the graduate courses were more diverse, including seminars and live streaming and other formats (Gong, 2020). About 25% of these graduate courses adopted two or more instructional forms to improve the teaching quality. Faculty members used diverse platforms, such as the Peking University teaching platform (Blackboard), ClassIn, and Canvas, and Zoom. Most faculty members chose ClassIn. In addition, faculty members who needed to organize seminars and record course videos primarily chose the Peking University teaching platform (Blackboard).

Challenges about (O)ER infrastructure according to academics

Interoperability issues (n=3) was among the challenges of (O)ER infrastructure mentioned in the Turkey, Canada and Spain's reports. For instance, in Turkey, the library services and OER repositories were incapable of operating between and among similar services. One of the interviewees from Canada (respondent C) said to have experienced technical issues in making adaptations from various platforms and suggested that some standardization of platforms would make the process much easier. In Spain, when academics were asked if the (O)ER repositories were connected to other institution systems, such as the LMS, the intranet, etc., 45.6% of them stated that this integration exists, but a high number of academic staff were unsure (34%).

If we look at the OER adoption pyramid framework, the main category involved in (O)ER Infrastructure is Availability as an additional challenge to interoperability. Subcodes that we integrated in this category are accessibility, lack of applicability, license issues and lack of discoverability.

- Accessibility (n=2). In this sense, university teachers in Japan used YouTube and OCW as OER platforms more often than other ones because their OER were perceived to be simple to use and easily accessible without making any changes. In Australia, the ability for a repository to include information about licensing and metadata options, available alongside where to input the information, was mentioned by a survey participant as something that would possibly also improve educator understanding and ease of use.
- Lack of applicability (n=11). A common theme in the interviewees from Canada were the difficulties to find OER fit well to a niche course/content/field (respondents A and B). Some of them also remarked the insufficient supply of OER for their disciplines or content (respondents C and D). There was an exception among the interviewees, who felt that being an experienced educator helped him to “know where stuff is” and that it was “so much more difficult for new faculty who are not as familiar with what’s “out there”” (respondent G). In the study by Hayman (2018b) in the context of Ontario, participants were persistent in their attitudes that there was an insufficient supply of OER for their disciplines. In the case of Spain, a high percentage of academic members did not find (O)ER useful for their teaching (43.7%). In Germany, in a study with 662 HE instructors across the country (Schmid et al., 2017), participants rather agreed with their field of teaching lacking adequate OER. Similarly, academics at the Australian universities of Technology Sydney, Tasmania and Southern Queensland highlighted that they had found it difficult to find suitable OER for their subject, outside of TedX talks and Youtube videos (Bossu, 2015b; Kandlbinder & Chelliah, 2015; Stagg & Partridge, 2019) particularly in regard to licensing and university policy environments. In addition, academics at the University of Technology Sydney remarked that although students could easily access Khan Academy and iTunes U, they did not necessarily match course aims as closely as their own content would (Kandlbinder, 2015). On the other hand, the lack of availability of context relevant (O)ER was a general concern in South Africa, since most works are from the Global North and particularly Eurocentric.
- License issues (n=3). Two academic interviewees in Canada highlighted this specific concern. One of them stated that she was often frustrated due to the lack of the appropriate licensing in the materials she wanted (respondent A), and the other one remarked the conflicting interests dependent on funding sources that determine the licensing and restricts the use of some resources (respondent B). In Australia, the need to include metadata to improve OER searchability was identified as a barrier for educators (Open Education Licensing Project, 2016a). Therefore, an advanced function to support the input of metadata in a repository including a place to input licensing details were considered useful. One Australian survey participant stated that “unfortunately the repository does not have a visible licence field which undermines our ability to support content in terms of infrastructure”.
- Lack of discoverability (n=6). Being able to find suitable, high quality OER had been found a particular issue by Australian academics (Kandlbinder & Chelliah, 2015), with pressure placed by academics on libraries to purchase more resources, which is often encouraged by publishers. Several respondents from Australia to a survey suggested that the establishment of standardized metadata for OER and/or a national/institutional repository would help with the major challenge of discoverability of (O)ER (Bossu et al., 2014, p. 21). An interviewee in Canada (respondent H) stated to advocate for open resources but found them difficult to access, and another one (respondent B) remarked the difficulty to find OER that meet her standards. In the study by Hayman (2018b), participants also highlighted the difficulty to find OER. Participants in the German survey indicated as a third reason for not using the institutional repositories not being able to find the appropriate resources (7.9%, the question was only shown to the participants that had answer negatively to the use of institutional repositories).

1.2 Quality

Concerning quality at this micro level, we looked at the how academics defined quality of (O)ER by examining their perceptions about quality of (O)ER, and at how aware academics were in terms of quality institutional measures and procedures, as well as of institutional agents for quality assurance.

Academics’ defining quality of (O)ER

Perceptions about the quality of (O)ER (n=10) appeared in six reports (Australia, Canada, South Africa, South Korea, Spain and Turkey). In most of the countries, these perceptions referred to a common prejudice against OER being of low

quality. For instance, in Turkey openness and OER related concepts were related to free sources with low quality. Such a perception by academic circles at individual and institutional levels inherit the developments of OER related issues in Turkey. In South Africa, the scepticism about the quality of (O)ER remains a challenge in the adoption, use, production and dissemination of (O)ER; in particular, Madiba (2018) referred to lecturers' misunderstanding and feeling frustrated "about how to strike a balance between determining the quality of educational resources on the open platforms and the maintenance standards that their respective departments or faculties demand from them" (p. 73) and fearing use of (O)ER by authors whose reputation is in doubt, or not yet established. Similarly, the quality of OER is a major issue and barrier to adoption for Australian academics (Kandlbinder & Chelliah, 2015). In the study by Hayman (2018a, 2018b) in Ontario (Canada), participants considered OER as reduced cost to learner and quality and an increased supply of high-quality OER developed was identified as one of the needs from academics involved. Furthermore, according to respondent E, OER supporters felt in the need to challenge the "myths" about the use of OER and their quality.

On the other hand, some perceptions referred to the elements that academics considered in (O)ER for being of quality. For Spanish academics, the participants in the survey valued the most the type of resource (text, video, audio, etc.) (55.1%), followed by the reputation of the author of the resource (50.8%) and its availability in the institutional repository (50.3%). In addition, some of them mentioned as an important element the presence of an evaluation or comments about the quality of the resource and aspects that relate to quality of the resource in terms of content and design as well as its pedagogical potential. The survey participants in Germany valued the reusability of the resource in their course first (72.3%), and then the resource type (65.8%), availability in the institutional repository (47.4%) and the reputation of the authors (42.1%). In Australia, the study by Wilson, Myatt and Purdy (2018, p. 6) identified as markers of good quality OER "currency, clarity, relevance and brevity". In the case of South Korea, faculty members often utilized the evaluation criteria offered by their institution in defining the quality of (O)ER and infrastructures.

Academics' awareness of institutional quality procedures

In most of the countries studied, a low awareness along with a lack of frameworks regarding quality of (O)ER and their infrastructures (n=8) was highlighted. For example, in the case of UCT (South Africa), while there was evidence of individual lecturers being committed to producing high quality (O)ER, there was no uniform understanding of quality in (O)ER, nor frameworks and processes to ensure quality in (O)ER. In Canada, respondent B remarked that in disciplines where there were regulatory bodies governing professional licences, curriculum developers were always wary of stepping out of/over the line set by the governing body; she suggests, however, that a process ensuring quality, a process of review and assessment, could and should nullify these concerns and restrictions. The study by Hayman (2018b) also found out the necessity for quality assurance for OER as an important theme among the participants. In Australia, Stagg et al. (2018) found that no Australian university had an open licensing policy, open assessment, or a quality assurance framework to support OEP; nor a quality assurance framework for OER. In German survey, focusing only on answers that explicitly sating that they do not know how QA works, it is 26 participants answering with a "I do not know" type of statement; out of 45 participants who provided an answer to this question. In China, participants from eight universities in the survey study of Xu (2018) stated that there was a lack of teaching quality supervision to ensure that faculty members implemented online teaching and (O)ER of a high quality. On the other hand, the report remarked that Chinese scholars had actively proposed different approaches and ways to evaluate the quality of (O)ER, but few documents addressed how the quality of educational resources was evaluated at the learning and teaching level in practice. In South Korea, a challenge pointed out by Lee and Kim (2015) for the active adoption of OCW was the lack of mechanism to ensure the quality of OCW.

Almost all the reports (Australia, China, Japan, Spain, Turkey and South Africa) mentioned institutional / general guidelines for (O)ER quality (n=9), although most of them did not refer to the academics' awareness. For example, in Japan there were no QA criteria for OCW, MOOCs and other OER at the organizational and national levels; however, CTL or a similar unit within some universities provided general guidelines for OER selection that individual faculty members could refer to when using (O)ER. Takahashi (2018) reported QA guidelines for e-learning design which have been applied in a collaborative online learning project linking five universities in Shikoku region in Japan. These guidelines were developed based on agreement between experts in online learning and instructional design from the five universities and have been applied in QA for e-learning and (O)ER. In Spain, not being the norm, a survey participant

mentioned that their university had included as new elements for (O)ER quality in their guidelines: short, clear, multiplatform, use of simple formats (inclusion).

In China, an interview participant who previously held a managerial role at Beijing Open University mentioned that the development of (O)ER by academics had been in accordance with national policies, and therefore the focus of quality evaluation had changed accordingly. According to this interviewee, the online course quality depended mainly on the evaluation carried out before it was implemented, and the feedback received after it was developed. Similarly, in an interview study with the Director of the Academic Affairs Office of a provincial normal university (Hou & Wang, 2012), the Director stated that the National Top-quality Courses program had improved the quality of the faculty members' offline courses and deepened their understanding of instructional methods and standards. Some faculty members interviewed also mentioned that all teaching staff knew the national standards for each course, and these standardized instructional methods set guidelines for faculty members, to improve the quality of their teaching.

In Turkey, quality assurance of OER practices at micro level functions according to traditional measures in which the individual university and the HEC play the prime function. However, in the particular case of Anadolu University's AKADEMA platform, academics used OpenupEd Quality Label assessment tool, developed based-on EADTU's (European Association for Distance Teaching Universities) E-xcellence Label, learner satisfaction survey, and a few other criteria, in order to secure the quality of these courses (AKADEMA, 2020). In South Africa, (O)ER Africa recommended the quality criteria on evaluating an (O)ER developed by British Columbia OER Librarians to be used by lecturers as a checklist. However, little evidence existed to suggest that South African lecturers were indeed using this checklist. In the case of the University of Tasmania in Australia, staff were encouraged to use the Quality Matters framework to review their (O)ER and the ones from their peers (Brown et al., 2013).

Institutional and individual QA agents

In this section, we address the awareness of faculty members concerning the institutional QA agents involved in (O)ER and the academics' involvement as QA agents in (O)ER at the teaching and learning level (institutional and individual QA agents, n=15).

For instance, in South Korea, the CTL or a similar unit within each university was responsible for defining the quality of (O)ER and deciding platforms and tools for online education and its decision-making follows its own QA process and involved a representative faculty member from each school or discipline. In China, Xu's survey (2018) showed that a low percentage of the faculty members (30.2%) agreed with the statement that "the university has a teaching team for developing online educational resources", whereas 25% responded with "completely disagree". Another survey investigated staff working in MOOC offices, information centers, educational resource offices, and multimedia offices from 50 universities in China (Liu, 2016). The majority of participants (96.15%) believed their offices played a role in overall regulation and planning, and only 23.08% considered that their offices managed or examined formative evaluations of the quality of (O)ER. With COVID-19, different college and universities in China acted in their own ways to ensure quality of (O)ER. For example, Peking University organized a teaching research group, composed of experienced professors, to investigate online courses to ensure their quality. In the first two weeks of the teaching research group, this group attended more than 60 classes.

In other countries institutional agents were part of other services. This is the case of Australia, where the library played a key role in OER development at the Queensland University of Technology (QUT), through an optional stage of quality assurance (Stevens, Bradbury, & Hutley, 2017). The University Copyright Officer or a Learning Designer could provide guidance to educators on the quality or suitability of OER, as well as appropriate repositories.

In Spain, the awareness of institutional QA agents reported by participants in the survey was low, since only a few academic staff mentioned some institutional services; for example, the vice rectorate of digital campus, the teaching department, the course manager/coordinator or the author (teacher/s), the technological or informatics unit, the unit of educational advising, or the library. Another participant mentioned the work towards (O)ER quality of the pedagogical and technological support unit. In Germany, between 30-45% of participants were unsure or did not provide an answer to the question. According to the participants in both surveys, the actors with more influence in their universities to

define the quality of (O)ER, their metadata and their repositories are mostly the same academic staff that use them (Spain: 41.2%; Germany: 42.1%). This involvement and responsibility of (O)ER quality was present in other countries too. For example, in Turkey, individual instructors and professors were responsible for the quality of the (O)ER they provided to their students in their courses. In Japan, most universities did not have its own QA guidelines for (O)ER and infrastructures, and therefore, individual faculty members were the ones who make their own QA decisions during the (O)ER creation and selection. In South Africa, it was remarked that while many educators emphasized ensuring the quality of (O)ER, there was no evidence of quality assurance and feedback activities as "personal practices" (Hodgkinson-Williams, Arinto, Cartmill & King, 2017, p. 50).

In addition, in Australia and Spain's reports, collaboration among faculty members to ensure quality of (O)ER was mentioned. In particular, at the University of Tasmania in Australia there was an institutional expectation that educators were involved in peer review procedures, both for their own work, but also to review the work of colleagues (Brown et al., 2013). In Spain, some participants in the survey mentioned that a collaborative work between faculty members with this respect took place.

1.3 Policy

In this section we looked at the existence of policies specific to study programs, departments or schools, the academics' involvement in policy making and the academics' awareness of institutional policies related to (O)ER.

Institutional specific policies

A lack of institutional policies for (O)ER (n=8) was acknowledged for most of the countries (Australia, Canada, Turkey, South Africa, Spain). No specific policies related to certain study programs or departments or schools, were acknowledged in any report.

For instance, in Turkey the shortage of clear legislation about copyrights for educational use of different resources created a hesitation among individuals to share their resources openly. In addition, the pandemic made the HEC to start developing tactics rather than entire policies to institutionalise OER in the country.

In the case of South Africa, and concretely at Unisa, staff were used to working within strict policy frameworks and the lack of an OER policy could be a contributing factor to the perceived barriers to staff engagement with OER (Cox & Trotter, 2017).

Among the interviewed educators in Canada, respondent E and H stated that there was at that point no guiding institution policy or direction in (O)ER. Respondent F was positive that policy and guidelines were coming to her institution and that, "in their absence, meanwhile, practice is not consistent. Integration is not consistent". In Australia, a dearth of institutional policies was also noted in the Open Education Licensing Project case studies (Open Education Licensing Project, 2016b), finding that is reflected in the expert survey study: when asked about explicit institutional OER policies or frameworks in the present study, 25 respondents out of 39 (64%) indicated that these are non-existent in their institution. Five people (7.14%) indicated that OER practices have been incorporated in their institution's current strategic plan, six people (9.48%) indicated that their institution has no plans to consider OER practice in future strategic plans, and fourteen people (20%) indicated that their institution will incorporate OER practice into their future strategic plans.

In the cases where some kind of (O)ER policy was in place (a few institutional cases in Canada and Spain, and in the centralised cases: China, South Korea), some remarks were done regarding the need for policy improvement (n=9).

A clear case of this is South Korea where, despite the emphasis on (O)ER creation and utilization, there was still acknowledged a need to improve policy to further promote (O)ER adoption by individual faculty members. Similarly, in the study survey by Wang and Wu (2013) at Peking University, 153 faculty members over 20 departments argued that policies and mechanisms for motivating faculties to develop (O)ER by protecting their intellectual properties were key to

promoting (O)ER, and more policies were needed in these aspects. Along the same lines, Xu's (2018) study showed that the majority of faculty members in the eight Chinese universities surveyed were in disagreement with the statement that the university had operated well in terms of mechanisms in place for providing support and incentives.

In Turkey, there was a need to develop some policies and walkthroughs to catch quality standards, widen their scopes, and make them compatible with international counterparts. Academics at Unisa (South Africa) must comply with tight policies, "but doing so yields productive results because academics see how they contribute to the broader institutional strategy" (Cox & Trotter, 2016, p. 152). Therefore, the authors pointed out that a strong policy imperative would be crucial for faculty in the context of Unisa to actively embrace (O)ER.

In Canada, three of the interviewees referred to a need for improvement in (O)ER policy at their institutions. For example, respondent B stated that "policy changes must occur so that teachers have easy access to free material". Respondent C hoped that a new strategic plan at her institution would include a designated person to head up the OER initiative, and respondent G found that "while institutional policy could be both a challenge and a solution, it did not contribute to increased OER use".

One of the participants in the survey study in Spain elaborated further on this topic regarding the situation in their institution: "There is a policy, but it will have to be improved and more widely disseminated. I do not believe that there is a lack of interest, on the contrary, but there is a lack of time and more measures in the direction taken so that it becomes part of the culture of the institution. Among these measures are all those that facilitate and make it possible to use it among that part of the academic staff interested: time, space, incentives, recognition...".

Academics' involvement in policy making

Academics' involvement in policy making (n=8) was present in some institutions but rather as anecdotical cases, except from South Korea, where individual faculty members were involved in policy making via various committees and internal/external reviews. Major committees for (O)ER included: planning and steering committees of CTL, Cyber education committee and IT committee.

For instance, in China, according to a field study at a university in Nanjing (Meng, 2018), faculty members were invited to attend seminars to give feedback on the policy for calculating their workloads related to using online courses to develop flipped classes, with face-to-face tutorials. The university administrators took their advice and feedback into consideration policy formulation.

In Australia, and as particular institutional case, the OER policy of the QUT approved in 2016 was developed with the input of the University Copyright Officer, Learning and Teaching Unit, Technology, Information and Learning Support, eLearning Services, and various individual academics interested in OER and OEP (Open Education Licensing Project, 2016c). When asked in the expert survey which actors were involved in OER policy making at their institutions, only 30% (n=21) of survey participants provided some level of response. Four participants stated that it was not applicable to them, two participants were unsure, four participants mentioned the Pro Vice-Chancellor's office or Associate Deans of Education for faculties, one mentioned Learning Design and one mentioned IT. The most involved actors of OER policy mentioned were the libraries and, whilst seven respondents mentioned educators in some respect, it seemed that only "individual academics" were involved, or "individual/small group of educators who are OER champions". The role of librarians is similarly emphasized in Canada. One of the interviewees (respondent E), a university librarian and point person for OER at her institution, belonged to a provincial working group on OER and was involved in pushing her institution for change and for policy development.

Along the lines remarked in Australia, most of the surveyed academics in Spain and Germany were either not involved in the preparation of institutional (O)ER policies (Spain: 36.3%; Germany: 19.7%) or uncertain about it (Spain: 54.6%; Germany: 57.9%). Regarding the possibilities to influence explicit policies, both Spanish and Germany academics were mostly unsure (Spain: 57.8%; Germany: 64.5%), and without them was more commonly perceived in Spain (26.2%) than in Germany (9.2% against 13.2% that perceived this possibility).

Finally, in the case of South Africa, there was no published evidence of how individuals' actions informed policy development for (O)ER. However, some referent, individual voices in (O)ER in South Africa were known to have impacted on policy development at their respective institutions (two individuals were mentioned for UCT and two more for the early days of the formulation of a strategy for the implementation of (O)ER in Unisa).

Academics' awareness of institutional policies

Overall, academics' awareness of institutional policies (n=7) was low across the countries, with the same exception as before (South Korea). Korean faculty members were well aware of institutional policies related to (O)ER as they were provided with announcements regularly via their department and CTL and received frequent emails and social networking messages promoting the development and utilization of (O)ER.

In Spain and Germany, most of the academics surveyed were unsure about the existence of institutional policies for specific study programs or to department/faculties (Spain: 67.4%; Germany: 56.6%) and only 14.8% in Spain and 17.1% in Germany were positive about this existence. In addition, only 21.7% of the Spanish participants and 25% of the German surveyed stated that there was an institutional explicit policy or regulations concerning the use and/or creation of (O)ER in their universities. Most of the participants were uncertain about this (Spain: 61.7%; Germany: 54%). Slightly some more participants in Spain and some less in Germany stated that there was an institutional implicit policy (Spain: 23.7%; Germany: 22.4%) – against a majority that did not know (Spain: 60.5%; Germany: 57.9%).

In a survey research with 172 faculty members from 8 representative Chinese universities (Xu, 2018), only 33% of the participants were aware of relevant national policies, and 37.2% knew about relevant university policies. The degree to which faculty members were familiar with policies was ranked by participants from high to low, with the following results for different policies (from high to low rankings, from most to least familiarity): (1) course management; (2) changes in teaching methods; (3) course content; (4) course resources; (5) course structure; (6) the training system; (7) the training system for technical personnel; and (8) support for relevant resources. Regarding faculty members' awareness of how courses or educational resources were managed, Xu's (2018) survey found that only 10.6% knew that their university had an office that specialized in online courses, and 45.9% reported that that they were not aware of such an office, whereas 43.5% stated that there was no such office in their university. This shows that most faculty members were not aware that policies regarding online courses and educational resources were managed from a central and specialized office.

On the other hand. in a study by de Oliveira Neto, Pete, Daryono and Cartmill (2017, p. 101), most South African (63%) said their institutional policies supported OER, but only a minority had used them (37%). In the study with Unisa staff by Cox and Trotter (2016), the findings showed that although staff could petition the relevant tuition committees to make the works available as (O)ER, most of the staff interviewed were not aware of the possibility and/or the processes.

1.4 Change

Promotion of change at the micro level was related directly to different parts of the OER Pyramid Adoption model. In particular, with permission, awareness, capacity and volition. In addition, individual volition had a clear and relevant extrinsic motivator factor: the presence or absence of incentives (see Figure 19).

Academics' involvement in creating (O)ER and advancing the infrastructures

To describe academics' involvement in (O)ER, we need to acknowledge different elements that directly affect this involvement.

The first of them is the factor permission (n=8), which refers to the institutional dispositions to which the academics are tied, particularly related to copyright issues and who owns (O)ER developed by academics within the frame of the institution.

In this sense, in the case of South Korea, (O)ER that are copyrighted cannot be used unless permission is obtained and copyright issues are cleared, and NILE's guidelines on copyrights are to be followed in developing a MOOC. However, in Turkey, copyright policy is one of the biggest challenges of OER related library services and repositories, but also in OERs and resources in general. The current Law of Intellectual and Artistic Property Rights (1951) had revised and included two articles (33th) in 2001 and (34th) that were related to use of resources created by others. According to these articles, as long as the creators were cited the resources could be used for not-for-profit educational processes. However, especially in the 33th article, it was clearly indicated that these could be used in face-to-face educational processes but nothing about open and distance learning.

On the other hand, the ownership of (O)ER is a crucial aspect within the factor permission. For example, in South Africa, and particularly in Unisa, the institution owned all the intellectual property of work by staff members created "within the normal courses and scope of their employment" (Cox & Trotter, 2016, p. 154). However, unlike other South African universities (like, e.g., Unisa), "UCT academics are allowed to possess the copyright of their teaching materials and thus turn them into OER" (Cox & Trotter, 2016, p. 152). In Canada, respondent A explained that part of the challenge to adopt OER is that at her institution, created material belonged to the institution, thus inhibiting some instructors from creating their own OER. Their contracts prevented them from seeking a Creative Commons license for their products. Similarly, in many Australian higher education institutions, teaching and learning resources "are traditionally closed to those outside of a course or unit, and ownership is retained by the university – the lecturer must seek policy approval to release course materials outside of the institution" (Stagg & Partridge, 2019, p. 479). For example, the QUT had an institutional Intellectual Property Policy, which incorporated the use of OER. This policy stated that before staff were able to release teaching and learning materials as OER, they must first receive approval from their Head of School and then seek approval from the Deputy Vice-Chancellor (Technology, Information and Learning Support).

The second factor that affects teachers' involvement in (O)ER actions is awareness (n=18), which refers to the degree of knowledge that faculty members have concerning (O)ER, OER and the philosophy behind (openness). Most of the countries have related statements that refer to either high or low awareness, being the latter more common.

For instance, in Turkey there was low awareness regarding the philosophy of openness and the way scholars perceive openness. Shortage of awareness about Creative Commons like licensing methods is also related to this barrier. Similarly, in South Africa, the research carried out by de Hart, Chetty and Archer (2015) found that participants had a limited understanding pertaining to IP and open licencing formats and processes. A further interesting finding in the study by de Hart, Chetty and Archer (2015) was that the respondents indicated generally that they were prepared to share their own work only if they could make money from this. This showed that many of them did not understand or comprehend the ethos of OER. A lack of knowledge about OER was also remarked by the study of Chikuni et al. (2019) in four South African universities. In addition, there was also evidence that in the context of South African universities, individuals' understanding, awareness of, and engagement with (O)ER were also shaped, and in many ways determined by their institutional location (e.g. role, department, discipline) and institutional environment (the character, values and mission and vision of the institution) (e.g., Cox & Trotter, 2016).

In Canada, the low response rate to the eCampus Ontario study on OER (Hayman, 2018a) was interpreted as a correspondingly level of interest or knowledge of the OER topic. Some concrete answers from participants in the survey in Spain brought light into this topic and referred concretely to the OER infrastructures. For instance, one instructor stated that "my university's repository has only been functioning for a few years, it still lacks dissemination, awareness, human resources and time to consolidate itself as a tool for everyday use". A second one stated that faculty members' awareness of the importance of uploading the used/created (O)ER in the institutional websites had been increased. The fact that the (O)ER transparency, sharing (O)ER (and use of internal repositories), had been improved was mentioned by several faculty members in Spain.

In China, the study by Zhang, Zhao and Li (2015) pointed out that faculty members' lack of understanding about the standards of (O)ER and open courses was problematic, because their perceptions of the universities' policies and standards of (O)ER could influence their (O)ER practices. Along the same lines, the most relevant challenge for faculty members highlighted in the study by Li and Li (2012) was lack of awareness (41.5%).

Australian educators' limited knowledge about OER, as well as licensing issues, was mentioned as a barrier at QUT and Swinburne University (Open Education Licensing Project, 2016a; 2016c). Similarly, concerns around staff knowledge of copyright and intellectual property policies were still abound among OEP grant holders (Stagg & Partridge, 2019). As Bossu and Meier (2018, p. 5) highlighted, there was still "an overall lack of understanding about the use of open licences and instititional practices in terms of copyright permissions". The small-scale study by Bossu (2015a) at the University of Tasmania in medical education showed that a significant number of students and staff had a limited awareness of OER and Free Open Access Medical Education (FOAM); and therefore, reinforces the previous statements about academics' OER awareness. However, results from the study by Bossu, Brown and Bull (2014) showed high levels of OER awareness and knowledge by participants. Similar findings were obtained in the expert survey, with 83% (n = 48) of the participants having previously heard of OER.

High levels of awareness of OER among a majority of the respondents from the four-year institutions were also found out in a large-scale survey with educators from Japanese higher education institutions between 2015 and 2016 (Shigeta et al, 2017, p. 199).

Capacity (n=11) is the third relevant factor in teachers' involvement with OER. Most of the countries highlighted some shortage of academics' digital skills and emphasised the importance of institutional professional development support. This latter will be described in the next section.

Concerning academics' digital skills, for instance, in a survey of teaching and research staff at Unisa (South Africa), Roberts (2016) found that the respondents' perception of their own ability to be technically sound, was very low and that training in this area was required. Similarly, a shortage of digital skills among Turkish educators was also noted as a barrier for (O)ER in Turkey. In Canada, according to respondent E, the lack of technical skills was an element that impeded some educators. This was also an important theme in the study by Hayman (2018b), which highlighted the need for educators to be better educated in OER-related skills, such as finding appropriate materials.

Similarly, in Australia, different studies have shown findings related to academics' capacity. For example, some of the lecturers at the UTS cited a lack of knowledge about video creation as a reason behind their lack of resource creation (Kandlbinder, 2015). Ward (2015) pointed out that the move of academics at Charles Sturt University to offer two courses on OERu involved a lot of technical and learning design capabilities, which not all educators had. These examples suggested the need for developing educator digital capabilities, such as in a case study by the Higher Education Standards Panel (Ewan, 2016), which raised "the need to develop the abilities of academics to select and curate content from multiple sources" (p. 2). Different authors had further acknowledged that educator capacity for OER creation and adaptation remained an area requiring improvement in Australian higher education (Stagg, 2014; Udas et al., 2016).

In China, the lack of skills was considered a challenge for faculty members to use OER in 24.6% in the study by Li and Li (2012). Interestingly to remark in the Chinese context was a comment from an interviewee from the BNU Centre of Information & Network Technology. He stated that the most considered important factor that impacted on the implementation was IT literacy among leaders and administrative staff who were involved directly in digitalization work at the institutional level. Similarly, a challenge pointed out by Lee and Kim (2015) for the active adoption of OCW in South Korea was the lack of technology competence at both faculty and institutional levels.

The last factor included here is volition and concerns the desire of academics to create, use, adapt, remix and share (O)ER when referred to individual volition (n=44), but there could be social and institutional volition too. Different elements that were identified within individual volition are: costs benefit, precarious employment situations, lack of time, concerns related to copyright, perceptions of (O)ER, and attitudes related to sharing (O)ER. We also identified a few elements within institutional and social volition, as will be described later.

The first element described here related to individual volition was identified in some countries where teaching materials (and particularly, textbooks) were expensive for students: costs benefit (n=4) as a motivator for academics to publish their materials as OER, in most cases referring to open textbooks. For instance, academics at UCT (South Africa) were aware of the challenges related to the cost and utility of traditional textbooks and were therefore experimenting with

new approaches towards resource creation through open practice (Cox, Masuku, & Willmers, 2020, p. 5). In Canada, one of the most common themes mentioned by the interviewees was costs benefit as a motivator for OER. For example, respondent A (an OER leader at her institution) especially liked to avoid textbooks for her students due to their high cost and, therefore, used OER. Another interviewee (a professor from a technology-focused institution) moved away from "licensed, subscription-based homework/assessment" (#OERThankU) systems to open source and one of his reasons was the cost of resources. The importance of costly textbooks as a driver for OER was also an important theme among the findings of the study by Hayman (2018b).

A first barrier in individual volition for (O)ER was identified in Canada and Spain with the employment conditions (n=3) specific types of academic ranks / institutions involved. Concretely, in Canada, respondent E stated that faculty in temporal positions did not want to lose what they saw as "leverage" as regards their own materials; existing a sense of possessiveness and insecurity. In addition, a finding regarding this barrier by Hayman (2018b) referred to a situation of less autonomy in the case of college educators with respect to course decisions than university educators. Similar remarks regarding faculty in temporal positions were mentioned by different participants in the expert survey in Spain, who pointed out the need to improve the working conditions of adjunct professors that already suffered from an excess of unpaid work, and therefore, the creation of (O)ER would be added to this work.

Lack of time (n=14) was considered a second barrier in individual volition for (O)ER, usually related to the already heavy workloads that academics experienced. For example, in Turkey, shortage of time for creating (O)ER along with a heavy workload were highlighted as barriers for the educators. In South Africa, the research by Cox, Masuku and Willmers (2020) remarked that "there is still a cost involved in the production and ongoing delivery of open textbooks, particularly in terms of the time required on the part of the academic to author, format and publish these resources". In Canada, diverse interviewees mentioned lack of time as a barrier for (O)ER. For instance, respondent B did not have the time to focus on creating materials and it neither helped that there were staff shortages at her institution at the point of the interview, since this increased her workload. A second interviewee, a communications professor at a technology-focused institution, admitted that creating OER was labor-intensive. Not only OER creation but also locating OER was related to lack of time. For example, respondent C said that it was a lot of work, and time-intensive, to find what she needs. Similarly, respondent H identified time to locate the right resources also as a challenge. In the study by Hayman (2018b), the lack of time to use OER (revise, adapt) were one of the reasons for general confusion about OER in potential users. In addition, the study found that f2f faculty members had less time to devote to learning how to use OER than online faculty members. Similar remarks were found in the reports of Spain and Australia. Several Spanish faculty members in the expert survey mentioned the lack of time as a barrier for (O)ER; for instance, one stated that it was very time consuming to create (O)ER, and another highlighted that "there is a big problem today with the availability of time for the work of the academic staff". In the German study by Schmid et al. (2017), instructors indicated to (rather) agree with lacking the time to search for OERs and judge their quality. In the study by Kandlbinder (2015) at the UTS (Australia), lack of time was one of the reasons to explain why lecturers of large classes did not create additional materials beyond lecture recordings. Lim, Kim and Choi (2017) identified as barrier to South Korean faculty involvement in the creation of (O)ER the heavy workload put onto individual faculty members in creating all course materials. On the other hand, although one of the challenges for faculty members to use OER in the study by Li and Li (2012) with Chinese academics was lack of time, this was not a major reason (9.2%).

In some countries, faculty members expressed concerns related to copyright (n=6) that could be considered an additional barrier to (O)ER. For example, in the study by de Hart, Chetty and Archer (2015) in South Africa, concerns about the copyright and legal considerations were manifested by Unisa staff. In Spain, the concern about the management of the (O)ER author rights was present in 21.1% of the participants in the expert survey (multiple selection was possible), and in Germany it was the most ranked option regarding the challenges of (O)ER and their repositories (9.2%). In Australia, the study by Bossu et al. (2014) exposed as main concerns behind people at their institution not developing and/or re-purposing OER the potential loss of intellectual property and the fear of exposure. In Canada, interviewee E stated that faculty member at her institution were hesitant to create their open content because they do not own it. On the other hand, interviewee H stated to be sensitive to legality and copyright and wanted to "stay within the rules", but wished the rules featured more openness and access.

An element that may act either as a driver or barrier for (O)ER were academics' perceptions of OER (n=10). As drivers we could identify the following:

- Participation in (O)ER is important (South Korea). It was a general perception of many faculty members that their participation in (O)ER was important for the university as well as for their own teaching.
- OER as a form to enhance the own reputation and for personal fulfilment (South Africa). Evidence suggested that "personal motivation, especially the desire to enhance one's reputation, underpins some educators' practice of creating and sharing teaching materials as OER", as well as feelings of "personal fulfilment and confidence" and educators seeing their participation in (O)ER as "a way of asserting an epistemic stance, or one's own unique (individual or collective) perspective of knowledge" (Hodgkinson-Williams, Arinto, Cartmill, & King, 2017, p. 586).
- OER as a way to improve teaching (Australia, Canada, Germany, South Korea). In the survey by Bossu et al. (2014) with respondents from Australian universities, remarked benefits for OER were their possibility to improve the quality of educational materials and their helpfulness to enhance quality of teaching and learning in HE. An interviewee in the Canada study (a professor from a technology-focused institution) explained as one of the reasons to move to OER was the understanding that there was a "better way" to engage students in their learning. The study by Jung and Lee (2020) with Korean faculty members revealed that academics were using (O)ER rather habitually with an expectation of their teaching performance improvement. German instructors in the study by Schmid et al. (2017) (rather) agreed that OER help them to prepare for their teaching and that OER enrich their courses.
- OER as a time-saver (Australia). Among the benefits of OER in the survey by Bossu et al. (2014), respondents highlighted that educators could save time and avoid duplication of effort.
- OER leads to institutional innovation (Australia). The majority of participants who answered questions to rate various statements about the use of OER in HE in the Australian expert survey agreed that using OER leads to institutional innovation (34.29%) and that the adoption of OER promotes the sharing of knowledge and the university service mission (36.71%) [2] .

Among the barriers for (O)ER in terms of academics' perceptions, we could highlight the following:

- Openness and OER related concepts as equivalent to free resources with low quality (Turkey). Such a perception by academic circles at individual and institutional levels inherited the developments of OER related issues in Turkey.
- (O)ER are incompatible with traditional instruction (China). The survey by Xu (2018) found out that 69.8% of the participants considered online educational resource or courses incompatible with traditional instruction. In online resources and courses, the methods of organizing content, scheduling time and making the course plan are different from those required for face-to-face teaching, and ineffective coordination significantly impacts the effectiveness of online teaching. Additionally, the lack of a scientific approach to resolving the tension between fragmented learning and integrated disciplinary knowledge was an important factor that accounted for the current problems in developing (O)ER online.

Another element related to individual volition that was present in some of the reports and that we wanted to analyse separately were the attitudes related to sharing (O)ER (n=11). Some of them relate to the concerns regarding copyright issues. For example, Educators at Swinburne University (Australia) reported creating videos and MOOCs as OER, with some expressing the desire to share their videos, but also to license them correctly, so as to not to allow their being "cut up" and redistributed (Swinburne Commons, 2015). In Turkey and Canada, similar concerns were reflected in the reports. In Turkey, educators hesitated to open up their materials either because they thought that others might use them for their own use (either for profit or not) and would not cite them, or because of fear of getting evaluated or criticized by their peers/colleagues. In Canada, two interviewees showed attitudes related to sharing OER in their institution. Respondent E indicated that faculty members at her institution would share OER within limited parameters – e.g., within their own department or with close colleagues. Similarly, respondent F found that sharing resources was dependent on personalities and collegiality. However, findings from the study by Hayman (2018b) showed different results: she found that her study participants were willing to take risks, were excellent curators of open content and happy to share their intellectual property, including via social media. In Spain, a survey participant indicated that sharing (O)ER was more a particular initiative of academic staff, rather than institutional encouragement. In Germany, a second

reason provided by survey participants not to use the institutional repositories was not wanting to publish (O)ER (7.9%, the question was only shown to the participants that had answer negatively to the use of institutional repositories) and, as in Canada, sharing (O)ER happens commonly in confined spaces (email, LMS) (Schmid et al. 2017). In South Africa, there were contradictory findings related to this topic: on the one hand, the study by Hodgkinson-Williams, Arinto, Cartmill and King (2017) found that there were also concerns by educators about the quality of their own work and to open their work for peer assessment, and evidence that educators would use existing (O)ER to benchmark the quality of their own work. On the other hand, the study by de Hart, Chetty and Archer (2015) at Unisa found that "respondents were apparently confident about the quality of their [(O)ER] offerings and were not concerned about their work being subject to scrutiny by others" (p. 33).

Concerning social volition (n=11), we refer to the social environment of the faculty members (department, other faculty members, colleagues) and how interested they are to be involved in (O)ER processes, but also the influence this operates on individual volition through modelling or social desirability. An element that stood up in the reports from Canada and China was the presence OER forerunners as advocators of OER and inspiration for colleagues at their institutions or even in a broader level. Many of the interviewees in Canada were identified as OER pioneers, champions or forerunners in their institutions (respondents A and F) and, some of them, even in the province and/or in the whole country (respondent B). For example, respondent A championed OER's foothold at her institution, and organized an "Open Day" in 2018 which served as a catalyst for raising interest among her colleagues. Two years later, there were 12 courses offered with open texts. Respondent F was a strong believer in OER and an advocate within her large university. In response to student demand, she had developed online programs in her field and various OER resources that respected the diversity in voice. She was committed to keeping available resources up to date and had created mobile OER resources that were being widely used in her field. Another respondent, a communications professor at an Ontario HE institution and creative creator of OER, credited librarians with being "rockstars" in the OER world. The importance of OER champions was constated by respondent E: "strong champions are needed to push OER acceptance forward". In Japan, social influence from peers was highlighted as more important than performance improving in adopting OER (Jung & Lee, 2020). In China, most interviewees in the study by Hou and Wang (2012) thought that top-quality courses were used mainly by peer colleagues from the same university or other universities. As an example, one faculty member from University A, whose course was a National Top-Quality course, mentioned that many universities used the course materials they produced, and that this was very helpful in order to broaden the influence of their course in the country. Faculty members from other universities had contacted them about how they produced their resources and some faculty members even visited their university in person to learn more about the course. In addition, another interviewee's course was very influential. He believed that his National Top-quality course had played an important role in improving the standards of instructional design and had had an impact on similar courses in many domestic universities. His course had an extremely high usage frequency, because it was also offered by other universities, and many faculty members browsed his course resources or contacted him when developing their own courses (Hou & Wang, 2012). Another element that should be considered as part of social volition is the resistance of faculty members to (O)ERs; this was remarked also in the report of Canada. Respondent D (a university teacher) did not know anyone who used OER but knew that some of her colleagues balked at the idea and were suspicious of open resources. Similarly, respondent E reported that faculty members were reluctant to use or trust repositories and respondent B (OER champion) had found faculty at her institution to be resistant to OER. A further interesting remark for social volition is the one made by respondent G, who stated that his experience at his institution had shown him that younger graduate students who assisted him in teaching were more receptive to creating and sharing materials, although they could be shared more widely, than older professors, who were not as open to sharing.

Institutional volition (n=22) is another factor related to development and adoption of (O)ER, which refers to the interest of the institution to push (O)ER forward. A main element are incentives, which are described in the next section. In some countries, institutional encouragement, commitment or requirement were noted also as important factors.

With regards to institutional encouragement (n=12), we found both presence and lack of it in the different reports. It was present in the reports of Australia, China, Japan and South Korea. The second most frequently mentioned activity in Australia concerning OER projects or initiatives in the expert survey was the promotion of using OER (n=3), next to the

institutional library (n=6). A concrete measure of encouragement was highlighted by a participant in the same survey: “unofficially, slight pressure is being applied to lecturers at a very low level to encourage them to consider open textbooks as a cost-reduction measure for students”. An example of an effective OER information dissemination strategy was an email from OER project coordinators to all staff in the faculty, which prompted increased engagement (Lambert, 2015). However, as pointed out by Kandlbinder and Chelliah (2015, p. 3), “the encouragement to use OERs is only likely to succeed if there is an institution-wide approach to that makes adoption and modification of OERs more attractive to subject coordinators”. Furthermore, support from senior administrators and at the national level, would also assist institutions in making changes towards further OEP development (Bossu & Meier, 2018; Bossu & Stagg, 2018; Open Education Licensing Project, 2016a, 2016b). In Canada, there were a couple of examples if this institutional encouragement explained by the interviewees. For example, respondent F stated that her institution was set up for cross-collaboration among areas where quality assurance experts, technical experts, and the teaching and learning center all united to create OER and encouraged its development. Another interviewee (a professor of a technology-focused institution) said that his university strongly encouraged the OER movement and had in place designated OER website as well as a “steward” program. In 2019-2020, the steward program had 19 members. This supports the finding from Hayman (2018b) that when OER advocates and educators from a variety of institutional roles were given encouragement and opportunities to share their knowledge, use of OER increased. In South Korea, this encouragement is even clearer, since individual faculty members were strongly and continuously asked to engage in the creation and utilization of (O)ER by their university. In the Japanese context, where (O)ER had been developed mainly at the institutional and individual faculty levels, member universities had encouraged individual faculty members to create OCW and MOOCs and linked them to JOCW and JMOOC sites. Finally, the case of a university in Nanjing (China) stood out: no matter how expensive the online course was, the universities provided sufficient financial support and encouraged the development of more such quality materials (Meng, 2018). Lack of institutional engagement was noted in the reports of Turkey and Spain. Turkish educators were not encouraged to produce and share OER at the individual level, but in contrast, they were encouraged to use institutional subscribed services. Similarly, in Spain, some participants noted that (O)ER repositories had very little visibility in general, and especially, that its reuse was not encouraged.

The institutional requirement or invitation (n=4) to create/use/share (O)ER and/or use the institutional repositories was another element identified within the institutional volition. For instance, an interviewee in the expert study that held a managerial role at BOU (China) stated that all the faculty members were required to curate one course online which would be integrated into their university learning portal and that would be reviewed by a university management group. On the other hand, the use of OER in Canada was best framed as an invitation for educators to explore and not as a requirement of practice (Hayman, 2018b); however, in exploring what the future of HE in Canada looked like, recommendations for policymakers highlighted the value of openness, and suggested “open” becoming a requirement. In Turkey, no requirement to integrate technology (lack of demand from students and administrators) into the courses was considered as a barrier related to institutional volition.

Finally, we would like to remark institutional support (n=6) as a third element within institutional volition. Although there was a signal of this support in the report of Australia, the reports of the other two countries (South Africa and Turkey) referred to the lack of it. So, in the expert survey from Australia, some academics indicated that their university was “overtly committed to transforming 2 degree programs each year into fully OEP over the next 3 years”. However, the study by Bossu et al. (2014) showed that despite the recognition that OER could assist improve the quality of teaching and learning, participants identified the lack of interest in creating (good quality) OER and the difficulties involved in changing academic culture. Additionally, only six participants (8.57%) in the expert survey either agreed or strongly agreed that ‘teaching strategies promoting the use of OER are supported in [their] institution’, and only seven (10%) agreed or strongly agreed that the ‘adoption of OER is supported in [their] institution’. In a study at four South African universities (Chikuni, Cox & Czerniewicz, 2019) a noted challenge for OER was the lack of institutional support. In the case of Unisa (South Africa), it was the institution , who at the end, “is in fact the unit of agential analysis regarding the ‘creation’ side of OER adoption” - “the institution would need to decide whether it wanted to openly license and share the teaching materials that it holds copyright over” (Cox & Trotter, 2017). In Turkey, administrators’ hesitation for use of

OERs created by others was considered as a barrier for dissemination of OERs and OEPs related to institutional volition and, in particular, to institutional support.

Support for academics in (O)ER creation

Academics were supported in creating, sharing, using and remixing (O)ER and using their repositories by two main elements at this level: institutional professional development support (addressed at improving capacity) and the use of incentives (targeted at increasing individual volition).

In terms of institutional professional development support (n=28), most of the reports mentioned different forms of this support and training. We incorporated institutional training and support as two different professional development offers, as well as the academics' awareness of professional development institutional agents.

Concerning institutional training (n=13), there was a wide range of possibilities, including workshop, information and training sessions or orientation programs, among others. For instance, at the UCT, in South Africa, support for faculty members included regular OER workshops and training sessions held by CILT and getting legal advice when licensing their materials as OER (Cox & Trotter, 2016, p. 153). The case of South Korea was special, since most universities had been implementing a policy which required all newly hired faculty members to receive an orientation program. During this orientation program, the new faculty members were provided with information about the (O)ER and their infrastructures available for their use, and offered opportunities to develop skills to use the institution's LMS, educational software, MOOCs, and other technologies, and learn about flipped learning, blended learning, copyright issues and more. Campus-wide organisations or teams concerned with teaching and learning matters in Japan provided faculty members with information and training sessions regarding the creation and utilization of (O)ER. For example, the Center for Promotion of Excellence in HE at Kyoto University offered frequent (optional) faculty development workshops on how to utilize (O)ER for effective teaching and learning (Fujioka et al., 2019). In addition, it ran an online training program called the Mutual Online System for Teaching & Learning to help faculty members develop effective teaching and learning strategies including the use of various kinds of (O)ER available for HE (Fujioka et al., 2019; Kubo, 2017). In Spain, participants in the survey mentioned that they used more often the faculty professional development offer as results of the COVID-19 remote teaching, and that to create (O)ER they needed pedagogical and technical support. The increase of (O)ER use and creation's competence by faculty members and the relevance of online training was mentioned by others too (not about sharing or the evaluation of (O)ER quality). Another participant mentioned the institutional use of peer mentoring. In Germany, 39.5% of the participants stated that support for professional development for (O)ER was a measure applied at their institutions.

In Canada, respondent A said that one day each semester there was an OER information session at her institution's teaching and learning centre. The 2017-2019 Canadian Digital Learning Research Association survey data show that institutions offered an extensive variety of practices to provide instructors with professional development and support; for example, workshops, one-to-one interactions and group professional development opportunities [3]. Participants in the study by Hayman (2018b) sought and valued professional development for OER use and among its recommendations we could find that "advocates and interested educators may benefit from social professional development experiences where they can communicate and support each other". In Australia, a free, open and online professional development course about curriculum design as a micro Open Online Course was developed within a joint project between the University of Tasmania and the USQ (Bossu, Fountain, Smyth, & Brown, 2016).

In China, the study by Xu (2018) found that faculty members mainly lacked an understanding of training programmes and policies regarding evaluation that might act as incentives for them to develop more resources. Regarding information technology training, only 14% of faculty members in the study by Xu (2018) responded "completely agree" and 16.9% responded "agree" to the statement that "the university conducted special training and assessment for faculty members", indicating that IT support for faculty members to develop online resources and courses was not sufficient. During the first moments of the emergency teaching due to COVID-19, as an exemplary case, the Centre for Excellent Teaching and Learning at the PKU held a training programme for faculty members very quickly in two stages with the idea that the first priority was to solve technical problems to ensure the development of online teaching and

then to increase the instructional design and strategy gradually to improve the quality of courses (Gong, 2020). In addition to these, regular training for young faculty members and teaching assistants was still continuing, also focusing on online learning and teaching.

With respect to institutional support (n=7), most of the references in the reports were related to technical support and, in some cases, also pedagogical support. In the institutional case of the University of Tasmania (Australia), the Strategic Plan for Teaching and Learning 2016-2020 outlined a focus on supporting staff in planning and development of OER. In the Australian expert survey, participants recognised the need to provide specific skill support for the development and use of OER. In the example case of PKU in China, at the beginning of remote teaching and to promptly solve the faculty members' problems in online teaching, the teaching centre opened a hotline, a consultation mailbox and a WeChat group to provide 24/7 support (Gong, 2020). Technical support from CTL or a related unit was among the most common incentives, along teaching load and assignment of teaching assistants in Japanese universities. In, Spain, support measures most commonly applied in institutions according to participants were technical support (42.2%) and training support (39.3%). However, this support was variable depending on institutions; for example, a participant stated that only technical support was offered and was extremely limited in its conditions (to produce short videos with a standard format). Technical support (52.6%) was the most common institutional measure highlighted by participants in the German survey.

We could also identify the academics' awareness of professional development institutional agents (n=4). For example, in the study by Bossu et al. (2014), Australian interviewees expressed a lack of knowledge of exactly which staff members at their institution could help them to learn about licensing and the development of OER. In the expert survey, a number of participants mentioned being supported by their libraries (6 participants mentioned them as OER initiative), including workshops and sessions conducted by them or by OER working groups. Another participant reported that each college in their university had a full-time learning technologist assigned to it for support and advice that takes place at an informal level. In Canada, respondent F stated that she had support from the teaching and learning centre and from their librarians at her institution. In Spain, a participant in the survey mentioned a specific unit in their university for the creation of (O)ER that worked pretty well and made annual calls, and offered technologies for their production, as well as a series of annual courses.

On the other hand, some reports highlighted a lack of professional development support (n=5). In particular, a shortage of modern and structured professional development opportunities as well as faculty support was identified as a barrier for the educators in Turkey in terms of promoting capacity. In China, faculty members stated that they had yet to be given the type of administrative and technical support that should be provided by professional teaching teams in the study by Xu (2018). In South Korea, a challenge pointed out by Lee and Kim (2015) for the active adoption of OCW was the lack of support for the development and location of quality OCW. In Spain, the lack of support mechanisms to use (O)ER repositories was one of the reasons not to use them (25.6%) given by participants in the survey. Similarly, the study by Hayman (2018b) in Canada exposed the lack of support resources (staff) to help academics with OER as a reason for general confusion about OER in potential users.

Incentives (n=29) were important measures to support change for (O)ER at the individual level. Diverse kind of incentives were addressed in the reports: assignment of teaching assistants, measures for recognition and faculty evaluation, reduction of teaching load and monetary incentives.

Concerning recognition and faculty evaluation (n=8), Australia's report cited it in three occasions. For instance, it was noted that of the three approaches used in the Learning2014 strategy – recognition, reward and monitoring progress – it was recognition that had the greatest impact on early adopters' decisions to make a change to their teaching practice" (Kandlbinder & Chelliah, 2015, p. 3). Similarly, in a study at USQ, those responsible for OEP had admitted that they "have learned that open practice by academic staff needs to be an individual decision but the University can reward and recognise open behaviour and support experimentation" (Udas et al., 2016, p. 338). Also as an institutional case in Australia, the Strategic Plan for Teaching and Learning 2016-2020 of the University of Tasmania outlined a focus on integration of recognising contribution to OEP through the Teaching Performance Expectations. In China, an interview participant (former manager at BOU) stated that BOU had policies to award 'high-quality courses' and 'teaching

excellence' to faculty members who proved themselves able to create high-quality educational resources or who demonstrated excellent instructional designs in their courses every year. Some Turkish HE institutions, like Anadolu University, would give at least 50 percent more points to each article or book or any scientific work published in open access journals or resources. Along with monetary support, additional points for faculty evaluation were the second most common incentive measure in South Korea. Two participants in the survey in Spain highlighted specific recognition measures as incentives in their specific institutions: a higher job stability, and faculty evaluation and accreditation.

The measure of reduction of teaching load (n=2) was one of the concreted in the case of a university in Nanjing (China), where faculty members who participated in developing of online open courses received also a certain workload subsidy (Meng, 2018). Faculty members were entitled to three times the workload of traditional face-to-face teaching in the first round of the flipped class, 2.5 times in the second round, and twice in the third round and beyond. In Japan, monetary incentives were not common in Japanese universities, but there might be a reduction in teaching load and assignment of a teaching assistant (TA) (n=1).

Some forms of monetary incentives (n=13) were present in some of the reports, often as part of institutional cases. For example, in the Learning2014 project at the UTS (Australia) (Kandlbinder & Chelliah, 2015), learning and teaching grants were offered to participating academics, which were primarily used to pay learning technologists to develop resources, rather than for academics to develop resources themselves. A special category was also created in the annual Vice Chancellor awards. Another institutional case in Australia is USQ, which had annual Open Educational Practice Grants, with one granted in 2019 for Open Assessment and two for open textbooks. Only one participant in the expert survey mentioned the existence of an annual grant for OEP that academics at their institution can apply for, in order "to transform a subject they teach". In Japan, monetary incentives were provided to faculty members who created and implemented the courses in the particular case of JMOOC. In Spain, a participant in the survey mentioned that in their institution there were at the point of the study incentives for shared creation and use of (O)ER without further concretion. In Canada, according to respondent F, the province-wide eCampusOntario had been useful in providing funding for (O)ER. Furthermore, the pandemic – in addition to causing a rapid shift to digital education - had led to increased calls for the use of OER in Canada. In Spain, a respondent referred to the Award of teaching innovation of the social council and the Call or program for the production of (O)ER at their institution. In South Africa, the UCT "provision of OER grants by the Centre for Innovation in Learning and Teaching (CILT)" was a support measure for academics (Cox & Trotter, 2016, p. 153). Where monetary incentives were rather common was in China and, especially, in South Korea. In China, the institutional case of a university in Nanjing (Meng, 2018) as an example described how the university provided financial support for open courses, which included all course-related expenses. In South Korea, monetary support for course/material development for faculty members was one of the major incentives related to (O)ER: as (O)ER creation and utilization was important at the institutional level, faculty members who decided to develop (O)ER were well supported with (O)ER development grant and technical and administrative support. However, insufficient financial incentives for faculty members to continuously share their copyrighted work such as textbooks and other materials from their lesson plans was noted by Lim, Kim and Choi (2017) as a barrier to faculty involvement in the creation of (O)ER.

In some reports (Canada, South Africa and Spain) it was referred to the lack of incentives too (n=7). For example, in South Africa, the lack of formal institution recognition for (O)ER was emphasized at UCT (Cox, Masuku & Willmers, 2020) by reporting that "the lack of institutional reward for open textbook development was compounded by a lack of support for the textbook development process, a lack of established quality assurance mechanisms and a lack of funds to buy out academics from their teaching commitments" (p. 6). In Canada, some of the interviewees pointed out the lack of incentives in their institutions; for instance, respondent B mentioned that there was no compensation for her "extra" work and she must complete it as volunteer labour. Respondent C stated that she received no consideration for creating or searching for OER in terms of funding. In the survey with Spanish faculty members, the 21.1% of the participants indicated as a reason not to use the institutional (O)ER repository the lack of any compensation for its use. In the German survey, 43.4% of the participants stated not knowing any measure for promoting (O)ER in terms of

incentives at their institutions, and 6.6% stated a lack of incentives for using institutional repositories (the question was only shown to the participants that had answer negatively to the use of institutional repositories).

(O)ER sharing, integration and remixing by academics

(O)ER practices (n=24) by faculty members in the reports show that (O)ER uptake is overall in its infancy, which could also be explained by factors identified in the previous sections. Although many of the reports mentioned (O)ER use and development, much less space is devoted to describing practices beyond these activities (e.g. sharing, remixing, integrating). However, some of these could be identified within the above-analyzed factors.

For instance, it is remarkable the case of South Korea, where despite consistent professional development and support for both new and experienced faculty members, only a few faculty members were engaged in (O)ER development at the individual level. Among the barriers to faculty involvement in the creation of (O)ER, the continuous use of the created (O)ER without an opportunity for revisions or updates was identified by Lim, Kim and Choi (2017). Similarly, in the study on OER by Shigeta et al. (2017) in Japanese HE institutions, 13.6% of the four-year institutions, 2.3% of the two-year colleges and 3.7% technical colleges developed OER, and 13.4% of the four-year institutions, 8.6% of the two-year colleges and 14.8% technical colleges reported to utilize OER. Regarding this, it should be noted that in both Japan and South Korea, OER were often used as supportive technology to provide quality content and offer learner-centered materials rather than disruptive technology to offer expanded and extended learning opportunities and improve sharing and networking. In China, 75% of academics in an interview study at the Northwest Normal University chose to design courseware either by themselves or by integrating teaching materials by themselves, whereas the others adopted multimedia resources either from CDs, websites, QQ sharing or WeChat (similar to WhatsApp) (Li, 2015).

The study from de Oliveira Neto, Pete, Daryono and Cartmill (2017) found that “South Africa – the most economically developed country by GDP per capita [...] had the lowest rate of instructor OER use compared to Ghana and Kenya” (p. 83) and that gender, age, digital proficiency, or qualifications of instructors played a significant role in instructor’s use of (O)ER in South Africa. Furthermore, de Hart, Chetty and Archer (2015) in their study with Unisa staff found that “although there is knowledge and understanding of OER, this has not been converted into active participation” (p. 18) and that “activities relating to the use of OER (accessing, redistributing and re-using) are far more frequent than activities relating to contributing to OER (revision, remixing, developing)” (p. 32).

In Canada, concrete OER practices were shown by respondents H, F and C. For instance, respondent H used search engines when looking for fast access to resources -libraries were thorough but often the search took too long. He revised material to suit his needs, looking for ways to effectively present the “found” resources and also created his own repositories of found resources for future use. Respondent F was committed to providing easy-to-access resources, which were also revised, adapted, and translated for international use as both an app and in web-based format. Respondent C had been an avid OER creator for several years and co-created together with her students a textbook with eCampus Ontario, then published via PressBooks. Furthermore, she would rather invest the time in adapting materials to her own needs than re-invent the wheel. In terms of OER sharing, she and her colleagues did it for relevant material, “the good stuff,” in its original format, often by email. So far, their networking was casual and unofficial, led by “unofficial” figureheads. Respondent E gave her vision from her perspective as university librarian and stated that faculty at her institution were looking for open materials to replace textbooks so they could build a course around the open resource. While initially not keep on adapting OER for their own use, faculty became more comfortable with this idea as they got used to it. However, these cases seemed to be rather anecdotical OER practices, since the study by Hayman (2018b) noted that “the use of OER is not widespread among Ontario college and university educators” (p. 150), apart from advanced OER practitioners (often also OER advocates). Similarly, in Germany, in HE is a field reliant on - quite frequently – the drive and perceived intention of individuals who have created a connected community.

Along the same lines, despite high levels of OER awareness and knowledge by participants, the majority of the faculty members in Australian HE involved in the study by Bossu et al. (2014) had rarely or never used, developed and/or re-purposed OER. Also, participants in the same study identified the lack of interest in creating (good quality) OER. However, in the expert survey, a participant mentioned that there was a push to “tag everything as being an OER upon

completion" but that there "is very small uptake", as well as storing OER (not just open access publications) in institutional repositories (n=3). Similarly, despite the creation of policies and frameworks, and increasing awareness of OER, OER use and creation remains low, as noted in the Open Education Licensing Project (2016c) for QUT. Some exceptions exist though, for instance, academics at USQ that were successful in receiving an OEP grant added value to curated OER by providing an explicit learning design that sequenced and aided students in "sense-making" (Stagg & Partridge, 2019, p. 479) and educators at the UTS were happy to use OER, as long as they were deemed to be as good as material they could produce themselves and that they required minimal modification (Kandlbinder & Chelliah, 2015).

[1] A reduced version of this chapter has been published in the following reference: Marín, V. I., Zawacki-Richter, O., Aydin, C.H., Bedenlier, S., Bond, M., Bozkurt, A., Conrad, D., Jung, I., Kondakci, Y., Prinsloo, P., Roberts, J., Veletsianos, G., Xiao, J., & Zhang, J. (2022b). Faculty Perceptions, Awareness and Use of Open Educational Resources for Teaching and Learning in Higher Education: A Cross-Comparative Analysis. *Research and Practice in Technology Enhanced Learning, 17*, 11. https://edtechbooks.org/-BSYU

[2] 41.43% of the participants in the survey did not answered that question.

[3] E.g. https://edtechbooks.org/-nfiH

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4

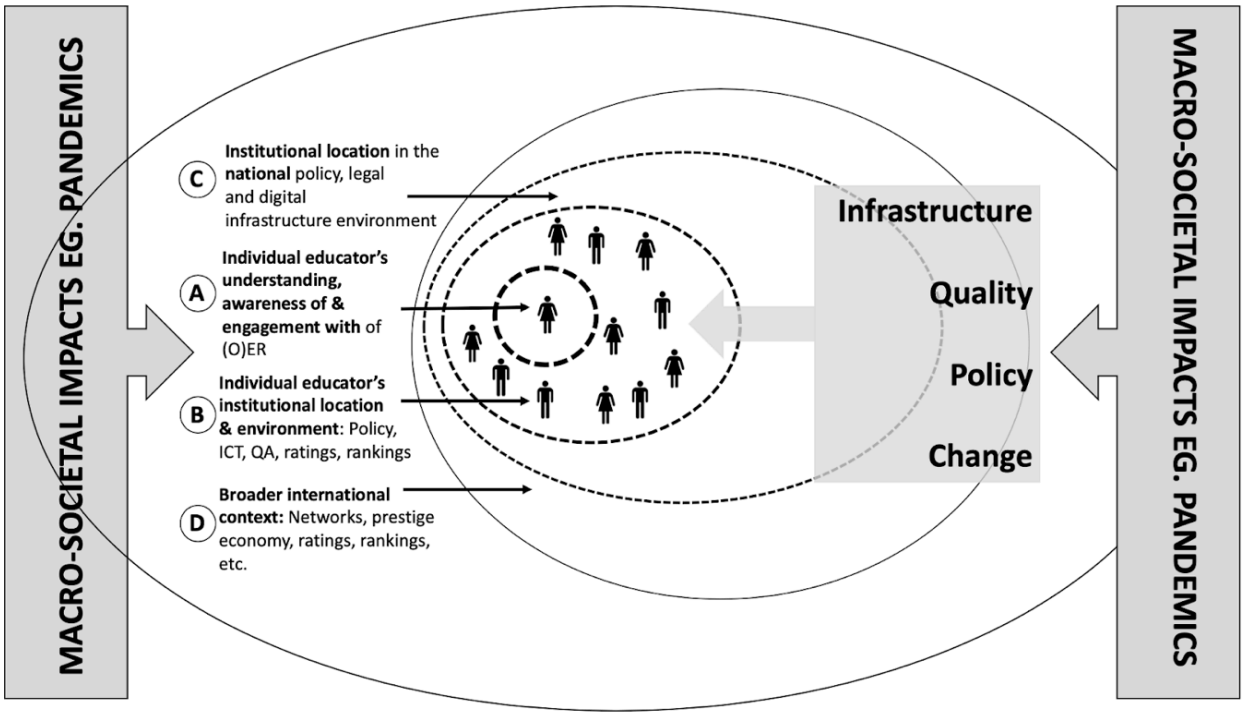
Conclusions of the International Comparison

This study contributes to the field with an international comparative approach to further understand the factors behind (O)ER infrastructure at the national level, institutional level and micro level (teaching and learning), some of which started to be covered separately in the Open and Distance Education volumes (Qayyum & Zawacki-Richter, 2018; Zawacki-Richter & Qayyum, 2019). This study´s findings could serve as a wake-up call for national/provincial organisations, to see countries comparatively reviewed and therefore justify their push for the improvement of (O)ER infrastructure in HEIs, as well as for individual HEIs and faculty members.

Despite the technological focus of the project EduArc, it is vital to acknowledge that it is not possible to understand national and institutional (O)ER infrastructure, and the associated support elements, without analyzing and understanding the differences of context and culture, as became clear from the analysis above, also in line with recent literature (Jung & Lee, 2020). Aspects such as the political context and the socioeconomic situation have been shown to be a major influence on how HE (O)ER infrastructures are - or are not - developed and change takes place. National and provincial legislation and recommendations, as well as measures for promoting change such as the provision of funding or the acknowledgement of merits, influence the development of (O)ER infrastructure in HE. Quality assurance mechanisms, such as the development of standards and ensuring its compliance, may be in place to ensure not only the interoperability between infrastructure but also the quality of (O)ER contents. A general overview of these elements can be seen in Figure 1.

Figure 1

Relations between the elements of the study, the levels and the macro-societal impacts. Source: report of South Africa by P. Prinsloo and J. Roberts.



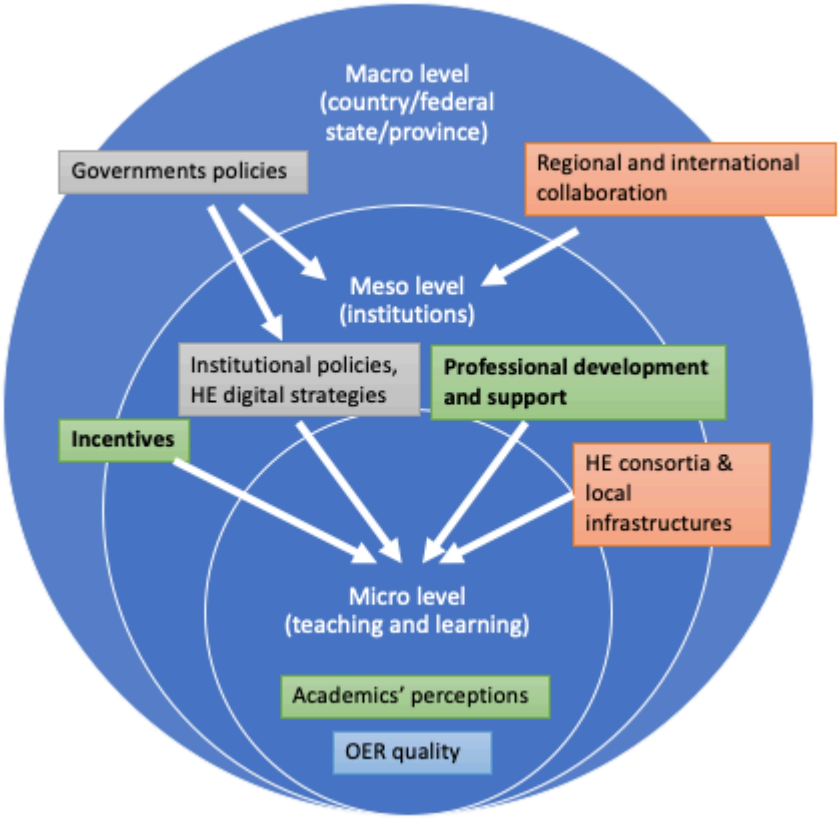
On the other hand, as previously asserted by Bossu, Brown and Bull (2014), the OER movement has moved more efficiently and effectively in countries where national support was provided, therefore further top-down approaches are needed at both the macro and meso levels. However, this is not enough, and factors related to the institution and the faculty members are also relevant. For example, at the meso level, institutional awareness of the importance of OER and co-participation with the educational community are elements to be considered. At the individual level, the OER adoption pyramid (Cox & Trotter, 2017) has provided a suitable framework to understand academics' (O)ER related factors and the relevance of professional development and provision of incentives in relation to increase capacity and individual volition, respectively.

Each country showed different dynamics in relation to the connections between macro, meso and micro levels, but those general aspects seem to be common (see Figure 2). Others were more concrete but could be integrated in broader aspects. For example, in the case of Japan and Korea, peers' behaviors and beliefs were mentioned as relevant elements at the micro level, unlike other cases. Another example is Canada, where the relevance of OER champions to push the OER movement was determined as cornerstone (micro level), but it was not reported in other cases. The role of libraries in (O)ER (meso and micro level) was recurrent in the cases of Canada, Australia and Spain, but not that prominent in other countries.

For all the cases, national or federal policies and funding at the macro level had a key influence on institutional level (policies, strategies, infrastructures) and these, in turn, on the individual level (especially for individual, social and institutional volition). Even though these dynamics exist, their relevance is also dependent on institutions in the same country, which also promote diverse kinds of professional development and support that go often along with macro and meso level policies and line of incentives. In addition, results at the micro level clearly show that there is still much to do in all the countries for individual (O)ER adoption, due to diverse reasons; e.g. lack or insufficient incentives, lack or insufficient professional development and support, insufficient institutional support or academics' perceptions and concerns about copyright issues.

Figure 2

Dynamics between macro, meso and micro level. Elements are distinguished by background color (orange for infrastructures, grey for policy, cyan for quality and green for change). Source: Marín, Zawacki-Richter & Bedenlier (2020).



In terms of (O)ER infrastructure, issues of discoverability of (O)ER, interoperability between (O)ER systems and the need for improved repositories and metadata specifications (e.g. related to license, evaluative comments, etc.) were present in many of the countries of the study. The analysis at the macro, meso and micro level shows that a solution of a hub to collect metadata, as well as improved metadata specifications, is still needed, not only for the German context but, we could also venture, for the global and international context too. Faculty members around the world need to be provided with (or co-develop) easy ways for accessing, using and publishing (O)ER, as well, as for remixing, sharing and adapting OER, accordingly to what the author's licenses allow.

Current studies regarding the use of (O)ER and their repositories during COVID-19 are still scarce but some national, institutional and individual experiences show that an important increase that may have relevant consequences and impact in the different levels, and especially, in academics' teaching practices, but also in the (O)ER infrastructures. This may be even more true for OER, for the use of which a framework, recommendations and a set of guidelines have been already developed in the context of the pandemic (Huang, Tlili, Chang, Zhang, Nascimbeni, & Burgos, 2020). Therefore, future work could consider more concretely the differences and similitudes between countries regarding these practices and (O)ER infrastructures and encourage ways of promoting them at the three levels.

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Glossary

Acronym	Explanation
ACBS	Academic Credit Bank System
ACDE	African Council for Distance Education
ACE	Advancement of College Education (Case of Japan and Korea)
ACE	Academic Commons for Education
ACE	Awards for OpenCourseWare Excellence
ACODE	Australasian Council on Open, Distance and e-Learning
ACT	Australian Capital Territory
ACU	ASEAN Cyber University
ACU-OCW	ASEAN Cyber University-OpenCourseWare
ADDIE	Analysis, Design, Development, Implementation, and Evaluation
ADMS	Academic Data Management System
AfSIS	African Soil Information Service
AHERO	African Higher Education Research Online
AI	Artificial Intelligence
ANECA	National Agency for Quality Assessment and Accreditation of Spain
ANU	Australian National University
ANU	Africa Nazarene University
AOASG	Australasian Open Access Strategy Group
API	Application Programming Interface
APQN	Asia Pacific Quality Network
AQF	Australian Quality Framework
AQU	Catalan University Quality Assurance Agency
ARC	Australian Research Council
ARCA	RSS Aggregator for the Academic Community
ARDC	Australian Research Data Commons
ARDEB	Research Support Program
AR4D	Agricultural Research for Development
ARROW	Australian Research Repositories Online to the World

Acronym	Explanation
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
ASCILITE	Australian Society for Computers in Learning in Tertiary Education
ASEAN	Association of South-East Asian Nations
ASSAF	Academy of Science of South Africa
ATEN	African Teacher Education OER Network
ATN	Australian Technology Network of Universities
ATSIDA	Aboriginal and Torres Strait Islander Data Archive
AusGOAL	Australian Government Open Access and Licensing Framework
AVU	African Virtual University
BAP	Scientific Research Projects
BASE	Bielefeld Academic Search Engine
BC	British Columbia
BCIT	British Columbia Institute of Technology
BMBF	Federal Ministery of Education and Research
BNU	Beijing Normal University
BOU	Beijing Open University
BTK	Information Technology and Communications Authority
BW	Baden-Württemberg
CAP	Chinese Advanced Placement
CARL	Canadian Association of Research Libraries
CAUDIT	Council of Australasian University Directors of Information Technology
CAUL	Council of Australian University Librarians
CAULLT	Council of Australasian University Leaders in Learning and Teaching
CC	Creative Commons
CCK08	Connectivism and Connective Knowledge
CDLRA	Canadian Digital Learning Research Association
CDO	Chief Digital Officer
CEDEC	National Centre of Curricular Development in non Proprietary Systems
CELTSC	Chinese E-Learning Technology Standardization Committee
CENT	Centre of Education and New Technologies
CEOE	Spanish Confederation of Corporate Organisations
CERNET	China Education and Research Network
CET	Centre for Educational Technology
CHE	Centre for Higher Education
CHE	Council on Higher Education

Acronym	Explanation
CHEA	Council for Higher Education Accreditation
CIC	Interuniversity Council of Catalonia
CIGI	Centre for International Governance Innovation
CILT	Centre for Innovation in Learning and Teaching
CiNii	Academic Information Circulation System
CIO	Chief Information Officer
CK	Creative Korea
CLO	Colleges Libraries Ontario
CMFS	China MOOCs for Foreign Studies
CMS	Content Management System
CMTN	Coast Mountain College
CNC	College of New Caledonia
CNIE	Canadian Network for Innovation in Education
COER	College of humanities' Research and Education
COHE	Council of Higher Education
CoL	Commonwealth of Learning
CoSTEP	Communication in Science and Technology Education & Research Program
CotR	College of the Rockies
CPC	Communist Party of China
CPD	Continuing Professional Development
CPEHE	Center for the Promotion of Excellence in Higher Education
CRDHE	The Center for Research and Development of Higher Education
CRUE	Conference of Vice-Chancellors of Spanish Universities
CSIR	Council for Scientific and Industrial Research
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSUC	Consortium of Catalan University Services
CTL	Center for Teaching and Learning
CU	C University
CU+	Career Up Plus
CUM	Chinese University MOOC
CUMCM	Contemporary Undergraduate Mathematical Contest in Modeling
DBE	Department of Basic Education, South Africa
DET	Department of Education and Training, South Africa
DHET	Department of Higher Education and Training, South Africa
DH-NRW	Digital University North Rhine-Westphalia

Acronym	Explanation
DIIS	Department of Industry Innovation and Science
DIPF	Leibniz Institute for Research and Information in Education
DIPIP	Data Informed Practice Improvement Project
DOAJ	Directory of Open Access Journals
DOAR	Directory of Open Access Repositories
DOE	Department of Education, China
DOT4D	Digital Online Textbooks for Development
DRIVER	Digital Repository Infrastructure Vision for European Research
DST	Department of Science and Technology, South Africa
DUCE	Dar es Salaam College of Education
DVC	Deputy Vice-Chancellors
EBA	Educational Informatics Network
ECTS	European Credit Transfer and Accumulation System
ECUAD	Emily Carr University of Art + Design
eCULT+	eCompetence and Utilities for Learners and Teachers
EDMS	Electronic Document Management System
EDTSC	Educational Digitalization Technology Standard Committee
EHEA	European Higher Education Area
EKUAL	National Academic License for Electronic Resources
ELAN	E-Learning Academic Network
eLOR	eLearning Objects Repository
ENI	National Interoperability Framework of Spain
ENQA	European Quality Assurance Association in Higher Education
EOSC	European Open Science Cloud
EQA	Education Quality Assurance
ER	Educational Resources
ERIC	Education Resources Information Center
EUA	European Universities Association
F.A.I.R.	Findable, Accessible, Interoperable, Reusable
FARA	Forum for Agricultural Research in Africa
FECYT	Spanish Foundation for Science and Technology
FHSST	Free High School Science Texts
GDP	Gross Domestic Product
GeRDI	Generic Research Data Infrastructure
GLOBE	Global Learning Object Brokered Exchange

Acronym	Explanation
HAW Hamburg	Hamburg University of Applied Sciences
HBZ	University Library Center of the State of North Rhine-Westphalia
HE	Higher Education
HEC	Higher Education Council
HEI	Higher Education Institution
HEQC	Higher Education Quality Council
HERDSA	Higher Education Research and Development Society of Australasia
HFD	Hochschulforum Digitalisierung
HOOU	Hamburg Open Online University
IA	Infrastructure Australia
IATI	International Aid Transparency Initiative
ICC	Information & Computer Center
ICT	Information and Communications Technology
ICTS	Information and Communication Technology Services
ICU	International Christian University, Japan
ID	Instructional Design
IDRC	Canadian International Development Research Centre
IEEE	Institute of Electrical and Electronics Engineers
iFLYTEK	Chinese information technology company
IIC	Information Initiative Center
INTEF	National Institute of Educational Technologies and Teacher Training, Spain
INQUAAHE	International Network for Quality Assurance Agencies in Higher Education
IoT	Internet of Things
IP	Intellectual Property
IPR	Intellectual Property Rights
IR	Institutional Repository
IRDB	Institutional Repositories Database
IRRODL	International Review of Research in Open and Distributed Learning
ISA	Innovation and Science Australia
ISKME	Institute for the Study of Knowledge Management in Education
IS&T	Information System and Technology
ITAC	Information Technology Association of Canada
ITC	Information Technology Center
IWM	Leibniz-Institut für Wissensmedien
JIBC	Justice Institute of British Columbia

Acronym	Explanation
JISC	Joint Information Systems Committee
JMOOC	Japan Massive Open Online Education Promotion Council
JOCW	Japan OpenCourseWare
JPCOAR	Japan Consortium for Open Access Repository
KCU Consortium	Korea Cyber University Consortium
KEM	Korea Education Metadata
KERIS	Korea Education and Research Information Service
KMK	Standing Conference of the Ministers of Education and Cultural Affairs, Germany
K-MOOC	Korean Massive Open Online Course
KNUST	Kwame Nkrumah University of Science and Technology
KOCW	Korea OpenCourseWare
KOCWC	Korean OpenCourseWare College
KPU	Kwantlen Polytechnic University
KREN	Korea Education Network
LCKC	Learning Cell Knowledge Community
LIFE	Libraries For Everyone
LINC+	Leaders in INdustry-university Cooperation
LMS	Learning Management System
LOCKSS	Lots Of Copies Keep Stuff Safe
LOM	Learning Object Metadata
LOR	Learning Object Repository
LRMI	Learning Resource Metadata Initiative
LTIP	Learning and Teaching Induction Program
LTSM	Learning and Teaching Support Materials
LTSC	Learning Technology Standards Committee
MDERC	Modern Distance Education Resources Committee
MDX	Teaching Materials in Net
MECD	Ministry of Education, Culture and Sports, Spain
METU	Middle East Technical University
MOE	Ministry of Education, China
MoNE	Ministry of National Education, Turkey
MOOC	Massive Open Online Course
mOOC	micro Open Online Course
MOST	Mutual Online System for Teaching & Learning
NARS	National Agricultural Research Systems

Acronym	Explanation
NCI	National Computational Infrastructure
NERC	National E-learning Resources Center
NFDP	New Faculty Development Program, ICU
NGO	Non-Governmental Organization
NHMRC	National Health and Medical Research Council
NIC	North Island College
NII	National Institute of Informatics
NILE	National Institute for Lifelong Education
NLC	Northern Lights College
NMMU	Nelson Mandela Metropolitan University
NOOC	Nano Open Online Massive
NOUN	National Open University of Nigeria
NRC	National Reading Coalition
NRF	National Research Foundation
NRW	North Rhine-Westphalia
NSW	New South Wales
NT	Northern Territory
NVIT	Nicola Valley Institute of Technology
NZ	New Zealand
OAI	Open Archives Initiative
OAI-ORE	Open Archives Initiative Object Reuse and Exchange
OAI-PMH	Open Archives Initiative-Protocol for Metadata Harvesting
OAIS	Open Archival Information System
OCAV	Ontario Council of Academic Vice-Presidents
OCLS	Ontario Colleges Library Service
OCUL	Ontario Council of University Libraries
OCW	OpenCourseWare
ODL	Open and Distance Learning
ODLAA	Open & Distance Learning Australia
OEC	Center for Open Education
OEC	Open Education Consortium
OECD	Organisation for Economic, Co-operation and Development
OEP	Open Educational Practices
OER	Open Educational Resources
OJS	Open Journal Systems

Acronym	Explanation
OL	Open Learning
OLC	Online Learning Consortium
ON	Ontario
OOI	Ontario Online Institute
OPE	Operation Phakisa in Education
OpenDOAR	Directory of Open Access Repositories
OUC	Open University of China
OUJ	Open University Japan
ORC-ID	Open Researcher and Contributor ID
PD	Professional Development
PEQAB	Postsecondary Education Quality Assessment Board
PHEA	Partnership for Higher Education in Africa
PKU	Peking University
PSE	Postsecondary Education
PSET	Post-school Education and Training
QA	Quality Assurance
QTI	Question & Test Interoperability
Que	Queensland
QULOC	Queensland University Libraries Office of Cooperation
R&D	Research and Development
REBIUN	Network of Spanish University Libraries
RECOLECTA	Open Science Harvester, Spain
RISS	Research Information Sharing Service
RMIT	Royal Melbourne Institute of Technology
ROAR	Registry of Open Access Repositories
ROARMAP	Registry of Open Access Repositories Mandatory Archiving Policies
ROER4D	Research on Open Educational Resources for Development
ROIS	Research Organization of Information and Systems
RRU	Royal Roads University
RTVU	China Central Radio and Television University
RUBRIC	Regional Universities Building Research Infrastructure Collaboratively
RUC	Renmin University of China
RWTH	Rheinish-Westphalian Technical University
SA	South Australia
SABINET	South African Bibliographical and Information Network

Acronym	Explanation
SABIS	Sakarya University Information System
SAIDE	South African Institute of Distance Education
SAIIA	South African Institute of International Affairs
SAIVCET	South African Institute for Vocational and Continuing Education and Training
SALDRU	Southern Africa Labour and Development Research Unit
SANLIC	South African National Library and Information Consortium
SAUX	Sakarya University Extended
SCI	Science Citation Index
SciELO	Scientific Electronic Library Online
SCORM	Sharable Content Object Reference Model
SCOSS	Global Sustainability Coalition for Open Science Services
SCUT	South China University of Technology
SFU	Simon Fraser University
SINET	Science Information NETwork
SNU	Seoul National University
SOS	Study of Success
SPARC	Smart Pavements Australia Research Collaboration
SPOCs	Small Private Online Courses
SSCI	Social Sciences Citation Index
STEM	Science Technology Engineering Mathematics
SWOT	Strength, Weaknesses, Opportunities, Threats
SynLLOER	Synergies for Teaching and Learning through OER
TA	Teaching Assistant
TBD	Turkish Informatics Association
TDX	Doctoral Thesis in Net
TEL	Technology Enhanced Learning
TEQSA	Tertiary Education Quality and Standards Agency
TESSA	Teacher Education in Sub Saharan Africa
THE	Times Higher Education
THEQC	Turkish Higher Education Quality Council
TRU	Thompson Rivers University
TSMDERC	Technical Specifications for Modern Distance Education Resources Construction
TSSSCC	Technical Specifications for State-benchmarking Shared Courses Construction
TÜBİTAK	Scientific and Technological Research Council of Turkey
TUHH	Technical University of Hamburg

Acronym	Explanation
TUT	Tshwane University of Technology
TVET	Technical and Vocational Education and Training
UAB	Autonomous University of Barcelona
UADMK	National Open Courseware Consortium
UB	University Library
UB	University of Barcelona
UBC	University of British Columbia
UCM	Complutense University of Madrid
UC3M	University Carlos III of Madrid
UCT	University of Cape Town
UDE	University Duisburg Essen
UdG	University of Girona
UDIMA, private open university	Distance University of Madrid
UdL	University of Lleida
UFS	University of the Free State
UFV	University of the Fraser Valley
UG	University of Ghana
UH	University H, Japan
UIB	University of the Balearic Islands
UJ	University of Johannesburg
UJS	Turkish Academic Network and Information Center Journal Systems
UKZN	University of Kwazulu Natal
ULAKBIM	Turkish Academic Network and Information Center
UNBC	University of Northern British Columbia
UNED	National University of Distance Education
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIA	University of Seville
UNIR	International University of La Rioja
Unisa	University of South Africa
UNED	National Distance Education University
UOC	Open University of Catalonia
UOW	University of Wollongong
UP	University of Pretoria
UPC	Polytechnic University of Catalonia
UPF	Pompeu Fabra University

Acronym	Explanation
UPM	Polytechnic University of Madrid
UPV	Polytechnic University of Valencia
URV	University of Rovira i Virgili
USAf	Universities South Africa
USQ	University of Southern Queensland
UTAS	University of Tasmania
UTEID	Unit for Educational Technology and Innovative Teaching
UTokyo	University of Tokyo
UTS	University of Technology Sydney
UVic	University of Victoria
UVic	University of Vic
UWC	University of Western Cape
UZEMs	Distance Education Centers
VCC	Vancouver Community College
VET	Vocational Education and Training
VHB	Virtual University Bavaria
Vic	Victoria, Canada
VIU	Vancouver Island University
VUT	Vaal University of Technology
WA	Western Australia
WOS	Web of Science
XCITR	eXplore Chemical Information Teaching Resources
ZIM	Learning Technologies Division of the Centre for Media and Information Services
ZOERR	The Central OER Repository of the Universities of the State of Baden-Württemberg

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