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Communities of Innovation

Individual, Group, and Organizational Characteristics Leading to Greater Potential for Innovation

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Editor's Note

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Video Abstract

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In this video abstract (available at http://bit.ly/COIAbstract), Dr. West discusses the Communities of Innovation framework. Additionally, in this presentation (available at http://bit.ly/CIDIPTSeminar) [http://edtechbooks.org/-fA]*, Dr. West and his collaborators share their efforts to implement ideas from this article in an interdisciplinary innovation studio at Brigham Young University as part of the* CID effort [http://innovation.byu.edu/]*.*

Introduction

In 1950, in a memorable presidential address to the American Psychological Association, Guilford chided his colleagues for the period's lack of research on creativity, noting that only 0.2% of published articles in *Psychology Abstracts* had discussed creativity. He then made a prescient prediction about the future, with the development of computers, which he called "thinking machines":

> [It will] be necessary to develop an economic order in which sufficient employment and wage earning would still be available . . . eventually about the only economic value of brains left would be in the creative thinking of which they are capable. (p. 36)

The time that Guilford envisioned is quickly becoming the present, when the combination of powerful computers and the ability to network these computers through the Internet has created a different kind of employment marketplace, one where employees are being expected to produce innovations, where knowledge is not managed but created (Howkins, 2002; Sawyer, 2006a; Tepper, 2010). As a sign of the times, patents granted in the United States have risen from about 49,000 in 1963 to over 276,000 in 2012 (U.S. Patent and Trademark Office, 2012). Patent filings are, of course, not a perfect measure of innovation for many reasons, but they reflect the current stress for innovation in business and industry.

Creativity in Education

Responding to this market need, educational organizations find it increasingly critical to develop creativity in their students. For example, the Partnership for 21st Century Skills has designated innovation as one of the skills students need (see http://edtechbooks.org/-nt). Livingston (2010) argued, "Higher education needs to use its natural resources in ways that develop content knowledge and skills in a culture infused at new levels by investigation, cooperation, connection, integration, and synthesis. Creativity is necessary to accomplish this goal" (p. 59).

How are we doing at teaching this critical capability? Not as well as we perhaps should be. Berland (2012) surveyed 1,000 adult working college graduates in the United States and found that 78% felt creativity to be important to their current career, and 82% wished they had been more exposed to creative thinking in school. In addition, 88% felt creativity should be integrated into university curricula, with 71% thinking it should be a class in itself. Particularly interesting is the work done by Kyung Hee Kim, who in 2011 published an influential article on the "Creativity Crisis" in the prestigious *Creativity Research Journal*. Kim reported that results from the Torrance Test of Creative Thinking (TTCT), widely used to measure creative and gifted abilities in children, had dropped significantly since 1990 on nearly all of its subscales, which represent the qualities of creative thinking defined by Torrance in his extensive work on the topic.

Collaborative Creativity and Communities of Innovation

There is a critical need to teach and foster basic creative thinking among today's students, but of particular importance is the need to develop their abilities to engage in collaborative creativity. Many of the current problems and challenges graduates will face in society and industry are too large to be faced alone. However, insufficient research is going into understanding, defining, and teaching collaborative creativity skills in educational contexts.

In seeking to understand what collaborative creativity would look like in education, I reviewed the literature on organizational and social creativity, along with social learning theory, to develop a framework of characteristics common to most environments that foster collaborative creativity in students (West, 2009). I see this framework, *Communities of Innovation*, as an evolution of popular conceptions about social activity within communities

of practice (Lave & Wenger, 1991; Wenger, 1998). Since publishing my 2009 paper, I have been seeking to research and develop this framework. I am still in this process, but the purpose of this paper is to update the framework with currently expanded knowledge and experience.

A Community of Innovation (COI) is a group of people focused on producing innovative outputs in a collaborative environment. Different COIs may have varying attributes or qualities that make them successful, but in general COIs have similar characteristics at the individual, group, and organizational levels (see Figure 1).

Figure 1. Communities of Innovation

In this paper I will explain what I see as some of the core attributes of COIs at each level, including what we know from research about each attribute. The following section will consider characteristics of Communities of Innovation in the categories of general characteristics influenced by social creativity and learning, characteristics significant on the level of individual groups, and characteristics necessary on the organizational level.

Individual but Socially Influenced Characteristics

Hacker Motivation

Hacker has typically been used to describe “illicit computer intruders” (Jordan & Taylor, 1998, p. 757), but more recently the word has been expanded beyond computer programming or networking buffs to any potential expert or enthusiast (Chance, 2005). Identifying hackers now is less about the domain of their expertise than about their motivation in using it. The term *hacker ethic* was popularized by Himanen (2001), who used it to designate a work ethic emphasizing (a) the importance of a particular kind of work that is motivating to the hacker beyond financial gain because it is valuable to others, (b) a playful and passionate approach to working, and (c) equal access to information and tools through open sharing. Thus hackers, according to Himanen, are motivated by the complexity of real-world problems, deep concern and care for their work, and dedication to quality.

Computer programmers have responded to this type of deep, intrinsic motivation when they have developed open source tools like Linux, Apache, and Wikipedia and given them away without charge, being motivated not by money but by the challenge and the opportunity to produce something that improves their lives and society. Even though the motivation is not financial, people exhibiting the hacker ethic can produce amazingly creative products. As Raymond (2003) said:

> To do the Unix philosophy right, you have to be loyal to excellence. You have to believe that software design is a craft worth all the intelligence and passion you can muster. . . . You need to *care*. You need to *play*. You need to be willing to *explore*. (p. 27)

One application of hacker motivation to creativity has been involving users to produce innovative consumer products. Jeppesen and Frederiksen (2006) reported that in various industries producing everything from electronics to computers to chemical processes/equipment, 11-76% of the innovation in the field came from actual users, not professionals, and that often products developed by collaborating lead users have been many times better than products generated in house (Lilien, Morrison, Searls, Sonnack, & von Hippel, 2003). Many companies have realized the power of hacker motivation and have tried to foster it with their employees by granting autonomy, resources, and access to collaborators for employees working on intrinsically motivating projects. Often these projects become some of the most creative products in the company. For example, Google has allowed its employees to work one day each week on their own intrinsically motivating projects, and from this hacker time have come AdSense, Gmail, Google Talk, Google News, and Google Reader.

Dynamic Expertise

Dynamic expertise, a term coined by Hakkarainen, Palonen, Paavola, & Lehtinen (2004), contrasts with traditional views of expertise as an accumulation of skills and knowledge in a particular domain. Dynamic expertise designates the ability to continually learn and surpass earlier achievements by "living on the edge" (Marianno & West, 2013) of one's competence, pushing for new expertise in ever-evolving new ways and domains. Thus expertise is a dynamic, progressive ability to gain new skills and knowledge. In developing and validating a survey to measure dynamic expertise in creative groups, Marianno and West (2013) found three main relevant factors: awareness and understanding of the problems facing the group, motivation to pursue these challenging problems, and ability to gain new competencies in the process. In this study, groups in which the individual members exhibited more dynamic expertise were significantly more innovative than their peers.

Entrepreneurship and Autonomy

Developing and using dynamic expertise requires that members of a community have a certain amount of entrepreneurship and autonomy. Gagne and Deci (2005) explained *autonomy* as acting with choice and purpose and engaging in an activity because one finds it enjoyable. McLean (2005) explained that freedom and autonomy within an organization will likely promote intrinsic motivation and, consequently, innovation (see also Oldham & Cummings, 1996). Similarly, scholars have found that promoting autonomy and self-directed activity can substantially improve student morale, motivation, learning, and performance (Gagne & Deci, 2005; Gelderen, 2010; Ryan & Deci, 2000). On the other hand, Amabile

(1996) found that perception of organizational control over its members impedes creativity. This relationship is especially important when critiquing or evaluating the work within a COI, as evaluation is critical to improving the product (West, Williams, & Williams, 2013), but feedback must be given without the perception of limiting autonomy (Egan, 2005).

While members of a COI need to feel autonomy over how they accomplish their work, this does not mean constraints should not be given or particular tasks assigned. In fact, constraints are widely recognized for improving creativity to a degree (Dyer, Gregersen, & Christensen, 2009; Moreau & Dahl, 2005). However, creativity flourishes when COI members feel they have high autonomy and ownership over the everyday work, ideas, and manner of discovering how to accomplish their tasks (Amabile, 1998; Amabile, Conti, Coon, Lazenby, & Herron, 1996; Egan, 2005; Kurtzberg & Amabile, 2001). Supporting autonomy can lead to the likelihood of group members internalizing and adopting the values and goals of the group (Gagne & Deci, 2005).

Group Level Characteristics

Group Flow

Keith Sawyer, whose graduate adviser was Mihalyi Csikszentmihalyi, adapted his mentor's conception of flow (Csikszentmihalyi, 1990) to group collaboration. Sawyer (2008) explained that group flow was more likely to occur based on 10 important elements of effective group collaboration: a shared goal, close listening, complete concentration, the ability to be in control (related to what I call autonomy), blended egos, equal participation, familiarity, communication, effort to move ideas forward (often through improvisation, building on previous ideas), and risk that comes from the potential for failure. Sawyer (2006b) argued that when groups achieve flow, innovation is at its peak: "Performers are in interactional synchrony," and "each of the group members can even feel as if they are able to anticipate what their fellow performers will do before they do it" (p. 158).

Research into group flow is still in the early stages, and few use the term besides Sawyer, but evidence has shown that Sawyer's theory is solid. For example, Byrne, MacDonald, & Carlton (2003; see also MacDonald, Byrne, & Carlton, 2006) studied how group flow impacted creative output in musical compositions of 45 university students who were rated for their creativity. The authors found a significant correlation between the levels of flow the student groups experienced and the creativity of their group compositions.

The biggest challenge with group flow is how "fragile" (Armstrong, 2008) it is and how difficult to foster. It is also "hard to predict in advance" (Sawyer, 2006b, p. 158), which makes it difficult to research. Of particular interest to me is what happens when group collaboration moves online. Sawyer (2013) has argued that the Internet cannot support group flow at all, but more research is needed, including studies into whether group flow might emerge online but require circumstances entirely different than those Sawyer articulated for group flow in face-to-face settings.

Idea Prototyping

Design industries have long acknowledged the value of rapidly prototyping group ideas so that collaboration can continue by improvising (Tripp & Bichelmeyer, 1990) on the design. This significant application of the design thinking approach to group creativity is growing in popularity in both industry and education because of its perceived ability to "change how people learn and solve problems" (Razzouk & Shute, 2012, p. 331). Sutton and Kelley (1997) noted that IDEO prototypes not only their products, but also their spaces, organizational structures, and size—making prototyping a core feature of their successful approach to innovation.

Idea prototyping

Brown (2008) explained, "[T]he goal of prototyping isn't to finish. It is to learn about the strengths and weaknesses of the idea and to identify new directions that further prototypes might take" (p. 87). Thus group members are able to learn through the process of creation, which has been shown to be a powerful way to promote constructivist learning (Kafai & Resnick, 1996).

Second, prototyping can facilitate group reflection by putting a concept into tangible form for discussion. We have seen this in research into collaborative innovation at Brigham Young University's Center for Animation, as much of the innovation in this highly successful studio emerges from group criticisms of designed prototypes in biweekly student-run meetings (see West, Williams & Williams, 2013). Third, Sawyer (2003b) has argued that improvisation is key to collaborative innovation, and prototyping can facilitate improvisation by providing an initial concept to begin experimentation.

Cognitive and Skill Diversity

Diversity is so critical to collaborative innovation that Justesen (2004) termed it "innoversity" (p. 79). Bielaczyc and Collins (2006) explained, "[M]ultiple perspectives . . . raise questions about what is the best approach. They provide different possible solutions. . . . They offer ingredients for new syntheses. . . . [and are] critical to the invention process" (p. 42). For innovation, the most important kind of diversity involves thinking abilities and design skills, so that a greater variety of ideas can be forged together for the most creative outcomes. Particularly valuable are individuals who have connections not only within a group, but outside of it and can thus contribute outside perspectives. This is widely referred

to as the “strength of weak ties,” since strength often comes from weaker but still important ties to others outside of the collaborating team, which can bring new perspectives into the collaborating group (e.g., Baer, 2010; Granovetter, 1973)

Individuals with diverse perspectives in a group must freely share these diverse viewpoints and ideas. Diversity can be inhibited by social constraints like hierarchies of power or even personal constraints like shyness; efforts must be made to bring out the diversity of the group. For example, research has found that traditional brainstorming does not produce better creativity (Pauhus et al., 1993; Taylor, Berry, & Block, 1958) because groupthink can emerge if a few individuals share opinions and the rest of the group is hesitant to challenge or offer their own. More effective are methods, such as the nominal group technique (Mullin et al., 1991; Putman & Paulus, 2009), which ask individuals to first do the hard work of developing their ideas and positions individually or in smaller teams before sharing them in an open, but critical and evaluative, collaboration where the ideas can be merged and improvised upon.

Critique and Reflection

An important quality of innovative communities is the ability of members to give and receive criticism in productive ways. This capacity is due in large measure to organizational-level efforts to support exploration and allow for failure with recoverability, as long as quality reflection enables learning from the failure, thus making it actually “productive” (Kapur & Rummel, 2012). As an organization creates a culture where failure is no longer devastating to the team, then at the group level teams have a greater opportunity to develop skills in critique, reflection, evaluation, and team learning.

One example of the role of critical evaluation and reflection in collaborative innovation was the Center for Animation that we studied (West, Williams & Williams, 2013). In that setting, evaluation was a top priority, and the design community met twice a week over a year and a half to showcase and critique weekly progress on their animated short. We found that the qualities that made evaluation successful in this community were the culture of high expectations, collaboration, and evaluation; the ability of the instructors to unite the students, teachers, and leaders as shared stakeholders in the success of the project; the important criteria for evaluating progress; and the frequent opportunities to question and discuss this progress.

In an earlier study (West & Hannafin, 2011), I learned that often the act of critiquing another’s work not only helps the person receiving the evaluation, but also the one giving it. One student in that study explained how she and her peers learned through the process of critique, quoting Nelson & Stolterman (2003): “[I]t is also possible to develop design skills by critiquing existing designs” (p. 217)

Common Vision

Essential to the ability of a group to collaborate and critique their progress effectively is

that they have a common vision of what they are trying to do. This does not mean they know exactly what the design will look like, but only what they hope the design will accomplish. Anderson and West (1998) explained that a group's shared vision is more effective when it is clear and understandable, is important to and widely shared by all members of the group, and is attainable so it is not demotivating. The importance of a common vision to a productive team climate has been shown in both business (Anderson & West, 1998) and education (West, Williams, & Williams, 2013). Wang & Rafiq (2009) explained the tension in organizational learning between paradigms of exploration and exploitation, and argued that organizational diversity and shared vision are vital to balancing these competing views of group productivity.

Organizational Level Characteristics

Flexible and Organic Organization

Many scholars in organizational studies argue that a flexible organizational structure can promote innovation in a community. For example, Volberda (1996) argued, "Bureaucratic vertical forms severely hamper the ability to respond to accelerating competition. Flexible forms, in contrast, can respond to a wide variety of changes in the competitive environment in an appropriate and timely way" (p. 359). A classic example is the organizational structure of IDEO. In a 2001 interview with *Businessweek*, Beth Strong, IDEO's Director of Recruiting, explained that IDEO's organizational structure is "very flat" where "hot teams" can form on their own and work as a studio for a period of time to complete a project that the team members are all excited about. There is no expectation of an entire career within one studio, and movement between studios is encouraged, with leadership within the studios often being organic—emerging from within the group.

This type of organizational structure is radically different from that of many communities of practice. Some research has argued that the type of organizational structure is less important than expected, and that flat organizations can struggle with inefficiency due to interpersonal conflicts and inadequate effort coordination (Carzo & Yanouzas, 1969). Possibly what matters more than tall vs. flat organizational structure are characteristics of that organization, such as how quickly innovative ideas can be approved for prototyping, how much autonomy individuals and groups have for innovating, and how flexible the organization is in reorganizing teams according to emergent needs and situations.

Mastery, Purpose, and Autonomy

Pink (2011) popularized the idea that higher-order thinking tasks, such as creativity, are best motivated by organizations that promote mastery, purpose, and autonomy in employees. His ideas are based in large part on the work of Teresa Amabile of Harvard, who has found in her research that "when it comes to granting freedom, the key to creativity is giving people autonomy concerning the means . . . but not necessarily the ends" of a task (1998, p. 81) or, in other words, "choice in how to go about accomplishing the tasks that

they are given" (Amabile, Conti, Coon, Lazenby, & Herron, 1996; see also Kurtzberg & Amabile, 2001). This finding holds true not only in business settings but in education (Gelderen, 2010) and research, where Parker & Hackett (2012) explained that research groups benefit from providing younger investigators autonomy, allowing them to be a group that is "getting-big-while-remaining-small" (p. 38): in other words, maintaining their entrepreneurial creativity.

An organization's focus on individuals and groups working towards mastery and purpose in their work can also increase motivation, often more effectively than extrinsic rewards, which have been shown in many research studies to diminish creativity (Hennessey, 1989) and damage intrinsic motivation (Deci, Koestner, & Ryan, 1999). For this reason many innovative design companies encourage lifelong learning for their employees, even in areas not directly related to their work (consider, for example, Pixar University), and to work on projects that give them a sense of purpose, so they feel they are accomplishing a greater good (see previous discussion on the importance of fostering a hacker ethic).

Sense of Community and Psychological Safety

The glue that unifies any community, particularly one with the differences in characteristics and structures of a community of innovation, is a strong sense of community and psychological safety among the members. Rogers (1954), well known for articulating the importance of psychological safety for creativity, explained that psychological safety depends on three separate processes: (1) accepting the individual as of unconditional worth, (2) providing a climate in which external evaluation is absent[* [#_ftn1]](#_ftn1)and (3) empathically understanding the individual (referred to by Sawyer [2008] as *close listening*). Since Rogers' work, many scholars have found evidence for the importance of a strong sense of community in education units (Rovai, 2002; West & Hannafin, 2011), work teams (Barczak, Lassk, & Mulki, 2010), and whole organizations (Baer & Frese, 2003).

Discussion and Implications

Implications for Teaching

Teaching in a way that builds communities of innovation is not easy, but it is increasingly important. Like many higher order skills, collaborative innovation skills are best taught through modeling, nurturing, and supporting students' growth in ways specific to every context and group of individuals. Still the community of innovation characteristics outlined in this paper seem to lead to some suggested strategies.

First, our research in online learning needs to transition from a predominant focus on delivering content and testing information recall (I'm looking at *you*, MOOCs) and more on how to recapture the powerful improvisational and impromptu conversations and interactions that lead to group innovation. Tools like Mural.ly (https://mural.ly/), Mendley (http://mendeley.com; see Zaugg, West, Tateishi, & Randall, 2011), and Chatter

(http://edtechbooks.org/-Dr) are examples of the kinds of collaboration tools we need that foster people and ideas "bumping into each other" in unforeseen ways to foster innovation.

Second, we need to foster idea generation in effective ways by encouraging individual work and contribution first and then group evaluation and improvisation/prototyping afterward. We will have more group genius (Sawyer, 2008) instead of groupthink when we use strategies that utilize the diversity within a group and encourage open and critical dialogue in an atmosphere of psychological safety.

Third, one of our primary goals in education should be to encourage group flow, which is where the magic of collaborative innovation happens. This means focusing less on seat time and more on project goals. Studio-based approaches to teaching (Chen & You, 2010; Clinton & Rieber, 2010; Docherty, Sutton, Brereton, & Kaplan, 2001) work well because they tend to de-emphasize time on task in favor of work completed and creativity developed. Nothing disrupts a group's flow worse than having the bell ring for the end of class. Instead, we should encourage students to work together in ways and on projects that are most likely to lead to flow, and when they are doing so effectively, we need to give them the space and time to keep it going!

Fourth, acknowledging the literature on autonomy and self-determination theory, we need to promote entrepreneurial attitudes among individuals and groups by allowing and rewarding choices within appropriate boundaries. Fifth, as instructors we need to be more flexible in allowing for self-organizing projects and teams and to create more opportunities for student communication. Sixth, reflection, critique, and learning from failure should be built into every assignment so that failure is productive, not destructive. Although there are many other strategies to explore, and much more to understand about effectively implementing the above strategies in ways that will work in our educational systems, I believe this is a fertile ground for additional research and theory development.

Implications for Research

To date, the research on teaching group- or community-based innovation strategies is nascent. Researching group innovation is challenging, particularly isolating variables and observing outcomes with no assurance of when or how the innovation will actually emerge. However, just because the research is difficult does not mean it should be avoided. Several areas of prospective research could be fruitful.

First, we need more concrete definitions and methods for measuring/observing the COI principles outlined in this paper, as well as any others that may also be important to collaborative innovation, using as many different research methods as possible. Although traditional creativity scholars have largely rejected qualitative methods, too much is still unknown about how to foster collaborative innovation for us to not use every potentially useful research method, including quantitative, qualitative, conversation analysis, and social network analysis.

Second, education is rapidly changing and transitioning towards online and blended environments. While this transition is clearly important and can provide many benefits, we need to be careful that we do not focus on what is easier to teach online (information) instead of what is more difficult but also important (collaboration, creativity, and critical thinking). Instructional designers and researchers need to lead out on setting the agenda for online education in ways that theory suggests will lead to better learning.

Third, we need to explore how to teach collaborative innovation skills on various educational levels. Most of the current research focuses on higher education, for example, and tight national standards for grade-school education often make it harder to justify spending time on skills such as creativity that do not readily show up on standardized tests. Still there is room in national standards for creativity, particularly in the upsurge of interest in teaching engineering practices to children. More research is needed on how to infuse group creativity into this type of curriculum effectively.

Unfortunately, education administrators' and leaders' talk about teaching creativity is often little more than "rhetorical flourishes in policy documents and/or relegated to the borderlands of the visual and performing arts" (McWilliam & Dawson, 2008, p. 634), perhaps because this capability is among the most "elusive" (p. 633) of skills. However, the scholar considered by many to be the father of creativity, E. Paul Torrance, encouraged creative persons to seek great teachers and mentors in their quest to develop their creativity (Torrance, 2002). As educators and instructional designers we are responsible to be those teachers and mentors as we design the kinds of learning environments that best foster creativity and innovation, especially in collaborative communities.

Application Exercises

- 71% of students surveyed by Berland (2012) felt that universities should offer a class on creativity. Using some of the guidelines and information from this chapter, create an outline of what you think a class on creativity would look like.
- Consider an organization that you are a part of. What are the ways in which you could integrate principles of communities of innovation?
- What is one thing you would do to create group flow in an online learning environment?

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* [#_ftnref1] I have previously argued for the importance of critique, but this critique must not reflect on the individual itself, but rather on the project.

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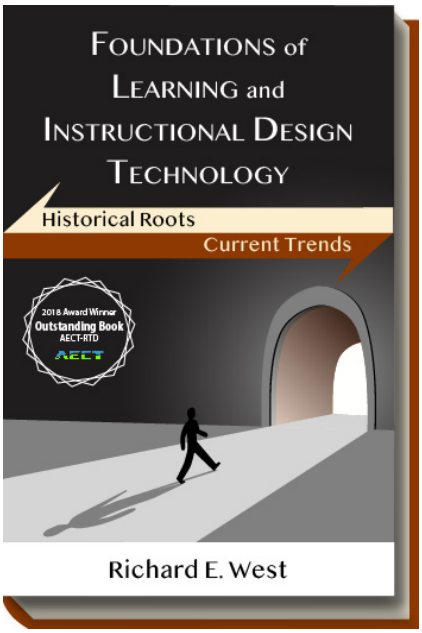

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