

Planning and Controlling Project Quality

Measurement

Quality

Project

Planning

Learning Objectives

1. Define statistical measurement terminology.
2. Identify sources of information for the planning process.
3. Identify and describe the techniques for controlling project quality.
4. Describe the results of planning and controlling quality.

High quality is achieved by planning for it rather than by reacting to problems after they are identified. Standards are chosen and processes are put in place to achieve those standards.

Measurement Terminology

During the execution phase of the project, services and products are sampled and measured to determine if the quality is within control limits for the requirements and to analyze causes for variations. This evaluation is often done by a separate quality control group, and knowledge of a few process measurement terms is necessary to understand their reports. Several of these terms are similar, and it is valuable to know the distinction between them.

The quality plan specifies the control limits of the product or process; the size of the range between those limits is the tolerance. **Tolerances** are often written as the mean value, plus or minus the tolerance. The plus and minus signs are written together, \pm .

Tolerance in Gasoline Production

The petroleum refinery chose to set its control limits for 87 octane gasoline at 86 and 88 octane. The tolerance is 87 ± 1 .

Tools are selected that can measure the samples closely enough to determine if the measurements are within control limits and if they are showing a trend. Each measurement tool has its own tolerances.

The choice of tolerance directly affects the cost of quality (COQ). In general, it costs more to produce and measure products that have small tolerances. The costs associated with making products with small tolerances for variation can be very high and not proportional to the gains. For example, if the cost of evaluating each screen as it is created in an

online tutorial is greater than delivering the product and fixing any issues after the fact, then the COQ may be too high and the instructional designer will tolerate more defects in the design.

Defining and Meeting Client Expectations

Clients provide specifications for the project that must be met for the project to be successful. Recall that meeting project specifications is one definition of project success. Clients often have expectations that are more difficult to capture in a written specification. For example, one client will want to be invited to every meeting of the project and will then select the ones that seem most relevant. Another client will want to only be invited to project meetings that need client input. Inviting this client to every meeting will cause unnecessary frustration. Listening to the client and developing an understanding of the expectations that are not easily captured in specifications is important to meeting the client's expectations.

Project surveys can capture how the client perceives the project performance and provide the project team with data that is useful in meeting client expectations. If the results of the surveys indicate that the client is not pleased with some aspect of the project, the project team has the opportunity to explore the reasons for this perception with the client and develop recovery plans. The survey can also help define what is going well and what needs improved.

Sources of Planning Information

Planning for quality is part of the initial planning process. The early scope, budget, and schedule estimates are used to identify processes, services, or products where the expected grade and quality should be specified. Risk analysis is used to determine which of the risks the project faces could affect quality.

Techniques

Several different tools and techniques are available for planning and controlling the quality of a project. The extent to which these tools are used is determined by the project complexity and the quality management program in use by the client.

Quality Management Methodology

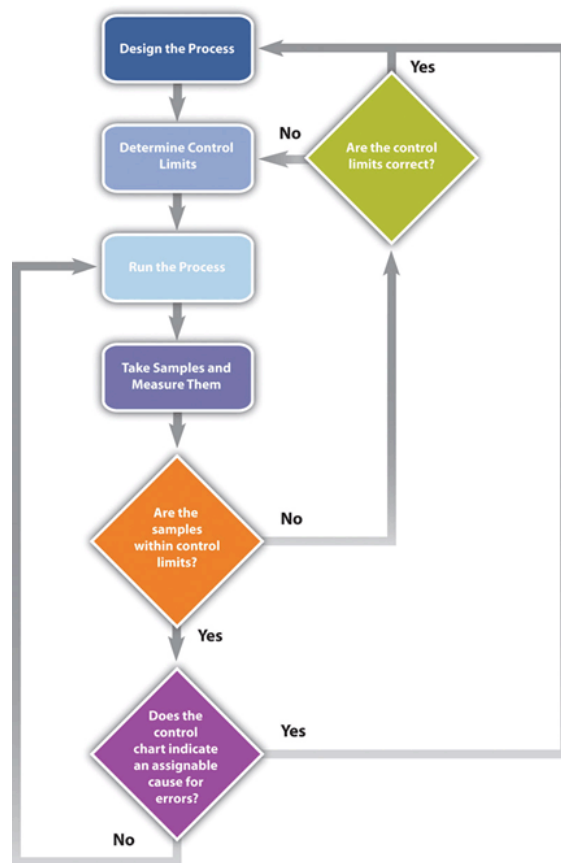
The quality management methodology required by the client is used. The project manager must provide the documentation the client needs to prove compliance with their methodology. There are several different quality management methodologies, but they usually have characteristics that are similar to the ones described previously in the text.

Flowcharting

Many processes are more complicated than a simple sequence of related events that include several different paths. A **flowchart** uses standard symbols to diagram a process that has branches or loops. Diamonds indicate decisions, and arrows indicate the direction of the flow of the process, as shown in Figure 10.8.

Figure 10.8

Flowchart of a Quality Control Process



The process used to plan and assess quality can be described using flowcharts. They are useful for communicating processes that have logical branches that can be determined by simple yes or no questions. Flowcharting is also useful for discovering misunderstanding in project roles and responsibilities and communicating responsibility for work processes.

Benchmarking

When products like shoes were made by hand, artisans would seek some degree of standardization by marking standard lengths for different parts of the product on their workbench. In modern management practice, if a particular method or product is a standard of quality, comparing your organization's quality plan to it is called **benchmarking**. If a product or service is similar to something that is done in another industry or by a competitor, the project planners can look at the best practices that are used by others and use them as a comparison.

Cost-to-Benefit Analysis

Because the cost of prevention is more often part of the project budget, the case must be made for increasing the project budget to raise quality. Some quality management programs, like Six Sigma, require that expenditures for quality are justified using a cost-to-benefit analysis that is similar to calculating the cost of quality, except that it is a ratio of cost of increasing quality to the resulting benefit. A cost-benefit analysis in some quality programs can take into account nonfinancial factors such as client loyalty and improvements to corporate image and the cost-to-benefit analysis takes the form of a written analysis rather than a simple numeric ratio. It is similar to determining the cost of quality (COQ).

Design of Experiments

Measuring for quality of manufactured products or use of repetitive processes requires taking samples. Specialists in quality control design a test regimen that complies with statistical requirements to be sure that enough samples are taken to be reasonably confident that the analysis is reliable. In project management, the testing experiments are designed as part of the planning phase and then used to collect data during the execution phase.

Control Charts

If some of the functions of a project are repetitive, statistical process controls can be used to identify trends and keep the processes within control limits. Part of the planning for controlling the quality of repetitive processes is to determine what the control limits are and how the process will be sampled.

Cause and Effect Diagrams

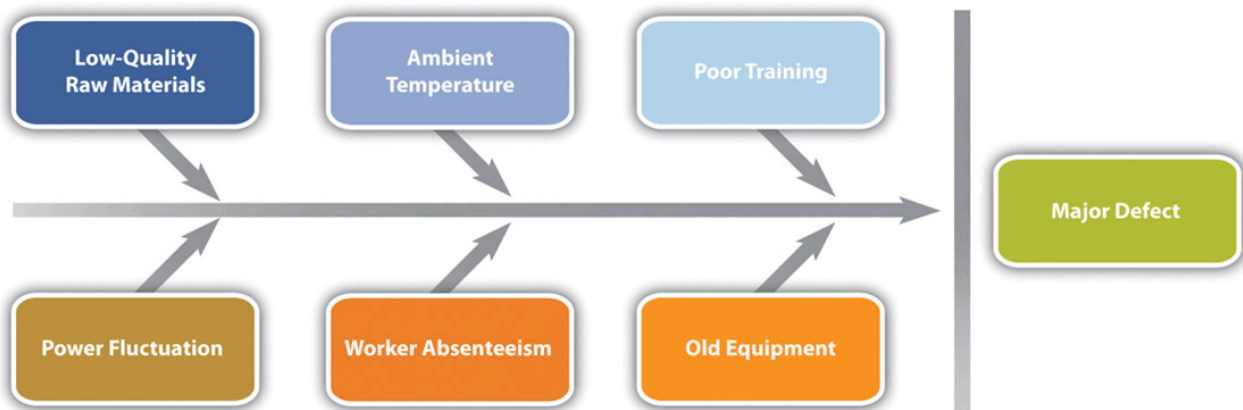
When control charts indicate an assignable cause for a variation, it is not always easy to identify the cause of a problem. Discussions that are intended to discover the cause can be facilitated using a cause-and-effect or **fishbone diagram** where participants are encouraged to identify possible causes of a defect.

Diagramming Quality Problems

For example, a small manufacturing firm tries to identify the assignable causes to variations in its manufacturing line. They assemble a team that identifies six possibilities, as shown in the fishbone diagram below.

Figure 10.9

Cause and Effect Diagram

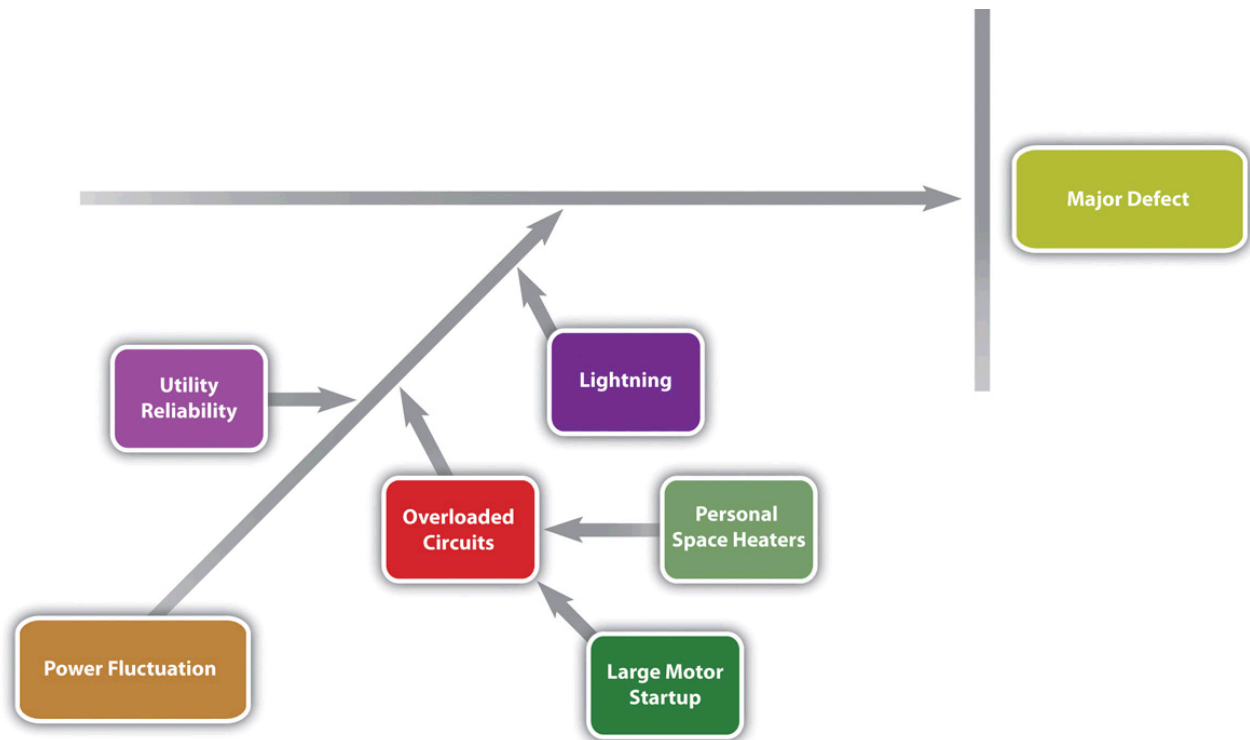


Each branch of the diagram can be expanded to break down a category into more specific items.

An engineer and the electrician work on one of the branches to consider possible causes of power fluctuation and add detail to their part of the fishbone diagram, as shown below.

Figure 10.10

Possible Causes of Power Fluctuation



Check Sheets, Histograms, and Pareto Charts

When several quality problems need to be solved, a project manager must choose which ones to address first. One way to prioritize quality problems is to determine which ones occur most frequently. This data can be collected using a **check sheet**, which is a basic form on which the user can make a check in the appropriate box each time a problem occurs or by automating the data collection process using the appropriate technology. Once the data are collected, they can be analyzed by creating a type of frequency distribution chart called a **histogram**. A true histogram is a column chart where the width of the columns fill the available space on the horizontal axis and are proportional to the category values displayed on the x axis, while the height of the columns is proportional to the frequency of occurrences. Most histograms use one width of column to represent a category, while the vertical axis represents the frequency of occurrence.

A variation on the histogram is a frequency distribution chart invented by economist Vilfredo Pareto known as a **Pareto chart**, in which the columns are arranged in decreasing order with the most common on the left and a line added that shows the cumulative total. The combination of columns and a line allows the user to tell at a glance which problems are most frequent and what fraction of the total they represent.

Planning and Control Results

The quality plan is produced during the initiation phase. The methods, procedures, and logic are described to demonstrate a commitment to a project of high quality. The plan identifies the products or services that will be measured and how they will be measured and compared to benchmarks. A flowchart demonstrates the logic and pathways to improve the plan.

During the execution phase, data are collected by measuring samples according to the design specified in the plan. The data are charted and analyzed. If variations are due to assignable causes, change requests are created.

Key Takeaways

- Statistical control terms that are commonly used are tolerance (the range between control limits), flowchart (a diagram showing decision branches and loops), benchmarking (comparison to best practices), fishbone diagram (shows possible causes of quality problems), check sheet (form used to record frequency of problem occurrences), histogram (column chart that shows frequency of problems), and Pareto chart (histogram sorted by frequency from highest to smallest with a line that shows total cumulative problems).
- The quality planning process uses initial scope, budget, and schedule estimates to identify areas that need quality management.
- Control of quality in repetitive processes use statistical control methods that involve designing testing while considering the cost of quality, taking measurements, and then analyzing the data using run charts that show control limits and trends. Methodologies are compared to the best practices by competitors, which is called benchmarking. Errors are documented using check sheets and analyzed using fishbone diagrams, histograms, or Pareto charts.
- The products of planning and controlling quality are a quality management plan, data, analysis documents, and proposals for improvement.



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