Project Quality Management

Quality Management Overview

THE PROJECT QUALITY MANAGEMENT PROCESS includes the activities of the performing organization that determine quality policies and objectives for the project to satisfy the needs for which it was undertaken. The Project Quality Management processes include **Plan Quality**, **Perform Quality Assurance**, and **Perform Quality Control**. These processes interact with each other and may involve effort from one or more persons or groups. Each process takes place and least once in every project and they may overlap.

Plan Quality is the process of defining the quality requirements and standards for the project and product and documenting how the project will show they are in compliance.

It is the task of the project manager to identify which quality standards are relevant to the project and determine how to satisfy them during the quality planning stage. Specific project guidelines are required or set during the quality planning stage, which determine standards and parameters for quality acceptance.

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PERFORM QUALITY ASSURANCE is the process involving applying planned quality activities that ensure all processes meet quality requirements.

TO ENSURE THE PROJECT MEETS QUALITY STANDARDS, the project manager should be informed about industry rules and regulations regarding minimal project requirements and standards. The project manager should also be informed about federal, state, and local laws and regulations determining minimum acceptable requirements for the particular type of project as well as the customer or stakeholder's requirements and expectations for the project.

PERFORM QUALITY CONTROL is the process of monitoring specific project results to determine if they comply with quality standards and to recommend changes if necessary.

Quality Management Overview

Basic approaches to quality management are in accordance with standards set by the INTERNATIONAL ORGANIZATION FOR STANDARDIZATION. (ISO). ISO is a non-governmental, international standard-setting group, comprised of representatives from numerous national standards bodies, which creates industrial and commercial standards.

NON-PROPRIETARY APPROACHES to quality management are contained in processes used by project managers, such as:

- ✓ TQM (Total Quality Management)
- ✓ Six Sigma
- ✓ COQ (Cost of Quality, Failure Mode and Effect Analysis)
- ✓ Design Reviews
- ✓ Voice of the Customer
- ✓ Continuous Improvement

Quality Management Overview

Non-Proprietary Quality Management Approaches:

TOTAL QUALITY MANAGEMENT (TQM) is used to track and maximize quality output and increase customer satisfaction. It is one of the most widely used management systems for quality control. It is effectively used to implement quality methods, processes, and procedures throughout the total production or service process, or, throughout the organization.

SIX SIGMA is a structured application of the tools and techniques of TQM. Six Sigma is applied to a project to achieve strategic business results, with a 99.99966% success rate. The Six Sigma application measures, analyzes, improves, and controls.

THE COST OF QUALITY (COQ) refers to the total costs incurred to ensure project quality. The cost of preventing mistakes typically costs less than the cost to correct them. CONTINUOUS PROJECT INSPECTIONS help detect mistakes that can cause bigger and expensive problems later on.

Quality Management Overview

PREVENTION AND APPRAISAL COSTS are costs of conformance. They include costs for quality planning, QC, and QA to ensure compliance to requirements such as, training, QC systems, and inspections.

FAILURE COSTS, OR COSTS OF NON-CONFORMANCE are operational costs to rework products, components, or processes that are non-compliant. Costs of warranty work and waste and loss of reputation are included.

QUALITY is the degree to which a set of inherent characteristics fulfill requirements.

GRADE is a category assigned to products or services having the same functional use but different technical characteristics.

LOW QUALITY is ALWAYS a problem.
LOW GRADE is NOT always a problem.

Quality Management Overview

EXAMPLE: Vehicles can be high quality products, but low grade (limited options). However, vehicles are not acceptable if they are low quality (cheaply made with defects) but have many options (high grade). The project manager and project management team are responsible for ensuring both quality and grade. Low project quality creates the most problems during project progress.

PRECISION is a value consistency where the value of repeated measurements are clustered and have little scatter. **Precise measurements are not necessarily accurate.**

ACCURACY is the degree of correctness that the measured value is very close to the true value. **Very accurate measurements are not necessarily precise.**

Quality Management Overview

Both quality management and project management focus on:

- ✓ customer satisfaction
- ✓ preventing mistakes
- ✓ management responsibilities for success
- ✓ continuous improvement using the plan-do-check-act cycle

Both quality management and project management recognize the importance of achieving customer satisfaction by:

- ✓ understanding, evaluations, defining, and managing expectations
- ✓ conforming to requirements (the project must produce what it said it would produce)
- ✓ Ensuring product or service fitness (satisfying needs).

Quality Management Overview

The basis for quality improvement is the plan-do-check-act cycle. TQM and Six Sigma also improve the quality of the project's management and the project's product quality.

Stakeholder stated and implied needs and expectations are critical elements of quality management which are needed to develop project requirements.

Project quality applies to all projects. But product quality measures are specific to a particular project or projects. For example, quality output on a bridge construction project is measured differently than quality output for products from a chocolate factory!

Plan Quality

QUALITY PLANNING involves identifying which quality standards are relevant to the project and

deciding how to satisfy and document them.

QUALITY PLANNING is a key process during planning and during development of the project management plan. It is performed in parallel with other planning processes in the event cost or schedule adjustments become necessary, such as those needed to match required changes with identified quality standards.

A FUNDAMENTAL PRINCIPLE OF MODERN QUALITY MANAGEMENT IS:
Quality is planned-, designed-, and built-in, NOT inspected-in.

Plan Quality

Enterprise environmental factor inputs into quality management include government agency rules, regulations, standards, and guidelines specific to the application area that might affect the project.

THRESHOLDS are part of the project scope statement and define cost, time, or resource values as parameters. Exceeding thresholds may require an exception report to be filed.

PLAN QUALITY – INPUTS:

Scope Statement: The scope contains a description of the project, the major deliverables of the project, and the acceptable project criteria. The product scope description will contain details of the technical issues and concerns that my affect quality planning.

WBS: The WBS identifies the project deliverables, the work packages, and the control accounts.

The **WBS Dictionary** is used to define technical information for WBS elements.

Plan Quality

Stakeholder Register: identifies stakeholders with an interest in or impact of quality

Cost Performance Baseline: the time phase used to measure cost performance

Risk Register: holds information on threats and opportunities that could impact quality

Enterprise Environmental Factors: include Governmental agency regulations and operating conditions of the project that could affect quality

Organizational Process Assets: organizational guidelines, historical databases, things learned from past projects, and an endorsed quality policy that sets the intended direction of those implementing the project with regards to quality

Plan Quality

ACCEPTANCE CRITERIA can significantly increase or decrease project quality costs. These criteria are performance requirements and essential conditions, which must be achieved before deliverables are accepted.

FORMAL ACCEPTANCE signifies the project deliverables meet specifications and requirements, and that they have been accepted by the customer.

The benefit of meeting quality requirements is less rework, which results in:

- ✓ higher productivity
- ✓ lower costs
- ✓ increased stakeholder satisfaction

Plan Quality

BENCHMARKING involves comparing actual or planned project practices to those of other projects to generate ideas for improvement. Benchmarks serve as a basis to measure performance.

TOOLS & TECHNIQUES USED IN QUALITY PLANNING:

DESIGN OF EXPERIMENTS (DOE) is a statistical method that helps optimize products and processes by identifying which factors may influence specific products or processes under development or production. It provides a statistical framework for systematically changing all important factors, instead of changing them one at a time.

Plan Quality

COSTS OF QUALITY are those costs incurred as a result of proactive prevention of nonconformance, noncompliance, and failing to meet requirements which result in rework.

BRAINSTORMING AND LATERAL THINKING are techniques group team members use to identify risks, or generate alternative approaches to performing work and executing the project. Each member's ideas are recorded for later analysis.

FLOWCHARTING creates a system process diagram that provides a step-by-step view into process inputs, process actions, and outputs. There are many styles, but all process flowcharts show activities, decision points, and the order of processing. They are helpful to the project team in that they help the team anticipate quality problems that might occur.

Plan Quality

PERFORMING AN INDEPENDENT QUALITY MANAGEMENT PEER REVIEW mitigates impacts from cost and schedule overruns and reworking.

A METRIC is an operational definition of what something is and how it is measured. Quality metrics are used in QA and QC processes. QUALITY METRICS include defect density, failure random availability, reliability, and test coverage.

A MEASUREMENT is an actual value. A measurement in the context of quality metrics is specific and goes beyond the value of management quality. For example, the management team determines when an activity should begin and end, and if the activities or only certain deliverables will be measured.

QUALITY CHECKLISTS are "Do this!" or "Have you done this?" directives that verify a set of required component-specific steps have been performed.

QUALITY CHECKLISTS are used in quality control processes. They are generally standardized to ensure consistency for frequently performed tasks.

Plan Quality

PROCESS IMPROVEMENT PLANS (PIPs) are subsidiaries of the project management plan that detail the steps for analyzing processes that facilitate the identification of waste and non-value added activity. The PIP increases customer satisfaction.

PROCESS METRICS maintain control over the status of processes.

PROCESS CONFIGURATION provides the project manager with a flowchart of processes to aid in analysis. Interfaces are identified.

PROCESS BOUNDARIES describe the purpose, process start- and end-dates, inputs and outputs, stakeholders and owners.

THE PERFORMANCE MEASUREMENT BASELINE is the basis for measuring and reporting quality performance. It is part of the quality baseline that records the quality objectives of the project.

QUALITY ASSURANCE (QA) is the process of auditing the project quality requirements to ensure the project employs processes necessary to meet requirements and quality standards.

Perform Quality Assurance

Continuous **PROCESS IMPROVEMENT** provides the project management team with an iterative means for improving the quality of all processes. Process improvement is distinguished from other processes by its identification and review of organizational business processes.

WORK PERFORMANCE INFORMATION and approved change requests are important QA inputs that can be used in audits, quality reviews, and process analyses.

QUALITY ASSURANCE (QA) APPROVED CHANGE REQUESTS include:

- ✓ modifications to work methods
- ✓ product and quality requirements
- ✓ the scope and schedule
- ✓ performance reports

If QA approved change requests are not formally documented in writing and verbally discussed, they should not be processed or implemented.

Perform Quality Assurance

QUALITY MEASUREMENTS are results of quality control activities, fed to the QA processes. Quality measurements are used to reevaluate and analyze quality standards and processes.

TOOLS & TECHNIQUES USED IN QUALITY ASSURANCE:

QUALITY AUDITS are structured, independent reviews to determine if project activities comply with organizational and project policies and procedures. Quality audits may be scheduled or performed randomly. The audits are conducted by trained in-house auditors or by third parties outside the performing organization.

THE PRIMARY OBJECTIVE OF A QUALITY AUDIT is to identify inefficient and ineffective policies, processes, and procedures used during the process. Best practices being implemented as well as shortcomings are identified and shared with those working on similar projects. Quality audits confirm the implementation of:

- ✓ approved change requests
- ✓ corrective actions
- ✓ defect repairs
- ✓ preventive actions

Perform Quality Assurance

The project manager uses **PROCESS ANALYSIS** to examine:

- ✓ problems
- ✓ constraints
- ✓ non-value added activities identified during process operations

ROOT CAUSE ANALYSIS is a specific process analysis technique used:

- ✓ to analyze a problem and/or situation, and its cause(s)
- ✓ to create preventive actions for future similar problems or situations

Perform Quality Control

QUALITY CONTROL should be performed throughout the project by a quality control department. It involves monitoring specific project results to determine if they comply with quality standards and also identifying ways to eliminate the causes of unsatisfactory results.

It is essential that the quality control team members have a working knowledge of statistical quality control methods, including:

- ✓ sampling
- ✓ determining probability to evaluate outputs

Perform Quality Control

It is equally important to know the difference among:

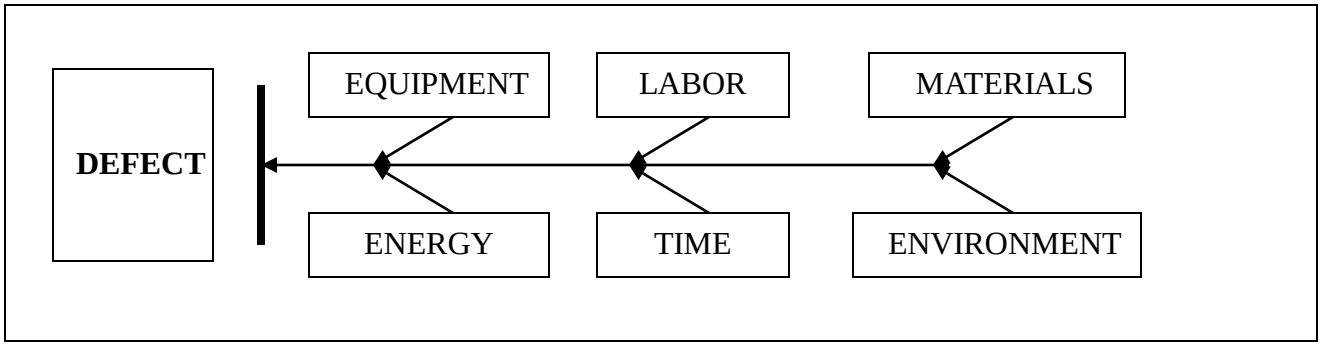
- ✓ Tolerances (specified range of acceptable results) and control limits (thresholds which can signal that the process is out of control)
- ✓ Prevention (keeping mistakes out the process) and inspection (keeping mistakes out of the customers hands)
- ✓ Attribute sampling (the end result either conforms or does not conform) and variables sampling (the end result is rated and the degree to which it conforms is measured.
- ✓ Common, or random, causes and events which impact quality

A sample test result is acceptable if it falls within the range specified by the tolerance. A process is said to be in control if the result falls within the control limits.

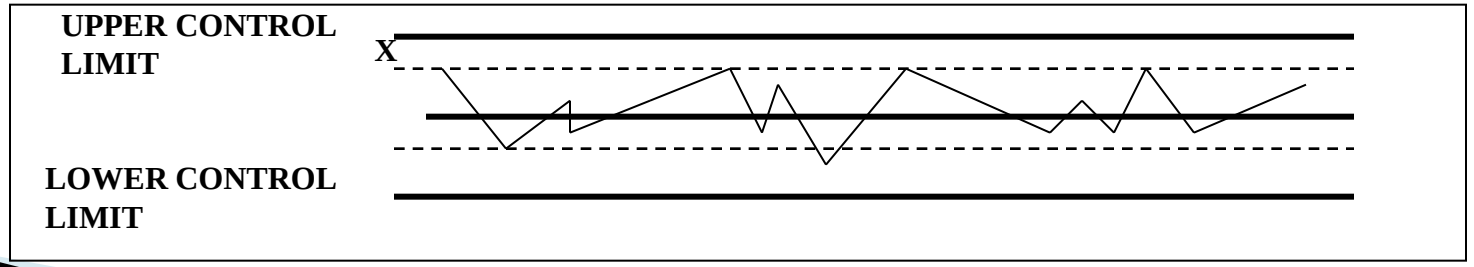
Perform Quality Control

TOOLS & TECHNIQUES USED TO CONTROL QUALITY:

A ISHIKAWA, FISHBONE, OR CAUSE AND EFFECT DIAGRAM indicates how various factors might be linked to potential problems or effects.

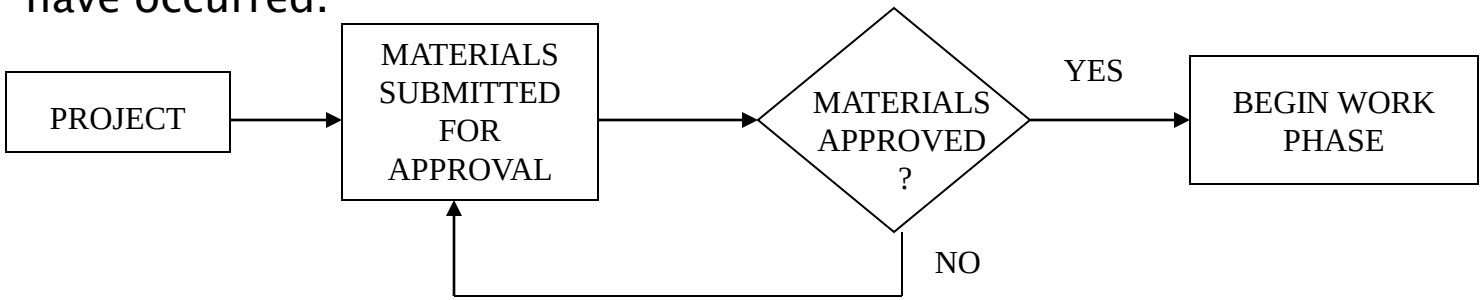


CONTROL CHARTS determine if a process is stable or unstable over time or has predictable performance. They graphically answer the question "Is this process variance within acceptable limits?" They may be used for both project and product life cycle processes, and to monitor output variables.

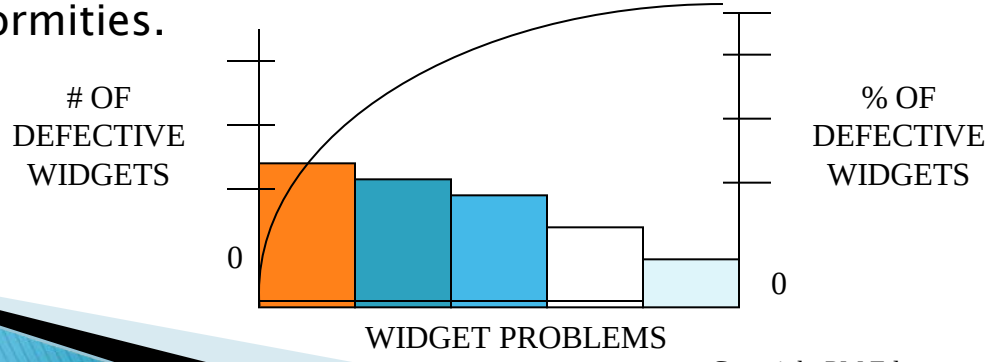


Perform Quality Control

FLOWCHARTS graphically represent a process and how various elements interact within that process. They are most effective in seeing how problems can occur, or have occurred.



HISTOGRAMS are representative, vertical bar charts showing a distribution of variables. The height of each column represents the frequency of the characteristic. **PARETO CHARTS** are a specific type of histogram. They are ordered by frequency of occurrence shown according to the number of defects generated categorically. This technique is typically used to identify and evaluate nonconformities.



Perform Quality Control

Run Charts: Similar to a control chart, a run chart is a line graph that shows points of data plotted in the order in which they occur. It shows the history and pattern of variation. A run chart can show trends in a process over time, variations or time, or improvements or declines in the process over time.

- ✓ **Trend analysis**: the process of using mathematical techniques to predict future outcomes based on past results is performed using run charts. It is often used to monitor:
- ✓ **Technical performance**: How many mistakes or defects have been uncovered and how many remain undetected?
- ✓ **Cost and schedule performance**: How many activities per period were done with significant variances?

Scatter Diagram: A scatter diagram depicts the relationship between variables. It allows the team to study and identify the possible link between changes involved in two variables. Dependent versus independent variables are posted and the closer the points are to a diagonal line, the more closely they are related.