The Importance of Project Quality Management

- Many people joke about the poor quality of IT products
- People seem to accept systems being down occasionally or needing to reboot their PCs
- But quality is very important in many IT projects

What Is Project Quality?

- The International Organization for Standardization (ISO) defines quality as “the degree to which a set of inherent characteristics fulfills requirements” (ISO9000:2000)
- Other experts define quality based on:
  - Conformance to requirements: the project’s processes and products meet written specifications
  - Fitness for use: a product can be used as it was intended
What Is Project Quality Management?

- **Project quality management** ensures that the project will satisfy the needs for which it was undertaken.

  Processes include:
  - **Quality planning**: identifying which quality standards are relevant to the project and how to satisfy them.
  - **Quality assurance**: periodically evaluating overall project performance to ensure the project will satisfy the relevant quality standards.
  - **Quality control**: monitoring specific project results to ensure that they comply with the relevant quality standards.

Project Quality Management Summary

- **Quality Planning**:
  - Implies the ability to anticipate situations and prepare actions to bring about the desired outcome.
  - Important to prevent defects by:
    - Selecting proper materials.
    - Training and indoctrinating people in quality.
    - Planning a process that ensures the appropriate outcome.

Design of Experiments

- **Design of experiments** is a quality planning technique that helps identify which variables have the most influence on the overall outcome of a process.

  Also applies to project management issues, such as cost and schedule trade-offs.

  Involves documenting important factors that directly contribute to meeting customer requirements.
Scope Aspects of IT Projects

- **Functionality** is the degree to which a system performs its intended function
- **Features** are the system's special characteristics that appeal to users
- **System outputs** are the screens and reports the system generates
- **Performance** addresses how well a product or service performs the customer's intended use
- **Reliability** is the ability of a product or service to perform as expected under normal conditions
- **Maintainability** addresses the ease of performing maintenance on a product

Who's Responsible for the Quality of Projects?

- **Project managers** are ultimately responsible for quality management on their projects
- Several organizations and references can help project managers and their teams understand quality
  - International Organization for Standardization (www.iso.org)
  - IEEE (www.ieee.org)

Quality Assurance

- **Quality assurance** includes all the activities related to satisfying the relevant quality standards for a project
- Another goal of quality assurance is **continuous quality improvement**
- **Benchmarking** generates ideas for quality improvements by comparing specific project practices or product characteristics to those of other projects or products within or outside the performing organization
- A **quality audit** is a structured review of specific quality management activities that help identify lessons learned that could improve performance on current or future projects

Quality Control

- The main outputs of quality control are:
  - Acceptance decisions
  - Rework
  - Process adjustments
- There are Seven Basic Tools of Quality that help in performing quality control
Cause-and-Effect Diagrams

- **Cause-and-effect diagrams** trace complaints about quality problems back to the responsible production operations.
- They help you find the root cause of a problem.
- Also known as fishbone or Ishikawa diagrams.

Sample Cause-and-Effect Diagram

Quality Control Charts

- A **control chart** is a graphic display of data that illustrates the results of a process over time.
- The main use of control charts is to **prevent defects**, rather than to detect or reject them.
- Quality control charts allow you to determine whether a process is in control or out of control.
  - When a process is in control, any variations in the results of the process are created by random events; processes that are in control do not need to be adjusted.
  - When a process is out of control, variations in the results of the process are caused by nonrandom events; you need to identify the causes of those nonrandom events and adjust the process to correct or eliminate them.

The Seven Run Rule

- You can use quality control charts and the seven run rule to look for patterns in data.
- The **seven run rule** states that if seven data points in a row are all below the mean, above the mean, or are all increasing or decreasing, then the process needs to be examined for nonrandom problems.
Sample Quality Control Chart

Run Chart
- A run chart displays the history and pattern of variation of a process over time.
- It is a line chart that shows data points plotted in the order in which they occur.
- Can be used to perform trend analysis to forecast future outcomes based on historical patterns.

Scatter Diagram
- A scatter diagram helps to show if there is a relationship between two variables.
- The closer data points are to a diagonal line, the more closely the two variables are related.

Histograms
- A histogram is a bar graph of a distribution of variables.
- Each bar represents an attribute or characteristic of a problem or situation, and the height of the bar represents its frequency.
Pareto Charts

- A **Pareto chart** is a histogram that can help you identify and prioritize problem areas.
- **Pareto analysis** is also called the 80-20 rule, meaning that 80 percent of problems are often due to 20 percent of the causes.

![Pareto Chart Diagram]

Flowcharts

- Flowcharts are graphic displays of the logic and flow of processes that help you analyze how problems occur and how processes can be improved.
- They show activities, decision points, and the order of how information is processed.

![Flowchart Diagram]

Statistical Sampling

- **Statistical sampling** involves choosing part of a population of interest for inspection.
- The size of a sample depends on how representative you want the sample to be.
- Sample size formula:
  \[
  \text{Sample size} = 0.25 \times \frac{\text{certainty factor/acceptable error}}{2}
  \]
- Be sure to consult with an expert when using statistical analysis.

Six Sigma

- **Six Sigma** is "a comprehensive and flexible system for achieving, sustaining, and maximizing business success. Six Sigma is uniquely driven by close understanding of customer needs, disciplined use of facts, data, and statistical analysis, and diligent attention to managing, improving, and reinventing business processes."

Basic Information on Six Sigma

- The target for perfection is the achievement of no more than 3.4 Defects Per Million Opportunities (DPMO).
- The principles can apply to a wide variety of processes.
- Six Sigma projects normally follow a five-phase improvement process called DMAIC.

Six Sigma and Statistics

- The term sigma means standard deviation.
- Standard deviation measures how much variation exists in a distribution of data.
- Standard deviation is a key factor in determining the acceptable number of defective units found in a population.
- Six Sigma projects strive for no more than 3.4 defects per million opportunities.

DMAIC

- Define the problem and customer requirements.
- Measure defect rates and document the process in its current incarnation.
- Analyze process data and determine the capability of the process.
- Improve the process and remove defect causes.
- Control process performance and ensure that defects do not recur.

Normal Distribution and Standard Deviation

- The normal curve.
Testing

- Many IT professionals think of testing as a stage that comes near the end of IT product development.
- Testing should be done during almost every phase of the IT product development life cycle.

Types of Tests

- **Unit testing** tests each individual component (often a program) to ensure it is as defect-free as possible.
- **Integration testing** occurs between unit and system testing to test functionally grouped components.
- **System testing** tests the entire system as one entity.
- **User acceptance testing** is an independent test performed by end users prior to accepting the delivered system.
Modern Quality Management

- Modern quality management:
  - Requires customer satisfaction
  - Prefers prevention to inspection
  - Recognizes management responsibility for quality
  - Noteworthy quality experts include Deming, Juran, Crosby, Ishikawa, Taguchi, and Feigenbaum

ISO Standards

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Improving Information Technology Project Quality

- Several suggestions for improving quality for IT projects include:
  - Establish leadership that promotes quality
  - Understand the cost of quality
  - Focus on organizational influences and workplace factors that affect quality
  - Follow maturity models

Leadership

- As Joseph M. Juran said in 1945, “It is most important that top management be quality-minded. In the absence of sincere manifestation of interest at the top, little will happen below.”*
- A large percentage of quality problems are associated with management, not technical issues

*American Society for Quality (ASQ). (www.asq.org/about/history/juran.html).
The Cost of Quality

- The cost of quality is the cost of conformance plus the cost of nonconformance.
- Conformance means delivering products that meet requirements and fitness for use.
- Cost of nonconformance means taking responsibility for failures or not meeting quality expectations.
- A 2002 study reported that software bugs cost the U.S. economy $59.6 billion each year and that one-third of the bugs could be eliminated by an improved testing infrastructure.

Five Cost Categories Related to Quality

- Prevention cost: cost of planning and executing a project so it is error-free or within an acceptable error range.
- Appraisal cost: cost of evaluating processes and their outputs to ensure quality.
- Internal failure cost: cost incurred to correct an identified defect before the customer receives the product.
- External failure cost: cost that relates to all errors not detected and corrected before delivery to the customer.
- Measurement and test equipment costs: capital cost of equipment used to perform prevention and appraisal activities.

Organizational Influences, Workplace Factors, and Quality

- Study by DeMarco and Lister showed that organizational issues had a much greater influence on programmer productivity than the technical environment or programming languages.
- A dedicated workspace and a quiet work environment were key factors to improving programmer productivity.

Chapter Summary

- Project quality management ensures that the project will satisfy the needs for which it was undertaken.
- Main processes include:
  - Quality planning
  - Quality assurance
  - Quality control