Chapter 8

Project Quality Management

Definition of Quality

- It is the conformance to requirements and fitness of use.
- The project manager should perform careful and accurate needs analysis at the beginning of the project to ensure stakeholder satisfaction.

Project Quality Management Concepts & Definitions

Management of the Project and the ***Product of the project***.

- While ***Project Quality Management*** applies to all projects, regardless of the nature of their product, ***product quality measures and techniques*** are specific to the particular type of product produced by the project.
  In either case, failure to meet quality requirements in either dimension can have serious negative consequences for any or all of the project stakeholders.
- A critical element of quality management in the project context is to turn stakeholder needs, wants, and expectations into requirements through Stakeholder Analysis (performed during Project Scope Management)
- No Gold Plating: giving extras

Impact of Poor Quality

- Increased cost
- Low morale
- Low customer satisfaction
- Increased risk
- Rework
- Schedule delays

Quality Philosophy

- ***Deming*** Leadership, long-term company

position; continuous improvement; participatory; opposes slogans; 14 steps to TQM.

- ***Japanese (Kaizen)*** Similar to *Deming*
- ***Juran*** Decrease cost of quality; 80/20 principle; fitness for use
- ***Crosby*** Decrease cost of quality; authoritarian; zero defects; Conformance to requirement.
- **Just In Time** (JIT): zero inventory; zero defect; higher quality
- **Total Quality Management:** encourage employees to find a continuous way of improving their business practices & products.
- **Six Sigma:** Project based improvement approach which uses data and statistical analysis.

ISO 9000

- It is a family of standards create by International Standard Organization to help insure the organizations have quality procedures & they follow them.
- It does not tell you what quality should be or describe a recommended quality system.
- ISO9001 Design/Develop/Produce/Install & Service
- ISO9002 Produce & Install
- ISO9003 Inspection & Testing
- Note 85 % of costs are responsibility of management

Precision vs. Accuracy

Precision	Accuracy
"Precision is consistency that the value of repeated measurements are clustered and have little scatter."	"Accuracy is correctness that the measured value is very close to the true value."
Precise measurements are not necessarily accurate.	A very accurate measurement is not necessarily precise.

Quality & Grade

- Quality and grade are not the same.
- 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 may not be.
- For example, a software product can be of high quality (no obvious defects, readable manual) and low grade (a limited number of features), or of low quality (many defects, poorly organized user documentation) and high grade (numerous features).
- The project manager and the project management team are responsible for determining and delivering the required levels of both quality and grade.

Modern Quality Management & Project Management

Both disciplines recognize the importance of:

- ***Prevention over inspection***.

  The ***cost of preventing mistakes*** is generally much less than the *cost of correcting* them, as revealed by inspection

- ***Management responsibility***

  Success requires ***the participation of all members*** of the team, but it remains ***the responsibility of management*** to provide the resources needed to succeed.

Modern Quality Management & Project Management

Both disciplines recognize the importance of:

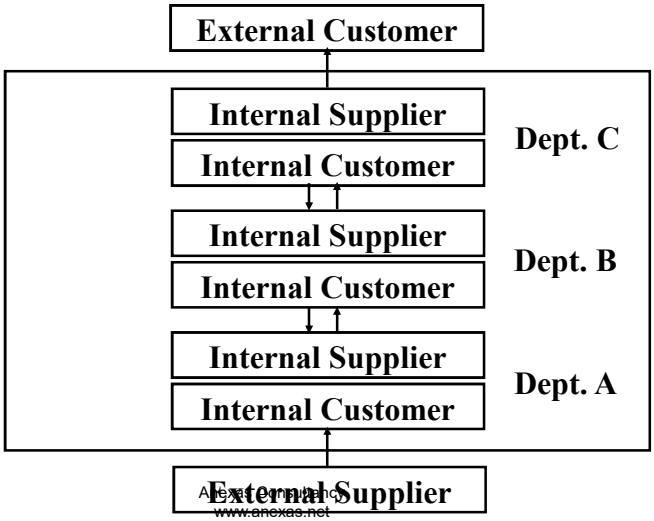
- ***Continuous improvement***.

  The ***plan-do-check-act cycle*** is the basis for quality improvement (as defined by Shewhart and modified by Deming)

  Quality improvement initiatives undertaken by the performing organization, such as **TQM** and **Six Sigma**, can improve the ***quality of the project's management*** as well as ***the quality of the project's product***.

Process improvement models include Malcolm Baldrige, CMM®, and CMMI.

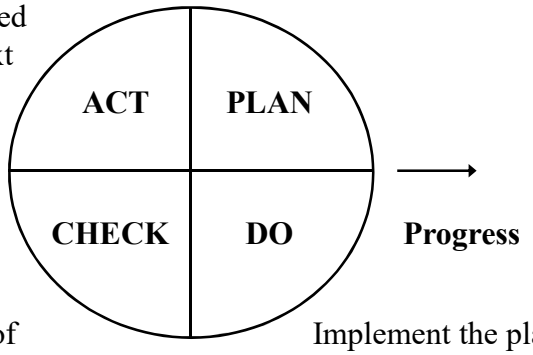
Customer Satisfaction



Continuous Improvement

Take corrective action on the opportunity, standardize, and feed forward for the next plan.

Plan improvements for present practices.

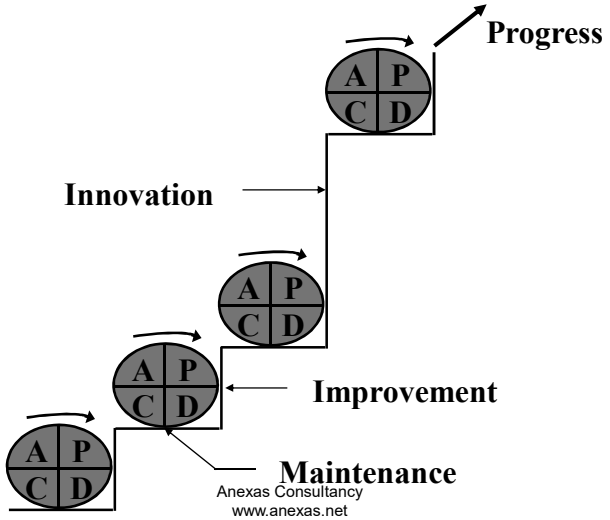


Verify the results of the plan.

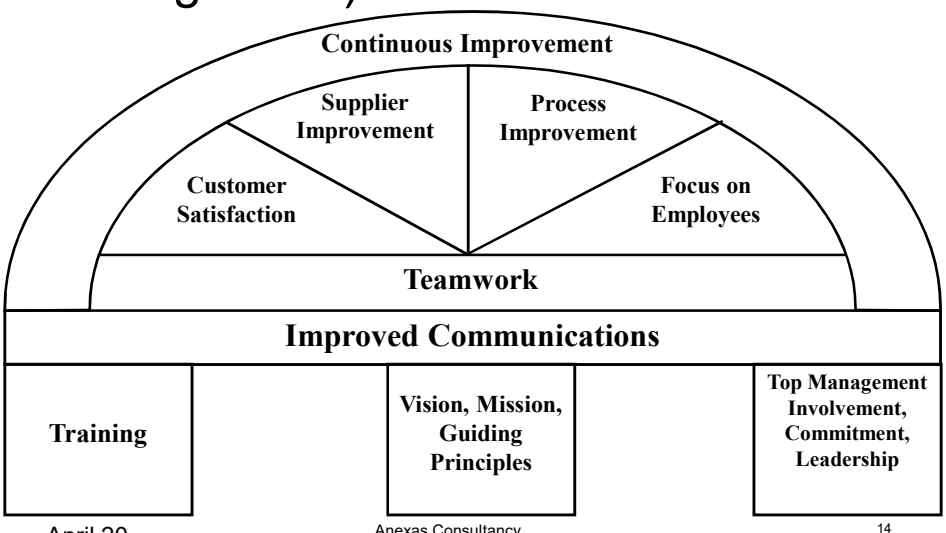
Implement the plan on a small scale.

Deming's Plan-Do-Check-Act (PDCA) Cycle

Continous Improvement



Principles of TQM (Total Quality Management)



Philip Crosby: (zero defects)

His audience is primarily top-management, stressing increasing profitability through quality improvement. His thesis is that higher quality reduces costs and raises profits. He defines quality as conformance to requirements. Crosby's program has 14 steps which focuses on how to change the organization.

Crosby's approach is based on 4 absolutes of quality management:

1. *Quality means conformance, not elegance.*

2. It is always cheaper to do the job right the first time.

3. The only performance indicator is the cost of quality.

4. The only performance standard is zero defects.

Crosby's fourteen-step quality improvement program:

1. Management commitment.
2. Quality improvement team.
3. Quality measurement.
4. Cost of quality evaluation.
5. Quality awareness.
6. Corrective action.
7. Establish *ad hoc* committee for the zero defects program
8. Supervisor training.
9. Zero defects day.
10. Goal-settings.
11. Error cause removal.
12. Recognition.
13. Quality councils.
14. Do it over again.

Juran: (cost of quality)

Juran emphasizes the cost of quality, because the language of top-management is money, and he recommends cost of quality for identifying quality improvement opportunities and developing a quality cost scoreboard to measure quality costs.

Juran defines quality as *"fitness for use"*, which he breaks down into quality of designs, quality of conformance, availability and field service. The goals of Juran's approach to quality are:

- **Increased conformance**
- **Decreased cost of quality**
- **Yearly goals are set in the objective setting phase of the program.**

Juran's approach is more consistent with US management practices - he takes the exciting management culture as a starting point and builds a quality improvement process from that baseline.

The Juran Method:

1. **Build awareness of the need and opportunity for improvement.**
2. **Set goals for improvement.**
3. **Organize to reach the goals.**
4. **Provide training.**
5. **Carry out projects to solve problems.**
6. **Report progress.**
7. **Give recognition.**
8. **Communicate results.**
9. **Keep the score.**
10. **Maintain momentum by making annual improvement part of the regular system and process of the company.**

Quality Approaches

- Proprietary approaches
  - Deming
  - Juran
  - Crosby
  - …others
- Non-proprietary approaches
  - Total Quality Management (TQM)
  - Continuous Improvement
  - Six Sigma
  - Lean

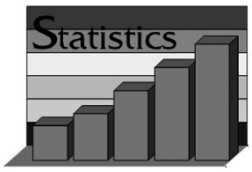
Quality Approaches (cont.)

- Proprietary approaches
  - Quality philosophies

Deming	Juran	Crosby	Ishikawa
PDCA (Plan, Do, Check, Act)	TQM Total Quality Management	Quality is free	Cause and Effect Fishbone Diagram (Flowchart)
Poor quality: 85% Process 15% Worker	Fitness for Use	Conformance to requirements	Design Statistics
Don't confuse with 80/20			

Design of experiments

- Statistical method that helps identify which factors might influence specific variables.
  - The statistical method technique is applied to:
    - The product of the project
    - The project management issues; like senior engineers will cost more than junior engineers.



Cost of Quality

- Refers to the total cost of all efforts to achieve product/service quality.

Cost Categories		
Cost of Conformance	**Cost of Nonconformance**	
Prevention and Appraisal Costs	Failure Costs	
Planning Training Auditing Controlling	Internal (pre customer)	Scrap Rework
	External (post customer)	Warranty Service Recalls

Measuring the Cost of Quality

Defect Prevention	Defect Detection	Defect Removal
Training	Inspections	Fault Isolation
Planning	Testing	Fault Analysis
Simulation	Auditing	Root Cause
Modeling	Measuring	Analysis
etc...	Verification	Regression
	Validation	Testing
	etc...	Problem Tracking
		etc...

Quality Metrics

- Some metrics are **subjective** – ask the customer

- Measure quality characteristics (speed, reliability, response time, etc)
- Try to make as **objective** as possible
  - Define the aspects of quality
  - Measure as much as you can

Processes

Quality Planning: identifying which quality standards are relevant to the project and determining how to satisfy them. Quality is planned in NOT inspected in

Perform Quality Assurance: applying the planned, systematic quality activities (such as audits or peer reviews) to ensure that the project will employ all processes needed to meet all stakeholder expectations.

Perform Quality Control: monitoring specific project results to determine if they comply with relevant quality standards and identifying ways to eliminate causes of unsatisfactory performance.

Quality planning Outputs

Process Improvement Plan

- The process improvement plan is a subsidiary of the project management plan
- The process improvement plan details the steps for analyzing processes that will facilitate the identification of waste and non-value added activity, thus increasing customer value, such as:
  - Process boundaries. Describes the purpose, start, and end of processes, their inputs and outputs, data required, if any, and the owner and stakeholders of processes.
- **Process configuration.** A flowchart of processes to facilitate analysis with interfaces identified.
- **Process metrics.** Maintain control over status of processes.
- **Targets for improved performance.** Guides the process improvement
- activities.

Quality audits

- They periodically review of quality management activities
- They measure how the project is progressing and identify corrective actions.
- They identify the lessons learned for the benefit of future projects.

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Requested changes & Recommended corrective actions

- Taking action to increase the effectiveness and efficiency of the project to provide added benefits to the project stakeholders.
- Preparing change requests or taking corrective action in accord with procedures for integrated change control.

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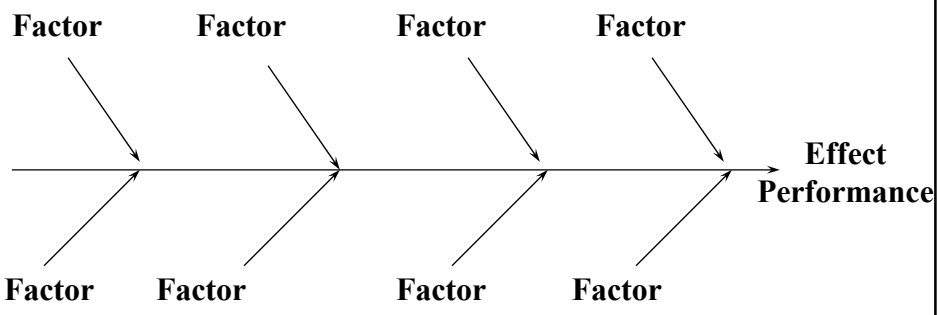
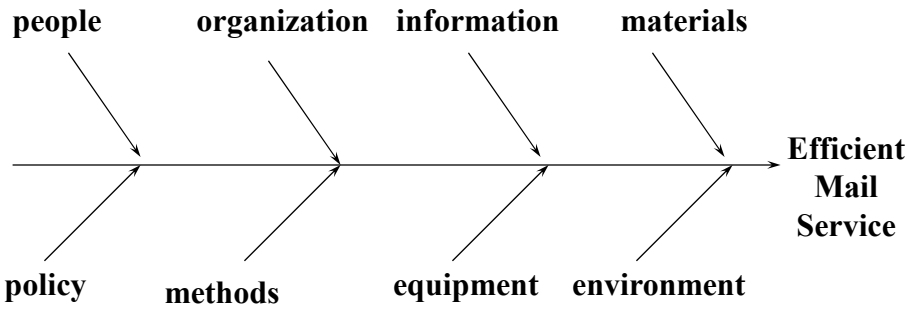
Cause and Effect Diagram



Cause and Effect Diagram

Example



Control Chart

- The following features can be found on a control chart:
  - Upper and Lower Control Limits (UCL & LCL) – the acceptable range of variation. It is determined by the **organization's quality standards (3 or 6 sigma)**
  - Mean – the line in the middle of control chart
  - Specifications limits – represent the customer specification. They are not calculated based on the control charts. They are input from the customer.
  - Out of control – a data point falls outside the UCL & LCL or the rule of seven.
  - Assignable cause – A data point, or rule of seven, that requires investigation to determine the cause of variation

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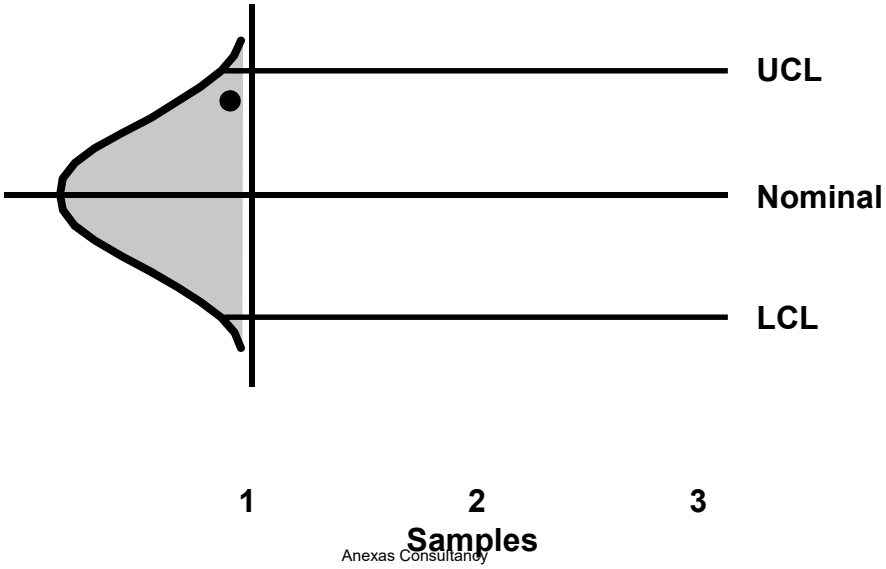
Quality Control

Control Chart



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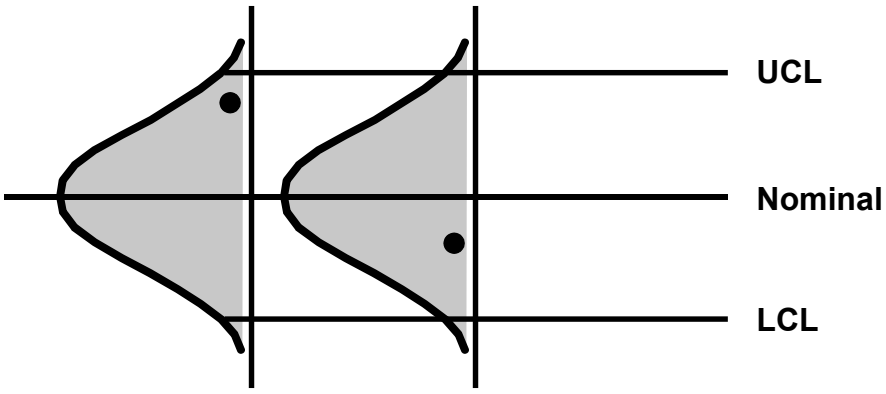
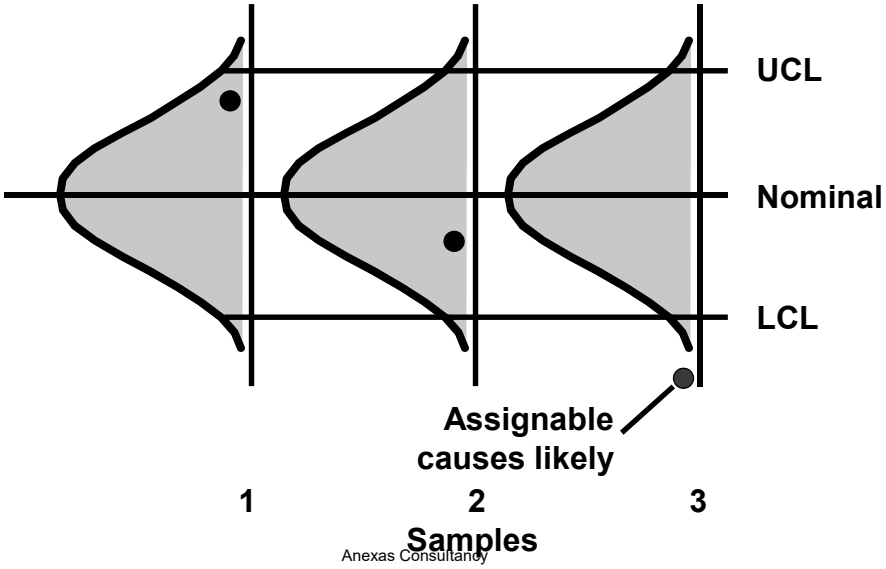
Quality Control

Control Chart



Quality Control

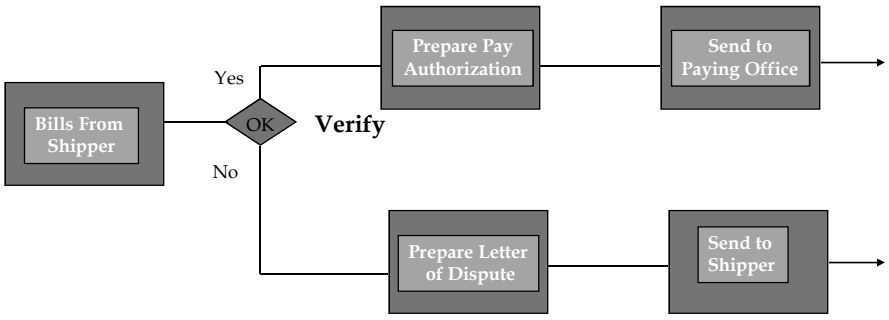
Control Chart



Sigma

- Sigma is taken on both side of the mean
- +/-1 sigma is equal to 68.26%
- +/-2 sigma is equal to 95.46%
- +/-3 sigma is equal to 99.73%
- +/-6 sigma is equal to 99.99985%

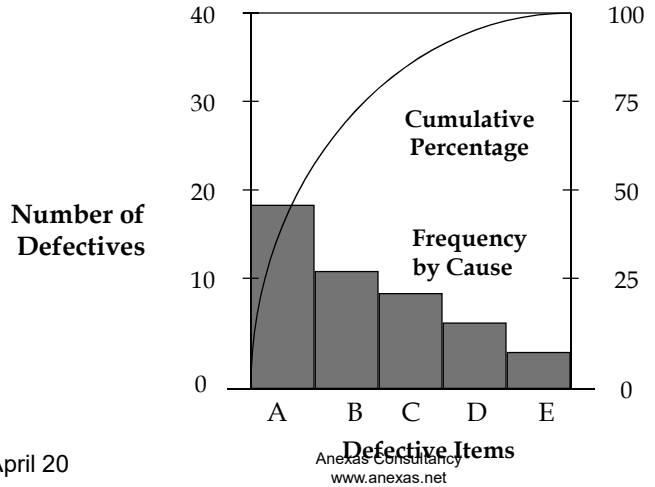
Process Flow Chart



Pareto Diagram

- It is a histogram chart which means that the data is displayed in the form of bar columns
- The higher the bar the more frequent the problem is.
- This chart helps focus attention on the most critical issues
- Prioritize potential causes of the problem
- Separates the critical few from the uncritical many
- It states that 80% of the problems are due to 20% of the root cause

Pareto Diagrams



Run Chart

- It shows the history and pattern of variation.
- It shows trends in a process over time.
- Trend analysis is performed using run charts.
- Often used to monitor:
  - Technical performance
  - Cost and schedule performance

Statistical sampling

- It involves choosing part of a population of interest for inspection.
- Appropriate sampling can reduce the cost of quality control.

Defect repair review

- Defect repair review is an action taken by the quality control department or similarly titled organization to ensure that product defects are repaired and brought into compliance with requirements or specifications.

Some definitions

- **Prevention** - keeping errors out of the process
- **Inspection** - keeping errors out of the hands of the customer

- **Attribute sampling** - the result conforms, or it does not
- **Variables sampling** - the result is rated on a continuous scale that measures the degree of conformity

- **Special causes** - unusual events
- **Random causes** - normal process variation

- **Tolerances** - the result is acceptable if it falls within the range specified by the tolerance
- **Control limits** - the process is in control if the result falls within the control limits

Seven Basic Tools of Quality

- Cause & effect diagram
- Flowchart
- Histogram
- Pareto chart
- Run chart
- Scattered diagram
- Control chart

Question 1

- **When a product or service completely meets a customer's requirements:**
  A. Quality is achieved.
  B. The cost of quality is high.
  C. The cost of quality is low.
  D. The customer pays the minimum price

Answer A

- **As a general rule, one cannot say that quality (as defined in the question) is either of high or low cost (choices B and C) or that it provides the minimum price (choice D). It does give the customer what the customer wanted, which may not be the lowest or highest cost. Therefore, the best answer is A.**

Question 2

- **To what does the following sentence refer? "The concept of optimal quality level is reached at the point where the incremental revenue from product improvement equals the incremental cost to secure it.":**
  - A. Quality control analysis
  - B. Marginal analysis
  - C. Standard quality analysis
  - D. Conformance analysis

Answer B

- **Know the term so you will be able to answer questions that deal with this concept. Choices A, C and D may sound good, but they are made-up terms.**

Question 3

- **Who is ultimately responsible for quality management on the project?**
  - A. Project engineer
  - B. Project manager
  - C. Quality manager
  - D. Team member

Answer B

- **Though each person working on the project should check their own work as part of any project, the project manager ultimately has the responsibility for quality on the project as a whole.**

Question 4

- **A team is using a fishbone diagram to help determine what quality standards will be used on the project. What part of the quality management process are they in?**

A. Perform quality control
B. Perform quality assurance
C. Quality planning
D. Variable analysis

Answer C

- **The key phrase here is "will be used." The team is looking to the future of what quality will be on the project and therefore must be in quality planning, choice C.**

Question 5

- **A manager notices that a project manager is holding a meeting with some of the team and some stakeholders to discuss the quality of the project. The project schedule has been compressed and the CPI is 1.1. they have worked hard on the project, the team has been rewarded according to the reward system the project manager put in place and there is a strong sense of team. The manager suggests that the project manager does not have enough time to hold meetings about quality when the schedule is so compressed. Which of the following BEST describes why the manager is wrong?**
  - A. Improved quality leads to increased productivity, increased cost effectiveness and decreased cost risk.
  - B. Improved quality leads to increased productivity, decreased cost effectiveness and increased cost risk.
  - C. Improved quality leads to increased productivity, increased cost effectiveness and increased cost risk.
  - D. Improved quality leads to increased productivity, decreased cost effectiveness and decreased cost risk.

Answer A

- **Notice in this question that there is a lot of data not relevant to answering the question? Expect these distracters to occur in almost every question on the exam. Quality should produce a decrease rather than an increase in cost risk as a result of less rework, so choices B and C can be eliminated. Quality should also provide increased cost effectiveness due to less rework. This eliminates choice D leaving the best answer, choice A.**