Project quality management
(PMI body of knowledge)

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Introduction

- Project Quality Management includes the processes & activities that determine quality polices, objectives & responsibilities to ensure that the project satisfies the needs for which it is undertaken.

PQM

- Plan Quality :
  - identify quality requirements and standards
  - Document how to demonstrate compliance
- Perform Quality Assurance （QA）:
  - Auditing the quality requirements
  - Ensure appropriate quality standards and operational definitions are used
- Perform Quality Control :
  - Monitor and record results
  - Assess performance
  - Recommend necessary change

Implementation of PQM

- These processes interact with each other as well as with the processes of other knowledge areas
- Each process involves an effort of one or more individual or group of individuals based on the need of the project.
- Each process occurs at least once in every project phase during the project life cycle.

Definitions of Quality (External)

- Transcendent definition: Excellence
- Product-based definition: Quantities of product attributes
- User-based definition: Fitness for intended use
- Value-based definition: Quality vs. Price
- Manufacturing-based definition: Conformance to specifications

QUALITY

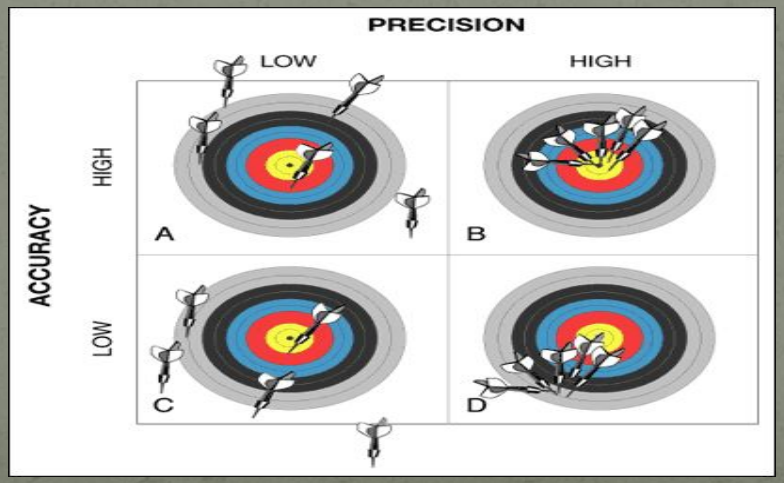
THE RACE FOR QUALITY HAS NO FINISH LINE-
SO TECHNICALLY IT'S MORE LIKE A DEATH MARCH.

Quality versus Grade

- Quality & Grade are not the same..
- Quality : Degree to which a set of characteristics fulfill requirements
- Grade : Category assigned to products or services having the same functional use but different technical characteristics
- While a quality level that fails to meet quality requirements is always a problem, low grade may not be

Precision versus Accuracy

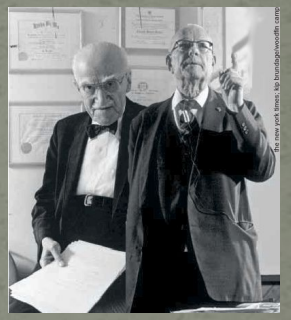
- Precision and Accuracy are not equivalent..
- Precision : repeated measurements are clustered and have little scatter
- Accuracy : measured value is very close to the true value
- Precise measurements are not necessarily accurate



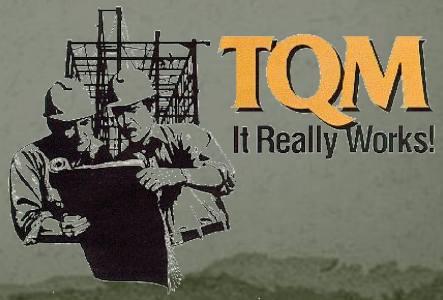
PQM Approach compatibility

- Compatible with ISO 9000 and 1000 series of standard guidelines

- Proprietary approaches to quality as recommended by Deming, Juran, and Crosby, and others.



- Nonproprietary approaches such as TQM, Continuous improvement approaches and others.



Nature of PQM

- Project quality management must address both the management of the project and the product of the project.
- Failure to meet quality requirements in either dimension can have serious and negative consequences for any or all of the project stakeholders

Examples of Negative Consequences

- Meeting the customer requirement by over working the project team may lead to negative consequence in employee turnover

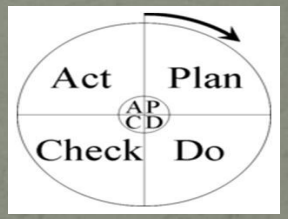
- Meeting project schedules by rushing planned quality inspections may produce negative consequences when errors go undetected.

Common understanding

- **Customer Satisfaction :**
  - Conformance to requirements
  - Fitness for use

- **Prevention over inspection :** cost of preventing mistakes is generally less than the cost of correcting

- **Continuous improvement**
  - (plan – do – check – act)
  - TQM & Six Sigma



- **Management responsibility**

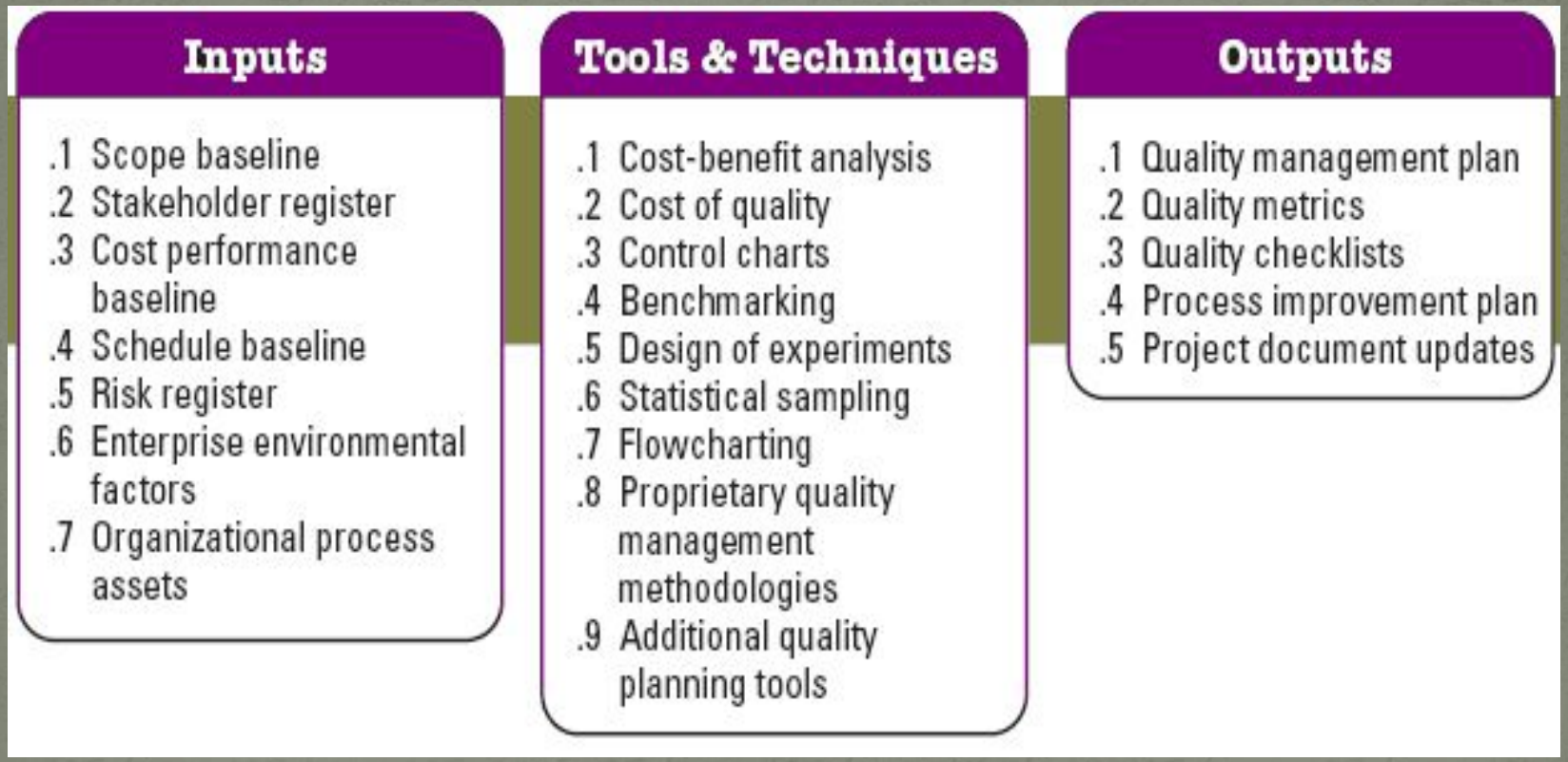
QUALITY PLANNING

Quality planning

- Quality Planning involves identifying with quality standards
- It is a key facilitating process during the Project planning Process

- In modern quality management quality is planned in and not inspected in
- Prior to the development of ISO 9000 series, quality planning concepts were widely discussed as part of quality assurance.

Quality Planning Flowchart



Quality Planning Inputs

Scope Baseline

- Scope statement: contain details of technical issues and other concerns
- WBS: identifies deliverables, work packages and control accounts used to measure project performance
- WBS Dictionary: defines technical information for WBS elements

Quality Planning Inputs

2) Stakeholder Register

- Identifies stakeholders with a particular interest in, or impact on, quality

3) Cost performance Baseline

- Documents the accepted time phase used to measure cost performance

4) Schedule Baseline

Documents the accepted schedule performance measures including start and finish dates

Quality Planning Inputs

5) Risk register

- Threats and opportunities

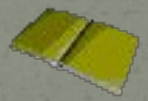
6) Enterprise Environmental Factors

- Governmental agency regulations
- Rules, standards & guidelines
- working / operating conditions

Quality Planning Inputs

7) Organizational process assets

- Organizational quality polices, procedures & guidelines
- Historical databases



- Lessons learned from previous projects
- Quality policy

Tools and Techniques for Quality Planning

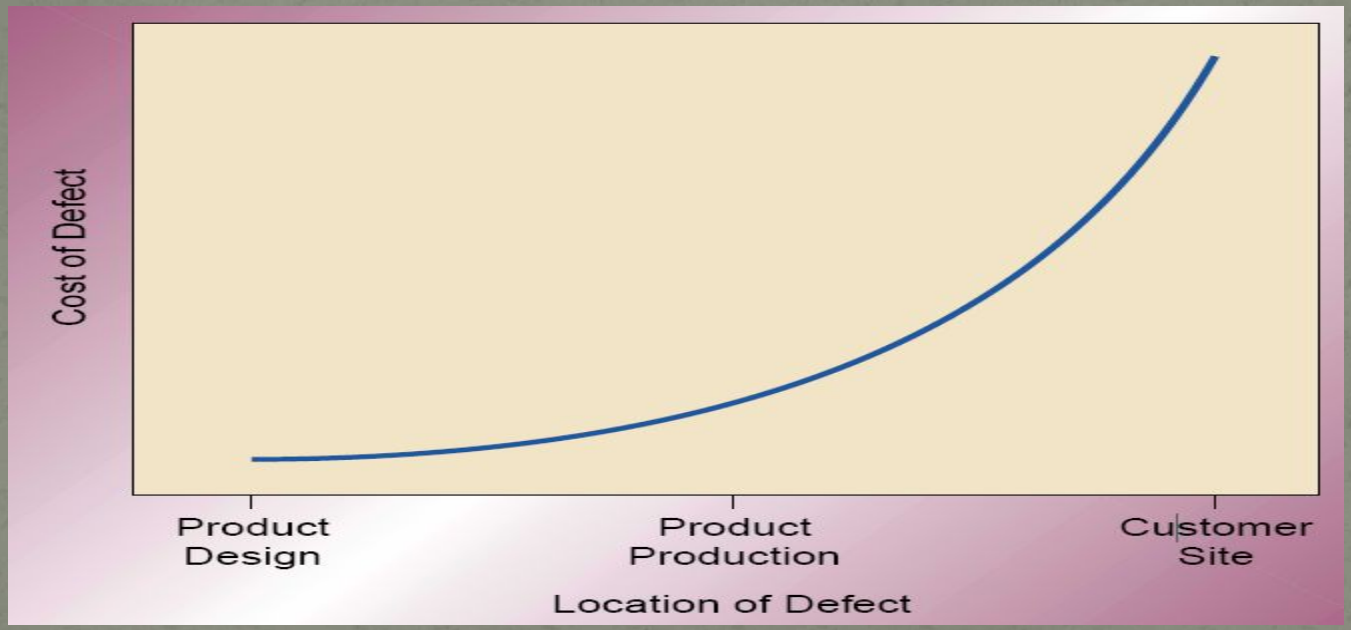
1) Cost / Benefit analysis

- The planning process must consider benefit/cost tradeoffs
- The Primary Cost: Is the expanses associated with PQM activities
- The Primary Benefit: Is less work, higher productivity, lower costs, and increased stakeholder satisfaction

Note: it is elementary that the benefit should outweigh the cost

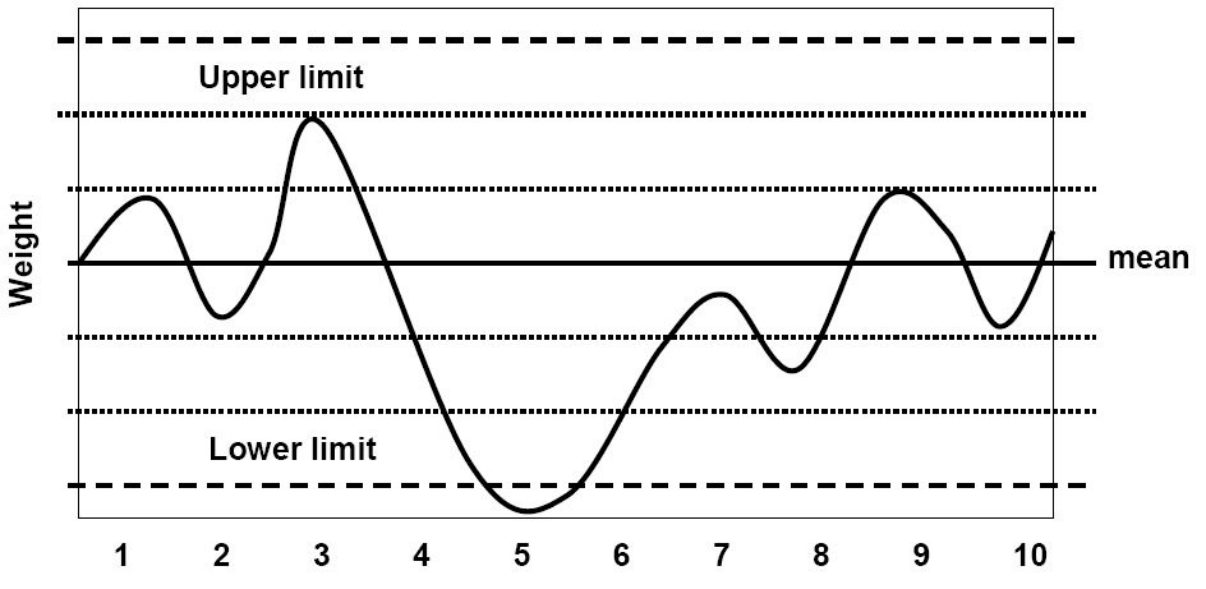
Tools and Techniques for Quality Planning

- 2) Cost of Quality (COQ)



Tools and Techniques for Quality Planning

- 3) Control charts
- To determine whether or not a process is stable or has predictable performance.



Tools and Techniques for Quality Planning

4) Benchmarking

- Benchmarking involves comparing actual or planned project practices to those of other projects to generate ideas to:

1- Generate ideas for improvement

2- provide a standard for measurement of performance

Note: other projects compared may be within the same organization or out side and may be within the same application area or in another

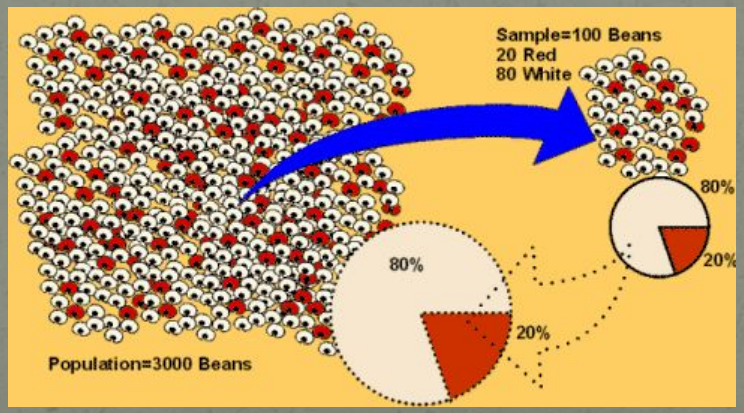
Tools and Techniques for Quality Planning

5) Design of Experiments DOE

- Aims to define variables that have most influence on the overall outcome
- Commonly applicable to the product of the project issues.
- Used in project management issues such as cost and schedule tradeoffs to allow for optima solutions.

Tools and Techniques for Quality Planning

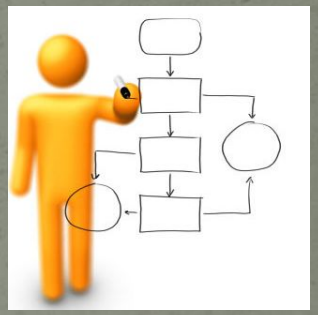
- **6) Statistical Sampling**
- Choosing part of a population of interest for inspection
- Sample frequency and sizes should be determined during the plan quality process



Tools and Techniques for Quality Planning

7) Flowcharting

- The flowcharting techniques in quality management generally include
  - cause and effect diagram
  - System or process flow charts



- Flowcharting can help in anticipating probable quality problems and thus helps to develop approaches for dealing with them

Tools and Techniques for Quality Planning

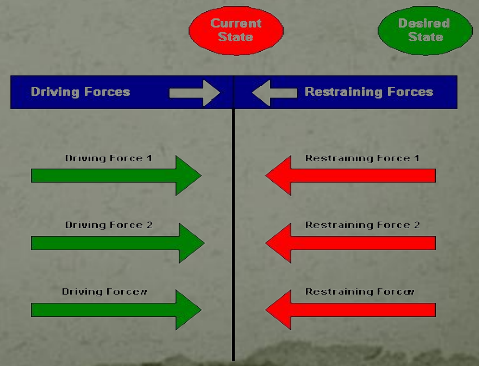
8) Quality Management Methodologies

- Six Sigma, Lean Six Sigma, Quality Function Deployment, CMMI, etc

Tools and Techniques for Quality Planning

9) Additional Quality Planning Tools

- Brainstorming
- Affinity diagrams
- Nominal group techniques
- Matrix diagrams
- Prioritization matrices
- Force field analysis



Outputs from Quality Planning

1) Quality Management Plan

- The Quality Plan should address:
  - Quality Control of the project
  - Quality Assurance
  - Quality Improvement of the project

Note: the project quality plan can be highly detailed or broadly framed based on the needs of the project

Outputs from Quality Planning

2) Quality Metrics

- On-time performance, budget control, defect frequency, failure rate, availability, reliability and test coverage

3) Quality checklists

- A structured tool used to verify that a set of required steps or requirements have been performed

Outputs from Quality Planning

4) Process Improvement Plan

- Process boundaries
- Process configurations
- Process metrics
- Targets for improved performance

5) Project Document Updates

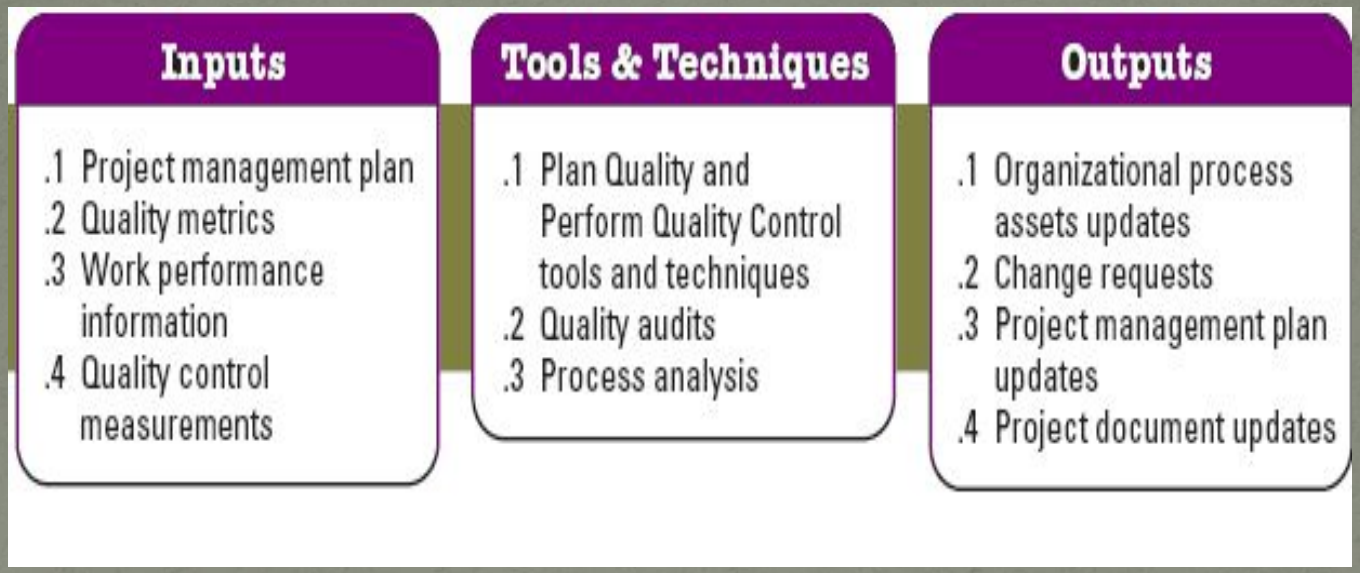
- Stakeholder register
- Responsibility Assignment Matrix

QUALITY ASSURANCE

Quality Assurance

- Process of auditing the quality requirements and the results from quality control measurements to ensure appropriate quality standards and operational definitions are used
- Continuous process improvement reduces waste and eliminates activities that do not add value.

Quality Assurance Flowchart



Inputs To Quality Assurance

- 1) Project management plan
  - Quality management plan : how quality assurance will be performed
  - Process improvement plan : steps for analyzing processes to identify activities which enhance their value
- 2) Quality Metrics

Inputs To Quality Assurance

- 3) Work Performance Information
  - Technical performance measures
  - Project deliverables status
  - Schedule progress
  - Costs incurred

- 4) Quality Control Measurements
  - To analyze the quality standards and processes of the performing organizations

Tools and Techniques For Quality Assurance

1) Plan quality and Perform Quality Control Tools & Techniques

2) Quality Audits

- Identify all the good/best practices being implemented
- Identify all the gaps/shortcomings
- Share the good practices introduced or implemented
- Proactively offer assistance in a positive manner
- Highlight contributions of each audit in the lessons learned

Tools and Techniques For Quality Assurance

- 3) Process analysis
  - Examines problems experienced, constraints experienced and non-value-added activities
  - Includes root cause analysis to develop the required preventive actions

Outputs From Quality Assurance

1) Organizational Process Assets Updates

2) Change requests

- To increase effectiveness and/or efficiency of the policies, processes and procedures

- 3) Project Management Plan Updates
  - Quality management plan
  - Schedule management plan
  - Cost management plan
- 4) Project Document Updates
  - Quality audits reports
  - Training plans
  - Process documentation

QUALITY CONTROL

Quality Control

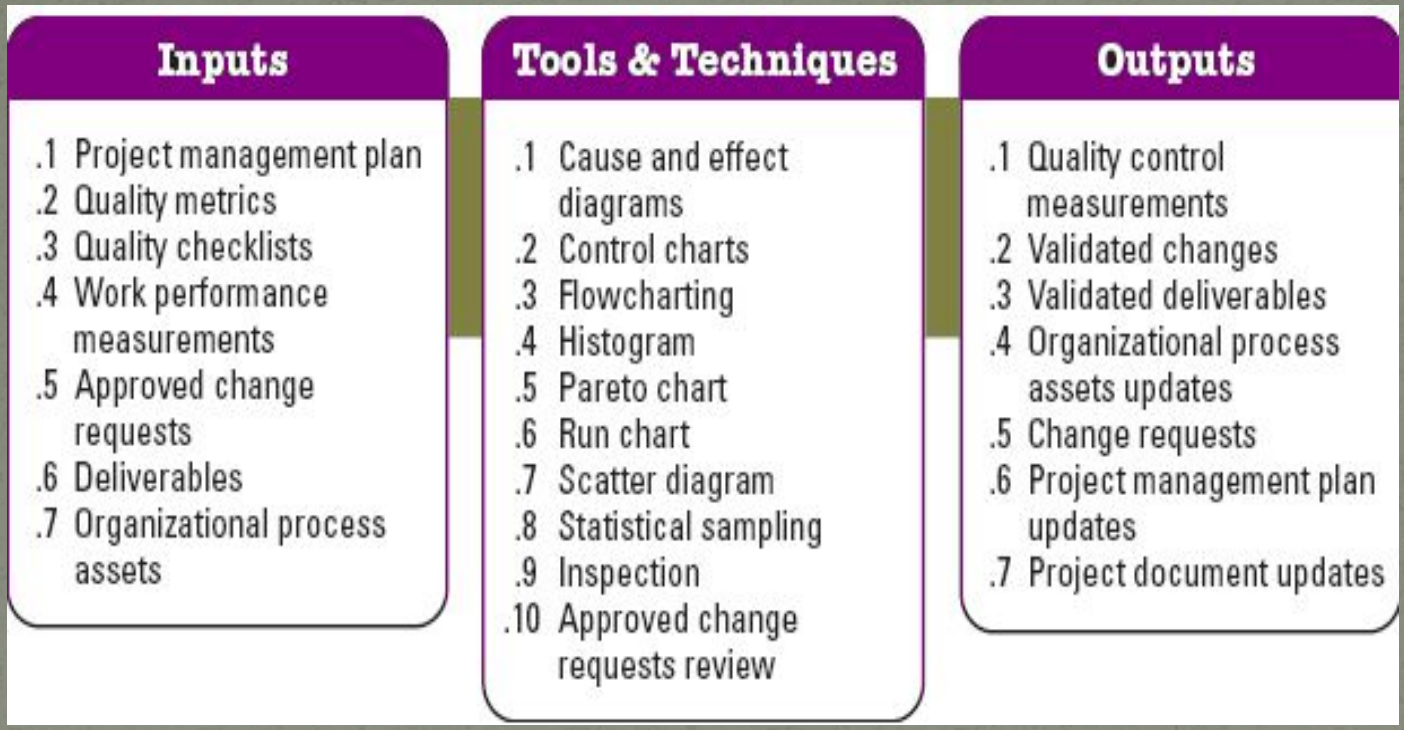
- The process of monitoring and recording results of executing the quality activities to assess performance and recommend necessary change
- Quality control is often performed by a quality control department
- The project management team should have a working knowledge of statistical quality control especially sampling and probability to help evaluate and control outputs.

Quality Control

- **The project management should be aware of the following among other subjects:**

- Prevention (keeping errors out of the process)
- Inspection (keeping errors out of the customers hand)
- Attribute sampling (for conformity of results)
- Variable sampling (where the results are rated on a continuous scale that measures the degree of conformity or non conformity
- Tolerances (specified range of acceptable results)
- Control limits (thresholds, which can indicate whether the process is out of control)

Quality Control Flowchart



Inputs To Quality Control

1) Project Management Plan

2) Quality Metrics

3) Quality Checklists

4) Work performance measurements

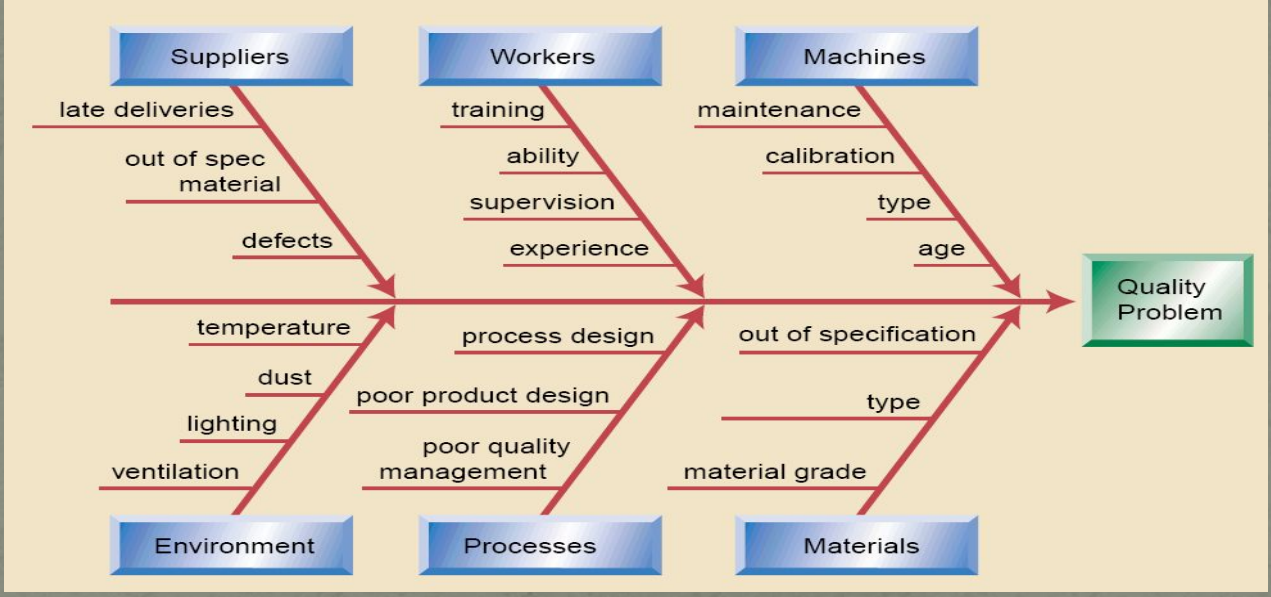
- Planned vs. actual technical performance
- Planned vs. actual schedule performance
- Planned vs. actual cost performance

Inputs To Quality Control

- **5) Approved change requests**
- **6) Deliverables**
- **7) Organizational process assets**
  - Quality standards & polices
  - Standards & work guidelines
  - Issue and defect reporting procedures and communication polices

Tools and Techniques for Quality Control

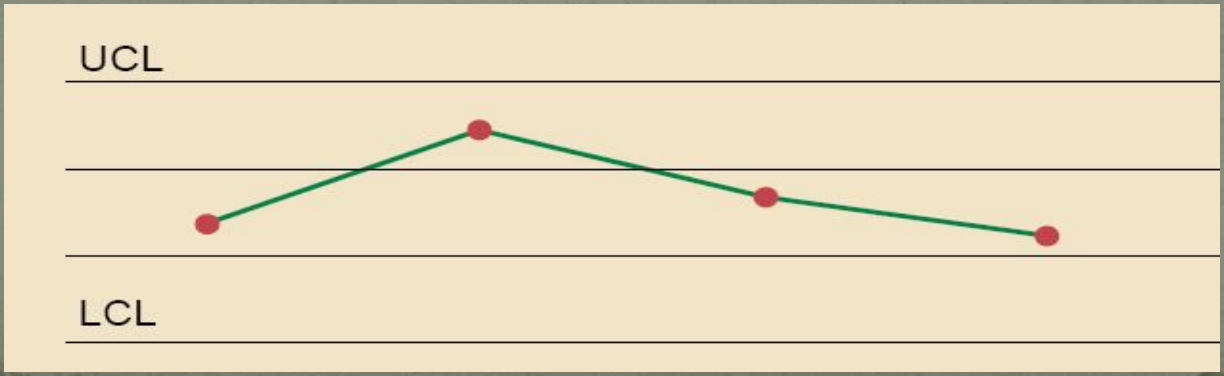
1) Cause & Effect Diagram* (Fishbone Diagram)



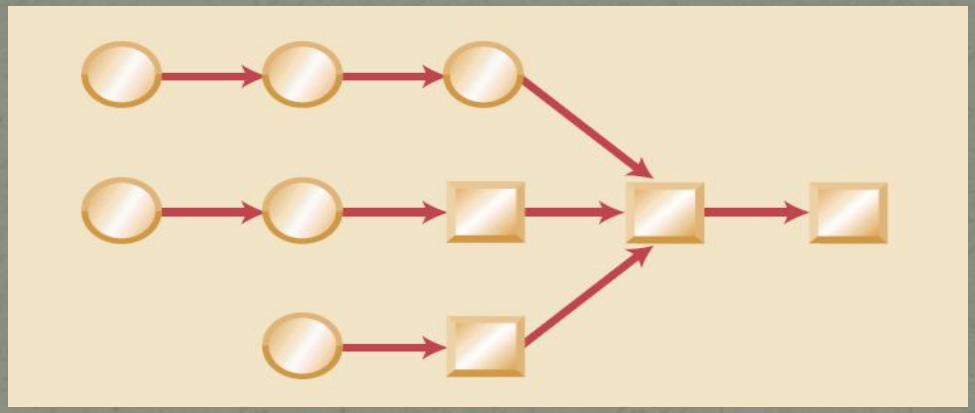
Tools and Techniques for Quality Control

2) Control Charts

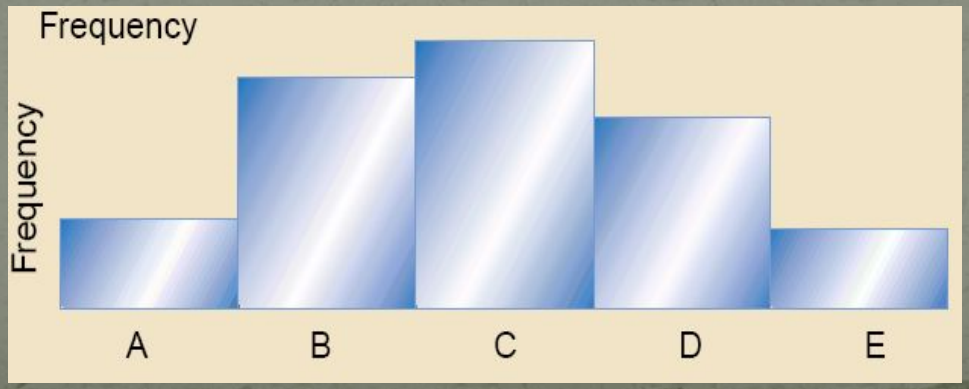
- Illustrates how a process behaves over time and when a process is subject to special cause variation, resulting in out-of-control condition
- Control charts are most often used to monitor repetitive activity in production but can also be used to monitor cost and schedule variances



3) Flowcharting



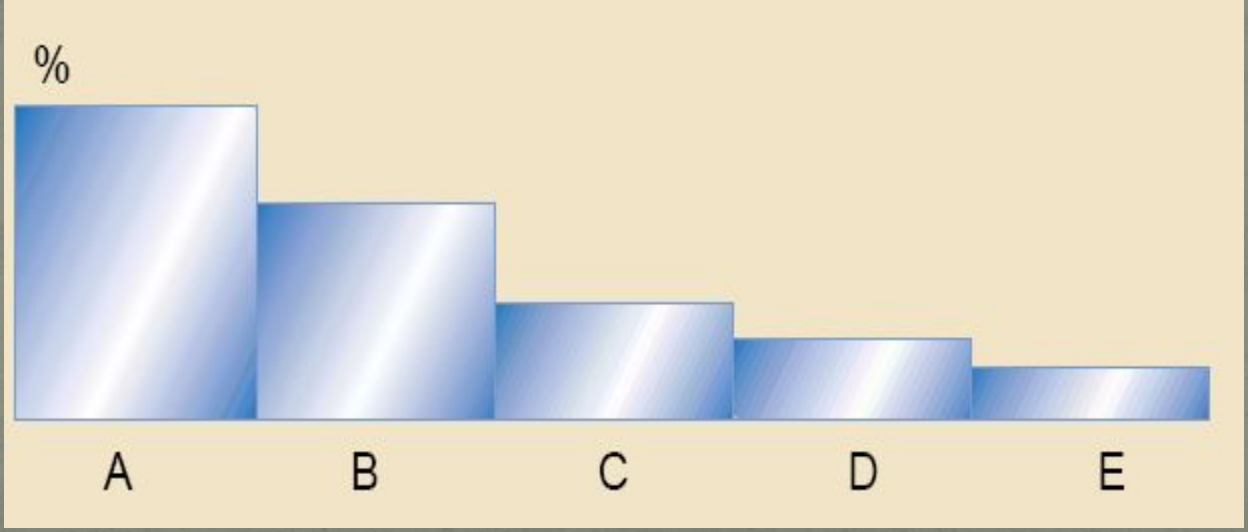
4) Histogram



Tools and Techniques for Quality Control

5) Pareto Diagram

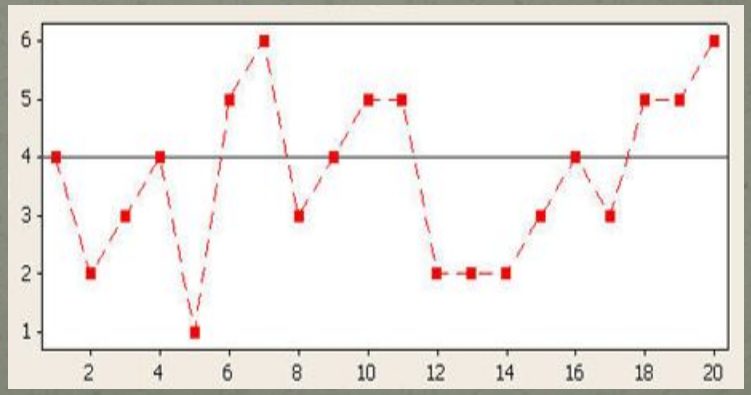
- A Pareto diagram is a histogram ordered by frequency of occurrence which shows how many results were generated by what category or identified cause



Tools and Techniques for Quality Control

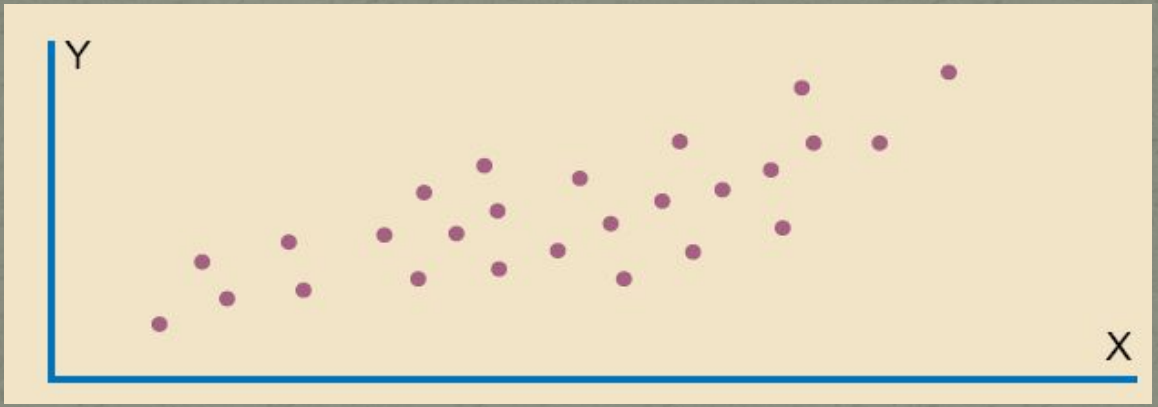
6) Run Chart

- Shows trends in a process over time, variation over time, or declines or improvements in a process over time
- Trend analysis is often used to monitor:
  - Technical performance
  - Cost & schedule performance



Tools and Techniques for Quality Control

7) Scatter diagram



8) Statistical Sampling

Tools and Techniques for Quality Control

9) Inspection

Examination of a work product to determine whether it confirms to documented standards

- **10) Approved change requests review**

Outputs for Quality Control

- Quality Control Measurements

  Documented results of quality control activities in the format specified during quality planning.

- Validated changes , where the inspected items will either be accepted or rejected and those rejected may be reworked
- Validated deliverables

Outputs for Quality Control

- Organizational Process Assets Updates
  - Completed checklists
  - Lessons learned
- Change requests
  - A change request should initiated in accordance with the defined perform integrated change control

Outputs for Quality Control

- Project Management Plan Updates
  - Quality management plan updates
  - Process improvement plan updates
- Project document updates

Outputs for Quality Control

- Completed Checklists, which become a part of a project record when they are used
- Process Adjustments, which involves immediate corrective or preventive action as a result of quality control measurements. In some cases the adjustment may need to be handled according to procedures for overall change control.

Questions on Quality

1. In today's view of quality, who defines quality?

a. Senior management
b. Project management
c. Project Team
d. Customers

2. Which of the following is true about quality costs when quality management principles are applied?

a. Prevention costs and failure costs (internal and external) are not related

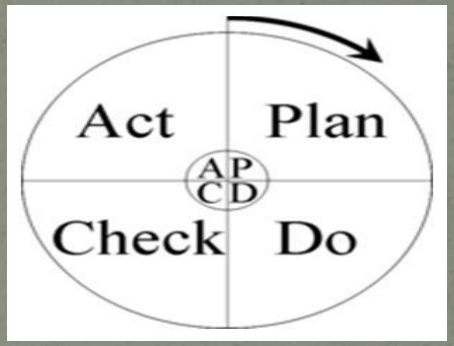
b. Prevention costs and failure costs (internal and external) are inversely related

c. Prevention costs and failure costs (internal and external) are directly related

d. Prevention costs should guarantee no failure costs

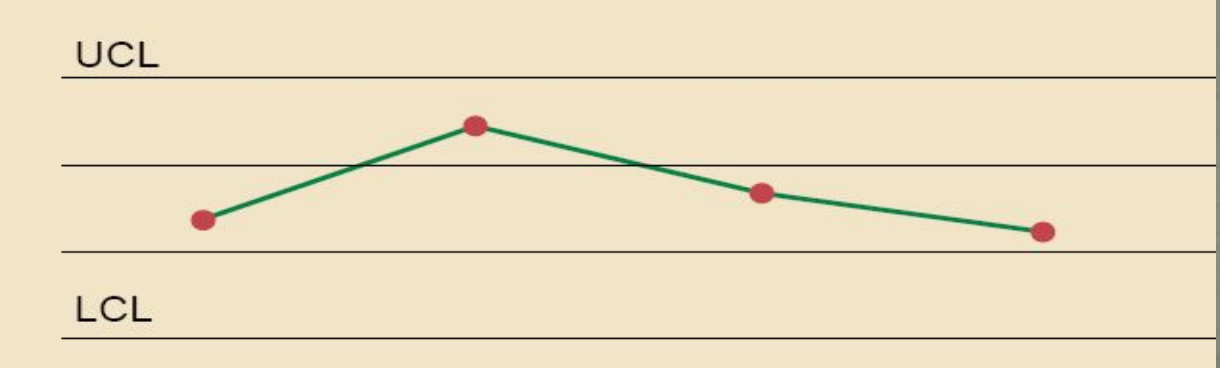
3. What is the order of the four steps in Deming's Cycle for Improvement?

a. Plan, do, check, and act
b. Do, plan, act, and check
c. Check, do, act, and plan
d. Plan, act, check, and do



4. A control chart helps the project manager to:

a. Focus on the most critical issues to improve quality
b. Focus on stimulating thinking
c. Explore a desired future outcome
d. Determine if a process is out of control



5. Which of the following is true?

a. ISO 9000 is a European standard

b. ISO 9000 is a paperwork nightmare

c. ISO 9000 certification ensures that your company produces quality products

d. ISO 9000 is an international standard for quality management systems

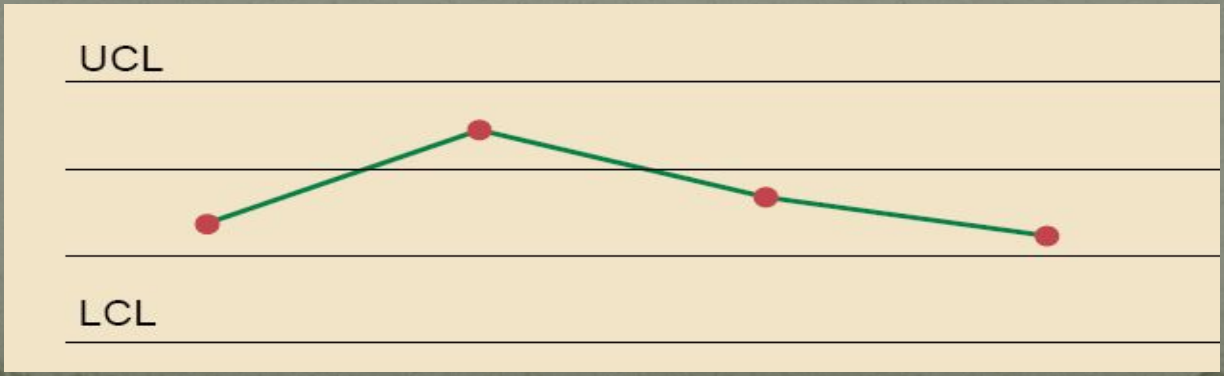
6. When a process is set up optimally, the upper and lower specification limits typically are:

a. Set equal to the upper and lower control limits

b. Set outside the upper and lower control limits

c. Set inside the upper and lower control limits

d. Set an equal distance from the median value



7. Which of the following is considered a cost of prevention?

a. In-process testing
b. Rework costs
c. Collecting data for use in process improvement efforts
d. Mass inspection

8. Quality assurance includes:

a. Collecting data for quality control
b. Completing tic charts
c. Planning for collection of data
d. Preparing a Pareto diagram

9. Quality Assurance should be performed:

a. during creation of the project proposal
b. during project design
c. during project testing
d. throughout the project

10. Another name for Inspection is:

a. Review
b. Audit
c. Walkthrough
d. All of the above

Thank You For your Attention!