

# CHAPTER 8

## PROJECT QUALITY MANAGEMENT

- Overview of Project Quality Management
- Plan Quality Management
- Perform Quality Assurance
- Control Quality

# Learning Objectives

After completing this chapter, you will be able to :

- Describe the quality theories, approaches, and recurring themes in Project Quality Management and explain the relationship between them and the three major processes of Project Quality Management
- Describe the Plan Quality Management process, its inputs, tools and techniques, and outputs
- Describe the Perform Quality Assurance process, its inputs, tools and techniques, and outputs
- Describe the Control Quality process, its inputs, tools and techniques, and outputs

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# Project Quality Management

Project Quality Management includes the processes and activities of the performing organization that determine quality policies, objectives, and responsibilities so that the project will satisfy the needs for which it was undertaken.

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## Quality Theories

# W. Edwards Deming

### The Deming Cycle

Iterative focus on continuous improvement

### Fourteen Points

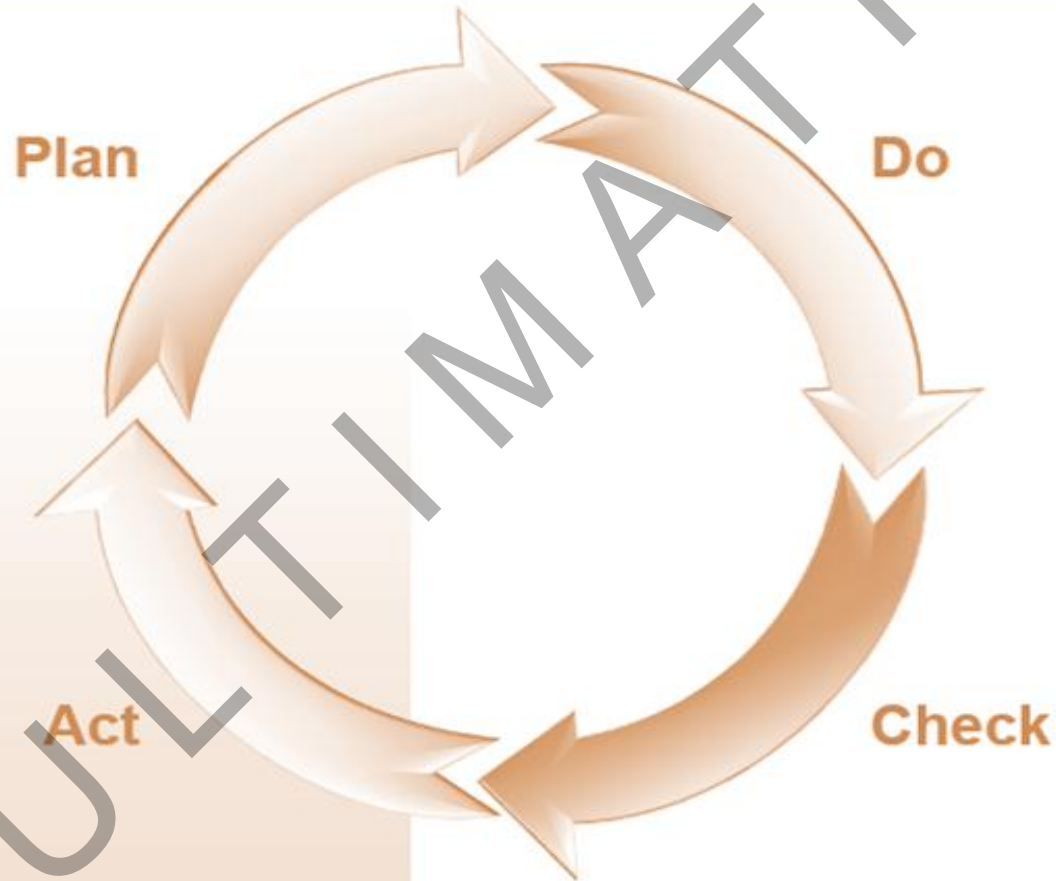
Summary of what must be done to move from business-as-usual to world-class quality

### Seven Deadly Diseases

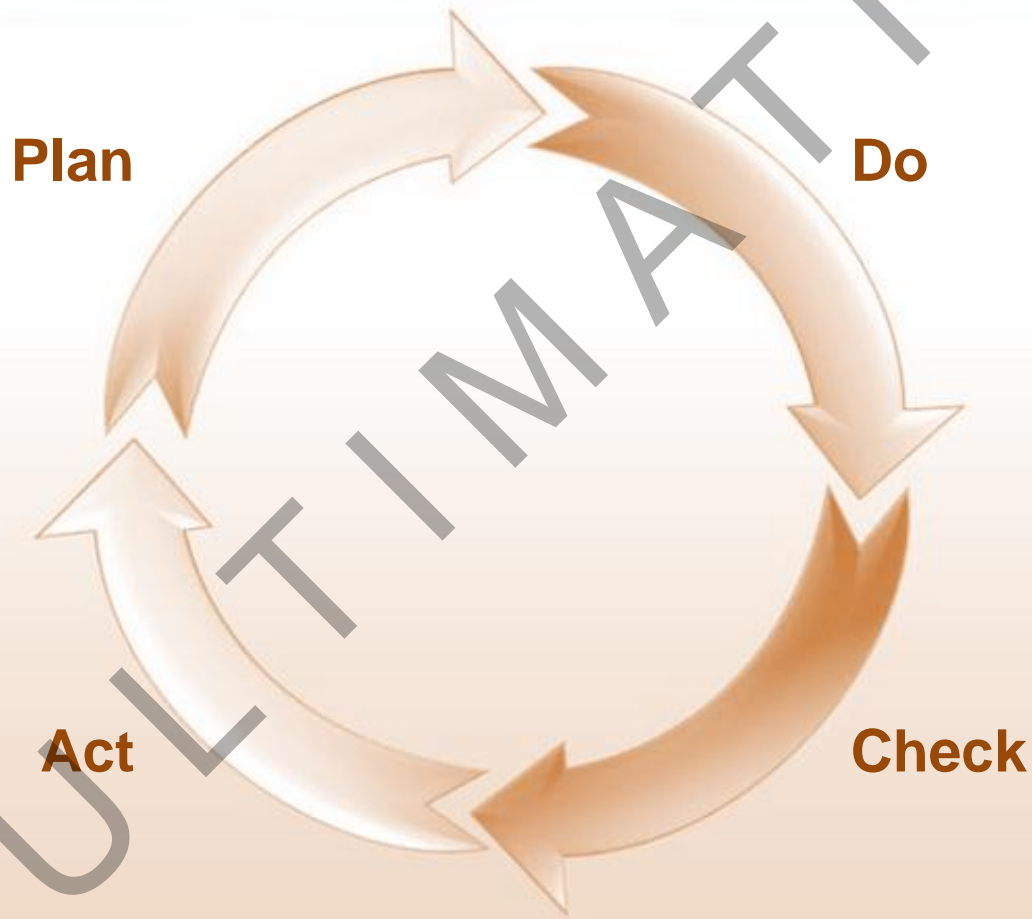
Factors that inhibit transition to world class quality



W. Edwards Deming  
**The Deming Cycle**



W. Edwards Deming  
**The Deming Cycle**



## Quality Theories

# Joseph M. Juran

### Juran's Three Basic Steps to Progress

Continuous improvement, extensive training, and commitment from senior management

### Juran's Ten Steps to Quality Improvement

Focus on goal setting, training, and recognition

### The Juran Trilogy

Quality planning, control, and improvement





Joseph M. Juran

## Juran's Three Basic Steps to Progress



**Continuous improvement through dedication and sense of urgency**



**Extensive training**



**Senior management commitment and leadership**



Joseph M. Juran

# Juran's Ten Steps to Quality Improvement



Joseph M. Juran

# The Juran Trilogy

**Quality planning**

**Quality control**

**Quality improvement**



## Quality Theories

# Philip B. Crosby

**Zero Defects**

**Get it right the first time**

**The Crosby Quality  
Vaccine**

**Determination, education,  
implementation**

**Crosby's 14 Steps  
to Improvement**

**Focus on management  
responsibility and zero defects**



Philip B. Crosby

## Zero Defects

**Prevention is key.**

**Preventing defects saves  
nonconformance costs of quality.**

**Focus on upfront planning  
lowers rework, improves productivity.**

**(Do it right the first time.)**



Philip B. Crosby

# The Crosby Quality Vaccine

**Determination**

**Education**

**Implementation**



Philip B. Crosby

# Crosby's 14 Steps to Improvement

1. Show management commitment for the long term.
2. Establish cross-departmental quality teams.
3. Identify current and potential problems.
4. Assess cost of quality.
5. Increase quality awareness and individual commitment.
6. Take immediate action.
7. Establish zero defect program.
8. Train supervisors.
9. Ensure awareness of new direction by all.
10. Encourage individual and team improvements.
11. Encourage employee feedback regarding quality obstacles.
12. Recognize employee participation.
13. Implement quality controls.
14. Repeat steps to ensure continuous improvement.



# Overview of Project Quality Management

## Quality Programs

**ISO 9000 Series**

**Continuous Process Improvement**

**Just-in-Time**

**Kaizen or Continuous Improvement**

**Voice of the Customer**

**Failure Modes and Effects Analysis**





## **Quality Programs ISO 9000**

### **International Organization for Standardization**

**Federation of standards bodies**

**Does not set specifications**

**Sets broad requirements for  
assurance of quality**

**ISO 9000 series focuses  
on quality for goods  
and services**

**ISO 9000: 2000  
(Fundamentals and vocabulary)**

**ISO 9001: 2000  
(Requirements)**

**ISO 9004: 2000  
(Guidelines for performance  
improvements)**

Quality Programs

# Continuous Process Improvement

Holistic  
approach

Gradual  
improvements

Continuous process  
improvement procedure:

Define and standardize  
processes.

Assess process performance.

Improve processes  
(similar to the Deming Cycle).

Measure progress.

## Quality Programs **Just-In-Time**

**The focus is on decreasing inventory costs.**

**Parts or materials are made available precise when needed.**

**Early arrival increases inventory costs.**

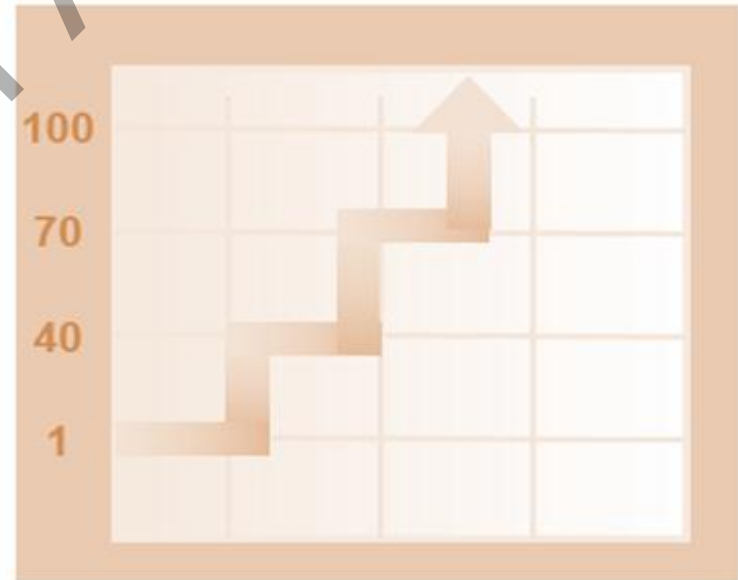
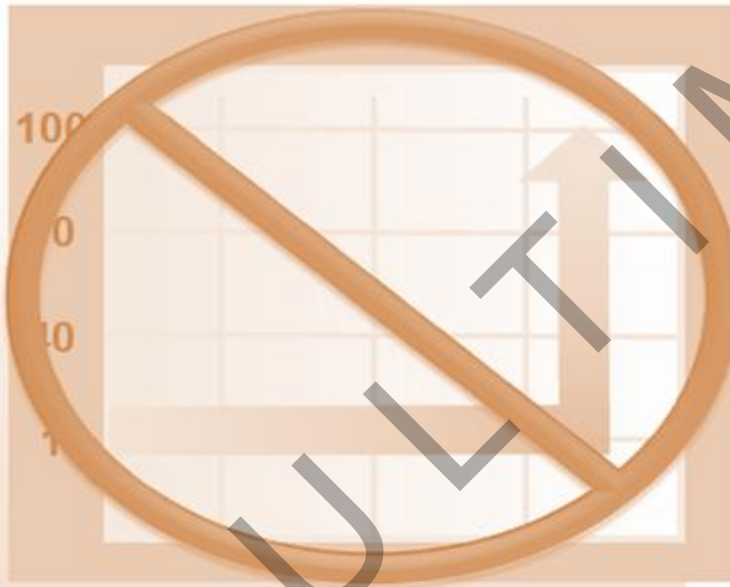


**Late arrival causes work slowdown/shutdown.**

## Quality Programs

### Kaizen or Continuous Improvement

**Instead of making 1 improvement of 100%, the goal is to make 100 improvements of 1% each.**



Recurring Themes

# Customer Satisfaction

## Quality

Meeting stakeholder expectations, not exceeding them

Understanding both stated and implied needs

Conformance to requirements

## Grade

Category or rank

Same functional use

Different technical characteristics





Recurring Themes

**Prevention Over Inspection**

**Prevention**

over

**Inspection**

Recurring Themes

## Management's Role in Cost of Quality

**85% of the cost of quality is in management's control and is management's responsibility.**





Recurring Themes

# Management's Role in Cost of Quality

Who is responsible for the quality of:

**The project's  
product?**

**The task or activity?**

**The organization?**



Recurring Themes

## **Continuous Improvement**

**Focus of Deming, Juran, and Crosby**

**Reinforced by:**

**P-D-C-A**

**Continuous improvement**

**Kaizen**

**Total Quality Management**

**Focus of the Quality Audit in quality assurance**

# Process

- 8.1 Plan Quality Management
- 8.2 Perform Quality Assurance
- 8.3 Control Quality

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# 8.1 Plan Quality Management

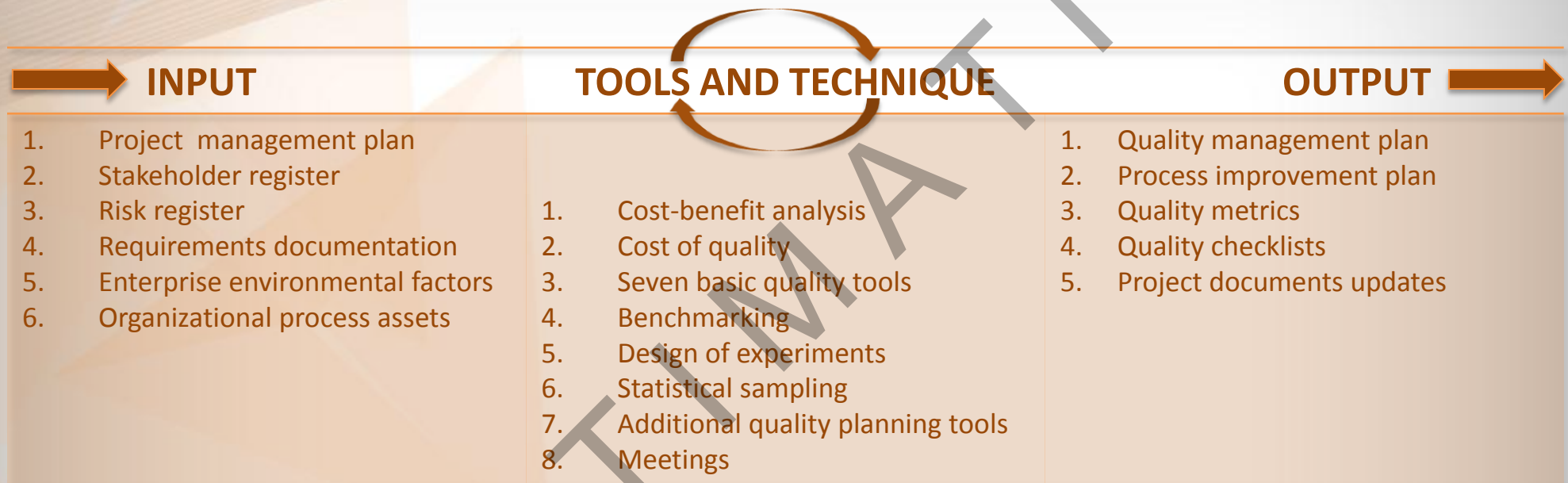
Plan Quality Management is the process of identifying quality requirements and/or standards for the project and its deliverables, and documenting how the project will demonstrate compliance with relevant quality requirements.

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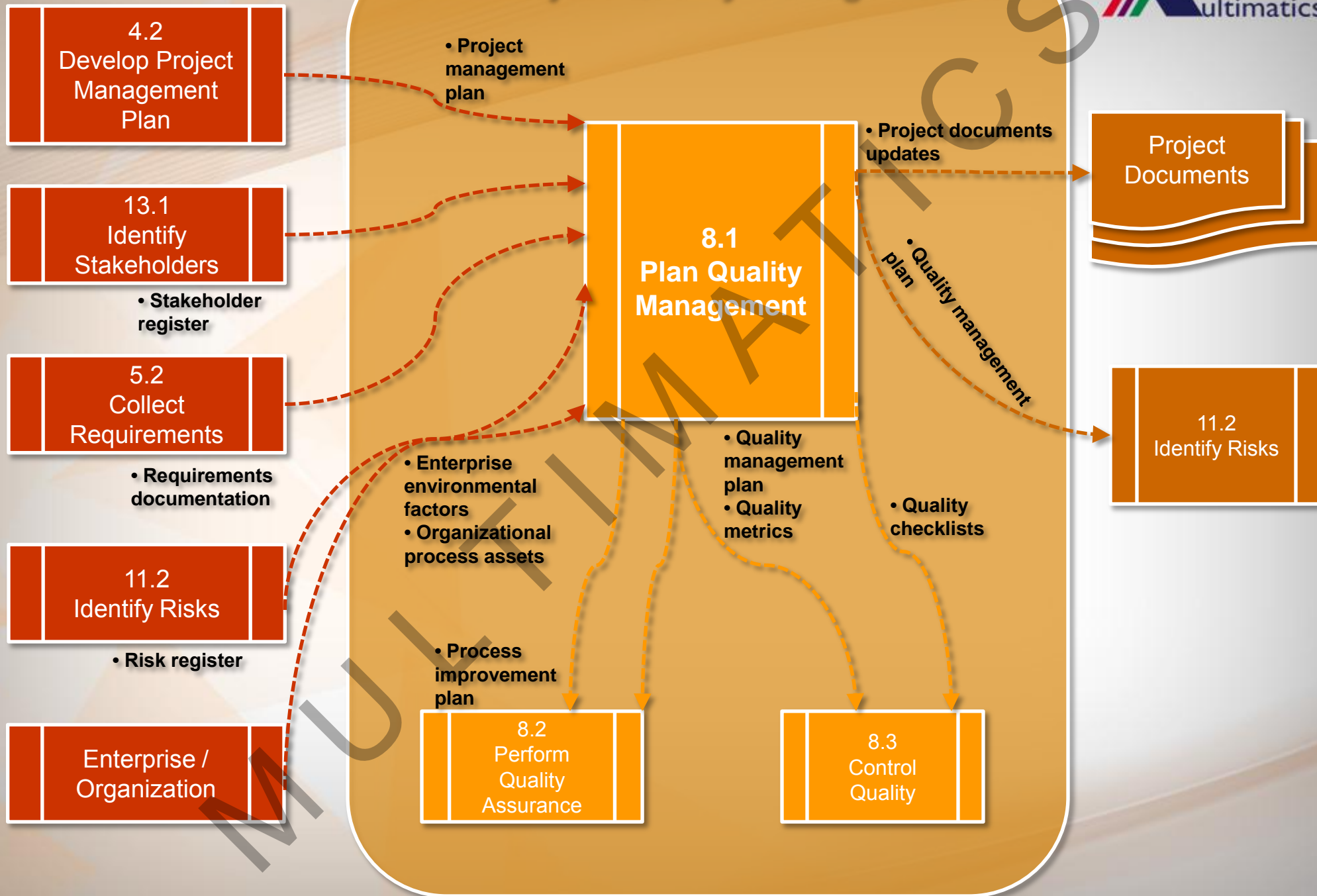
## Plan Quality Management



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# Project Quality Management





# Inputs

## 1. Project Management Plan

The project management plan is used to develop the quality management plan.

## 2. Stakeholder Register

The stakeholder register aids in identifying those stakeholders possessing a particular interest in, or having an impact on, quality.

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# Inputs

## 3. Risk Register

The risk register contains information on threats and opportunities that may impact quality requirements.

## 4. Requirements Documentation

Requirements documentation captures the requirements that the project shall meet pertaining to stakeholder expectations.

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# Inputs

## 5. Enterprise Environmental Factors

The enterprise environmental factors that influence the Plan Quality Management process include, but are not limited to :

- Governmental agency regulations;
- Rules, standards, and guidelines specific to the application area;
- Working or operating conditions of the project or its deliverables that may affect project quality; and
- Cultural perceptions that may influence expectations about quality.

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# Inputs

## 6. Organizational Process Assets

The organizational process assets that influence the Plan Quality Management process include, but are not limited to :

- Organizational quality policies, procedures, and guidelines. The performing organization's quality policy, as endorsed by senior management, sets the organization's intended direction on implementing its quality management approach;
- Historical databases; and
- Lessons learned from previous phases or projects.

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# Tools & Techniques

## 1. Cost-Benefit Analysis

The primary benefits of meeting quality requirements include less rework, higher productivity, lower costs, increased stakeholder satisfaction, and increased profitability.

## 2. Cost of Quality

Cost of quality includes all costs incurred over the life of the product by investment in preventing nonconformance to requirements, appraising the product or service for conformance to requirements, and failing to meet requirements (rework).

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# Tools & Techniques

## 3. Seven Basic Quality Tools

The seven basic quality tools, also known in the industry as 7QC Tools, are used within the context of the PDCA Cycle to solve quality-related problems.

## 4. Benchmarking

Bench marking involves comparing actual or planned project practices to those of comparable projects to identify best practices, generate ideas for improvement, and provide a basis for measuring performance.

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# Tools & Techniques

## 5. Design of Experiments

Design of experiments (DOE) is a statistical method for identifying which factors may influence specific variables of a product or process under development or in production.

## 6. Statistical Sampling

Statistical sampling involves choosing part of a population of interest for inspection (for example, selecting ten engineering drawings at random from a list of seventy-five).

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# Tools & Techniques

## 7. Additional Quality Planning Tools

Other quality planning tools are used to define the quality requirements and to plan effective quality management activities.

## 8. Meetings

Project teams may hold planning meetings to develop the quality management plan.

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Tools and Techniques

## Cost Benefit Analysis

Similar to cost-benefit ratio determination

**Focus on:**

Reducing rework

Increasing  
productivity

Reducing costs

Increasing customer  
satisfaction



## Tools and Techniques

# Cost of Quality

### Cost of Conformance

#### Prevention:

- Quality planning
- Quality training
- Reliability engineering
- Data analysis
- Test engineering

#### Appraisal:

- Inspection
- Studies and surveys
- Test equipment
- Calibration



### Cost of Nonconformance

#### Failure costs:

- Scrap/inventory costs
- Rework
- Warranty costs
- Liability or insurance
- Low sales
- Lost customers
- Loss of reputation
- Low team morale
- Decreased efficiency
- Cost to regain customers and reputation

## Tools and Techniques

# Control Charts

**Control charts help determine whether or not a process is in statistical control.**

**They establish:**

**Mean:**

**Target performance**

**Control limits:**

**Ranges of acceptable variance**

**3 standard deviations (99.73%):**

**Establishes upper and lower control limits**

**Look for special-cause variations  
(those outside of established limits).**

## Tools and Techniques

### Control Charts (cont.)



## Tools and Techniques

### Control Charts (cont.)



## Interpretation Rules

Process is out of statistical control when any one of these rules applies:

**Rule of 7 or 7 Run Rule:**

7 data points in a row are above or below the mean.

**Trend of 7 Rule:**

7 data points in a row follow a trend up or down.

**2 out of 3 Rule:**

2 out of 3 data points fall between the control limits (2 standard deviations) and the specification limits (3 standard deviations).

**Rule of 1:**

Any single data point falls outside of the upper or lower specification limits.



Tools and Techniques

## Cause and Effect Diagrams

**Cause and effect diagrams, also known as Ishikawa diagrams or fishbone diagrams, are techniques for root cause analysis.**

**One of Ishikawa's 7 basic quality control tools, which include:**

**Cause and effect diagrams**

**Control charts**

**Flowcharts**

**Histograms**

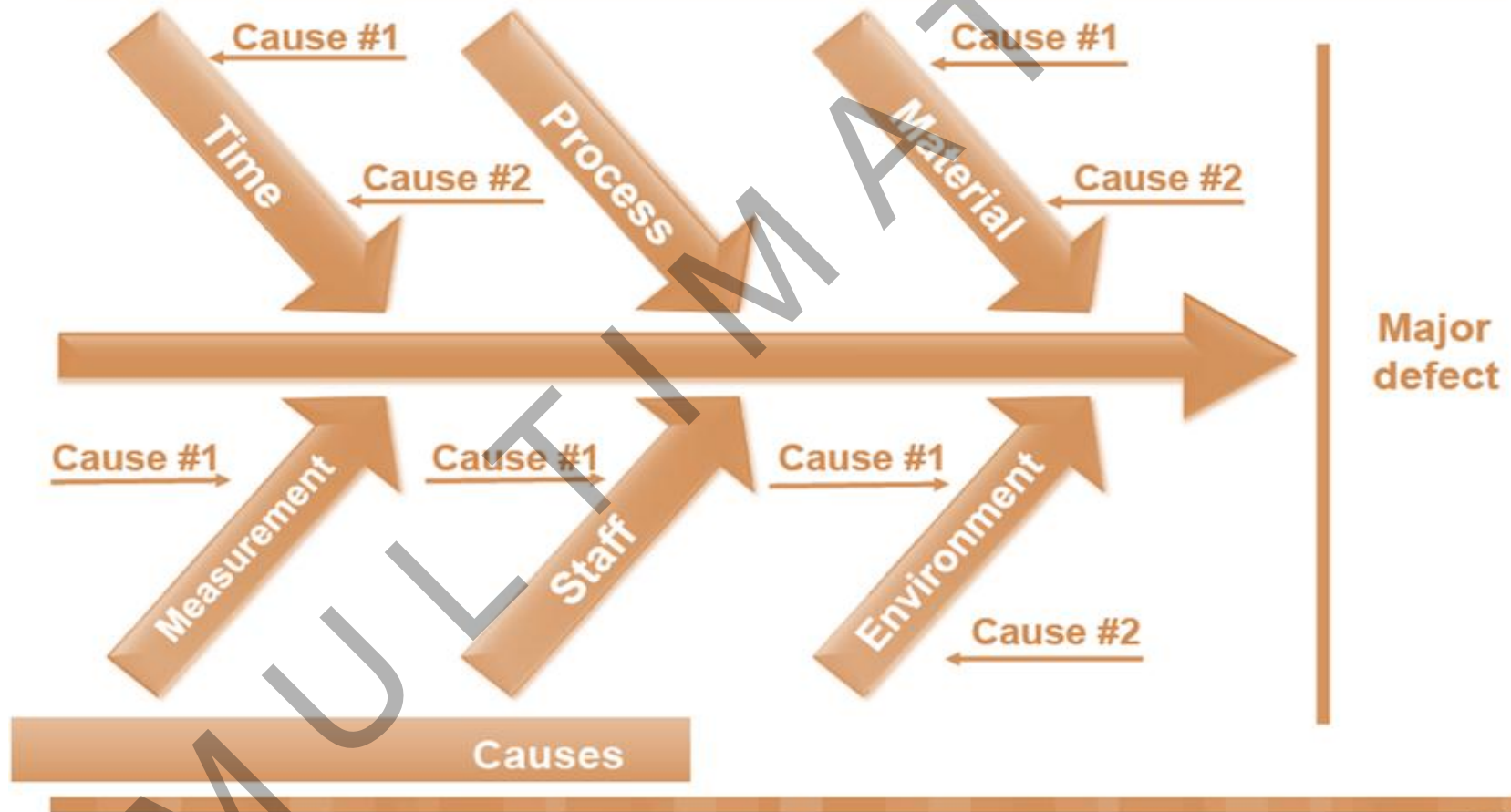
**Pareto charts**

**Run charts**

**Scatter diagrams**

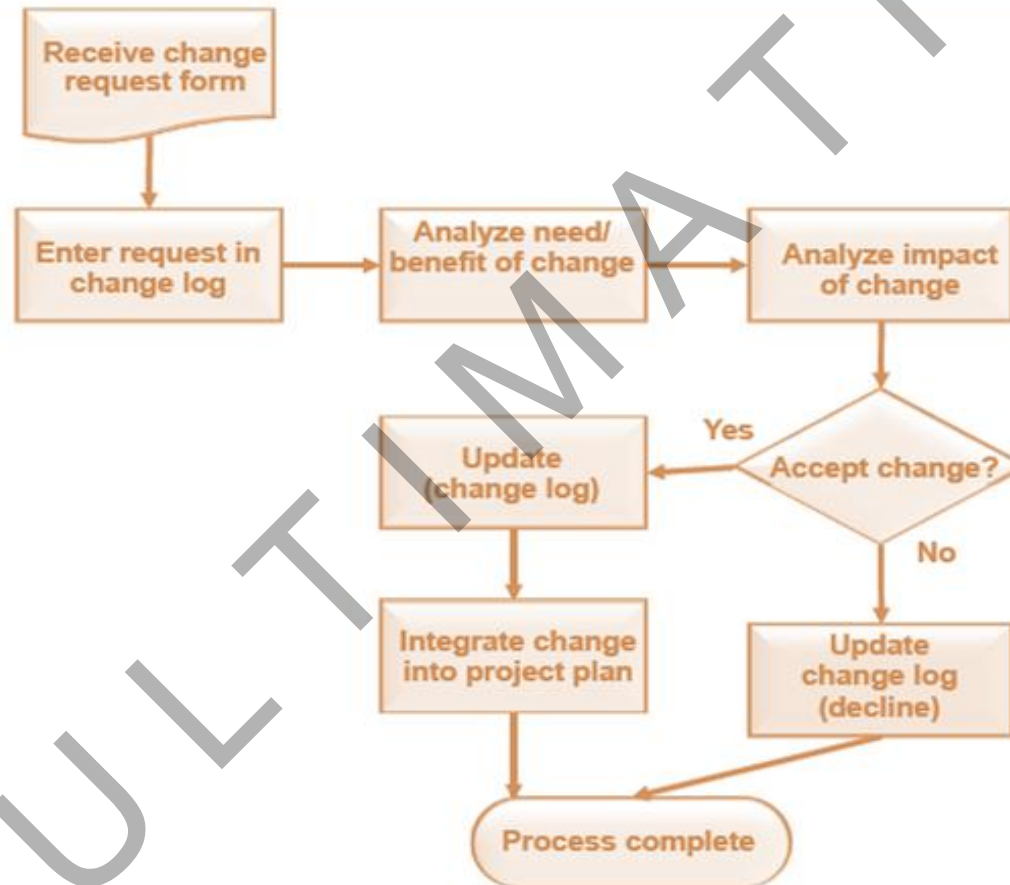
## Tools and Techniques

# Cause and Effect Diagrams (cont.)



## Tools and Techniques

# Flowcharting



## Tools and Techniques

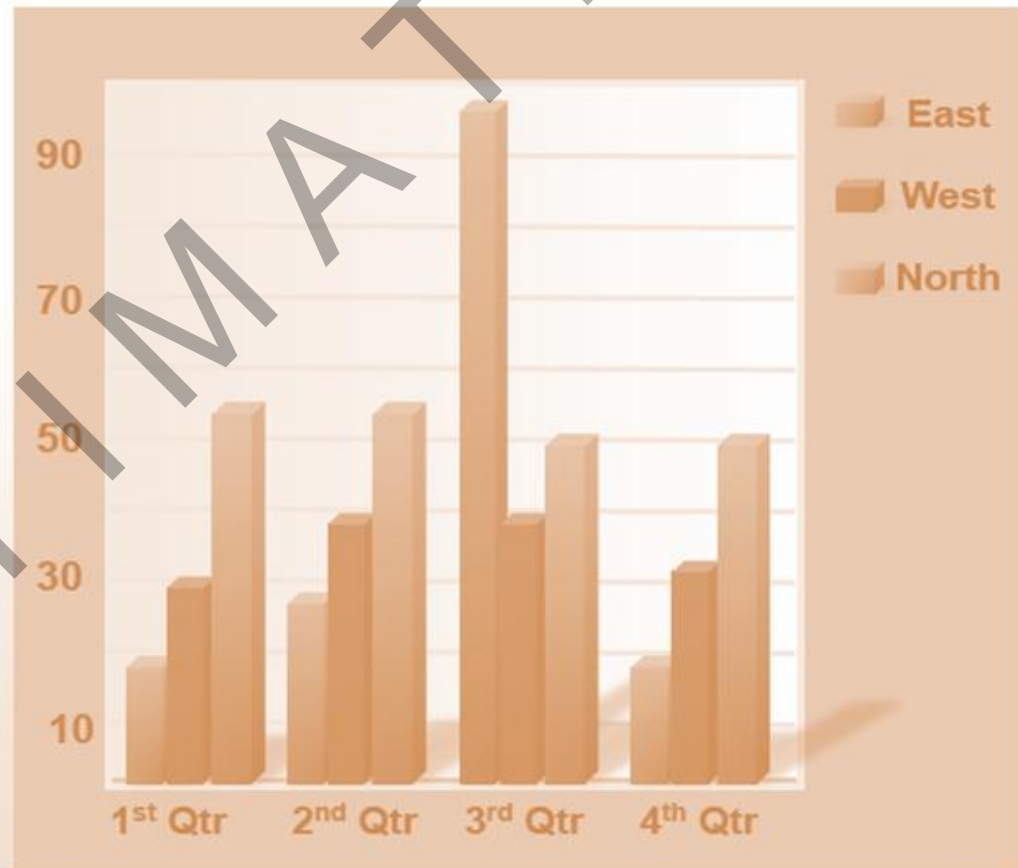
# Histogram

Vertical bar chart

Frequency of occurrences

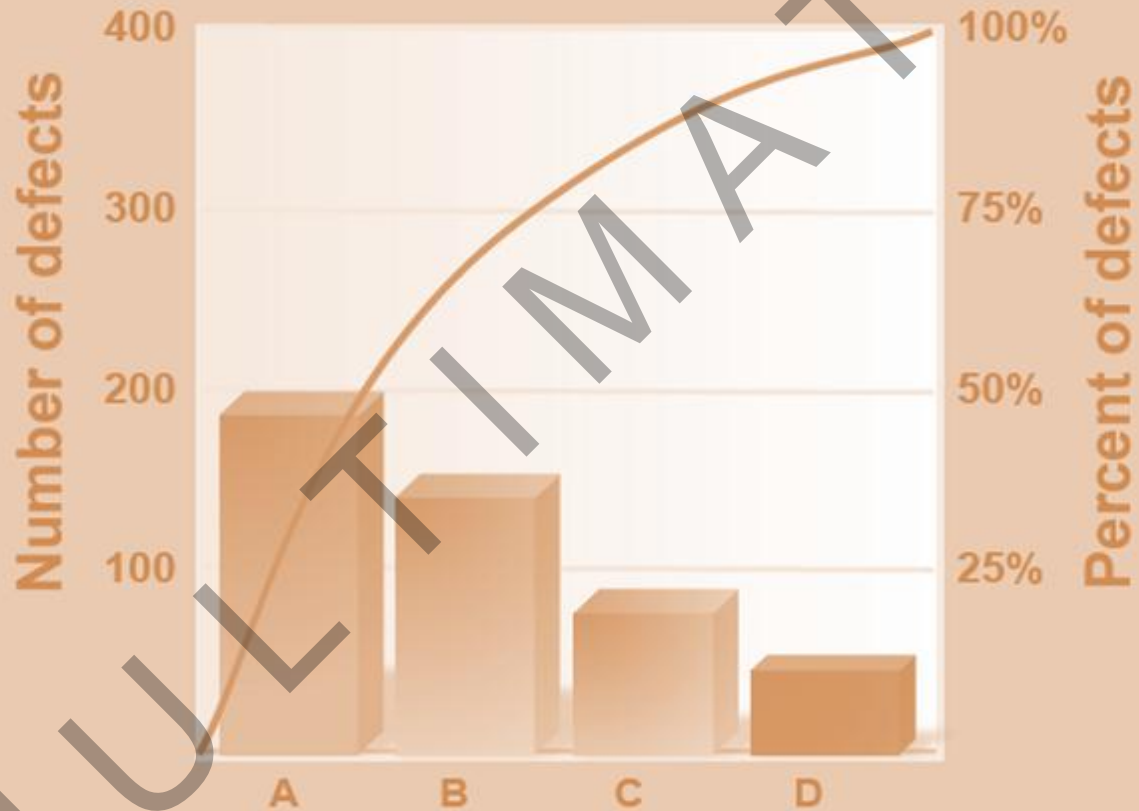
Can be ordered (like a Pareto chart) or unordered

Helps identify common causes



## Tools and Techniques

# Pareto Chart



# Scatter Diagram

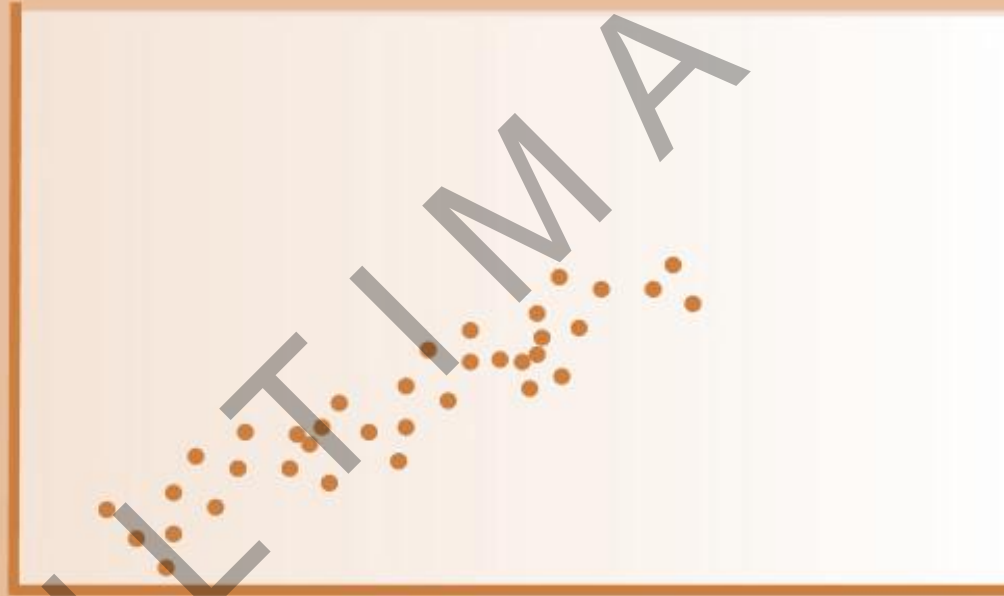
- A scatter diagram looks at the relationship between variables (independent and dependent).
- Plotted data shows pattern of direction and tightness.
- A tighter pattern indicates a stronger relationship.
- Positive correlation exists when increase in one variable is accompanied by increase in the other variable.
- Negative correlation exists when increase in one variable is accompanied by decrease in the other variable.



## Tools and Techniques

# Scatter Diagram

PMP  
exam  
score



Study time

## Tools and Techniques **Benchmarking**

**Best  
practice**  
(external standard)



## Tools and Techniques

# Design of Experiments



What if?  
Must it?

## Tools and Techniques

# Statistical Sampling

**Select and inspect a few, then extrapolate results.**

**Attribute  
sampling**

**Determination of  
whether a sample  
conforms**

**True/False, Right/  
Wrong, Pass/Fail**

**Variable  
sampling**

**Determination of the  
degree of conformity**

**Number of calls per  
hour, weight of  
chickens**

**Quality management plan establishes the type,  
frequency, and size of sample.**

# Outputs

## 1. Quality Management Plan

The quality management plan is a component of the project management plan that describes how the organization's quality policies will be implemented.

## 2. Process Improvement Plan

The process improvement plan is a subsidiary or component of the project management plan.

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# Outputs

## 3. Quality Metrics

A quality metric specifically describes a project or product attribute and how the control quality process will measure it.

## 4. Quality Checklists

A checklist is a structured tool, usually component-specific, used to verify that a set of required steps has been performed.

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# Outputs

## 5. Project Documents Updates

Project documents that may be updated include, but are not limited to :

- Stakeholder register; and
- Responsibility assignment matrix; and
- WBS and WBS Dictionary.

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Outputs

## **Quality Management Plan**

**Component of the project management plan**

**Defines:**

**Approach to quality management**

**Project quality policy**

**Quality metrics and tools for quality control**

**Quality activities of quality assurance**

Outputs

## **Process Improvement Plan**

**The process improvement plan is a component of the project management plan.**

**Establishes:**

**How process improvement will be approached**

**How processes will be identified**

**How processes will be analyzed**

**Focuses on enhancing process value**

Outputs

## Quality Metrics & Quality Checklists

### Quality Metrics

Part of the quality management plan

Specific definition of:

What to measure

How to measure it

Acceptance criteria for it

### Quality Checklists

Part of the quality management plan

Used in quality control

Ensure specific steps, procedures, requirements are fulfilled

Outputs

## Project Document Updates



Stakeholder register

Responsibility assignment matrix

Possibly others

## 8.2 Perform Quality Assurance

Perform Quality Assurance is the process of auditing the quality requirements and the results from quality control measurements to ensure that appropriate quality standards and operational definitions are used.

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# ITTO

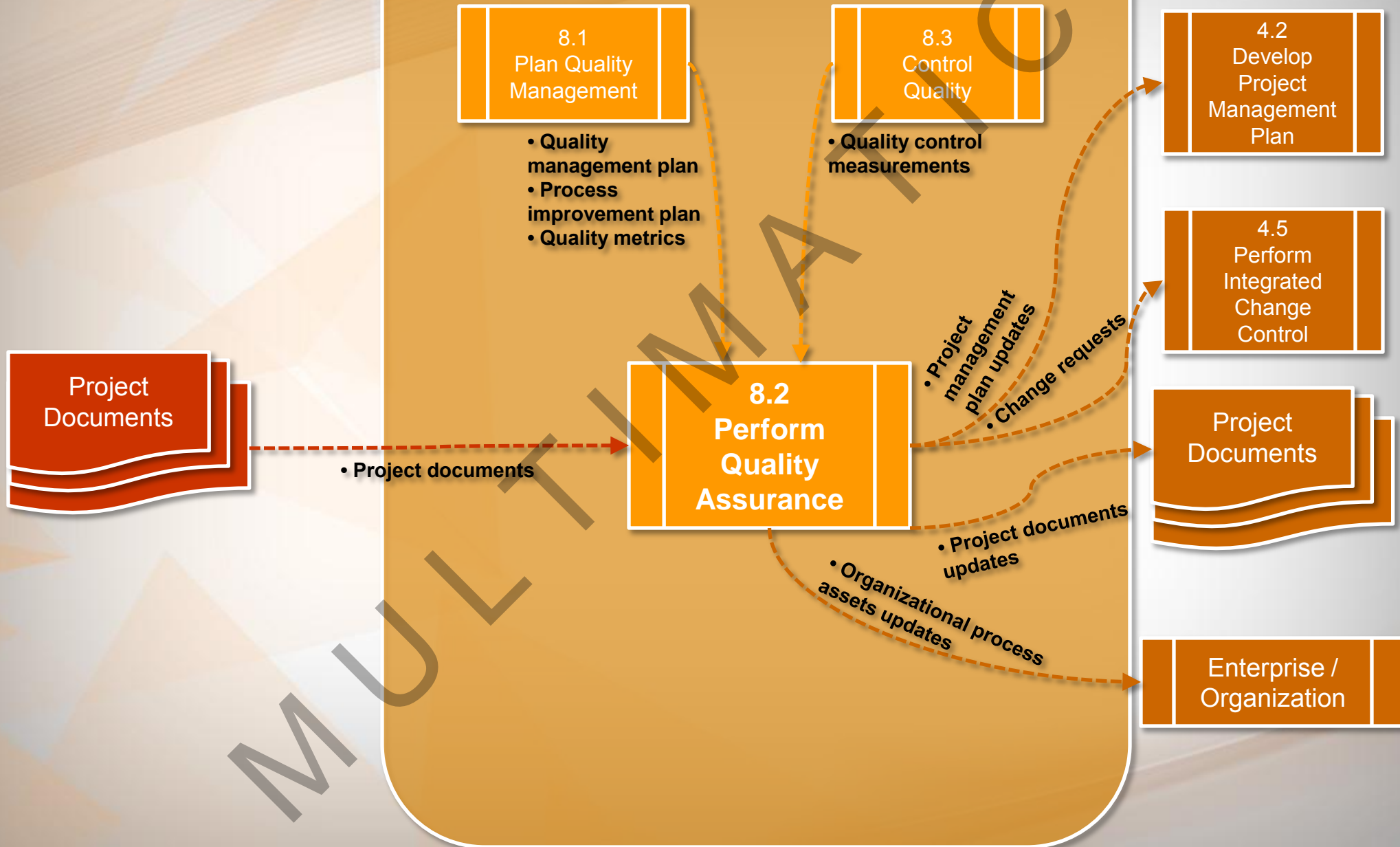
## Perform Quality Assurance



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# Project Quality Management



# Inputs

## 1. Quality Management Plan

The quality management plan describes the quality assurance and continuous process improvement approaches for the project.

## 2. Process Improvement Plan

The project's quality assurance activities should be supportive of and consistent with the performing organization's process improvement plans.

## 3. Quality Metrics

The quality metrics provide the attributes that should be measured and the allowable variations.

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# Inputs

## 4. Quality Control Measurements

Quality control measurements are the results of control quality activities.

## 5. Project Documents

Project documents may influence quality assurance work and should be monitored within the context of a system for configuration management.

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# Tools & Techniques

## 1. Quality Management and Control Tools

The Perform Quality Assurance process uses the tools and techniques of the Plan Quality Management and Control Quality processes.

## 2. Quality Audits

A quality audit is a structured, independent process to determine if project activities comply with organizational and project policies, processes, and procedures.

## 3. Process Analysis

Process analysis follows the steps outlined in the process improvement plan to identify needed improvements.

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## Tools and Techniques

# Quality Audits



**Regularly scheduled or ad hoc**

**Structured review**

**Identify lessons learned**

**Ensure quality processes are followed**

**Identify corrective actions**



# Outputs

## 1. Change Requests

Change requests are created and used as input into the Perform Integrated Change Control process to allow full consideration of the recommended improvements.

## 2. Project Management Plan Updates

Elements of the project management plan that may be updated include, but are not limited to :

- Quality management plan,
- Scope management plan,
- Schedule management plan, and
- Cost management plan.

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# Outputs

## 3. Project Documents Updates

Project documents that may be updated include, but are not limited to :

- Quality audit reports,
- Training plans, and
- Process documentation.

## 4. Organizational Process Assets Updates

Elements of the organizational process assets that may be updated include, but are not limited to, the organization's quality standards and the quality management system.

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## 8.3 Control Quality

Control Quality is the process of monitoring and recording results of executing the quality activities to assess performance and recommend necessary changes.

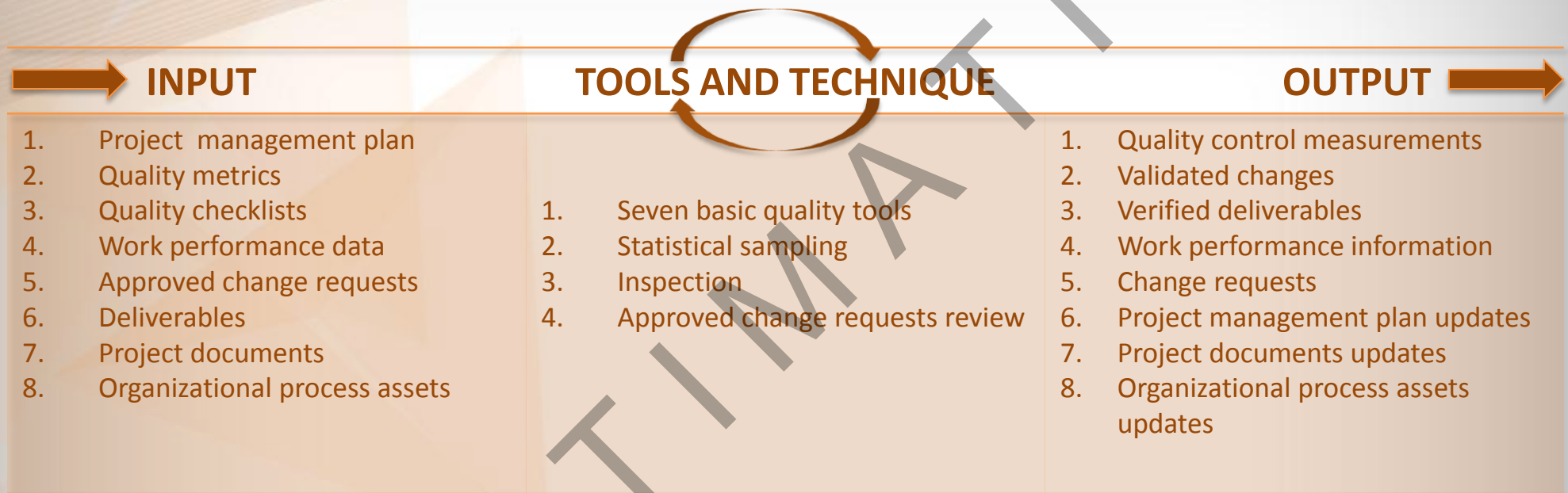
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# ITTO

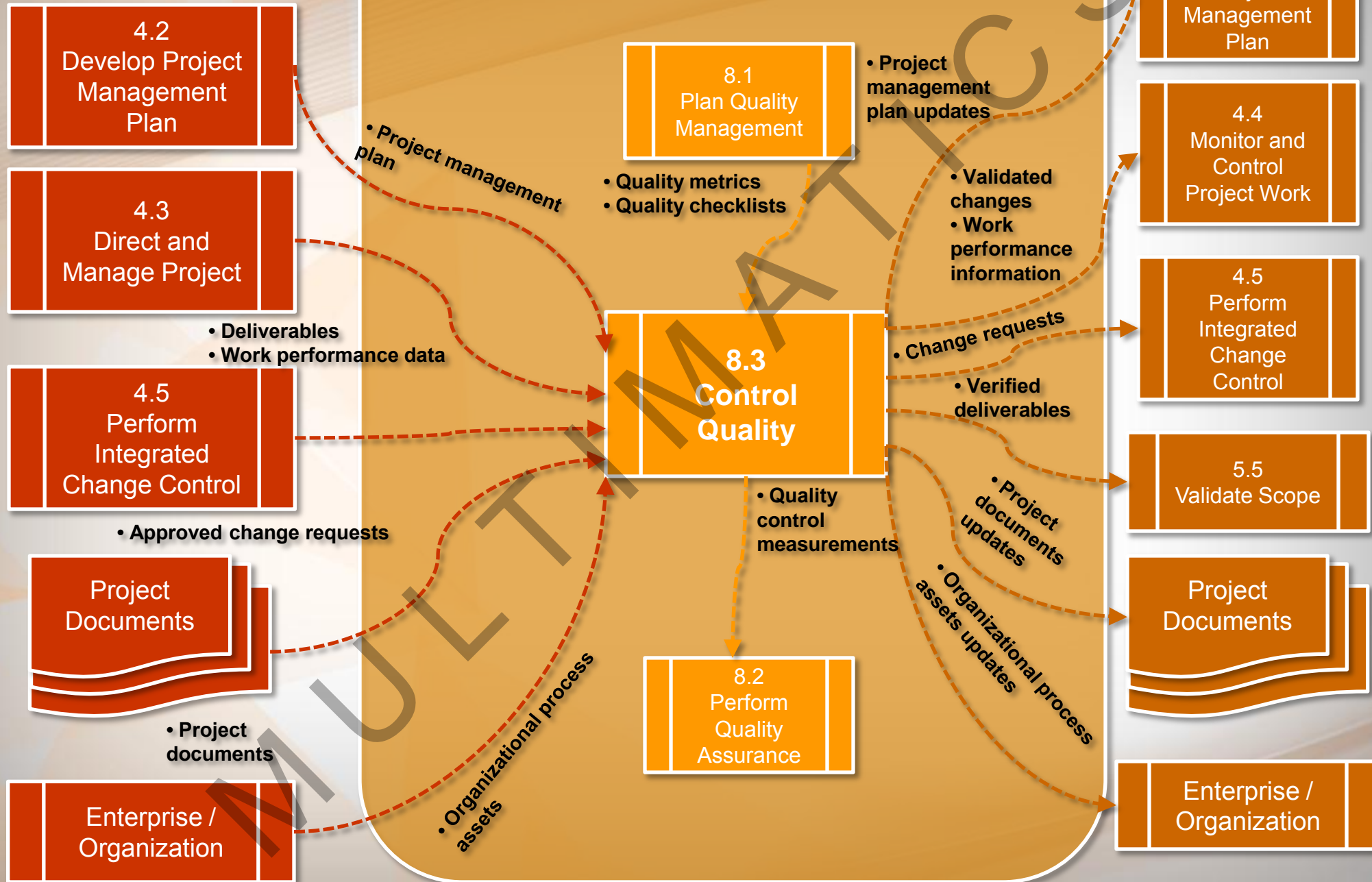
## Control Quality



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# Project Quality Management





# Inputs

## 1. Project Management Plan

The project management plan contains the quality management plan, which is used to control quality.

## 2. Quality Metrics

A quality metric describes a project or product attribute and how it will be measured.

## 3. Quality Checklists

Quality checklists are structured lists that help to verify that the work of the project and its deliverables fulfill a set of requirements.

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# Inputs

## 4. Work Performance Data

Work performance data can include :

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

## 4. Approved Change Requests

As part of the Perform Integrated Change Control process, a change log update indicates that some changes are approved and some are not.

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# Inputs

## 6. Deliverables

A deliverable is any unique and verifiable product, result, or capability that results in a validated deliverable required by the project.

## 7. Project Documents

Project documents may include, but are not limited to :

- Agreements,
- Quality audit reports and change logs supported with corrective action plans,
- Training plans and assessments of effectiveness, and
- Process documentation such as those obtained using either the seven basic quality tools or the quality management and control tools shown

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# Inputs

## 8. Organizational Process Assets

The organizational process assets that influence the Control Quality process include, but are not limited to :

- The organization's quality standards and policies,
- Standard work guidelines, and
- Issue and defect reporting procedures and communication policies.

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# Tools & Techniques

## 1. Seven Basic Quality Tools

The seven basic quality tools are illustrated conceptually in Figure 8-7.

## 2. Statistical Sampling

Samples are selected and tested as defined in the quality management plan.

# Tools & Techniques

## 3. Inspection

An inspection is the examination of a work product to determine if it conforms to documented standards.

## 4. Approved Change Requests Review

All approved change requests should be reviewed to verify that they were implemented as approved.

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## Tools and Techniques

# Inspection

**Examining or measuring to verify whether an activity, component, product, result, or service conforms to specified requirements.**





Tools and Techniques

## Approved Change Request Review

Ensuring that approved changes have:

Been implemented in  
a timely manner



Been implemented as  
approved

# Outputs

## 1. Quality Control Measurements

Quality control measurements are the documented results of control quality activities.

## 2. Validated Changes

Any changed or repaired items are inspected and will be either accepted or rejected before notification of the decision is provided.

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# Outputs

## 3. Verified Deliverables

A goal of the Control Quality process is to determine the correctness of deliverables.

## 4. Work Performance Information

Work performance information is the performance data collected from various controlling processes, analyzed in context and integrated based on relationships across areas.

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# Outputs

## 5. Change Requests

If the recommended corrective or preventive actions or a defect repair requires a change to the project management plan, a change request should be initiated in accordance with the defined Perform Integrated Change Control (4.5) process.

## 6. Project Management Plan Updates

Elements of the project management plan that may be updated include, but are not limited to :

- Quality management plan and
- Process improvement plan.

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# Outputs

## 7. Project Documents Updates

Project documents that may be updated include, but are not limited to :

- Quality standards;
- Agreements;
- Quality audit reports and change logs supported with corrective action plans;
- Training plans and assessments of effectiveness; and
- Process documentation, such as information obtained using the seven basic quality tools or the quality management and control tools.

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# Outputs

## 8. Organizational Process Assets Updates

Elements of the organizational process assets that may be updated include, but are not limited to :

- Completed checklists.
- Lessons learned documentation.

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