

MODULE  
**5**

Process—  
Secondary Constraints

CHAPTER

**3**

Delivery Performance  
Domain

# Delivery of Value

## Deliverables: Strategic requirements

**Value:** New deliverables, risk resolution, R&D at acceptable cost.

Business case = strategic value baseline; outcomes quantified; risk acceptable.

## Deliverables: Functional requirements

**Value:** Conditions/capabilities known or discovered during project.

Consensus on well-written requirements; changes proactively managed; customers satisfied, including “know it when I see it.”

## Deliverables: Scope

**Value:** WBS decomposition or agile roadmap of deliverables needed to meet requirements.

Decomposed at enough detail; technical specifications clear; acceptance criteria/ “done” met; scope creep controlled.

## Quality: Performance requirements

**Value:** Realize expected and required performance at price competitive for grade.

Success criteria/ “done” met; cost of quality falls; quality built into processes and training.

# Delivery of Value

## Checking Outcomes

- Charter versus strategic/business plans
- Team requirements comprehension: few changes in predictive; conversations and retrospectives in agile
- Financial and schedule value versus benefits management plan, business case, baselines
- Portfolio/program for longer-term metrics
- Formal acceptance
- Satisfaction metrics and indexes

## Tailoring

- Cultural priority on quality: embrace or mitigate
- Level of empowerment
- Industry/quality standards; regulations
- Requirements management systems and level of stability
- Quality policies, models, methods, and artifacts

# Benefits of Project Quality Management

- Decreased cost due to less waste and rework
- Easier integration
- Better customer satisfaction
- Better team morale, since issues will be identified and corrected quickly
- Continual improvement of organization's quality processes

# Common Themes in Quality Management

- Quality is free (when benefits outweigh costs).
- Quality starts at the top, but everyone must be involved.
- Transform to adopt integrated system; train employees.
- Requires planning: customer needs in design; best processes.
- Fitness for use, not conformance to specifications.
- Monitor and control to defined metrics or standards.
- Zero defects.
- Continual improvement of quality processes.

# Quality Initiatives for Organizations

TQM

- Total quality management; ancestor of many initiatives

Six  
Sigma

- Certified “black belt” practitioners
- Integration of quality in all business processes

ISO

- International Organization for Standardization
- ISO 9000 series

CMMI

- Capability Maturity Model Integration
- Software project-oriented

# Six Sigma

## ■ Principles:

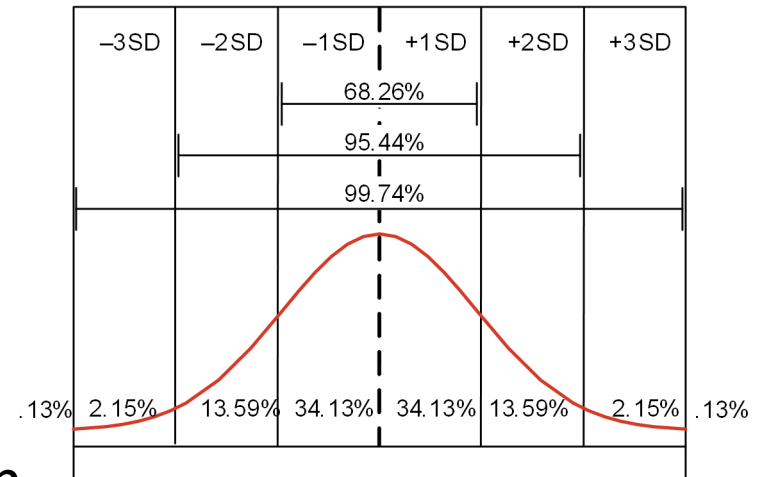
- Full integration with strategy
- Measurable financial impact
- Decisions based on facts

## ■ Sigma

- Standard deviation (SD) from mean
- Six sigma—reducing defects to 3.4 per million opportunities (almost undetectable)

## ■ DMAIC (existing) and DMADV (new)

- Define, Measure, Analyze, Improve, Control
- Define, Measure, Analyze, Design, Verify



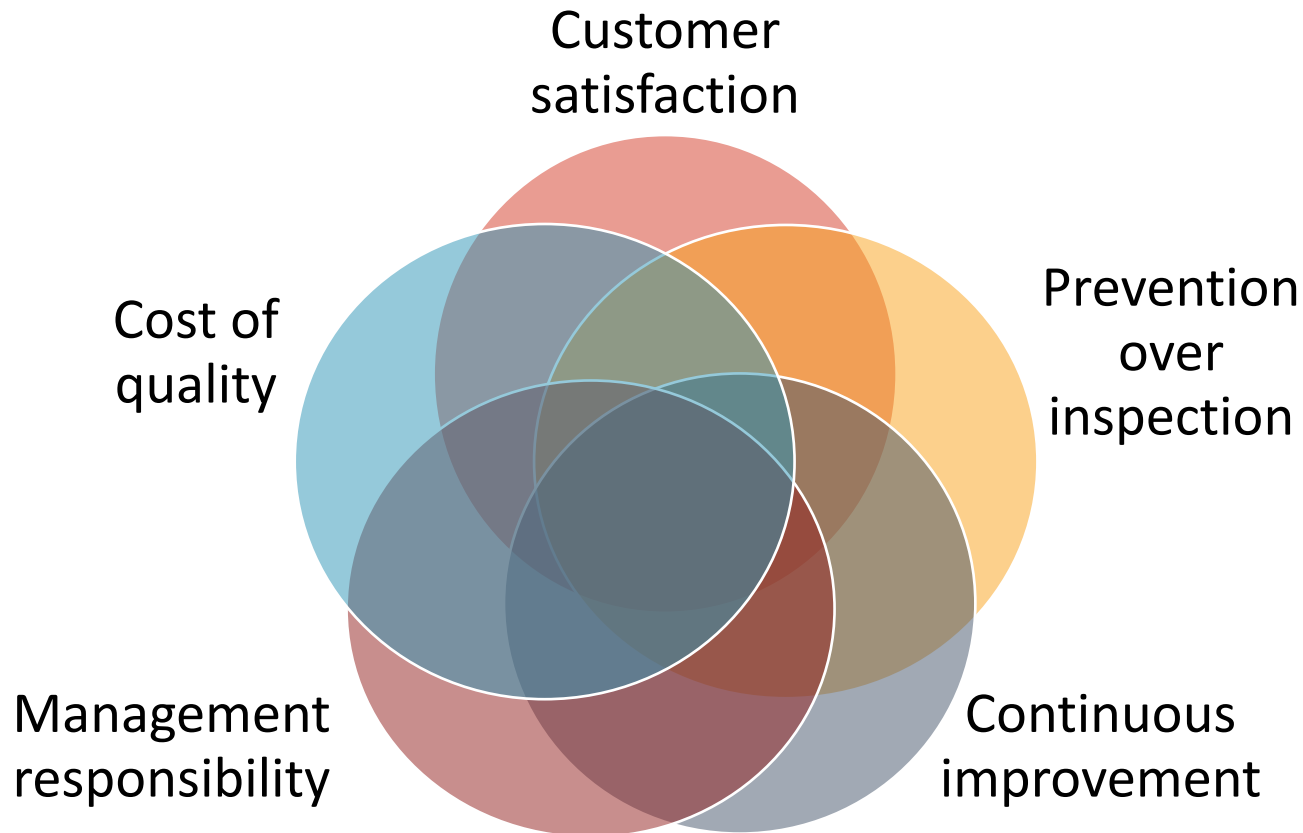


## Discussion Question

How do organizational quality initiatives affect project teams?

- A. They affect teams only indirectly, through operations.
- B. They may shape project quality processes and objectives.
- C. They are secondary to PMO processes.
- D. They affect project managers but not team members.

# Key Elements of Quality Management



# Predictive: Project Quality Management

KNOWLEDGE AREAS	PROCESS GROUPS				
	Initiating	Planning	Executing	Monitoring and Controlling	Closing
<b>Project Quality Management</b>		• Plan Quality Management	• Manage Quality	• Control Quality	

**Source:** Adapted from Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)—Sixth Edition*, Project Management Institute, Inc., 2017, Table 1-4, Page 25. Material from this publication has been reproduced with the permission of PMI.

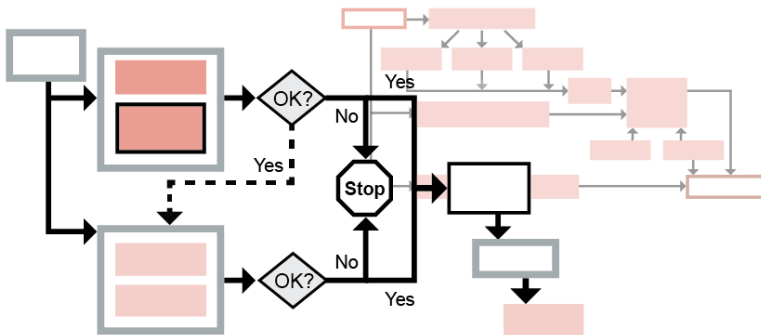
- The quality processes and activities that ensure that the project will meet its objectives and satisfy the customer

# Distinguishing QA from QC

## Quality Assurance (QA)

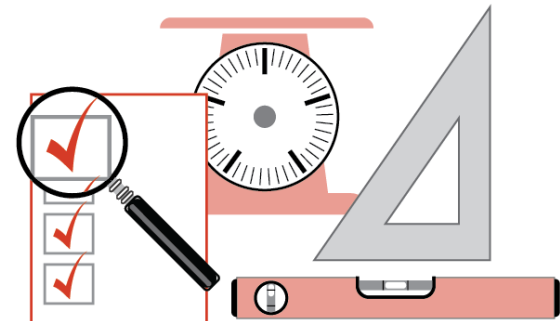
VS

## Quality Control (QC)



### Process-Oriented

Independent internal review of tools and techniques to see if project is actually being implemented according to plan and if processes are as efficient and effective as they can be.



### Deliverable-Oriented

Internal review of interim and final deliverables for conformance to measurable quality requirements.

# Planning Quality Management on Agile/Hybrid Projects

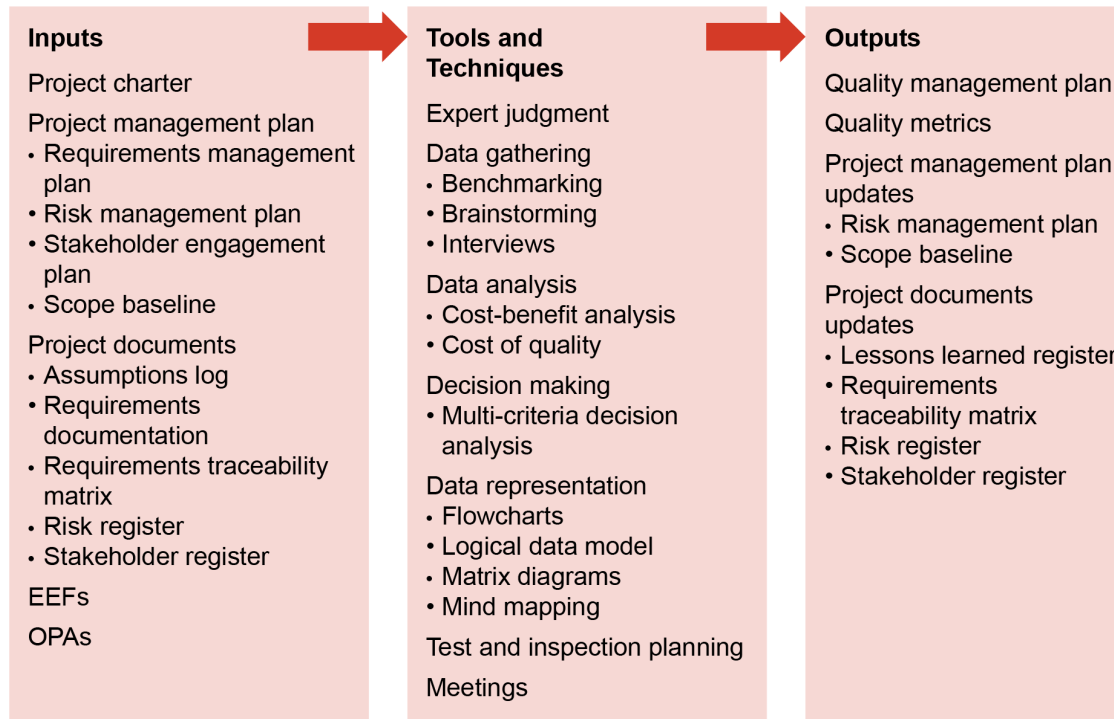
## Planning quality assurance

- Retrospective ceremonies.
- Encourage/reward measurable and lasting improvements.
- Set goals and success metrics at same time.
- Encourage experimentation (secure enough to fail).

## Planning quality control

- Not a separate step.
- Part of every task.
- Discuss/refine definition of “done.”
- Ensure that errors are very small, found early.
- Aim small, miss small.
- Plan who will review and accept/reject.

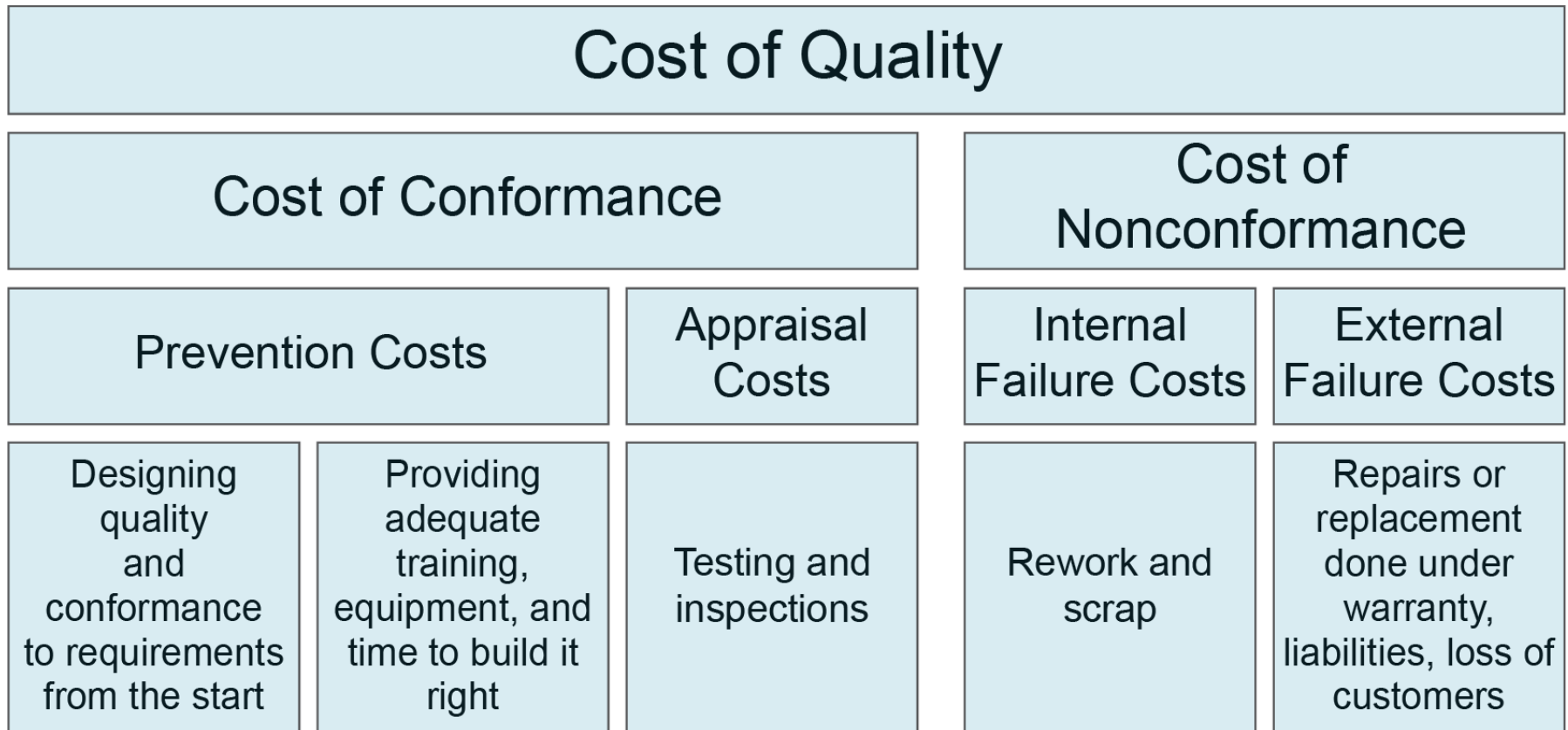
# Predictive: Plan Quality Management



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- Outputs include documented quality decisions.

# Cost of Quality (COQ)



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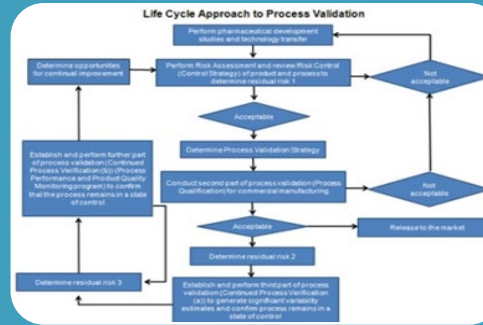
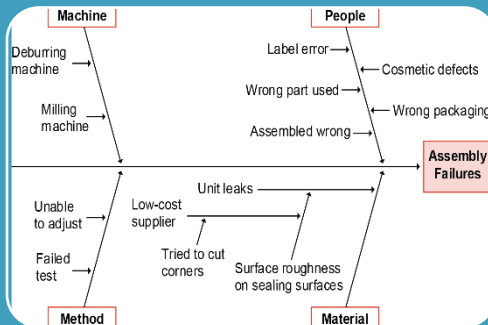


## Discussion Question

What expense would be considered a cost of nonconformance?

- A. An action must be corrected because of incomplete project communication.
- B. All components are subjected to rigorous inspections.
- C. Engineers must be trained in a new process.

# Seven Basic Quality Tools



Std	Label Error	Assembled Wrong	Failed Test	Cosmetic Defects	Unable to Adjust	Unit Leaks	Wrong Packaging
1							
2							
3							
4							
5							
	20	23	48	16	11	59	8

## Cause-and-effect diagram

Ishikawa or fishbone diagram

5 Whys

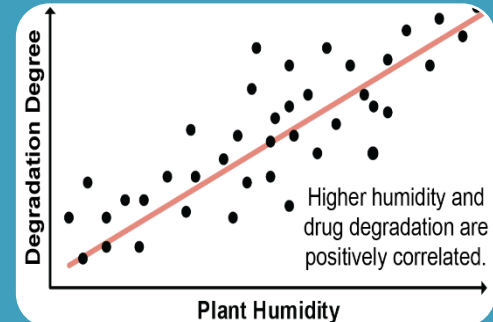
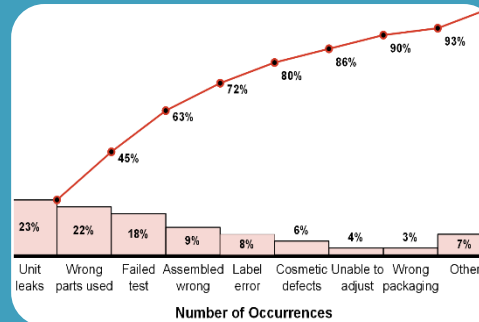
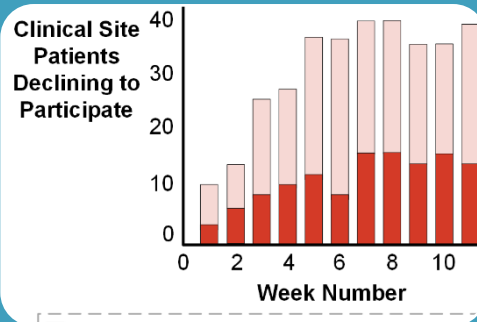
## Flowchart

Identify inter-dependencies in complex processes

## Checksheet

Summarize and categorize events

# Seven Basic Quality Tools (*continued*)



## Histogram

Bar chart  
Sort and compare data

## Pareto diagram

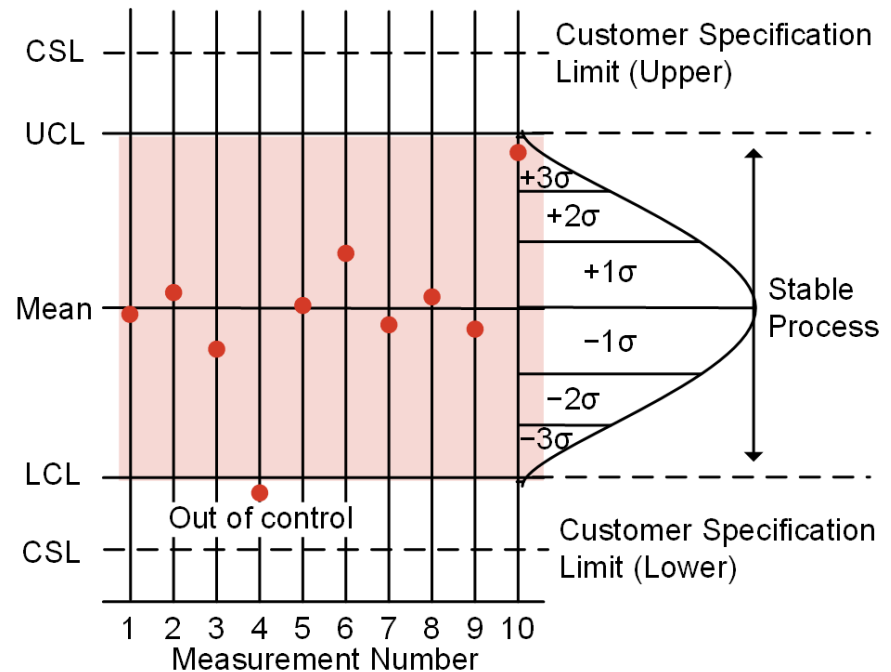
80/20 cut  
Distinguish the “vital few” causes

## Scatter diagram

Plot data from two variables to detect associations

# Control Charts

- Plot a series of data points against specifications to detect if a process is out of control
  - Single data point above or below control limits
  - Rule of 7: 7 consecutive points above or 7 consecutive points below the mean





## Discussion Question

What quality tool is being used?

*Needs collected during successive customer workshops are grouped by type.*

- A. Scatter diagram
- B. Pareto diagram
- C. Control chart
- D. Histogram

# Additional Quality Tools

## Benchmarking

- Establish standards against which project practices and deliverables can be compared.

## Sampling and Testing

- **Statistical:** Choosing a representative subset of a population of interest.
- **Attribute:** Test for the presence of a certain characteristic.
- **Variables:** Determine the degree of variation from a standard in each sample group.

# Plan Quality Management Outputs

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## **Quality management plan**

How the team will achieve its quality objectives

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## **Quality metrics**

What will be measured, target values, tolerances

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## **Project management plan updates**

Risk management plan and scope baseline

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## **Project documents updates**

Lessons learned, risk, and stakeholder registers; requirements traceability matrix

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## Some Distinctions

- **Quality:** Degree to which a thing fulfills its requirements.
- **Grade:** Way to distinguish items with same functional use but different quality requirements.
- **Accuracy:** Correctness. The closeness of the measurement to the true value.
- **Precision:** Exactness. The similarity (or clustering) of repeated measurements.



## Discussion Question

Is this a difference of quality or grade?

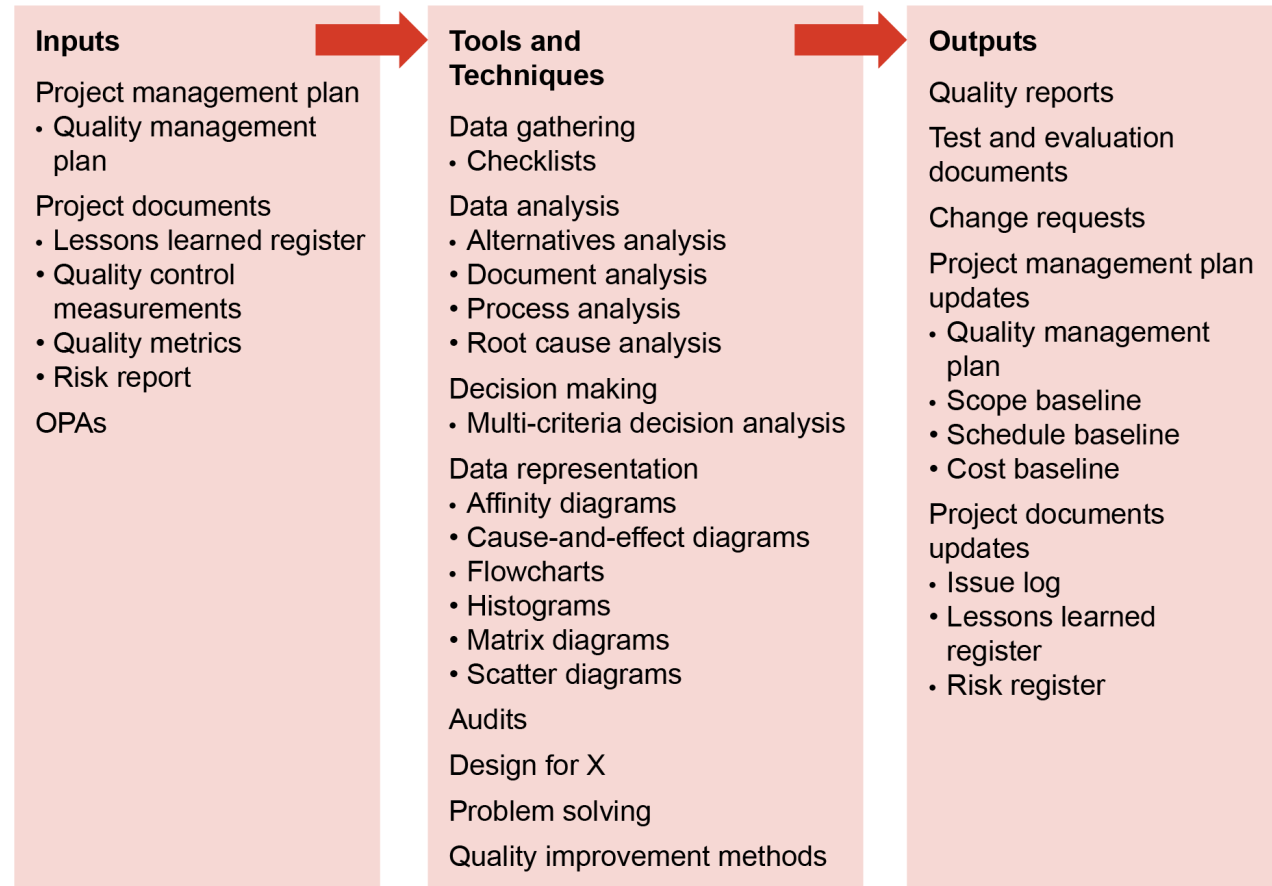
*Two sun lotions have the same SPF factor, but one's protective effects last longer than the other's.*

# Managing Quality

Predictive	Agile
One team or team member responsible for quality.	Entire team is responsible for quality.
Quality review reserved for end of project.	Frequent quality review built into project processes.
High change costs due to late detection of quality issues.	Change costs low due to early detection of quality issues using retrospectives: <ul style="list-style-type: none"> <li>• Focus team on goal to achieve rather than sole focus on problems.</li> <li>• For issues, assess root causes, run improvement trials, and continue, adjust, or drop.</li> </ul>
Stakeholder engagement reserved for specific milestones and accepting deliverables at end of project.	Product owner engaged with team daily, which is key to customer satisfaction.

## Predictive: Manage Quality

- Confirm that quality processes are being followed.
- Assure that these processes are producing the intended effect.
- Identify opportunities for improvement.



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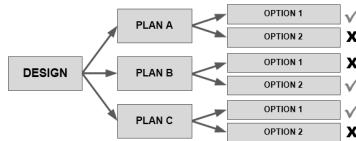
# Quality Tools

- Used to understand work performance data, identify issues, assign priorities, and choose the best solutions



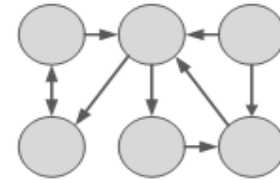
## Affinity diagram

Sort data before problem solving



## Process decision program chart (PDPC)

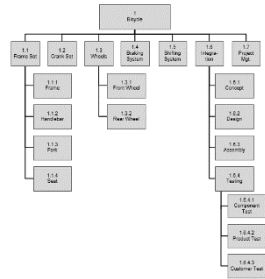
Identify problem nodes



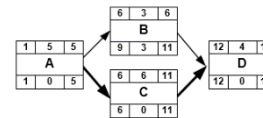
## Inter-relationship digraph

Show cause/ effect

# Quality Tools (*continued*)



Feature/Function	Business Need	User Experience	Technology Complexity	TOTAL
Single Sign-on	1	1	3	5
Check-out capability	3	3	3	9
Form Submission	1	2	2	5
Responsive Design	1	1	2	4
Search	2	2	3	7



Probability	Impact				
	Insignificant	Minor	Moderate	Major	Severe
Very likely	Medium	Medium	High	High	High
Likely	Medium	Medium	Medium	High	High
Moderate	Low	Medium	Medium	Medium	High
Unlikely	Low	Low	Medium	Medium	Medium
Rare	Low	Low	Low	Medium	Medium

## Tree diagram

Decompose into components

## Prioritization matrix

Assess items by weighted criteria

## Activity network diagram

Sequence events and their relationships

## Matrix diagram

Score items against categories

# Additional Tools

<b>Checklists</b>	Gather data and verify that specific steps have been performed.
<b>Design of experiments (DOE)</b>	Identify the optimal combination of factors through iterative quantitative modeling.
<b>Failure mode and effect analysis (FMEA)</b>	Analyze the effect of potential failure modes on the reliability of the deliverable.
<b>Fault tree analysis</b>	Analyze contributors to failure in hierarchical manner, starting with specific failure and possible reasons for it and then proceeding to possible reasons.
<b>Design for X</b>	Follow technical guidelines to control and improve a product's final characteristics.

# Quality Audits

- Structured process to determine conformance with policies, processes, and procedures
- Could be independent and external
- Uses quality tools
- Results in report



## Discussion Question

A project manager receives a report with recommendations from an internal QA department about changes to team procedures. What should the project manager do?

- A. Disregard the recommendations since they are internal and will have negative effects.
- B. Implement the recommendations since the team is committed to process improvement.
- C. Analyze the impact of the changes on project baselines.
- D. Initiate a change request.

# Process Analysis

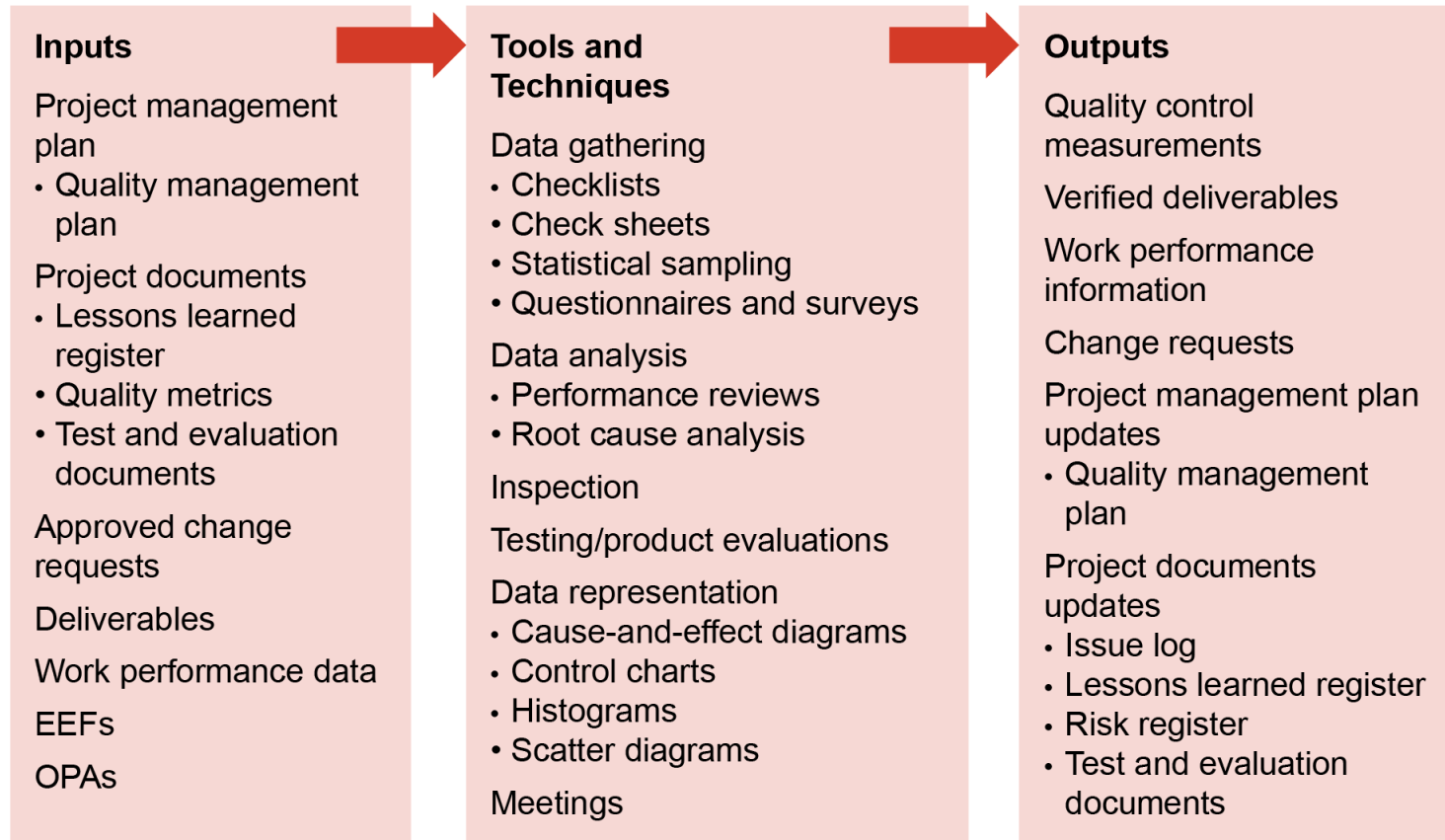
- The process is flowcharted.
- Each step is analyzed to identify:
  - ✓ Input and output.
  - ✓ Resource requirements.
  - ✓ Relationships with other activities.
  - ✓ Potential for defects.

***Possible outcomes:***  
 Opportunities to  
 eliminate  
 redundancies,  
 modify bottlenecks,  
 combine tasks

# Controlling Quality on Agile/Hybrid Projects

- **Software**
  - Testing protocols for stories or defects at individual task and integration levels.
  - Sandbox for integration testing (safe environment, can roll back).
- **Software architecture quality**
  - Architectural runway (from SAFe® framework).
  - Allow emerging requirements to require architecture expansion, but add near-term likely runway needed for efficiency (e.g., for epics on roadmap).
- **Non-software**
  - Include quality in smallest steps. (Use retrospectives, too.)
  - Also use predictive quality controls as needed.
- **Product owner (or designated stakeholder) accepts/rejects**
  - Use of working product prior to end customer essential to quality.

# Predictive: Control Quality



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# Inspection

- Process of examining or measuring to verify conformance.
- Can occur during or at the end of a process, although earlier inspection supports prevention efforts.
- Can include testing under customer-use conditions.