

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:

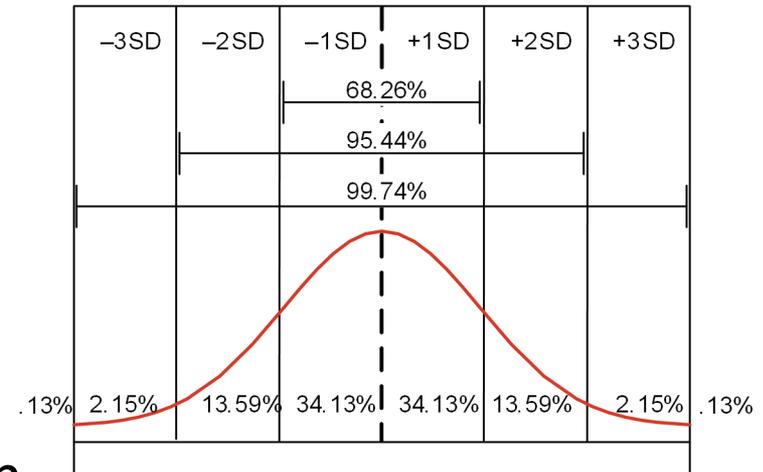
- Full integration with strategy
- Measurable financial impact
- Decisions based on facts

■ 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



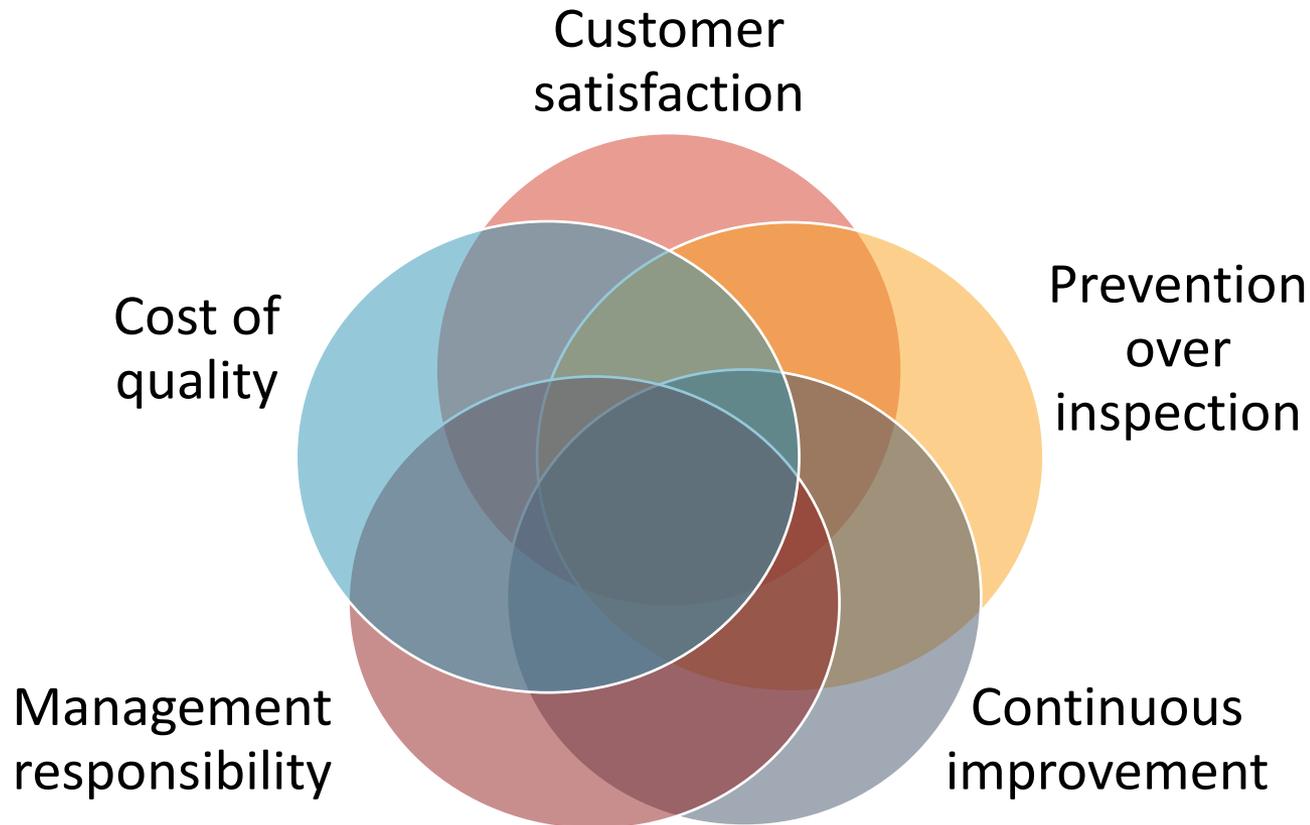


Discussion Question

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 |
| Project Quality Management | | • 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.

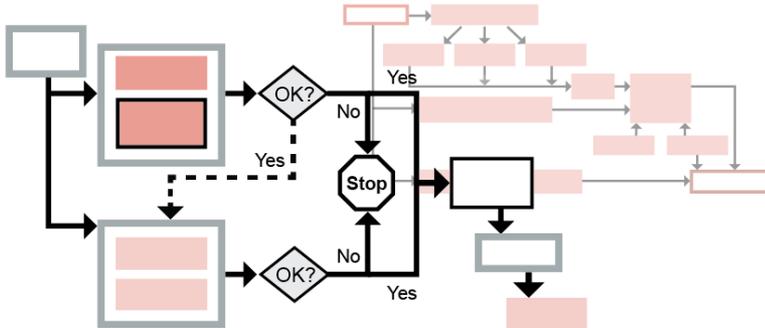
- The quality processes and activities that ensure that the project will meet its objectives and satisfy the customer

Distinguishing QA from QC

Quality Assurance (QA)

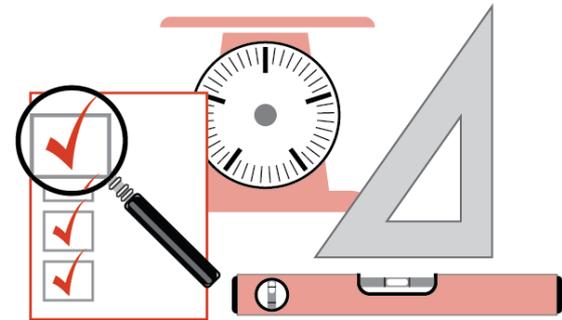
VS

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

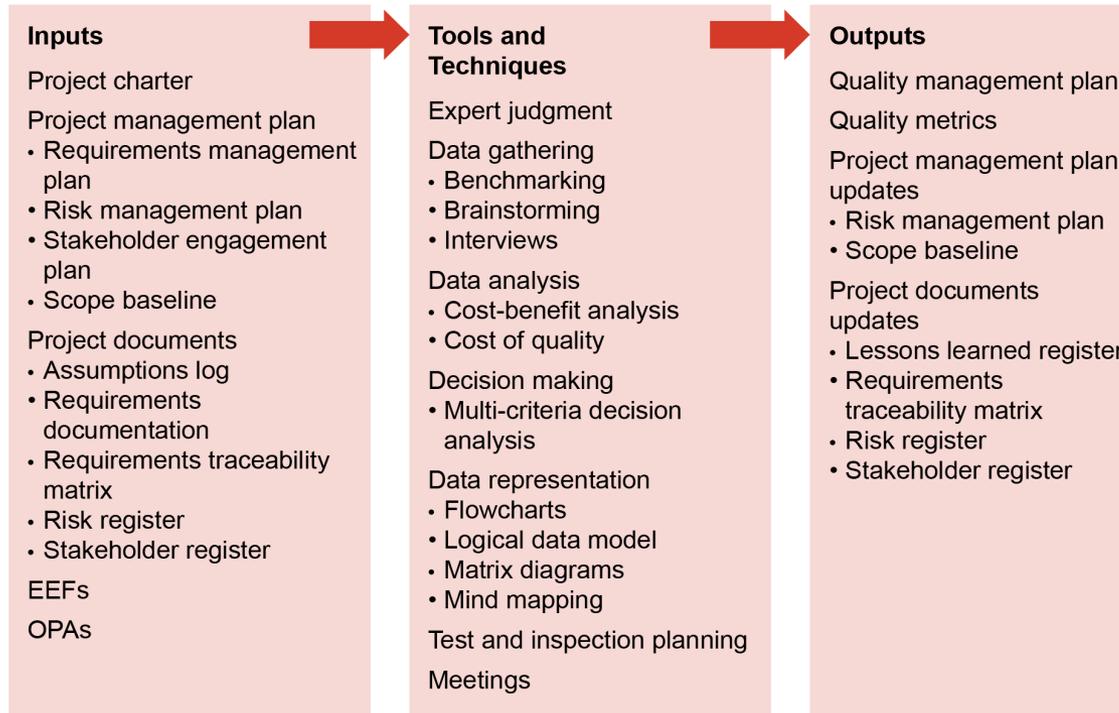
Planning quality assurance

- 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.

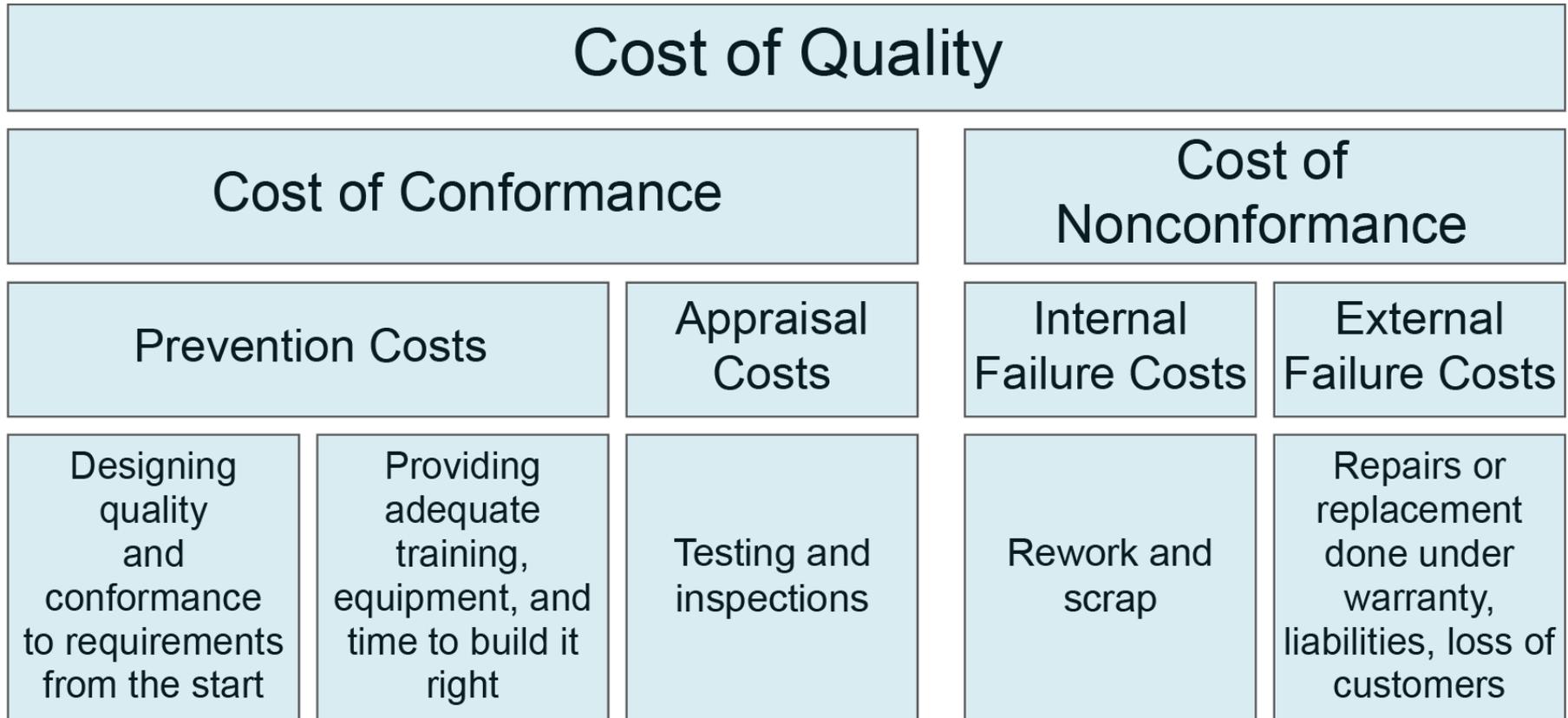
Predictive: Plan Quality Management



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- Outputs include documented quality decisions.

Cost of Quality (COQ)



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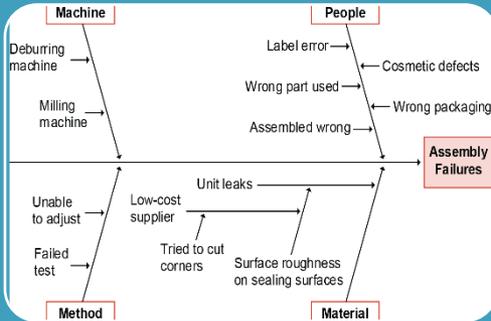


Discussion Question

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.

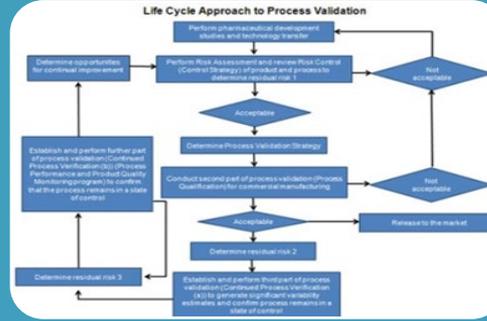
Seven Basic Quality Tools



Cause-and-effect diagram

Ishikawa or fishbone diagram

5 Whys



Flowchart

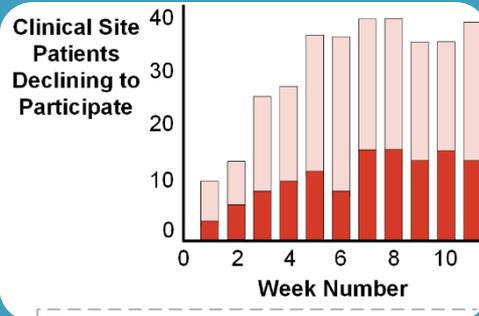
Identify inter-dependencies in complex processes

| Std | Label Error | Assembled Wrong | Failed Test | Cosmetic Defects | Unable to Adjust | Unit Leaks | Wrong Packaging |
|-----|-------------|-----------------|-------------|------------------|------------------|------------|-----------------|
| 11 | | | | | | | |
| 11 | | | | | | | |
| 11 | | | | | | | |
| 11 | | | | | | | |
| 1 | | | | | | | |
| 20 | | 23 | 48 | 16 | 11 | 59 | 8 |

Checksheet

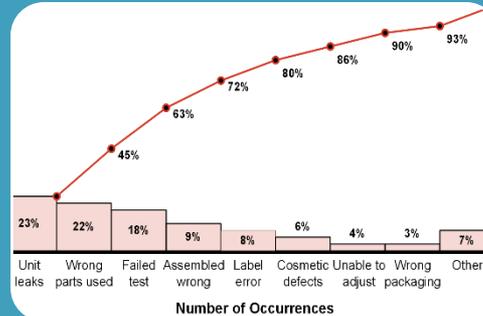
Summarize and categorize events

Seven Basic Quality Tools (*continued*)



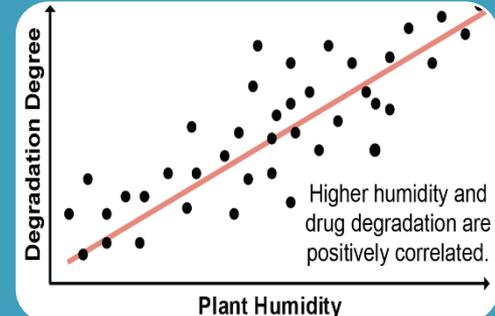
Histogram

Bar chart
Sort and compare data



Pareto diagram

80/20 cut
Distinguish the “vital few” causes

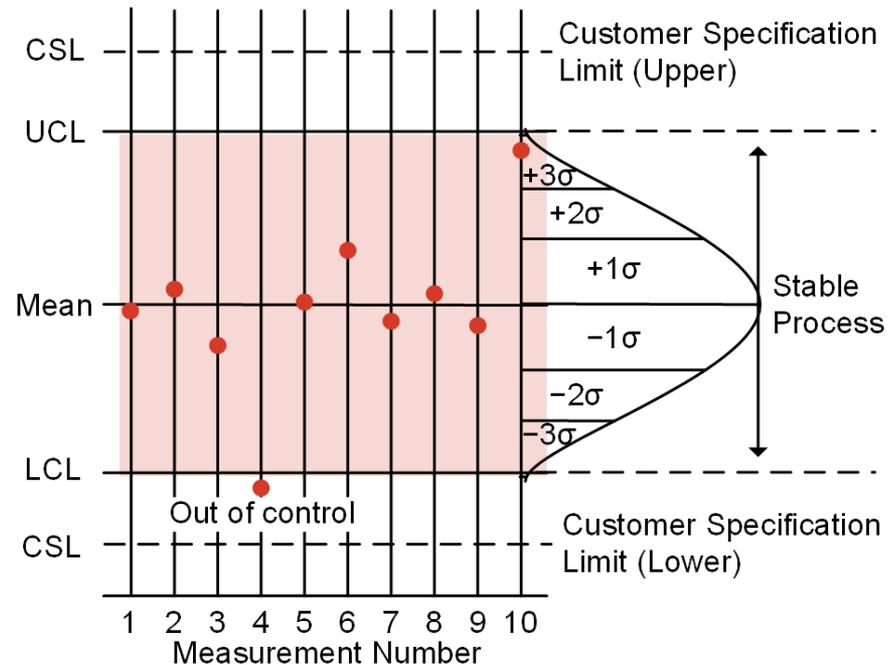


Scatter diagram

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

Quality management plan

How the team will achieve its quality objectives

Quality metrics

What will be measured, target values, tolerances

Project management plan updates

Risk management plan and scope baseline

Project documents updates

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

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?

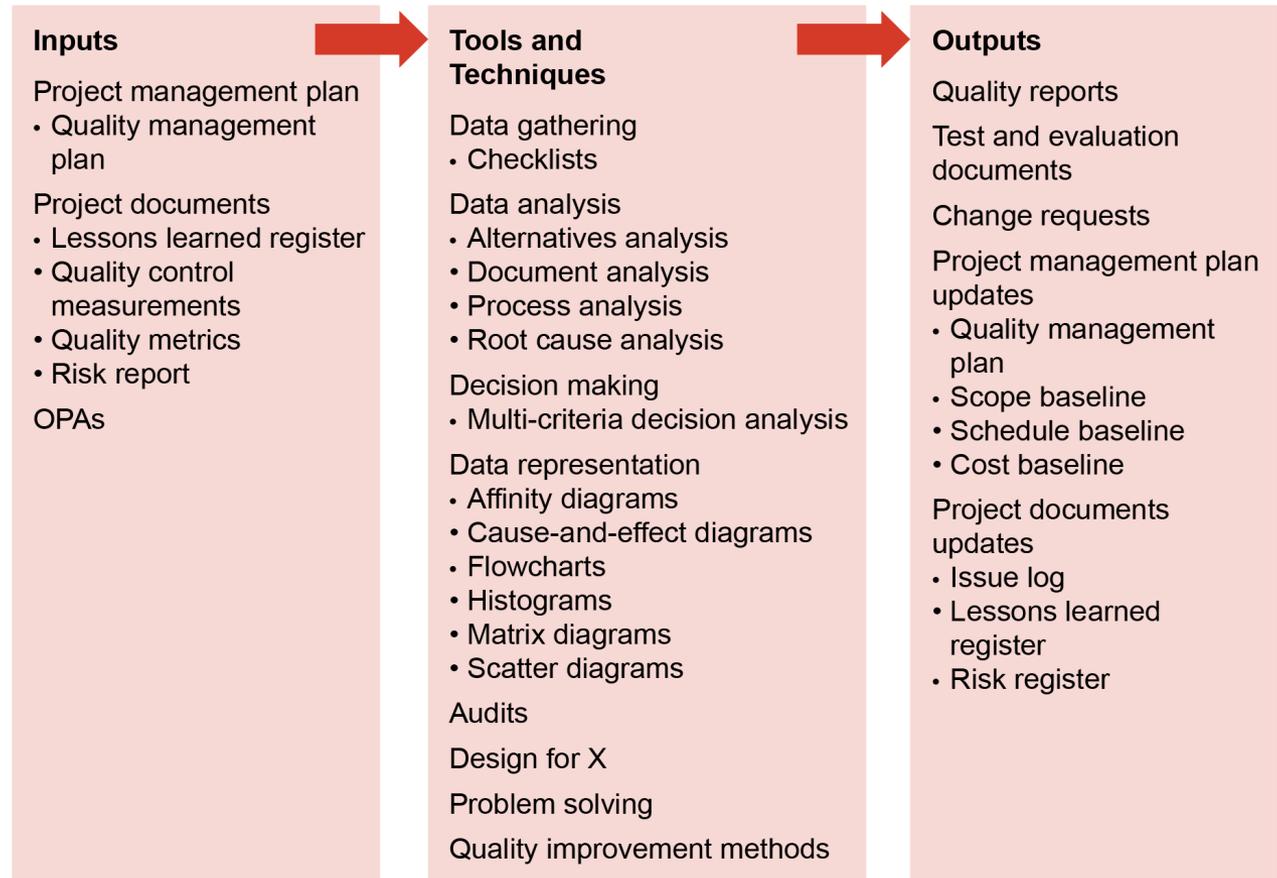
Two sun lotions have the same SPF factor, but one's protective effects last longer than the other's.

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"> • Focus team on goal to achieve rather than sole focus on problems. • For issues, assess root causes, run improvement trials, and continue, adjust, or drop. |
| 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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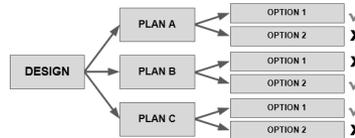
Quality Tools

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



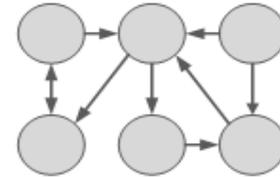
Affinity diagram

Sort data before problem solving



Process decision program chart (PDPC)

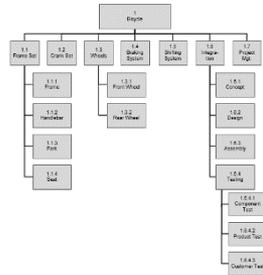
Identify problem nodes



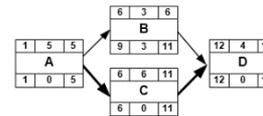
Inter-relationship digraph

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

| | |
|--|---|
| Checklists | Gather data and verify that specific steps have been performed. |
| Design of experiments (DOE) | Identify the optimal combination of factors through iterative quantitative modeling. |
| Failure mode and effect analysis (FMEA) | Analyze the effect of potential failure modes on the reliability of the deliverable. |
| Fault tree analysis | Analyze contributors to failure in hierarchical manner, starting with specific failure and possible reasons for it and then proceeding to possible reasons. |
| Design for X | 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

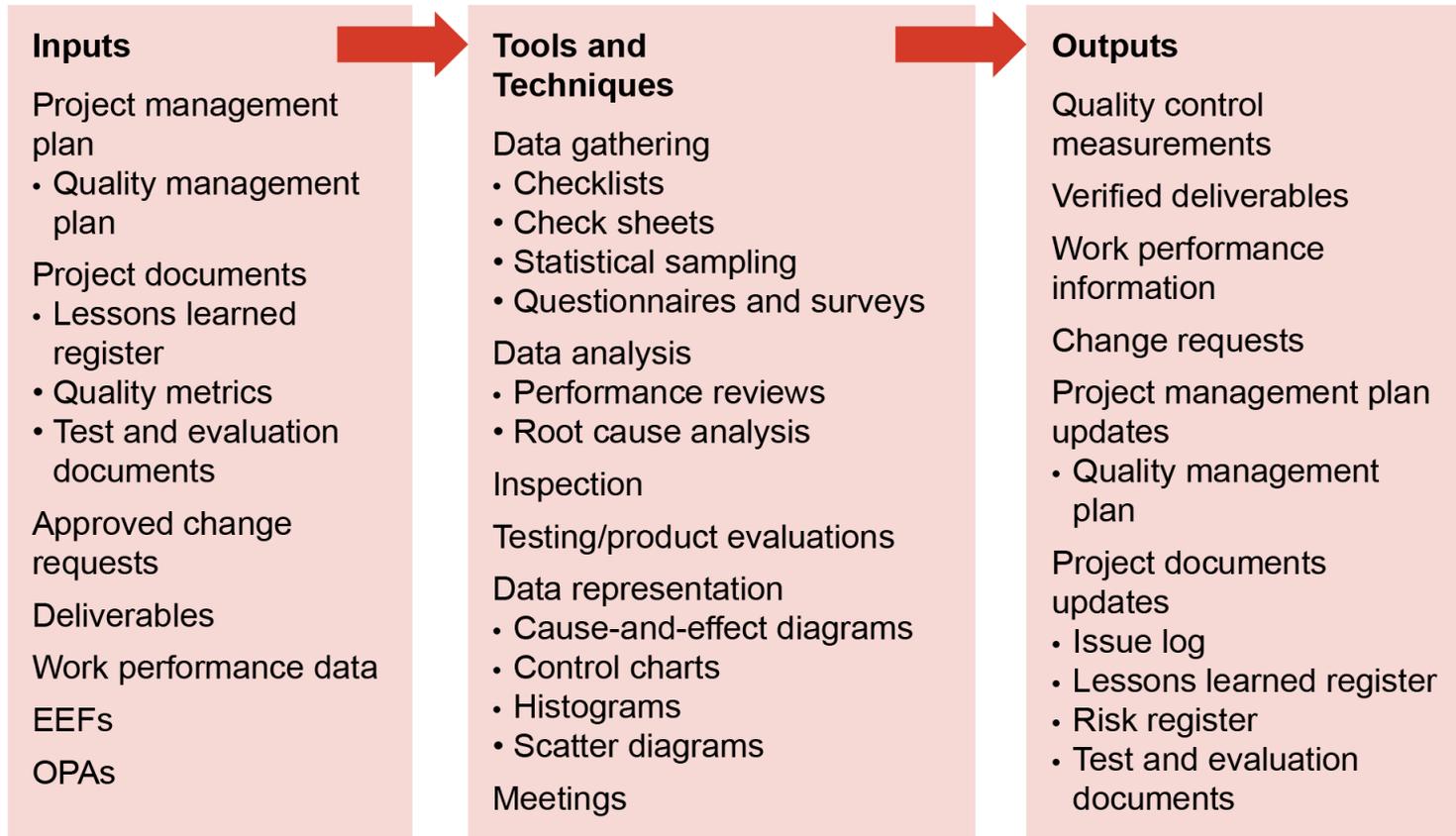
- The process is flowcharted.
- Each step is analyzed to identify:
 - ✓ Input and output.
 - ✓ Resource requirements.
 - ✓ Relationships with other activities.
 - ✓ Potential for defects.

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.