

Lecture 9 Project Quality Management

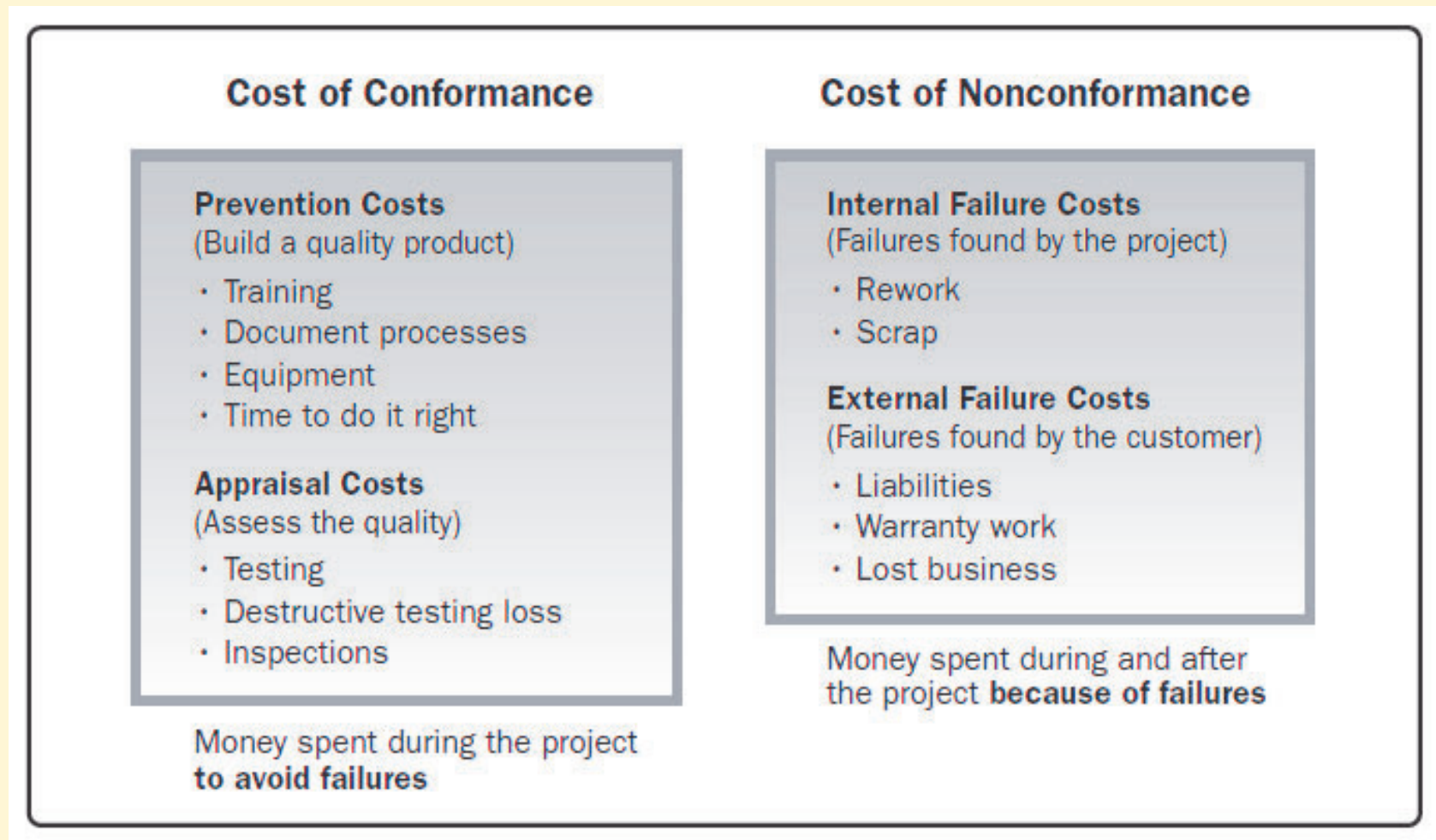
Dr Andre Samuel

Why Project Quality Management?

- Completing a project on time and within cost, loses importance if Quality is not attained
- Since rework, condemnation and accidents may be the results, which ultimately leads to delays and cost overruns
- Project Quality Management is designed to assure the attainment of Quality.

“quality is never an accident, it is the result of intelligent effort” John Ruskin

Cost of Quality



Total Cost of Quality = Prevention Cost + Appraisal Cost + Failure Cost

Implications

- A **balance** should be found between the Cost of Prevention and Appraisal and the Cost of Failure
- **Poor Quality Management Processes will lead to higher Failure Cost**
- By implementing **planned appraisal and prevention audits the Total Cost of Quality will reduce.**

So What is Quality?

- Customers know it when they see it!
- Suppliers promise that their goods and services embody it !
- Therefore:
 - Customers demand quality and an organization promise to deliver quality
- But the project manager is the one who has to do it!

Some Definitions

- Quality is what customer expects as a lasting experience
- Joseph M. Juran:
 - Quality means “features of products which meet customer needs and thereby provide customer satisfaction.”
 - Quality also means “freedom from deficiencies.”

Quality has to do with:

- **Customers-** quality is defined by customers, their needs, and their expectations.
- **Product-** We define quality by our view of the features or attributes of some particular product
- **Defects-** We expect quality products to be free of defects
- **Processes-** If we manufacture a product, we probably care very much about processes. The processes that produce that product have great effect on the outcome

Bottom Line

- What the customer or stakeholder needs from the project, and therefore can be different on a per-project basis.
- The main objective in **project quality management** is making sure that the project meets the needs it was originally created to meet—nothing more, nothing less.
- In other words, to ensure quality, you must meet the needs of the stakeholder

The Problem- Gaps



How the customer explained it



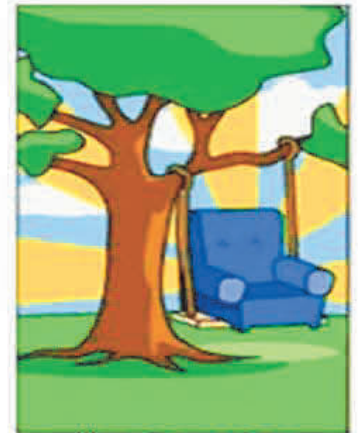
How the project leader understood it



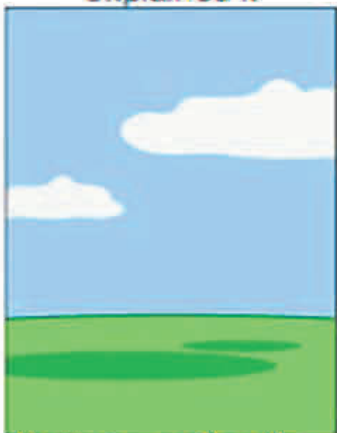
How the engineer designed it



How the programmer wrote it



How the sales executive described it



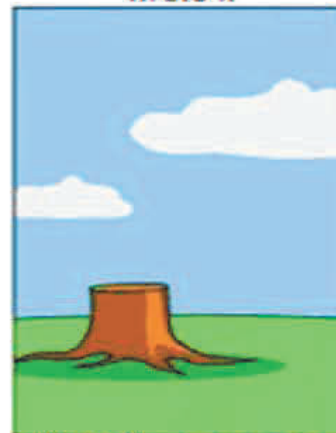
How the project was documented



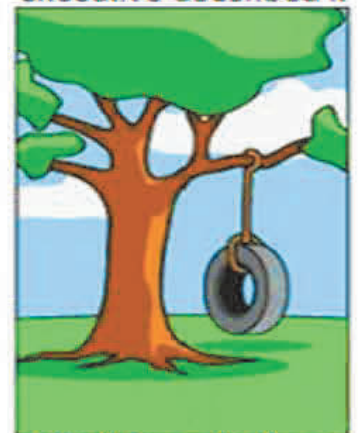
What operations installed



How the customer was billed

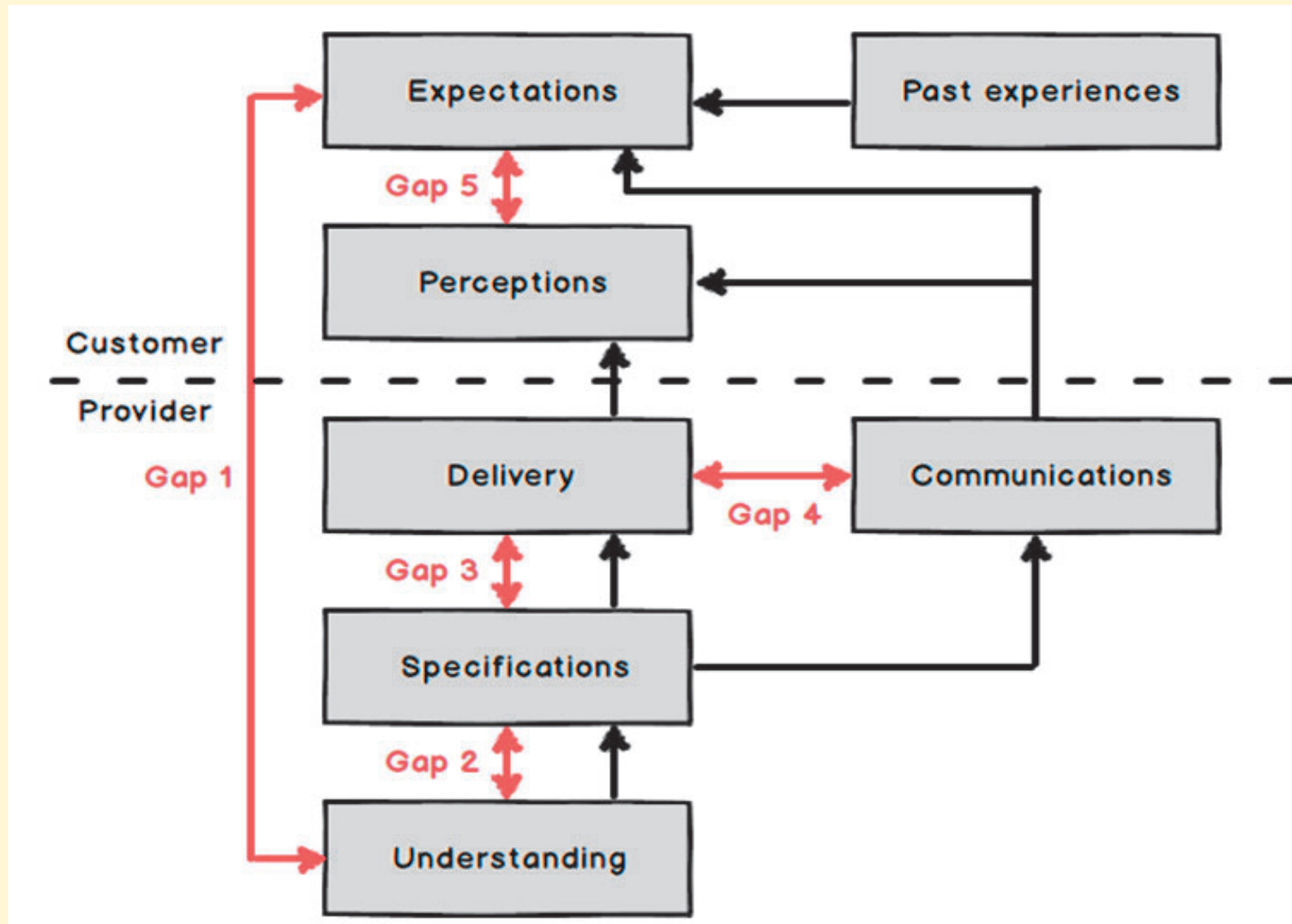


How the helpdesk supported it



What the customer really needed

Gap Model - Parasuraman et al. (1985)



GAP Model

- It recognises five major areas where quality gaps can occur between expectations and reality:
 1. Customer expectations and manager expectations
 2. Management perceptions of what is required and what is actually delivered
 3. Documented quality levels and actual delivered quality levels
 4. Level of quality promised and level of quality delivered
 5. Customers expectations and perceptions

Never, never, ever trade-off quality

- Quality can be achieved without extra cost!
- Using Juran and Godfrey (1999) quality is “fit for purpose”
 - downgrading quality is not an option, **non-negotiable**
- Hence using “level of specification” or “performance” is more negotiable
 - **Marble floors** vs **carpeted floors**- fit for purpose, but cost saving as the level of specification has changed

Quality vs Grade

- **Quality**

- as a delivered performance or result is “the degree to which a set of inherent characteristics fulfill requirements” (ISO 9000)

- **Grade**

- as a design intent is a category assigned to deliverables having the **same functional use but different technical characteristics**

- **Low quality is always a problem**

- **Low grade may not be a problem**

Activity- Preferred Option- Quality vs Grade

- A software may be of:
 - **Option 1:**
 - High Quality- no obvious bugs, readable manual
 - Low Grade- limited number of features
 - **Option 2:**
 - Low quality- many bugs, poor documentation
 - High Grade- numerous features
- Use the chat! Option 1 or 2?

Ultimately

- The project manager and project management team have a special responsibility to **balance quality and grade**
- This responsibility ensures quality expectations are met.
- This means that it might be possible and reasonable to have a quality, low-grade product,
- But it is **never acceptable to have a low-quality product.**

Discussion- Do we Add Extras?

- **Quality is not** about giving the customer extras or completing extra work.
- The notion of extras is often based on possibly erroneous perceptions of what you believe the customer wants.
- These extras add time, possible costs and other impacts to a project but do not always result in increased customer satisfaction.

Understanding Product Quality

- Fitness for use
- Compliance with requirements
- Conformance
- Performance
- Reliability
- Durability

Project Quality?

- ‘how diligent are we in terms of **project processes** to deliver **project objectives**’?
- This is the minimum requirement to meet the customer needs.
- ‘how good is our project management ... as a vehicle for delivering the longer-term outcomes and benefits as required by the sponsors and end users’.

- **Turner (2002)** is among the few authors who attempts to more clearly define project quality comprising two dimensions:
 - **Product Quality**- WHAT?- Outcome- quality of the product of the project
 - **Process Quality**- HOW?- Processes- quality of the project itself
- **PMI (2013)**
 - “the degree to which a set of inherent characteristics fulfill requirements”

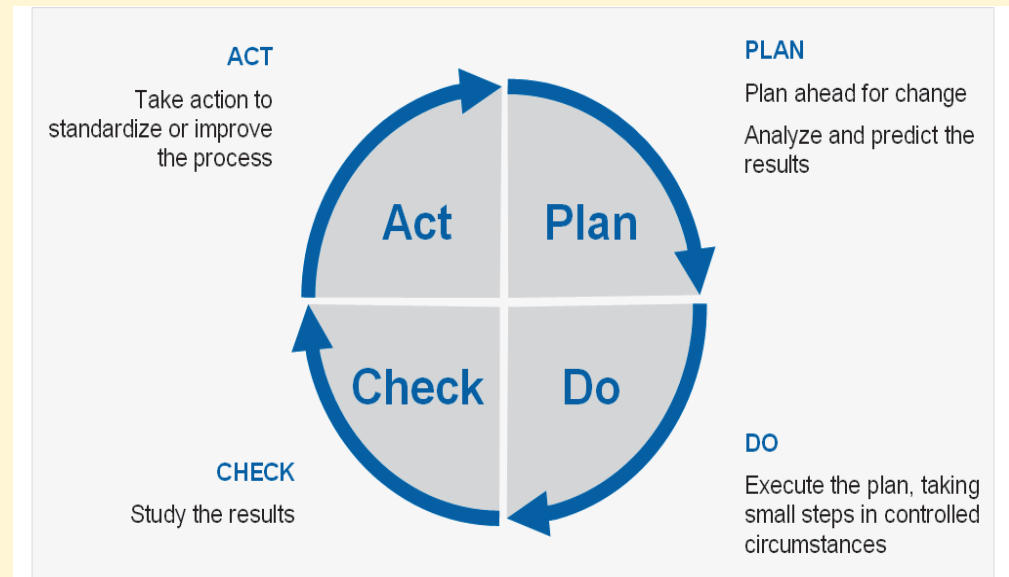
- **Project Quality Management includes** the processes and activities of the performing organization that:
 - **determine quality policies, objectives, and responsibilities**
 - so that the project will satisfy the needs for which it was undertaken.
- It **supports continuous process improvement** activities as undertaken on behalf of the performing organization.
- Project Quality Management works to ensure that the project requirements, including product requirements, are met and validated

Project Quality Management Frameworks

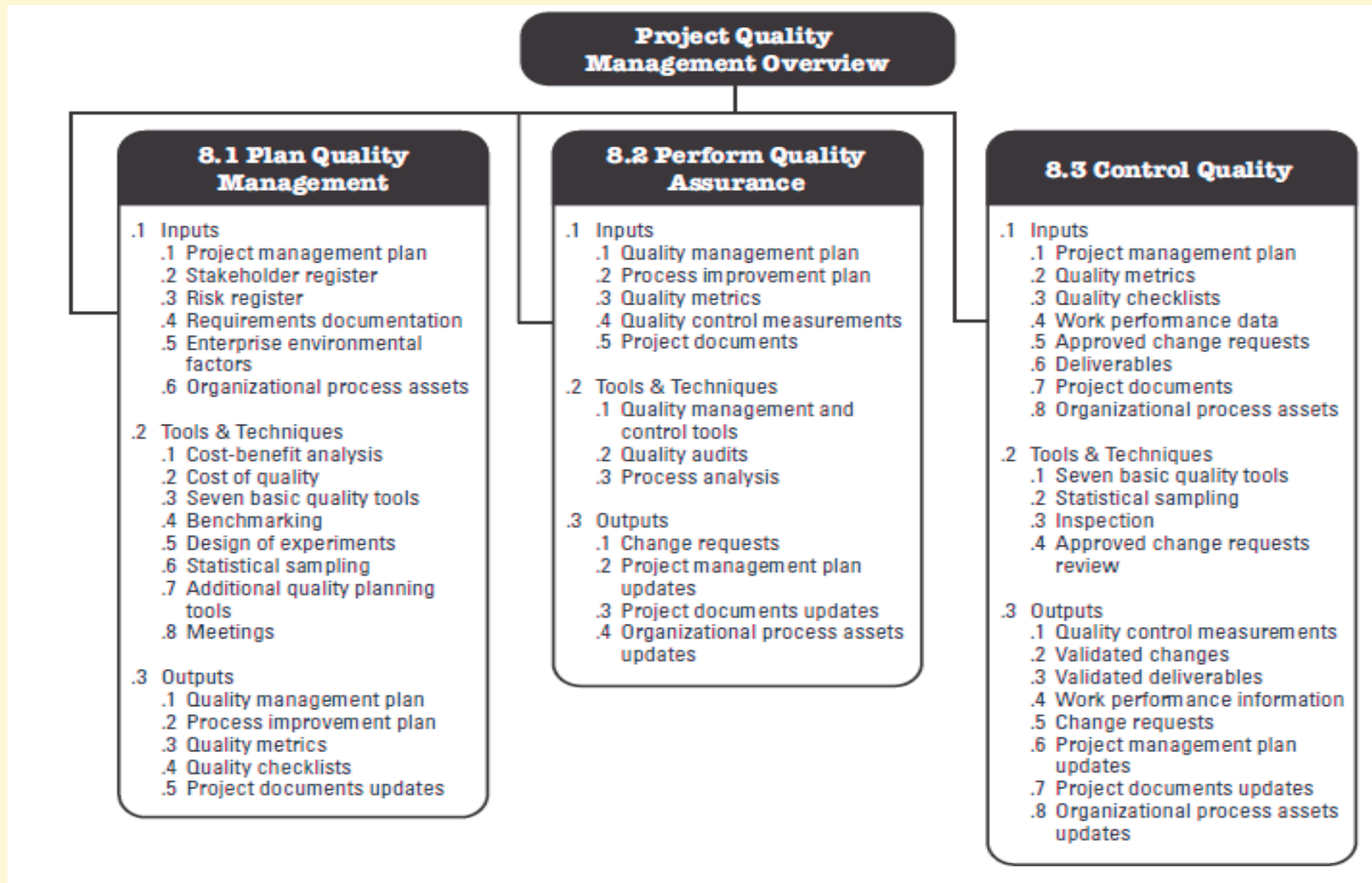
- PDCA cycle
- PMI Quality Management Processes
- Prince 2 Quality Management

PDCA Cycle

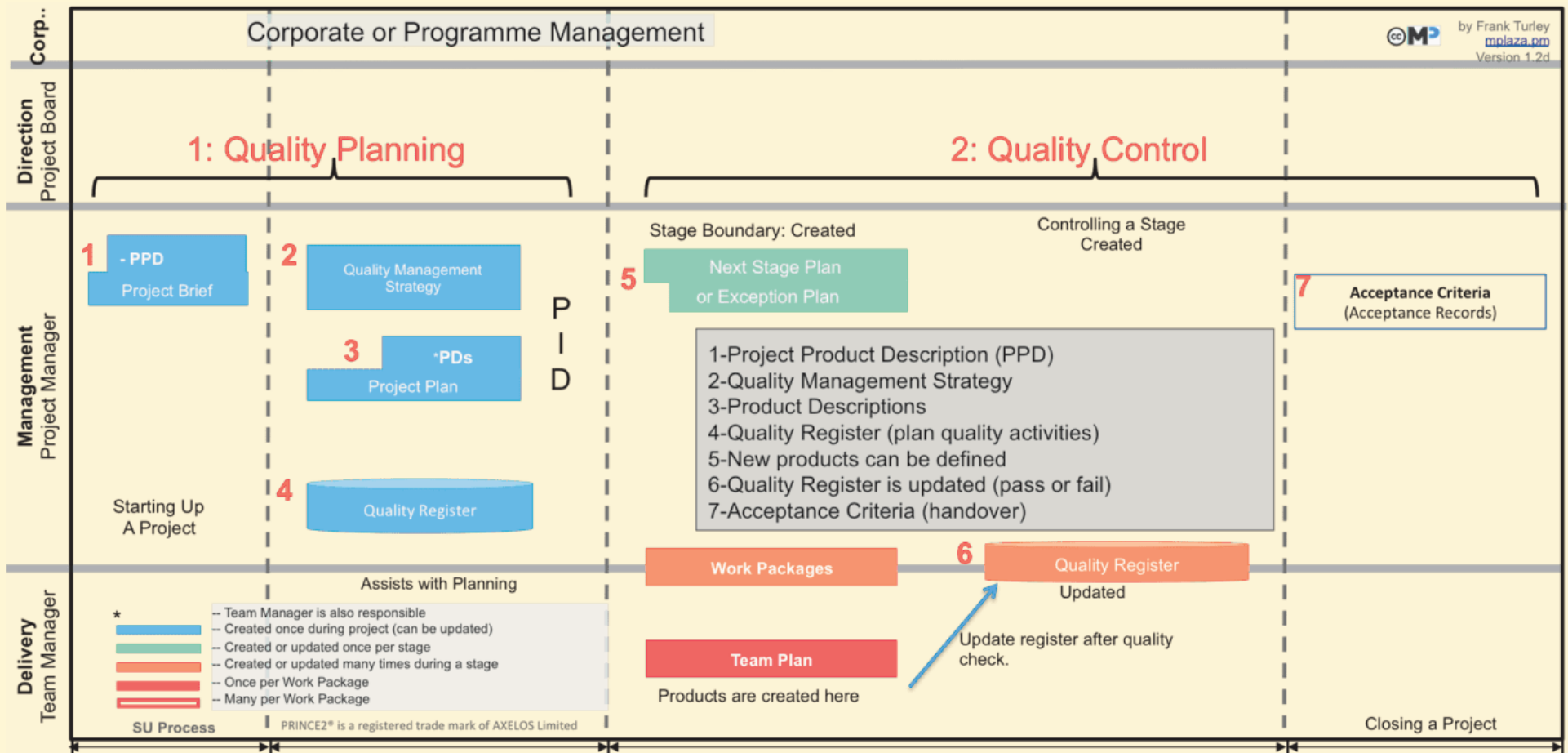
- Developed by Edward Deming
- Create vision and demonstrate commitment
- Learn the philosophy of quality – meeting customer satisfaction levels
- Understand inspection
- Don't make decisions purely on cost
- Improve constantly and forever



PMI Quality Management Processes



Prince 2 Quality Management



Quality Management Planning

- To achieve quality requires a clear definition of function, performance objectives and Design
- **Translation of the requirements into drawings, procedures and instructions**
- Therefore, it 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.
- **As such, it provides guidance and direction on how quality will be managed and validated throughout the project.**

Example of Quality Planning- Translation of Requirements into Specification and Performance

A. Cladding Material

All cladding shall be 4.0mm thick aluminium composite panel comprising a core containing not less than 70% non-combustible mineral filling sandwiched between two skins of aluminium alloy as follows:

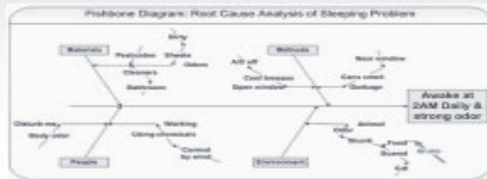
- i. Aluminium skin:
 - 0.5mm thick
- ii. Mechanical Properties:
 - Tensile strength $\geq 130 \text{ N/mm}^2$
 - 0.2% proof stress $\geq 90 \text{ N/mm}^2$
 - Elongation $5.65 \sqrt{S_0} \geq 10\%$
 - Modulus of Elasticity $70,000 \text{ N/mm}^2$
- iii. Vibration and Noise Damping:
 - Average airborne – sound transmission loss RW 26 dB (DIN 4109)
- iv. Rigidity (E x I)
 - $0.240 \text{ kNm}^2/\text{m}$
- v. Panel weight:
 - $7.6\text{kg}/\text{m}^2$
- vi. Finish
 - The external cladding panel surface shall be factory prefinished by the manufacturer with a Fluoropolymer coating of either PVDF or FEVE or combination of both applied through a "REVERSE ROLLER COATING" process. Total dry-film thickness of the coating shall be 25 microns minimum consisting of a chromate conversion coating, an inhibitive primer and a top coat. The coated surface shall comply strictly with:
 - EN13523 "Coil Coated Metals – Test Methods" as required by ECCA (European Coil Coating Association) to achieve the quality Label Category 1
 - AAMA 2605-11
 - The finished surface shall be factory protected with a self-adhesive peel-off foil, tested to withstand at least 3 months' exposure to local weather conditions without losing the original peel-off characteristic or causing stains or other damages.
 - Application of the Fluoropolymer coating system by means of spray coating before or after forming and shaping of the cladding elements shall not be permitted.
 - The reverse side of the cladding panel surface facing the wall shall be in mill finish.

Quality Control

- Control Quality is the **process of monitoring and recording results of executing the quality activities to assess performance** and recommend necessary changes.
- The **key benefits** of this process include:
 - (1) **identifying the causes of poor process or product quality** and recommending and/or taking action to eliminate them; and
 - (2) **validating that project deliverables and work meet the requirements specified** by key stakeholders necessary for final acceptance.
- The **Control Quality process uses a set of techniques** to verify that the delivered output will meet the requirements.

Project Quality Control Tools- 7QC Tools

Cause & Effect Diagram



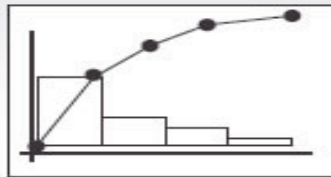
Flowcharts



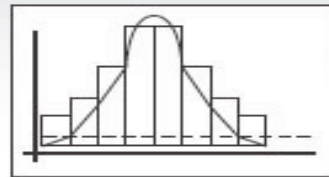
Checksheets

| Category | Strokes | Frequency |
|--------------|---------|-----------|
| Attribute 1 | | |
| Attribute 2 | | |
| Attribute .. | | |
| Attribute n | | |

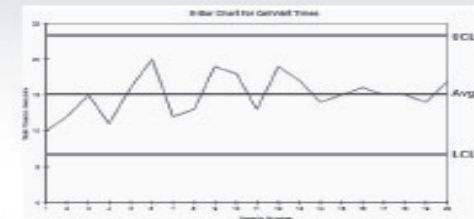
Pareto Diagrams



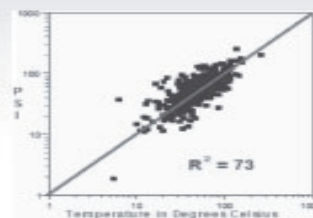
Histograms



Control Charts



Scatter Diagrams



Product Quality Control Tools

- **Inspection-** is the examination of a work product to determine if it conforms to documented standards.
- The results of an inspection generally include measurements and may be conducted at any level.
- For example, the results of a single activity can be inspected, or the final product of the project can be inspected.
- Inspections may be called reviews, peer reviews, audits, or walkthroughs. In some application areas, these terms have narrow and specific meanings.
- Inspections also are used to validate defect repairs.

Quality Control Tools: Inspections and Tests

- **List the inspections and tests** that will be performed over the life cycle of the construction project
- **Inspect each phase of the construction** as part of the overall construction project management of your build.
- **Conduct tests to verify the quality of material** used or the functioning of quality management systems

Quality Control- During Construction phases

- **Preconstruction phase:**

- Supplier qualifications
- Peer reviews

- **Post construction phase:**

- Commissioning and validation
- Close-out

- **Construction phase:**

- Pre-installation meetings
- Collaboration
- Mock ups
- Initial inspection of first-install work
- Compliance inspections
- Zero-defect policy
- Follow-up inspections
- Testing

Quality Register

- The Quality Register is a diary of the Quality events that take place during the project,
- Such as workshops, reviews, testing and acceptance

Quality Register Template

| Product ID | Product Name | Quality Method | Producer | Reviewers | Approver | Target Review Date | Actual Review Date | Target Approval Date | Actual Approval Date | Result | Records |
|------------|------------------|------------------|----------|-----------|----------|--------------------|--------------------|----------------------|----------------------|--------|-----------------------|
| 11 | Wall Insulation | Inspection | JV | WP | RT | 2/10 | 10/10 | 10/10 | 11/10 | Pass | links |
| 12 | Heating Furnace | Inspection | TM | TL | RT | 21/10 | 21/10 | 27/10 | 30/10 | Fail | links |
| 12 | Heating Furnace | Performance test | MP | TL | RT | 21/10 | 21/10 | 27/10 | 30/10 | Pass | links |
| 13 | Kitchen Fittings | Inspection | AM | OH | BD | 5/11 | 7/11 | 14/11 | 18/11 | Pass | links |
| .. | ... | | .. | .. | .. | ... | | | | ... | |

Quality team comprises

- QC department
- Third-Party Inspection Agency
- Owners or Client's Engineer or Representative.
- Auditors (Internal and external)

Software Quality Control Tools

- Reviews

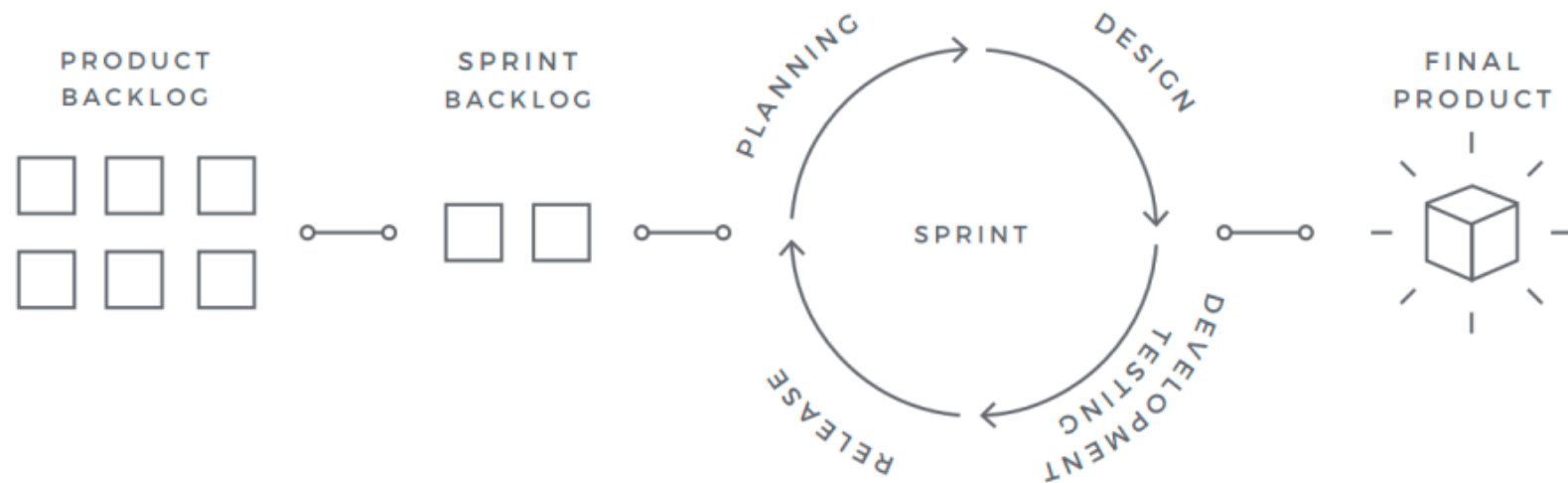
- Requirement Review
- Design Review
- Code Review
- Deployment Plan Review

- Testing Levels

- Unit Testing
- Integration Testing
- System Testing
- Acceptance Testing

Agile Testing

- Agile breaks the development process into smaller parts, iterations, and sprints

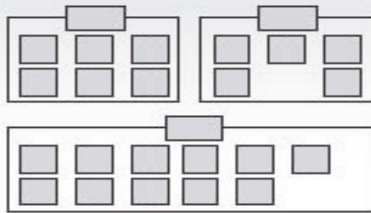


Quality Assurance

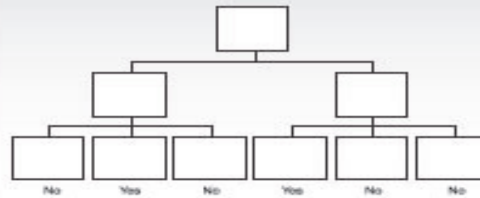
- Quality Assurance is the process of:
 - **auditing** the quality requirements
 - and the results from quality control measurements
 - to ensure that appropriate quality standards and operational definitions are used.
- The key benefit of this process is that it facilitates the **improvement of quality processes**.
- Seeks to build confidence that a future output will be completed in a manner that meets the specified requirements and expectations.
- Preventing defects through the planning processes or by inspecting out defects during the work-in-progress stage of implementation

Quality Assurance Tools

Affinity Diagram



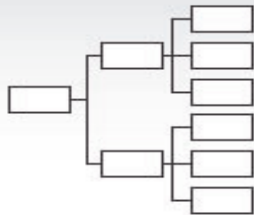
PDPC



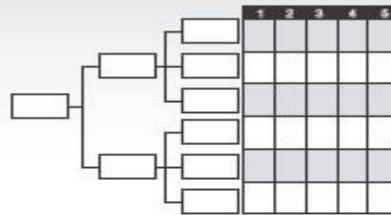
Interrelationship Digraph



Tree Diagrams



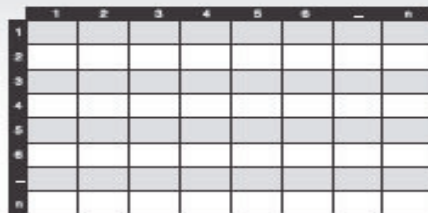
Prioritization Matrices



Network Diagrams



Matrix Diagrams



Link between Testing, QC and QA in Software Development



QA, QC and Testing in software development process

Quality Assurance, Quality Control, and Testing

| | QA | QC | Testing |
|----------------|--|--|--|
| Purpose | Setting up adequate processes, introducing the standards of quality to prevent the errors and flaws in the product | Making sure that the product corresponds to the requirements and specs before it is released | Detecting and solving software errors and flaws |
| Focus | Processes | Product as a whole | Source code and design |
| What | Prevention | Verification | Detection |
| Who | The team including the stakeholders | The team | Test Engineers, Developers |
| When | Throughout the process | Before the release | At the testing stage or along with the development process |