What is Quality

Meeting the customers requirements

Reliability

The ability of a product or service to continue to meet the customer's requirements satisfactorily over a period of time

Importance on customer loyalty

Cost less to retain than acquire

Longer relationship higher profitability

Half new customers come through referrals

Levels of Quality

System focus

Specific project/process

Daily work

Old vs new Satisfaction model

Kano	Traditional
• Performance on the attributes of certain categories produces higher levels of satisfaction than others	• more is better, i.e. the more you perform on each service attribute the more satisfied the customers will be

Critical to Quality Characteristics

• Dissatisfier – 'Must be's' – Cost of Entry • Satisfier – More is better – Competitive • Delighter – Latent Need – Differentiator

Levels of Customer Requirement

• **Basic** – fundamental features, customer does not even think about
• **Normal** – expected features, stated by customers
• **Latent** – additional features, customers not aware they need them

Cost of Quality

Total cost of both preventative and reparatory
- **Internal failure costs** – those associated with defects found at the company
- **External failure costs** – those associated with defects found after the customer receives the product

Quality Tools and Areas of use

Data Collection and Analysis	-Check sheets	Gathering Data, no additional processing required, simple layout
	- Scatter Diagram	Establish association between two variables, shows strong or weak correlations
Cause Analysis	Ishikawa Diagram (fishbone or cause-effect diagram)	Catergorise causes of problems or issues and identify root couse and potential outcomes

Quality Tools and Areas of use (cont)

	Pareto Diagram	80% of problems come from 20% causes, prioritise areas for improvement and investment first
Process Analysis	Flowcharts	Sequences of activities and flows of materials, pin point places where quality measurements should be taken
	Poka - Yoke	Prediction, recognise defect is about to occur - Detection, recognising that a defect has occured and stopping the process
	Failure **M**ode **E**ffect **A**nalysis	Analysing potential reliability problems **in devleopment cycle** where it is easier to take actions
		Identify Potential failure modes and effects on operations to mitigate failures

Quality Tools and Areas of use (cont)

Capture historical information for improvement

Cosistent use in design process

Cost of Quality

Total cost of both preventative and reparatory

- **Internal failure costs** – those associated with defects found at the company
- **External failure costs** – those associated with defects found after the customer receives the product

Fundamentals of FMEA

1. Define scope, functional requirements, design parameters and process steps.
2. Identify potential failure modes
3. Potential failure effect
4. Severity
5. Potential causes
6. Occurrence
7. Current controls
8. Detection
9. Risk Priority Number (RPN)
10. Actions recommended

4 Houses of Quality

1. Identify customer requirements
2. Identify technical requirements
3. Relate technical requirements to customer requirements
4. Consider interrelationships between technical requirements
5. Develop importance ratings
6. Conduct an evaluation of competing products and services

4 Houses of Quality (cont)

7. Evaluate technical requirements and develop targets

Why would a project have risk?

Unique, complex, assumptions and constraints, people, stakeholder requirements, change, environment

Levels of risk management

Eliminate root cause	What leaads to it
Eliminate risk	prevent risk
Reduce risk	reduce likelihood
React to risk	emergency plans to react quickly
Crisis management	treat problems that occur from non-identified risks

ISO 9000 Family

The ISO 9000:7 principles:

Customer Focus

Leadership

Engagement of people

Process approach

Improvement

Evidence based decision making

Relationship Management

Advantages and disadvantages of ISO certifications

What is Six-Sigma?

“Level of process performance equivalent to producing only **3.4 defects for every 1 million opportunities or operations [DPMO].** - using sigma based process measures and striving for six-sigma

Steps to implement six-sigma

Sigma 6 critical success factors

Factor	Explanation
Strategic objectives	
Champion projects	Support teams and overcome resistance
Quantifiable measures	
Tools and analysis	Implement and improve project
Metrics	Focus on business results
Training	Teams and reduce waste
Qualified process improvement experts	
Clear communication	
Set stretch objectives for improvements	
measure and recognise financial benefits	

DMAIC

Define
Measure
Analyse
Improve
Control

What is SPC?

Statistical Process Control (SPC) is an industry-standard method-ology for measuring and controlling quality during the manufacturing process.

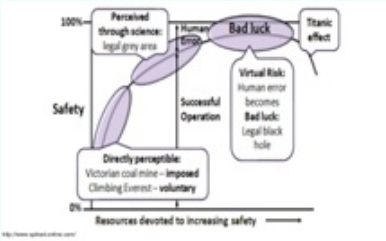
Cp and Cpk

Needs to be greater than 1 and approaching 2 but not too high. Cp close to 1-2 significant range correct Cpk leans to one side if not 1-2

A+D 9001

• Create a more efficient and effective operation • Increase customer satisfaction and retention • Improve employee awareness and involvement • Reduce waste and increases profitability • Increase profits • Enhance marketing • Promote international trade	Disadvantages of Certification • From an Engineer's perspective • Time consuming - lots of paperwork • Full of management jargon • High level process with limited communication from management • Lack of unders-tanding - leading to poorly focussed efforts • Unclear quality benefits

Human reliability curve



Human Error

Error of omission	Operator fails to perform step	
Error of Commission	Operator performs step incorrectly or adds additional steps	
Mistakes	Knowledge based	Wrong as did not assess situation
	rule based	wrong rule used
	fail to come up with solution	
Slips	right intention excuted wrong	
	capture errors	routine behaviour incorrect in situatio ne.g. press enter when not meant to

Human Error (cont)

Lapses	Failure to carry out action	**Errors of Omission**
Mode errors	Right response in wrong mode	e.g. caps lock on password

Risk Attitudes

Risk Averse
Risk Neutral
Risk Seeking

Risk Management ISO 31000

Component 1 - Principles - What risk management is aiming to achieve + how its integrated in the structure
Component 2 - Risk Management framework design implement monitor etc.
Component 3 - Risk M Process - continually monitor and review identify analyse select risk treatment

Importance Of

Aspect	Terminology	Details
Risk Assessment	A systematic method of examining a process or system to identify potential hazards or failures	**Quantitive** - risk relating to numbers - numerical measure of outcome
		Qualitative - Personal judgement as High, Medium or Low
Analysis	Set of procedures allowing a qualitative or quantitative representation of risk	**Preliminary Hazard Analysis** - Start of risk assessment to identify potential hazards

Importance Of (cont)

	What-if - Changing factors and seeing how those chnages affect outcomes, Can use scenarios to anticipate consequences
	HAZOP - List of Hazards, Then using process diagrams and guide words to look at potential deviations from normal operating conditions
	Failure Mode Effect (FMEA) - Design out errors to produce reliable, safe and customer pleasing products
	Human Reliability Analysis - Human input to risk
Tree Methods	**Fault tree** - Potential causes of fault or failure in a system, Boolean logic **TOP DOWN**

Importance Of (cont)

		Event Tree- Logical modelling technique to determine potential outcomes if fault occurs+ assessing probabilities **BOTTOM UP**
		Cause and Effect- (Fishbone) Assit teams in catergorising the potential causes, identify root causes
Management	Specific measures to mitigate or diminish the risk	**Redundancy** - Back up components that kick in is a component fails
		Fault Tolerance - allows a system to continue to function in event of failure of part of system - decrease is proportional to level of failure

What is Risk?

is the exposure to harm, danger or loss to someone or something valued, together with an indication of how serious the harm could be

• Risk:

• uncertainty based on a well grounded (quantitative) probability

• Risk = (the probability that an event will occur)

What is Risk? (cont)

x (the consequences if it does occur)

Excellence

MBNQA	EFQM

8 Fundamental Concepts of Excellence

- Adding Value for Customers
- Creating a Sustainable Future
- Developing Organisational Capability
- Harnessing Creativity and Innovation
- Leading with Vision, Inspiration and Integrity
- Managing with Agility
- Succeeding through the Talent of People
- Sustaining Outstanding Results

Phase of TQM Implementation

Phase 1: Awakening

Phase 2: Progression

Phase 3: Under control

Phase 4: Customer focused redesign

Phase 5: Quality Culture

TQM - Total Quality Management

Critical Success Factors for Achieving TQM

- Highly visible commitment of leaders
- Link to few clear, strategic goals
- Bespoke approach
- Customer focus
- Clear unambiguous communication
- Good team facilitation
- Employee empowerment

Good QMS

Customer requirements	Company requirements
Confidence in ability of organisation	Internal and external
	Efficients utilisation of available resources

QMS - Quality Management System

A set of business processes designed to meet the company quality policy and objectives, in order to deliver customer requirements

• Organisational structure • Policies • Procedures • Processes • Resources