A Beginner's Guide to Quality Management

About me

- Sandeep Kumar
- 11 Courses on Udemy
- 25000 + students

This course

- First launched in Sept 2014
- Revision 2 of this course
  - 100% re-recorded
  - Better audio and visuals

Target Students

- New to Quality
- Quality professionals interested in reviewing basics and philosophies
- Everyone in the organization
  - Quality is everyone’s responsibility
  - Sales, design, manufacturing, assembly, dispatch
  - Management or working level

What is Quality?

What is Quality?

- Quality has many definitions.
- Quality is defined by the customer
- A quality product or service is one that meets customer requirements.

What is Quality?

Conformance to requirements	CONFORMANCE
Fitness for Use	FIT FOR USE
Meeting Customer Expectations	EXPECTATIONS
Exceeding Customer Expectations	EXPECTATIONS
Superiority to Competitors	COMPETITION
Freedom from Deficiencies	DEFECTS FREE

What is Quality?

- **Conformance to Requirements**
  - Quality is keeping the promise made when an order is taken or a commitment is made.
  - Quality means meeting the specifications
  - The service or product is free of deficiencies.

CONFORMANCE

FIT FOR USE

EXPECTATIONS

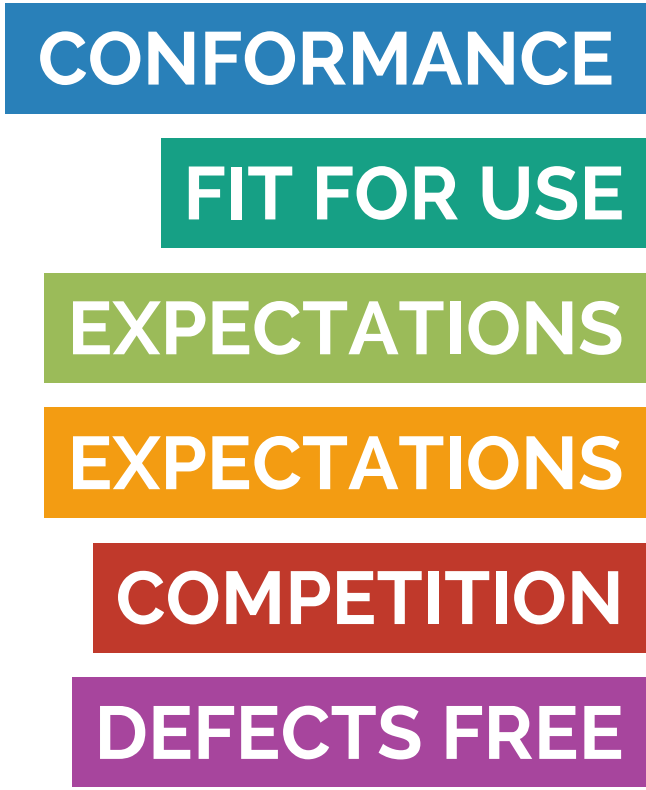
EXPECTATIONS

COMPETITION

DEFECTS FREE

What is Quality?

- **Fitness for Use**
  - Quality means the product or service does what it is intended to do
  - Quality is what a product or service costs users if it doesn't do what it is supposed to do



What is Quality?

- **Meeting Customer Expectations**
  - Quality is satisfying the customer
  - Quality is whatever the customer says it is
  - The quality of the product or service is whatever the customer perceives it to be.

CONFORMANCE

FIT FOR USE

EXPECTATIONS

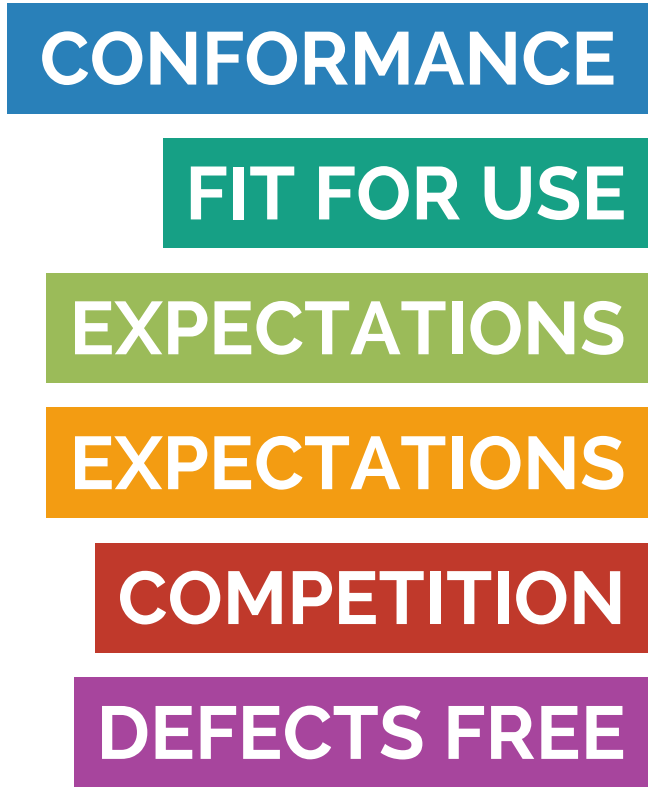
EXPECTATIONS

COMPETITION

DEFECTS FREE

What is Quality?

- **Exceeding Expectations**
  - Quality to the extent to which the customers/ Client believe the product or service surpasses their needs and expectations
  - Quality is delighting the customer



What is Quality?

- **Superiority to Competitors**
  - Quality is how a company's products and services compare to those of competitors or how they compare to those offered by the company in the past
  - Quality is perceived as the overall measure of goodness or excellence or a brand or supplier.

CONFORMANCE

FIT FOR USE

EXPECTATIONS

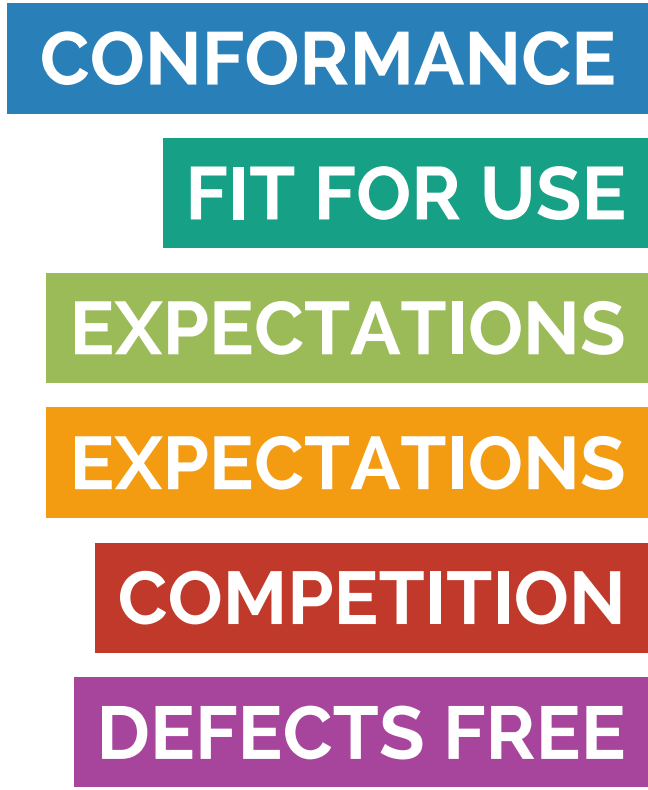
EXPECTATIONS

COMPETITION

DEFECTS FREE

What is Quality?

- **Freedom from Defects**
  - Defects that require doing work over again or that result in field failures, customer dissatisfaction, customer claims, and so on.
  - Higher quality " COSTS LESS".
  - Consistency is quality.



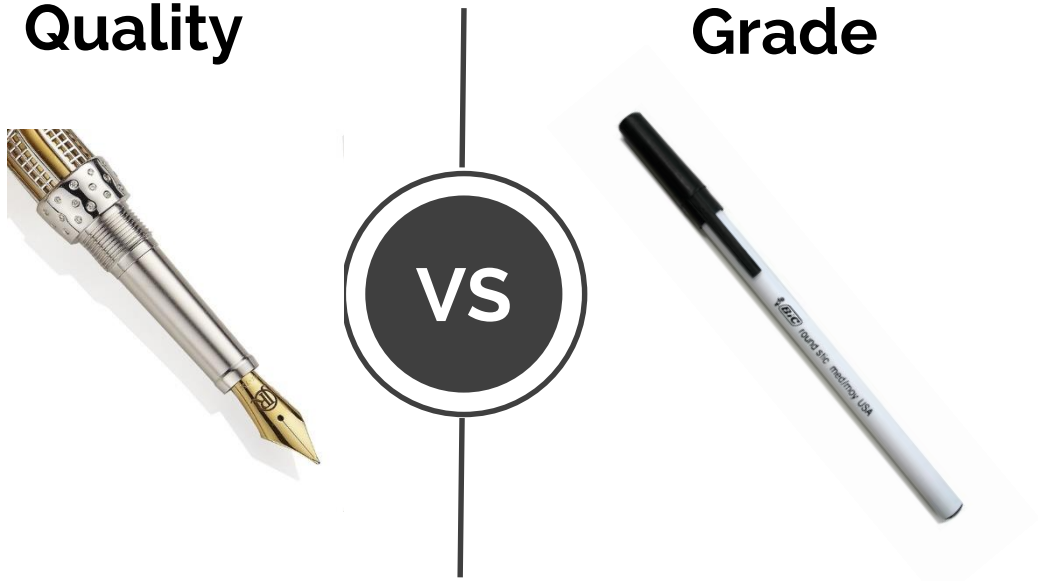
What is Quality?

- **ISO 9001:2015**
  - degree to which a set of inherent characteristics of an object fulfils requirements

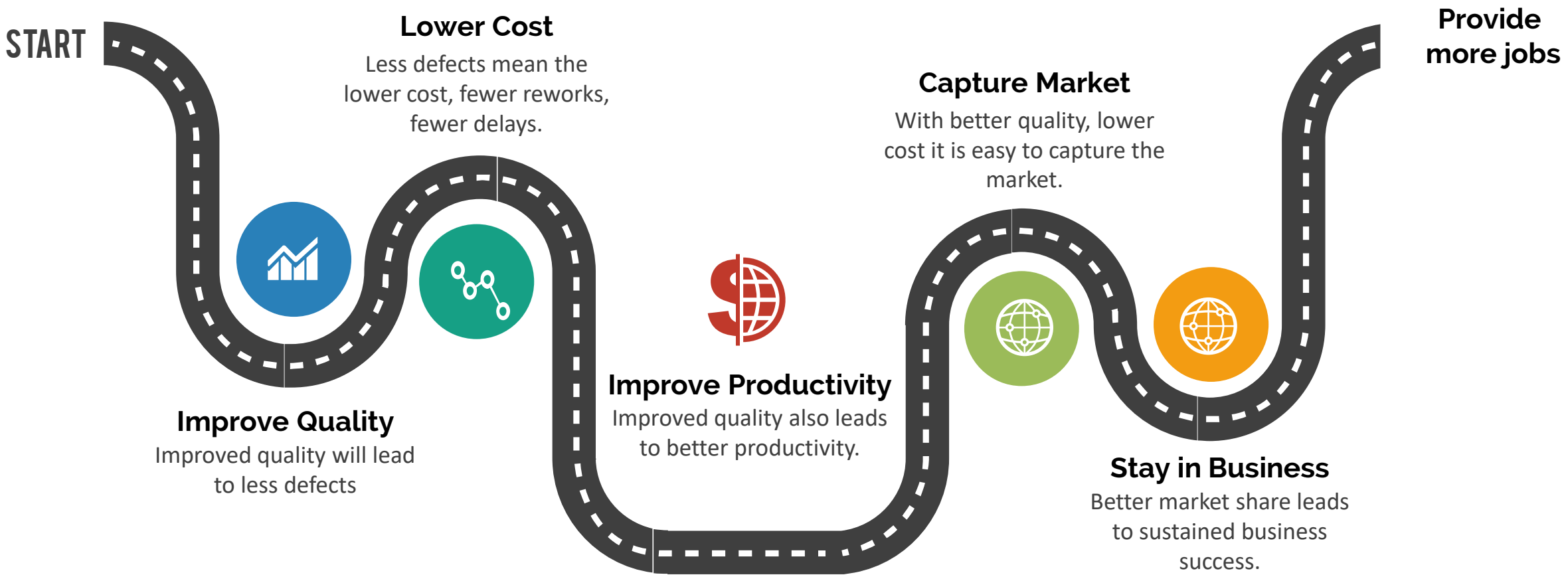
  - Note 1 : The term “quality” can be used with adjectives such as poor, good or excellent.
  - Note 2 : “Inherent”, as opposed to “assigned”, means existing in the object .

Quality vs Grade

- Grade is the category of the product.



Why Quality?



Deming Chain Reaction

Garvin's 8 Dimensions of Quality

Garvin's 8 Dimensions of Quality

1. Performance
   - Product's primary operating characteristics.

PERFORMANCE

FEATURES

RELIABILITY

CONFORMANCE

DURABILITY

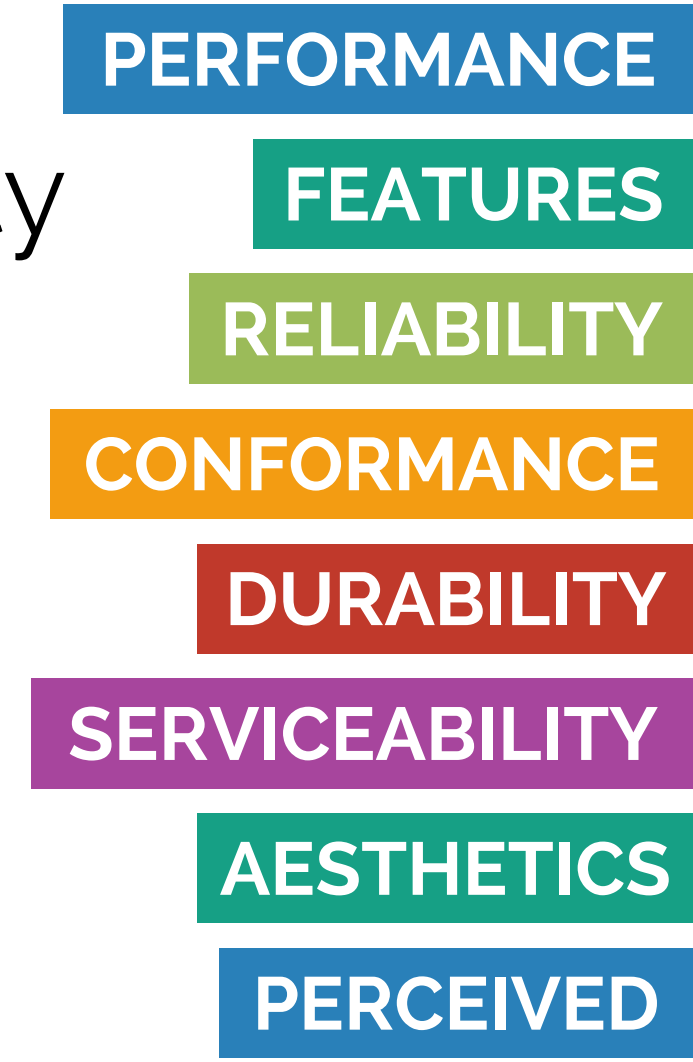
SERVICEABILITY

AESTHETICS

PERCEIVED

Garvin's 8 Dimensions of Quality

2. Features
   - The secondary aspects of performance.



Garvin's 8 Dimensions of Quality

3. Reliability
   - The probability of a product malfunctioning or failing within a specified time period.

PERFORMANCE

FEATURES

RELIABILITY

CONFORMANCE

DURABILITY

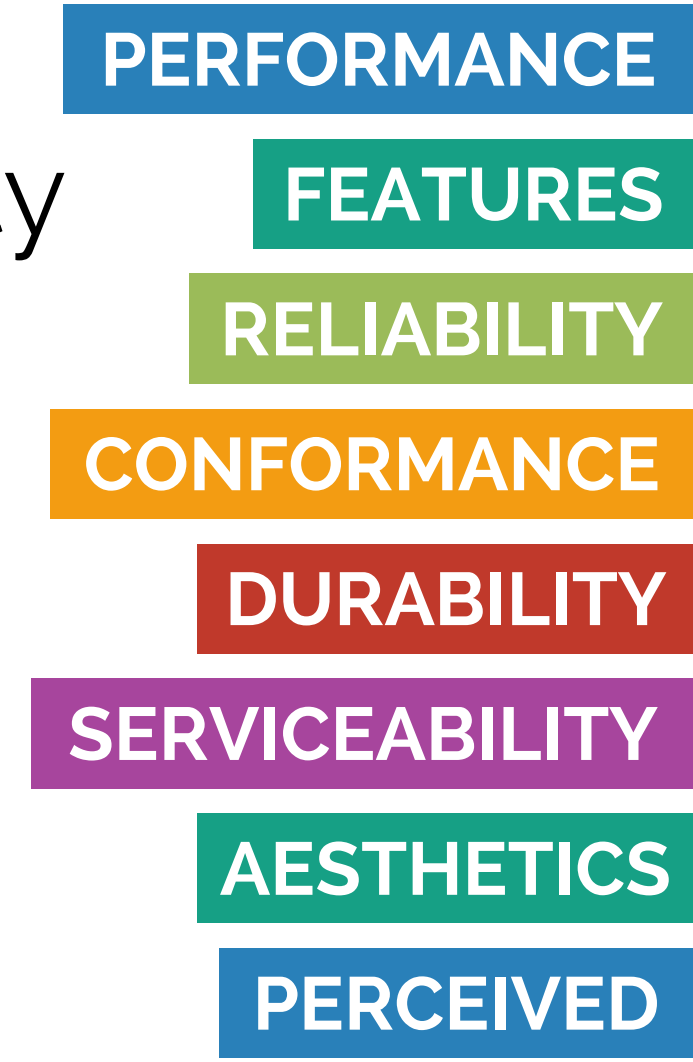
SERVICEABILITY

AESTHETICS

PERCEIVED

Garvin's 8 Dimensions of Quality

4. Conformance
   - Meeting established standards



Garvin's 8 Dimensions of Quality

5. Durability
   - Measure of product life

PERFORMANCE

FEATURES

RELIABILITY

CONFORMANCE

DURABILITY

SERVICEABILITY

AESTHETICS

PERCEIVED

Garvin's 8 Dimensions of Quality

6. Serviceability
   - Speed, courtesy, competence, and ease of repair

PERFORMANCE

FEATURES

RELIABILITY

CONFORMANCE

DURABILITY

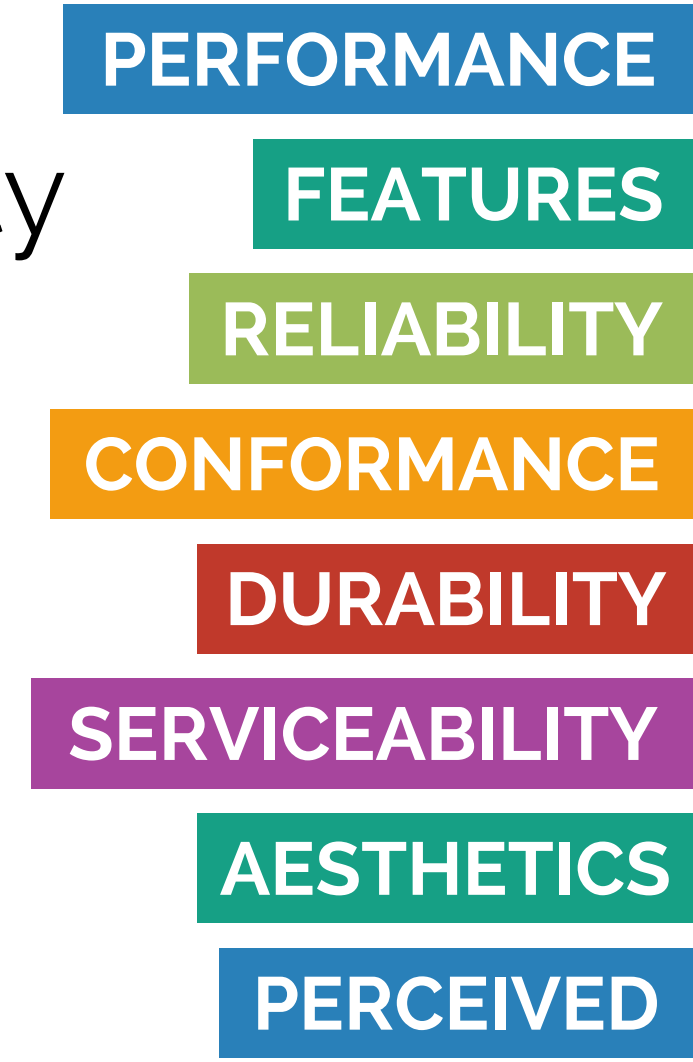
SERVICEABILITY

AESTHETICS

PERCEIVED

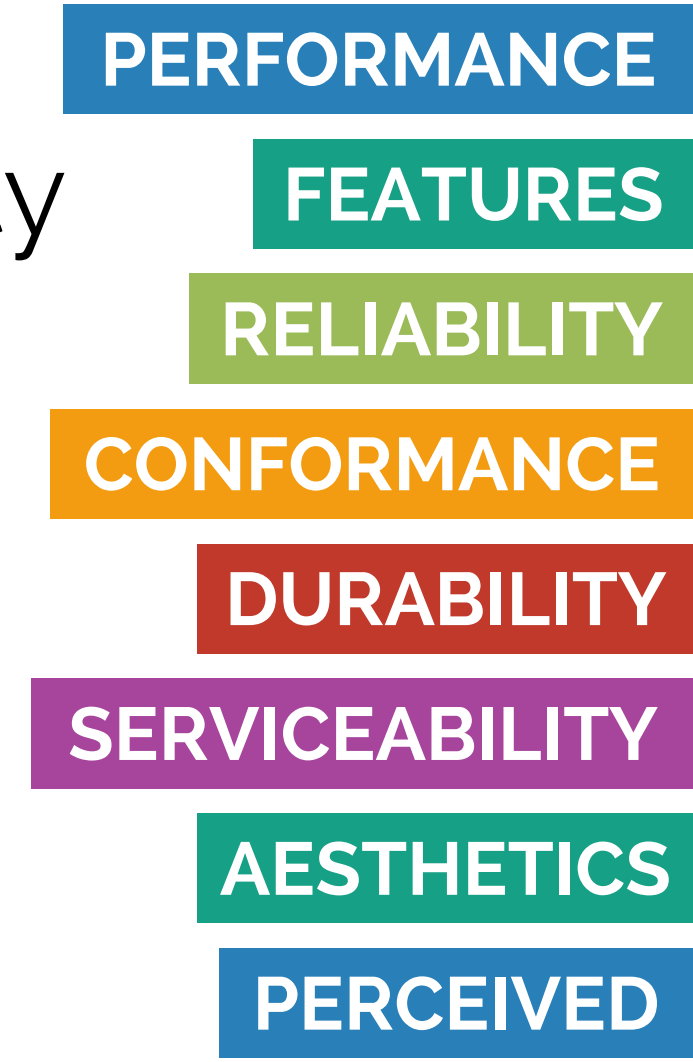
Garvin's 8 Dimensions of Quality

7. Aesthetics
   - Subjective dimension of quality



Garvin's 8 Dimensions of Quality

8. Perceived Quality
   - Indirect measure of comparing brands.



Quality Control

Quality Assurance

Quality Management System

Quality Control

- The operational techniques and activities used to fulfill requirements for quality.

Quality Assurance

- All the planned and systematic activities implemented within the quality system that can be demonstrated to provide confidence that a product or service will fulfill requirements for quality.

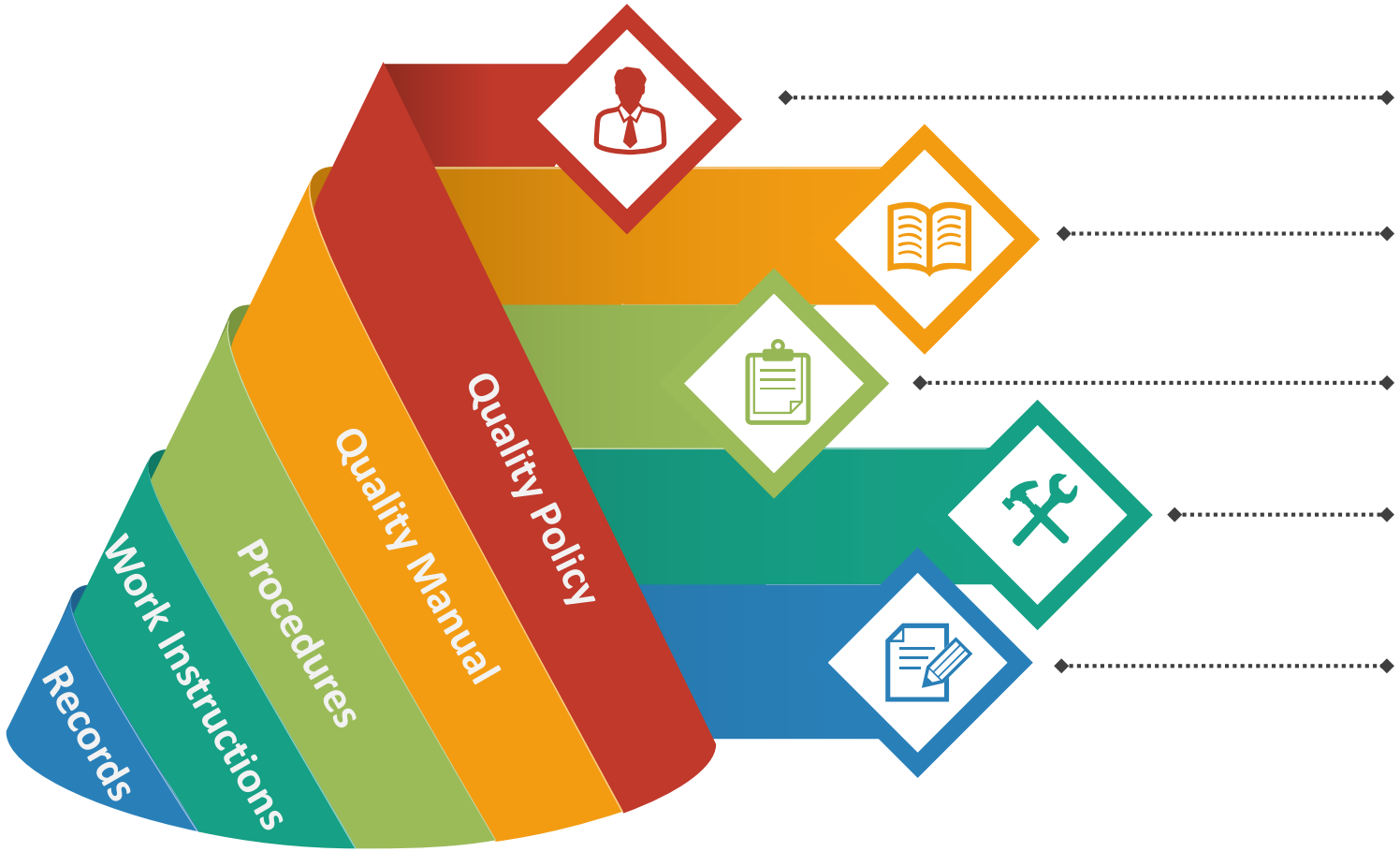
QC vs QA

QC	QA
Focused on Product	Focused on Process
Reactive	Pro-active
Line function	Staff function
Finds defects	Prevents defects
Testing	Quality audits

Quality Management System (QMS)

- Part of a management system with regard to quality (ISO 9000:2015)
- A formalized system that documents the structure, responsibilities and procedures required to achieve effective quality management.

Quality Management System (QMS)



Quality Policy
Overall direction in regards to quality.

Quality Manual
The Why? organizations commitment, system description

Procedures
The What? When? Where? Who?, Overall procedures.

Work Instructions
The How?, Detailed instructions to work.

Records
Objective Evidence?, Recorded data, for example filled in forms.

History of Quality

1900's

- Industrial expansion caused need for more focus on quality

1910

- Frederick W Taylor introduced the Principles of Scientific Management

6. Quality Timeline

1920's

- Walter Shewhart developed **Statistical Process Control (SPC)** and use of control charts. However, little use of SPC was made until 1940

1946

- American Society for Quality (**ASQ**) established

6. Quality Timeline

QUALITYGURUS

1950's

- Quality Management developed rapidly in Japan
- The first edition of Joseph M. Juran's Quality Control Handbook published. Juran was invited to Japan

1950's

- Deming trained hundreds of Japanese Engineers in Statistical Process Control and Concepts of Quality.
- The concept of Quality Costs by Armand V. Feigenbaum

6. Quality Timeline

QG | QUALITYGURUS

1960's

- **Kaoru Ishikawa**
  Introduced Seven Tools of Quality
- **Quality Circles**
  introduced by Ishikawa

1979

- **Philip Crosby**
  Published “Quality is Free”

6. Quality Timeline

QUALITYGURUS

6. Quality Timeline

1986

- **Six Sigma** formulated by Bill Smith in Motorola

1987

- International Organization for Standardization (ISO) introduced the first issue of **ISO 9001**

6. Quality Timeline

1988

- National Institute of Standards and Technology introduced **Malcolm Baldrige National Quality Award**

1991

- **European Foundation for Quality Management** Excellence Model launched

6. Quality Timeline

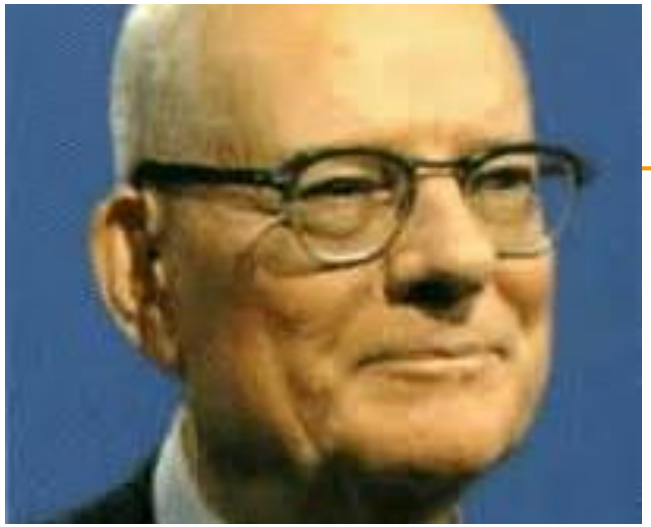
2008

- International Organization for Standardization (ISO) introduced the fourth issue of **ISO 9001**

2015

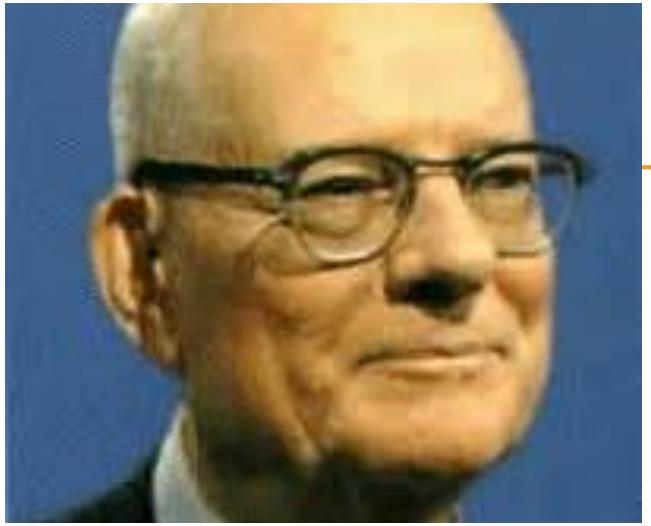
- Latest revision of **ISO 9001**

Three Quality Gurus



W. Edwards Deming

- 1928 - Ph.D. in Mathematical Physics
- 1920's, 30's - Western Electric.
- 1946-1993 Professor of Statistics
- 1950 – Taught Quality Control
- 1951 Deming Prize for high level of achievement in quality practices
- 1980 NBC "If Japan Can…Why Can't We?" US discovers



W. Edwards Deming

- Deming's Quality Chain Reaction
- 14 Principles of Management
- System of Profound Knowledge
- Seven Deadly Diseases
- Variation – Common Cause vs Special Cause
- Red Bead Experiment

1. Create Constancy of Purpose

Create constancy of purpose toward improvement of product and service, with the aim to become competitive and to stay in business and to provide jobs.

- Long tern view
- Customer focus
- Invest in innovation, training, research
- Improve competitive position

2. Adopt the New Philosophy

Adopt the new philosophy. We are in a new economic age. Western management must awaken to the challenge, must learn their responsibilities, and take on leadership for change.

- Be prepared for changes
- Improve the customers' satisfaction
- Train people

3. Cease Dependence on Mass Inspection

Cease dependence on inspection to achieve quality. Eliminate the need for inspection on a mass basis by building quality into the product in the first place.

- Inspection is too late
- Build quality in processes

4. Don’t Award Business on the Basis of Price

End the practice of awarding business on the basis of price tag. Instead, minimize total cost. Move toward a single supplier for any one item, on a long-term relationship of loyalty and trust.

- Multiple suppliers lead to increased variability
- Volume discounts, fewer setups
- Supplier-customer bond

5. Improve Constantly and Forever

Improve constantly and forever the system of production and service, to improve quality and productivity, and thus constantly decrease costs.

- Reduce causes of variation
- Engage all employees
- PDCA approach

6. Institute Training on the Job.

Institute training on the job.

- People want to do a good job
- They need training to know how to do a good job
- Invest in their future
- Training should include tools for
  - Identify improvement opportunities
  - Solving quality problems

7. Institute Leadership

Institute leadership. The aim of supervision should be to help people and machines and gadgets to do a better job.

- Supervisors need to understand processes.
- Good supervisors are coaches, not policemen.

8. Drive Out Fear

Drive out fear, so that everyone may work effectively for the company.

- Managers and workers must have mutual respect
- Make workers feel valued and encourage them to improve processes.

9. Break Down Barriers

Break down barriers between departments. People in research, design, sales, and production must work as a team to foresee problems of production and use that may be encountered with the product or service.

- Build the concept of internal customers.
- Common vision
- Cross functional teams

10. Eliminate Numerical Goals, Posters and Slogan

Eliminate slogans, exhortations, and targets for the work force asking for zero defects and new levels of productivity.

- Slogans assume quality problems caused by people
- Deming thinks the system is responsible for problems
- Workers demoralized when they cannot fix defects, and yet are held accountable

11. Eliminate Numeric Quotas

a) Eliminate work standards (quotas) on the factory floor. Substitute leadership.

b) Eliminate management by objective. Eliminate management by numbers, numerical goals. Substitute leadership.

- They do not encourage improvement
- Arbitrary goals are demoralizing without a plan of how you can reach those goals

12. Remove Barriers to Pride in Workmanship

a) Remove barriers that rob the hourly worker(s) of their right to pride of workmanship.

b) Remove barriers that rob people in management and in engineering of their right to pride of workmanship.

- Don't make your people compete against each other
- Abolish annual merit rating

13 Education & Retraining

Institute a vigorous program of education and self-improvement.

- Encourage workers to learn new skills to face future challenges.

14. Take Action

Put everybody in the company to work to accomplish the transformation. The transformation is everybody's job.

- Involve everyone
- Start the cultural change with top management
- People will be skeptical until they start to see change

Joseph Juran

- 1920s - Joined Western Electric
- 1951 – Quality Control Handbook
- Taught quality principles to Japanese in 1950s

Joseph Juran

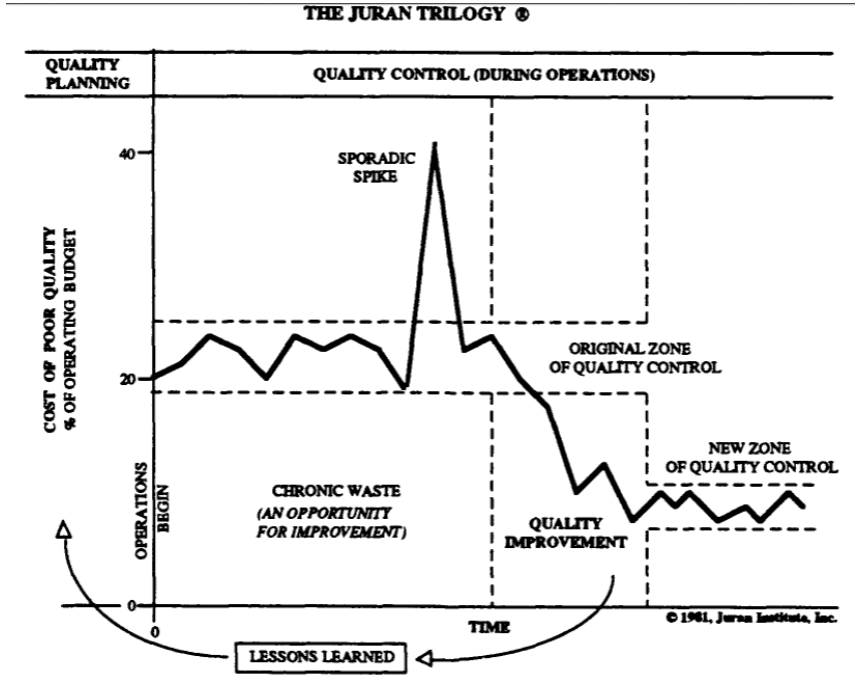
- Ten Steps of Quality Improvement
- Quality Control Handbook
- The Juran Trilogy
- Top management involvement,
- The Pareto principle
- The definition of quality as fitness for use
- The project-by-project approach to quality improvement

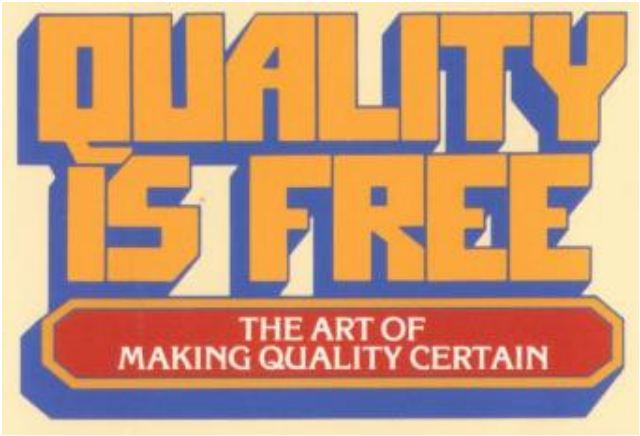
10 Steps of Quality Improvement

1. Build awareness of the need and opportunity for improvement
2. Set goals for improvement
3. Organize to reach the goals
4. Provide training
5. Carry out projects to solve problems
6. Report progress
7. Give recognition
8. Communicate results
9. Keep score of improvements achieved
10. Maintain momentum

The Juran Trilogy

- Quality Planning
  - Preparing to meet quality goals
- Quality Control
  - Meeting quality goals during operations
- Quality Improvement
  - Breaking through to unprecedented levels of performance



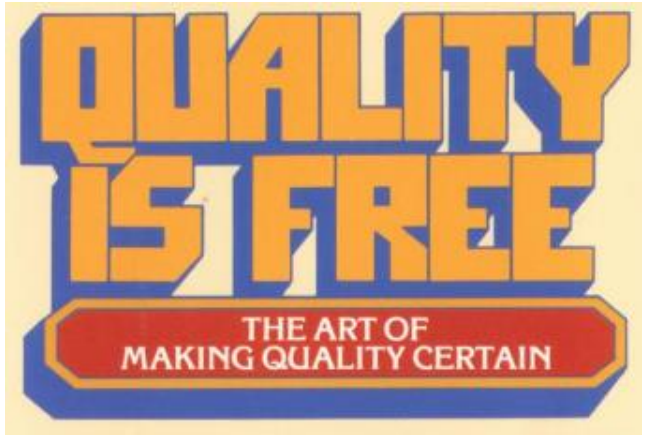


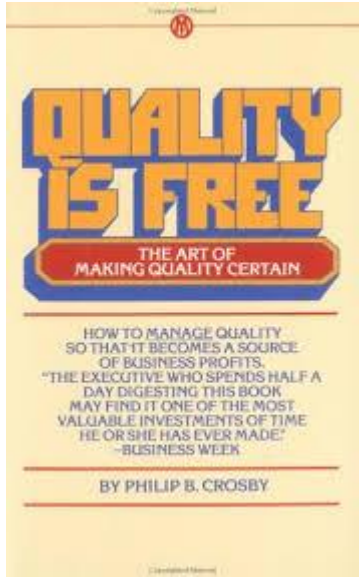
Philip Crosby

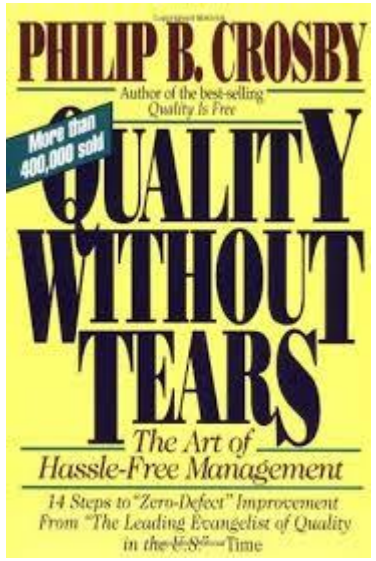
- 1952 - His first job in the field of quality was that of test technician in the quality department at Crosley Corporation
- 1979 - Crosby started the management consulting company Philip Crosby Associates, Inc.
- 1979 - Crosby published his first business book, *Quality Is Free*
- Quality is Free – 1 million copies sold

Philip Crosby

- Quality as Conformity to Specification
- Four Absolutes of Quality
- “Quality is Free” and “Quality Without Tears”







QG | QUALITYGURUS

Four Absolutes of Quality

1. The definition of quality is conformance to requirements (requirements meaning both the product and the customer's requirements)
2. The system of quality is prevention
3. The performance standard is zero defects (relative to requirements)
4. The measurement of quality is the price of non-conformance.

1. The definition of quality is conformance to requirements

- Quality means conformance, not elegance or goodness
- "Do It Right the First Time (DIRFT)"
- Management has 3 tasks related to this:
  - Clearly establish requirements
  - Supply means to meet requirements
  - Spend time helping employees meet requirements

2. The system of quality is prevention

- The system for causing quality is prevention, not appraisal.
- An error that does not exist can't be missed.
- Secret of prevention is to look at process and identify opportunities for error

3. The performance standard is zero defects

- Not a “motivational” program. It is a management standard tells people what is expected of them.
- Employees perform to the standards of the leaders.
- Mistakes caused by two factors:
  - Lack of knowledge. Knowledge can be measured in deficiencies corrected through tried-and-true means.
  - Lack of attention. Must be corrected by the person himself or herself. An attitude problem.

4. The measurement of quality is the price of non-conformance

- Traditional quality measurements are technical in nature, however, they need to be converted to numbers that management understands.
  - **Price of Conformance.** All expenses necessary to make things right. Quality functions, prevention efforts, quality education.
  - **Price of Non-conformance.** All expenses involved in doing things wrong. Cost of fixing problems, correcting orders, correcting products, warranties.

Cost of Quality

PREVENTION

APPRAISAL

INTERNAL FAILURE

EXTERNAL FAILURE

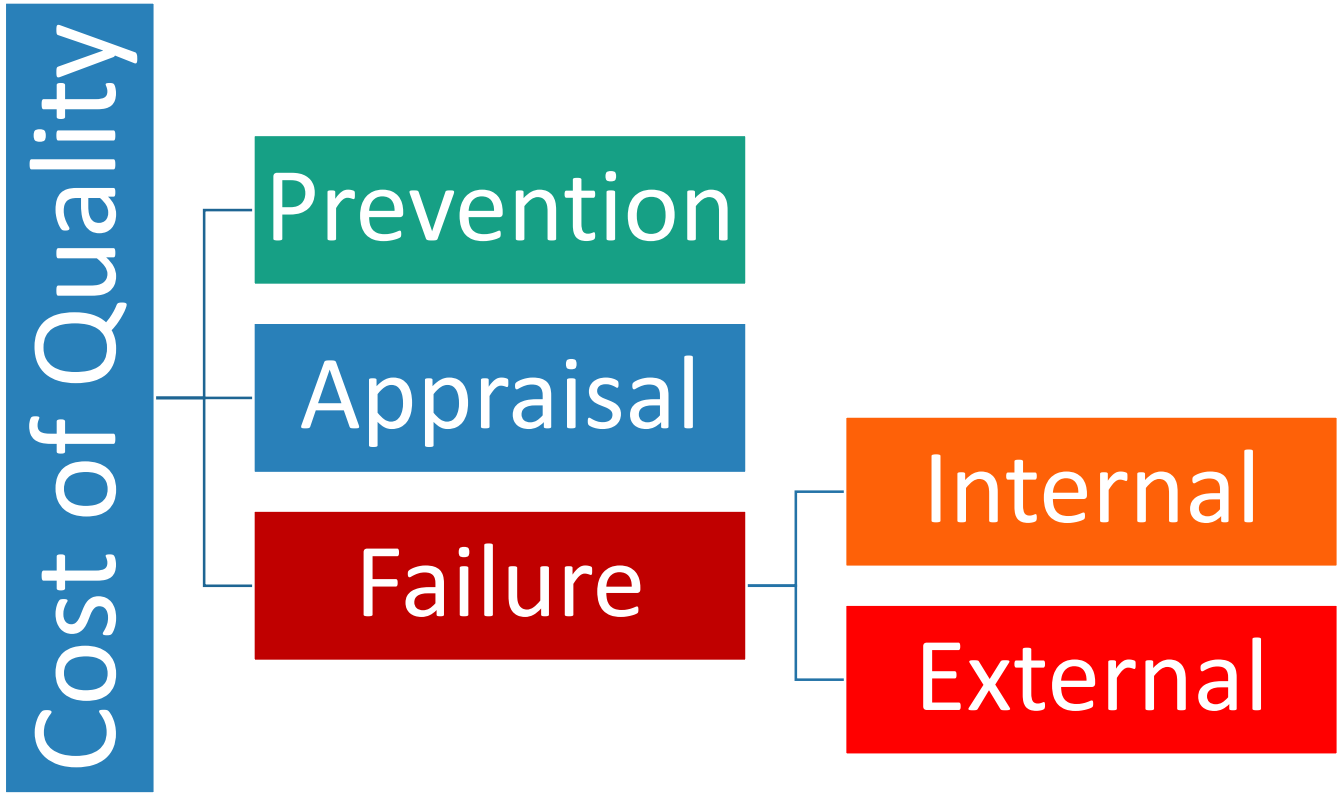
Visible

rejection, rework, repair cost and the cost of inspection

Invisible

Lost sales, excess inventory, additional controls and procedures, complaint investigation, fines, legal fee etc.

Cost of Quality



PREVENTION

APPRAISAL

INTERNAL FAILURE

EXTERNAL FAILURE

Prevention Cost

- Quality planning
- Education and training
- Conducting design reviews

Appraisal Cost

- Test and inspection
- Supplier acceptance sampling
- Auditing processes

PREVENTION

APPRAISAL

INTERNAL FAILURE

EXTERNAL FAILURE

Internal Failure Cost

- In-process scrap and rework
- Troubleshooting and repairing
- Design changes
- Additional inventory required to support poor process yields and rejected lots
- Re-inspection and retest of reworked items
- Downgrading

PREVENTION

APPRAISAL

INTERNAL FAILURE

EXTERNAL FAILURE

External Failure Cost

- Sales returns and allowances
- Service level agreement penalties
- Complaint handling
- Field service labor and parts costs incurred due to warranty obligations
- Recall
- Legal claims

PREVENTION

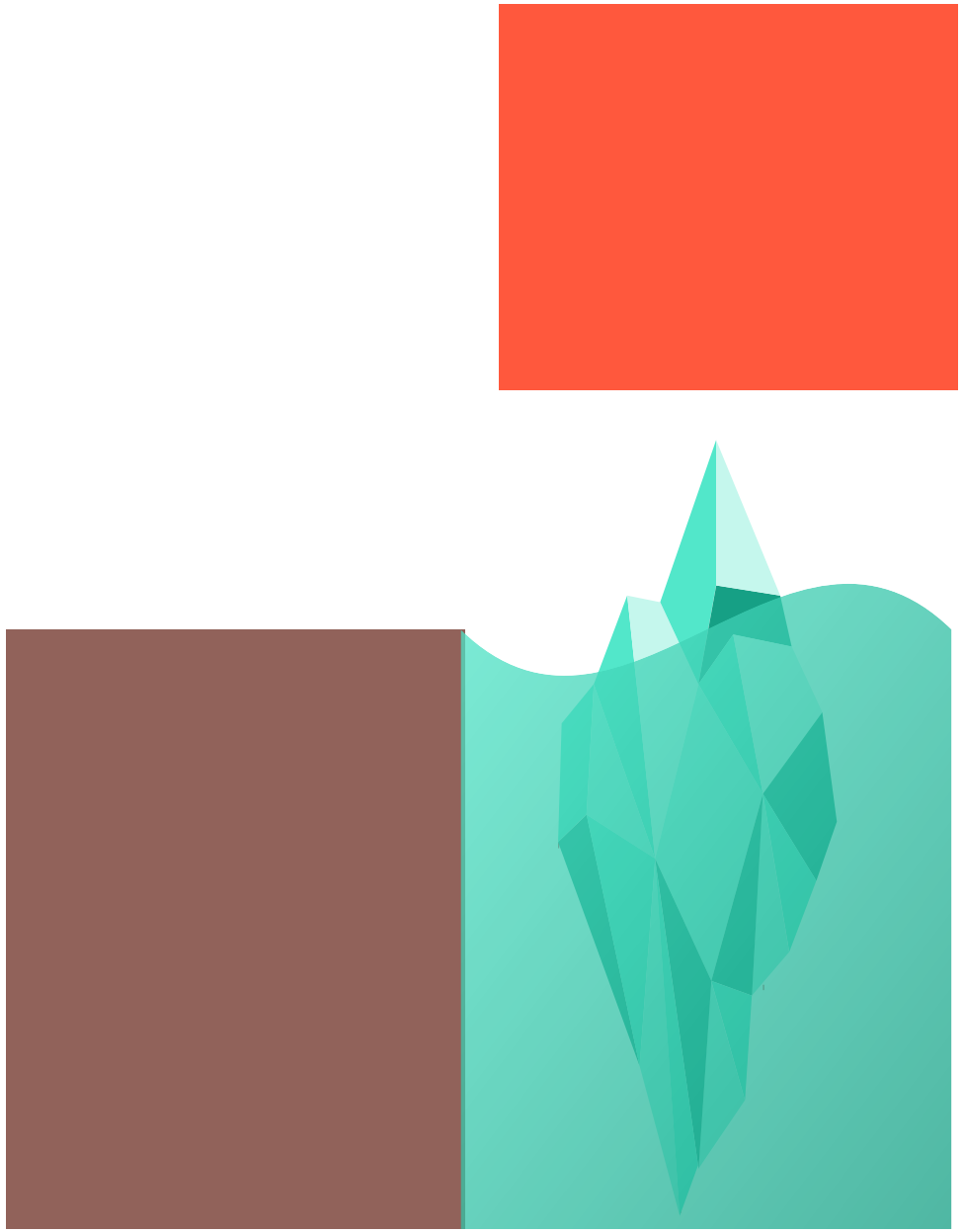
APPRAISAL

INTERNAL FAILURE

EXTERNAL FAILURE

Why Measure?

- Management understands the language of money
- Quantify the costs
- Set targets to reduce
- Justifies money spent on improvement and prevention activities.



Wastes

Philosophy

- Waste exist in all processes at all levels in the organization.
- Waste elimination is the key to successful implementation of lean.
- Waste reduction is an effective way to increase profitability.

Three Types of Wastes

1. Muda

- Muda is a traditional Japanese term for an activity that is wasteful and doesn't add value or is unproductive
  - **Type I Muda: (Incidental Work)**
    - Non-value-added tasks which seam to be essential. Business conditions need to be changed to eliminate this type of waste.
  - **Type II Muda: (Non-Value-Added Work)**
    - Non-value-added tasks which can be eliminated immediately.
    - TIMWOOD

2. Mura

- MURA: Any variation leading to unbalanced situations.
- Mura exists when
  - workflow is out of balance
  - workload is inconsistent
  - not in compliance with the standard.

3. Muri

- MURI: Any activity asking unreasonable stress or effort from personnel, material or equipment.
  - For people, Muri means too heavy a mental or physical burden.
  - For machinery Muri means expecting a machine to do more than it is capable of or has been designed to do.

Seven Types of Wastes

- Transportation
- Inventory
- Motion
- Wait time
- Over-Processing
- Over-Production
- Defects

1. Transport

- Unnecessary movement of people or parts between processes.

2. Inventory

- Materials parked and not having value added to them.

3. Motion

- Unnecessary movement of people or parts within a process.

4. Waiting time

- People or parts waiting for a work cycle to finish.

5. Over Processing

- Processing beyond the demand from the customers.

6. Over Production

- Producing too much, too early and/or too fast.

7. Defects

- Sorting, repetition or making scrap

8. Unexploited Knowledge

- Failure when it comes to exploiting the knowledge and talent of the employees.

Seven Basic Quality Tools

Philosophy

- Emphasized by Kaoru Ishikawa
- All Quality Circle members are trained to use these tools.

Seven Basic Quality Tools

1. Check sheet
2. Cause-and-effect diagram
3. Histogram
4. Pareto chart
5. Scatter diagram
6. Control charts
7. Stratification

1. Check Sheet

- What?
  - A data-collection form used to manually tally and record the number of observations or occurrences of certain events during a specified time period.
- Why?
  - To collect and display the data.
  - To detect patterns.
  - Solving a problem.

1. Check Sheet

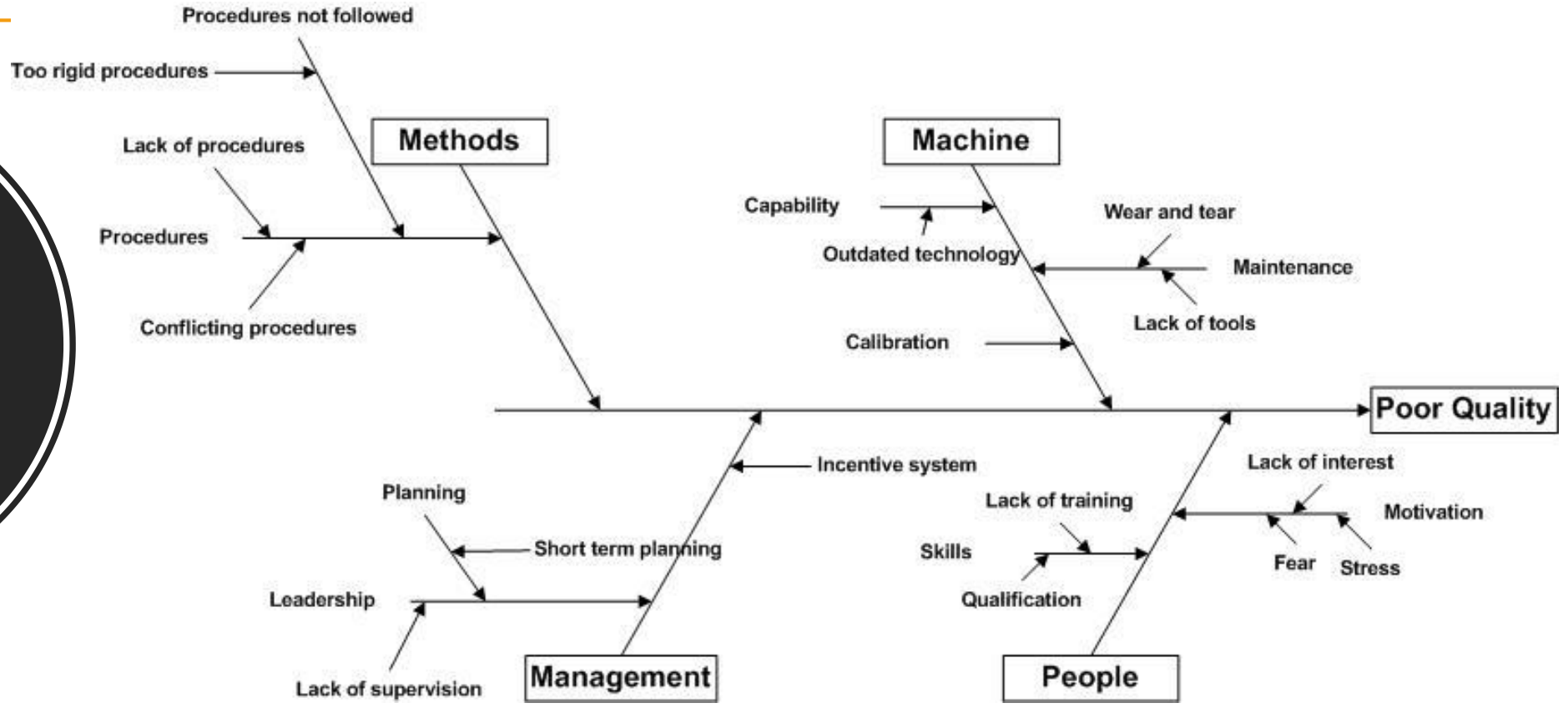
Defects during water bottle manufacturing

Defect						
Defect / Capacity	Scratch	Loose Cap	Label	Volume	Leakage	Frequency
300 ml.	𝍸	𝍸	𝍸	𝍸	𝍸	11
500 ml.	𝍸	𝍸	𝍸	𝍸	𝍸	12
1000 ml.		𝍸 𝍸	𝍸		𝍸	13
Sum	5	18	8	2	3	36

2. Cause and Effect Diagram

- What?
  - A tool used to graphically display the relationship between an effect (e.g., a problem statement) and the its causes.
- Why?
  - To identify the various causes affecting a problem.
  - Helps a group reach a common understanding of a problem.

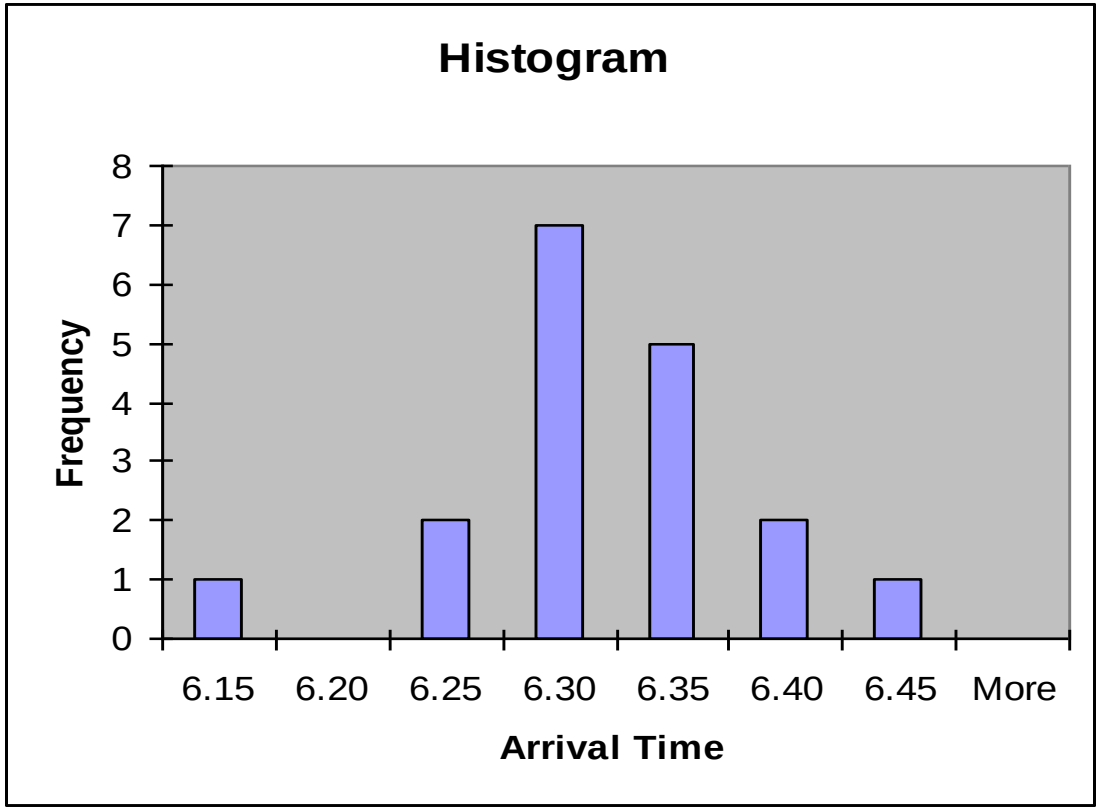
2. Cause and Effect Diagram



3. Histogram

- What?
  - A bar chart that displays the distribution of individual measurements
  - Also called a frequency distribution
- Why?
  - To quickly visualize the center, variation (spread), and shape of the distribution of measurements.
  - Provides clues to reducing variation and causes of problems.

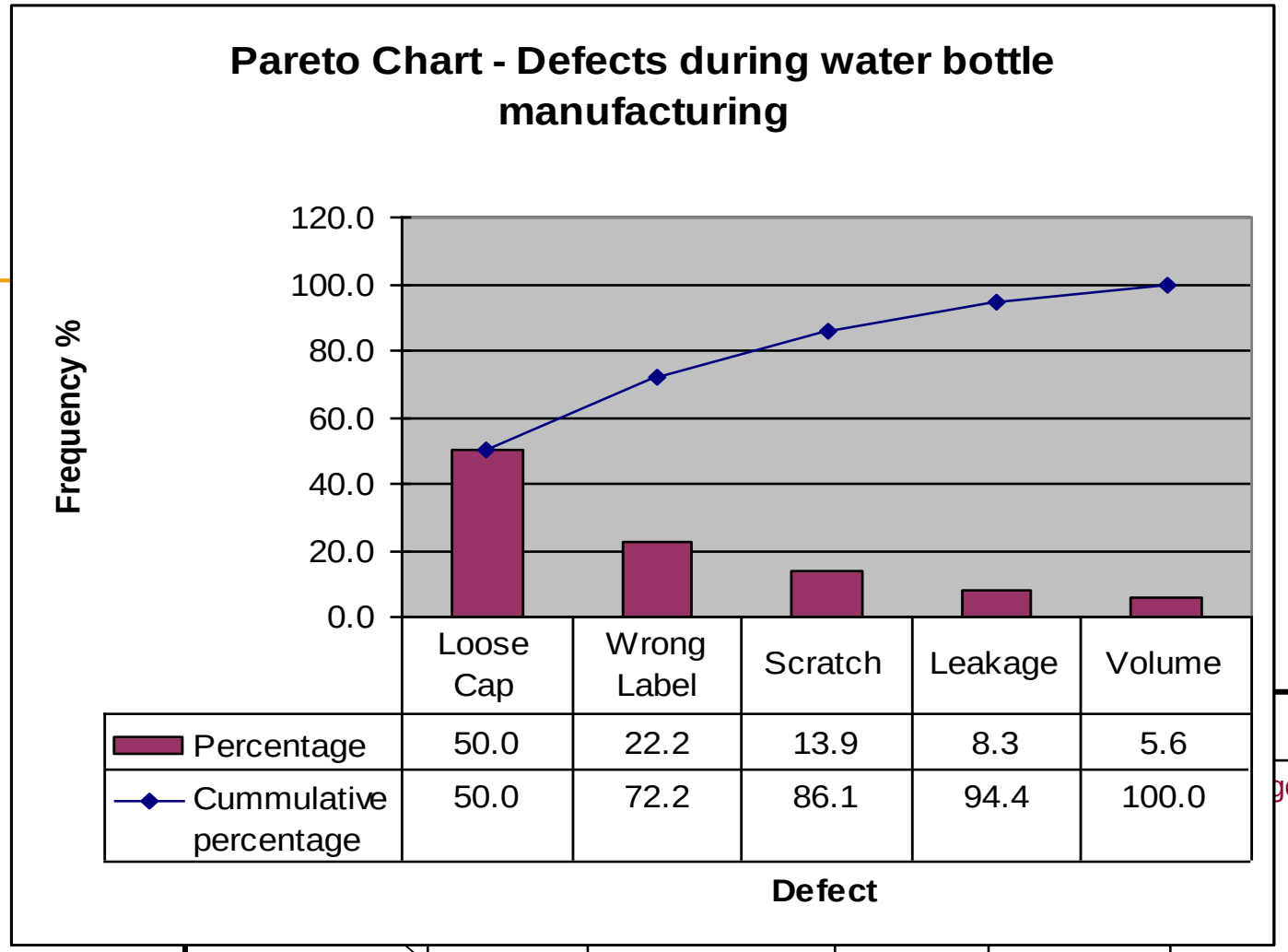
3. Histogram


Histogram
Frequency
0
1
2
3
4
5
6
7
8
6.15
6.20
6.25
6.30
6.35
6.40
6.45
More
Arrival Time

4. Pareto Chart

- What?
  - A bar chart where the bars are arranged in descending order of magnitude.
- Why?
  - To prioritize actions needed to solve complex problems.
  - To sort out the “vital few” from the “trivial many.”
  - To separate important from unimportant causes contributing to a problem.

4. Pareto Chart

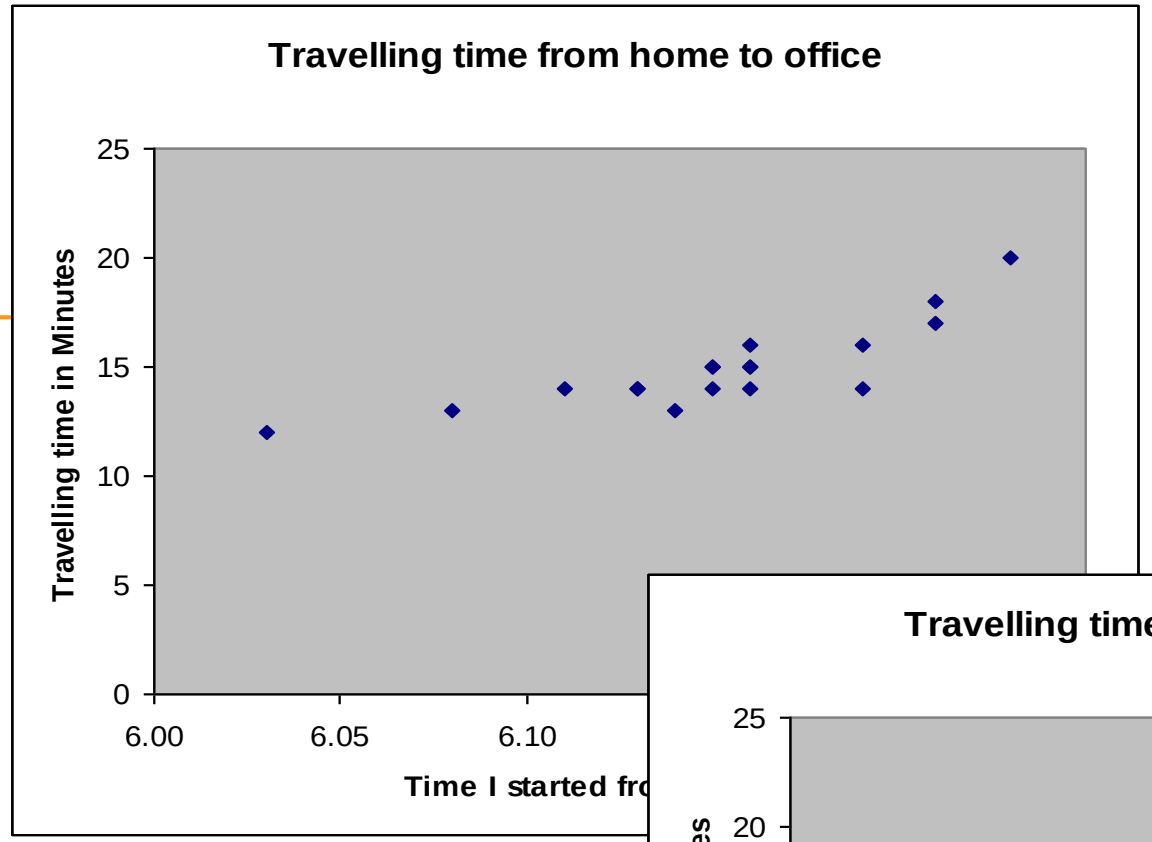


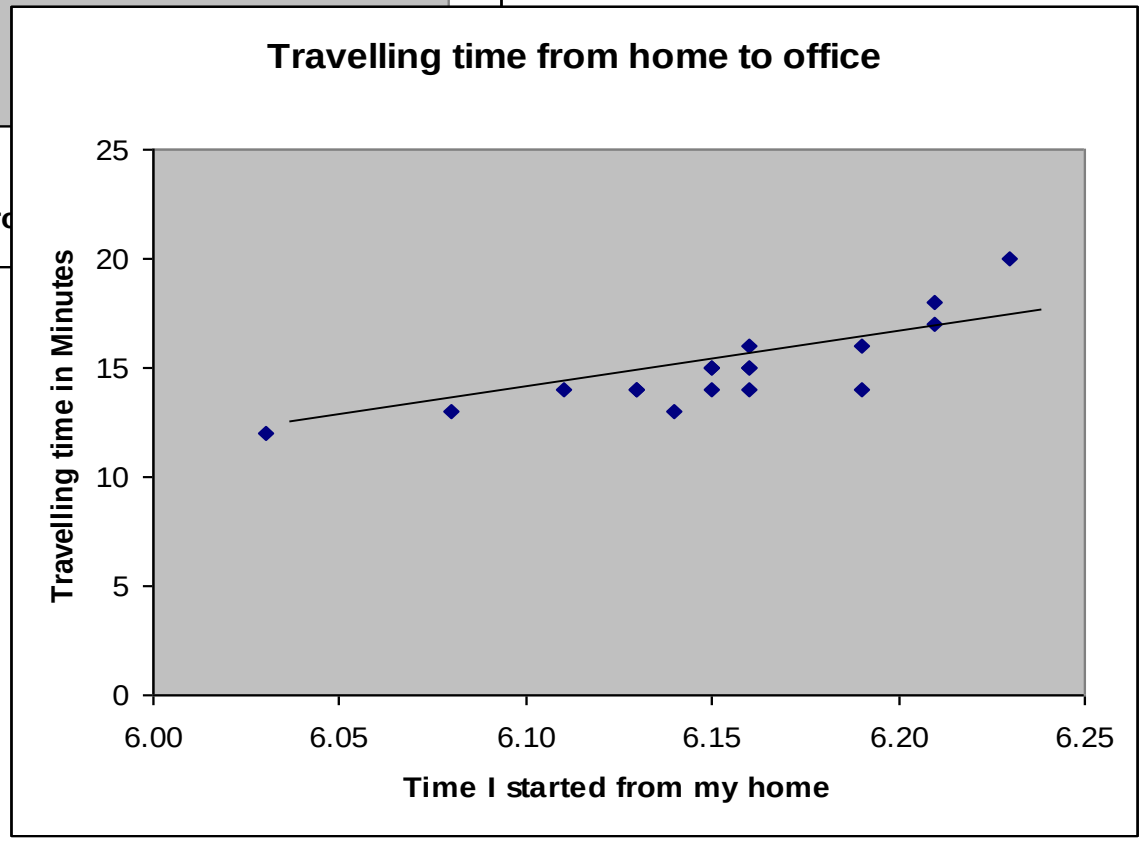
						Frequency
300 ml.	||	||	||||	|	|	11
500 ml.	|||	||||	||	|	|	12
1000 ml.		|||| |||| |	|		|	13
Sum	5	18	8	2	3	36

5. Scatter Diagram

- What?
  - A plot of one measured variable against another. Paired measurements are taken on each item and plotted on a standard X-Y graph.
- Why?
  - To study the possible relationship between one variable and another.

5. Scatter Diagram

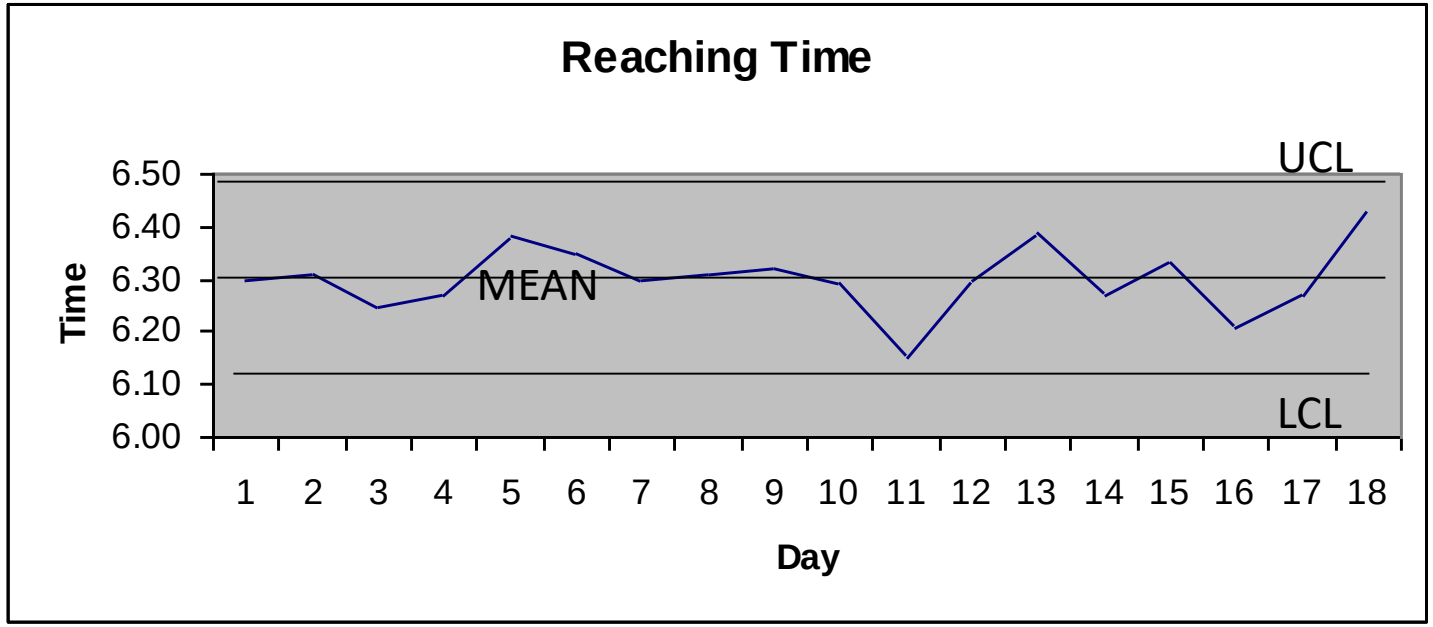




6. Control Charts

- What?
  - A line graph of the measurements of a product or process over time that has statistically based control limits placed on it.
- Why?
  - To display and manage variation in process output over time.
  - To identify when a process changes.
  - To distinguish special from common causes of variation.
  - To tell the operator when to take and when **not** to take action and just let the system run.

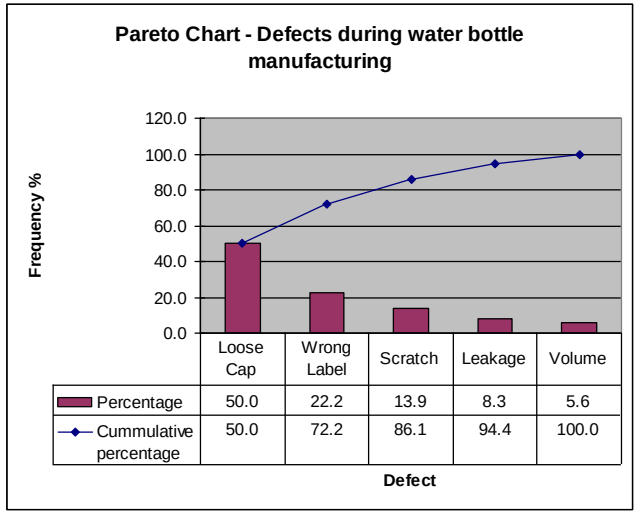
6. Control Charts

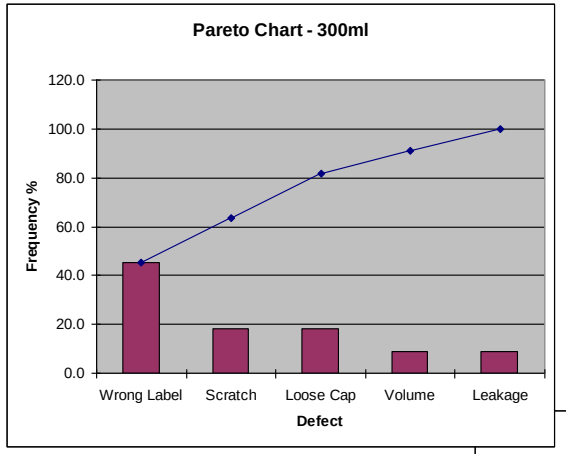


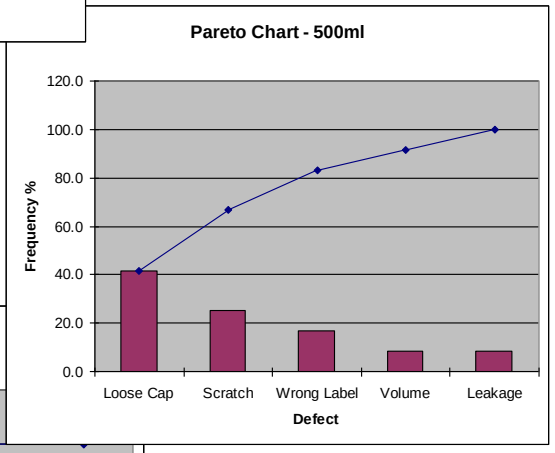
7. Stratification

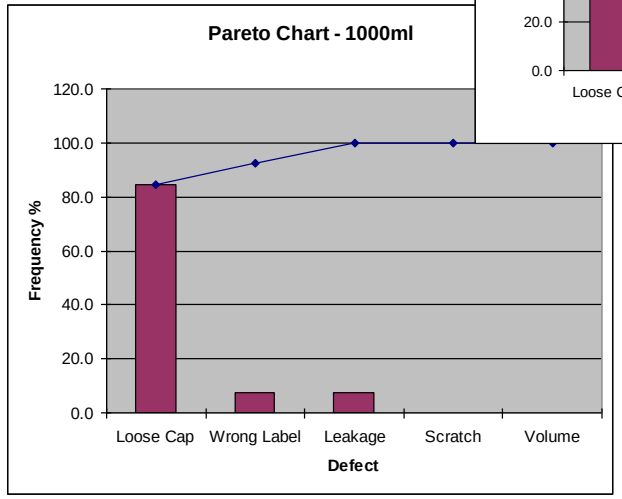
- What?
  - Breaking down data into categories so you can make sense of it.
- Why?
  - When data from a variety of sources or categories have been lumped together, the meaning of the data can be impossible to see. This technique separates the data so that patterns can be seen.

7 Stratification





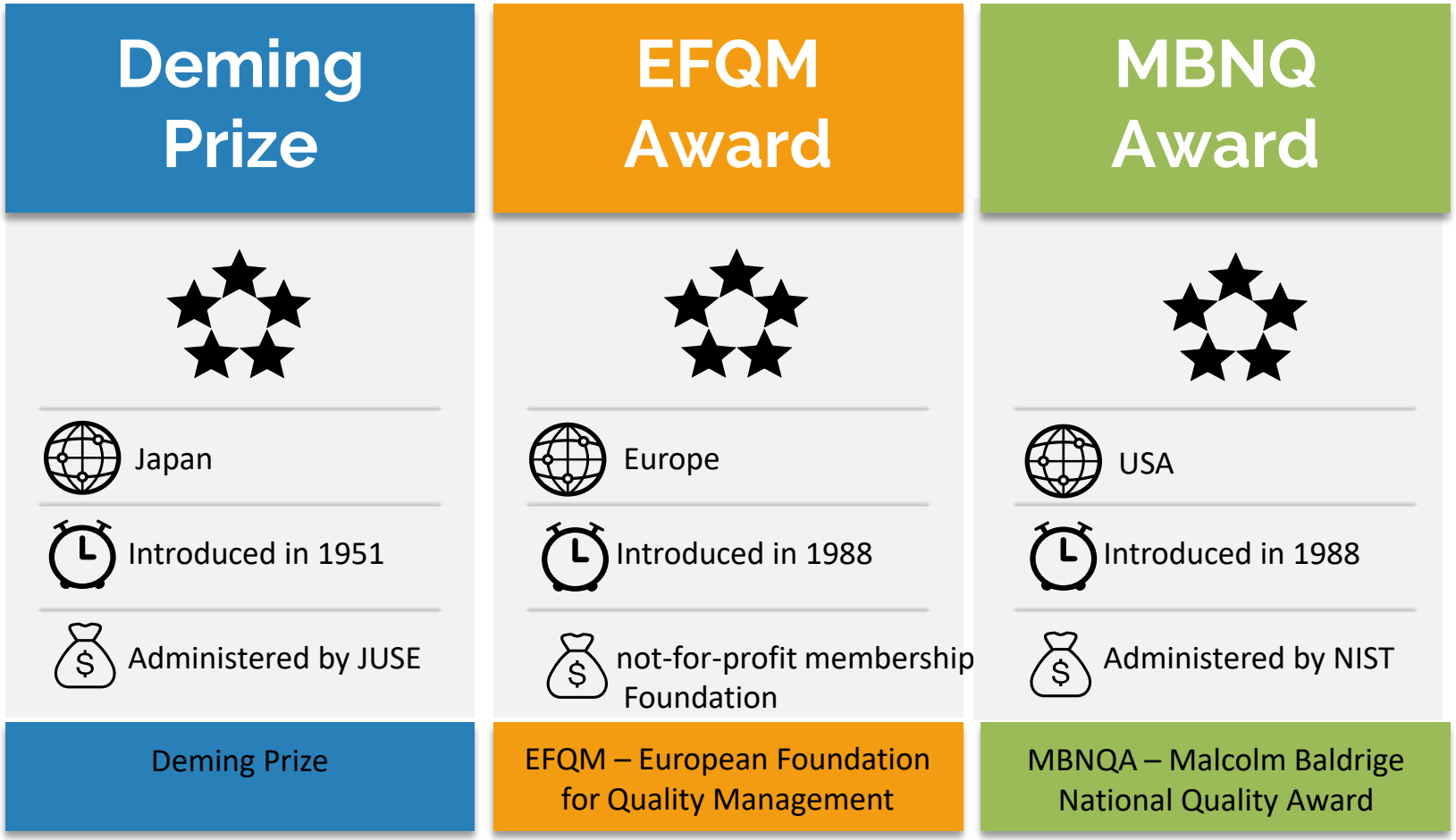




QUALITYGURUS

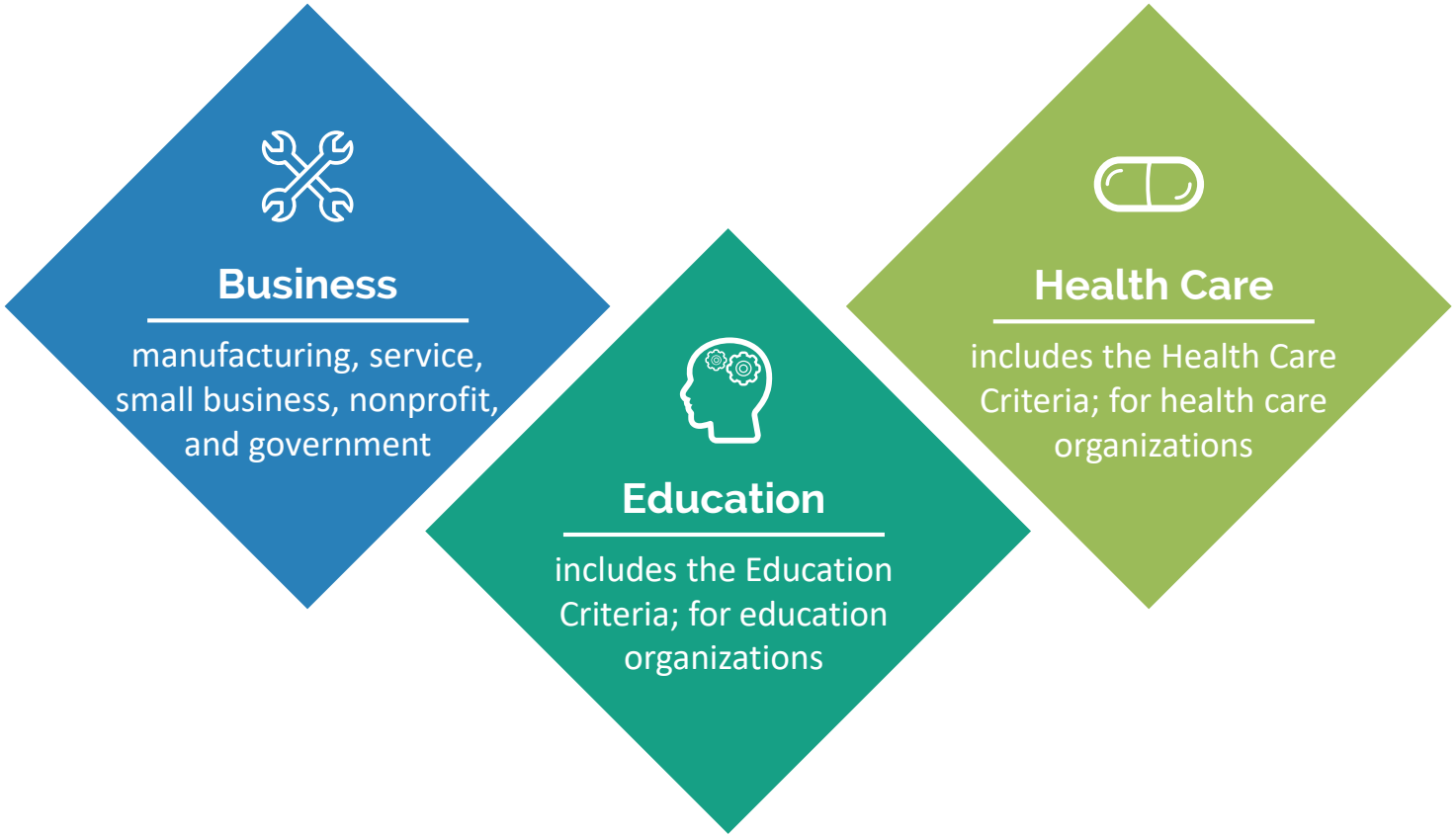
Quality Awards

Quality Awards

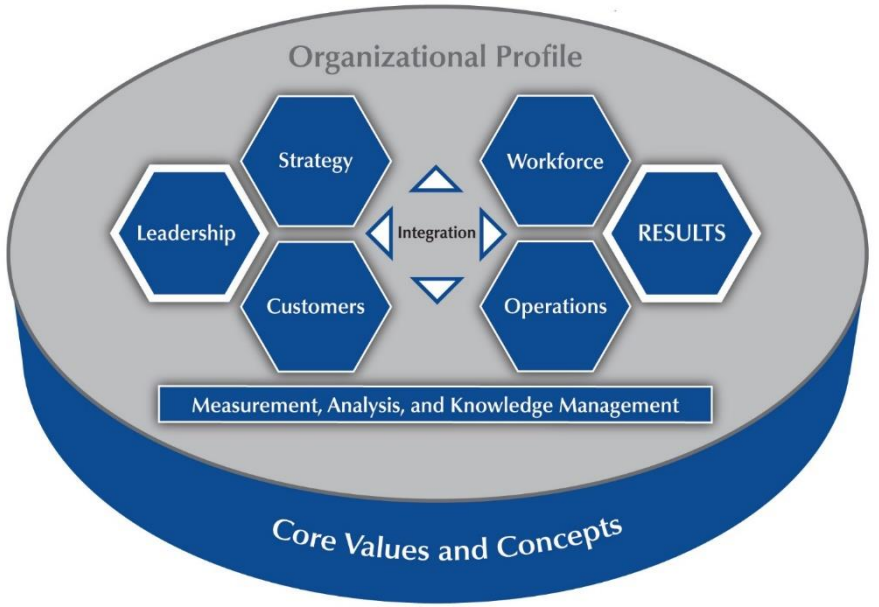


JUSE - Union of Japanese Scientists and Engineers
NIST - National Institute of Standards and Technology

Malcolm Baldrige National Quality Award (MBNQA)



Categories and Items		Point Values
1	**Leadership**	**120**
	1.1 Senior Leadership	70
	1.2 Governance and Societal Responsibilities	50
2	**Strategic Planning**	**85**
	2.1 Strategy Development	40
	2.2 Strategy Implementation	45
3	**Customer Focus**	**85**
	3.1 Voice of the Customer	45
	3.2 Customer Engagement	40
4	**Measurement, Analysis, and Knowledge Management**	**90**
	4.1 Measurement, Analysis, and Improvement of Organizational Performance	45
	4.2 Management of Information, Knowledge, and Information Technology	45
5	**Workforce Focus**	**85**
	5.1 Workforce Environment	40
	5.2 Workforce Engagement	45
6	**Operations Focus**	**85**
	6.1 Work Systems	45
	6.2 Work Processes	40
7	**Results**	**450**



From Baldrige Performance Excellence Program. 2015. *2015–2016 Baldrige Excellence Framework: A Systems Approach to Improving Your Organization's Performance.* Gaithersburg, MD: U.S. Department of Commerce, National Institute of Standards and Technology. http://www.nist.gov/baldrige.

Malcolm Baldrige National Quality Award (MBNQA)