QUALITY MANAGEMENT
(MSL 71500)
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WEEK: I (Lecture 1 and 2)

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I. Quality defined: A Conceptual Framework:

-Derived from the latin word ‘qualis’, meaning ‘what kind of ’.

-A slippery concept

- Used both as an absolute and a relative concept.
- Used both in philosophical and operational terms.
- Different approaches:
  total, product-based, user-based and value-based.

Used both as an absolute and a relative concept:

A) In its *absolute* sense:
Used to convey status and positional advantage.

B) In the *relative* sense:
Technically oriented; About meeting pre- determined standards.
Has two concepts:

1. Procedural concept
2. Transformational concept

The Webster International Dictionary offers the following definitions of the noun Quality:

a) peculiar or essential character
b) a distinctive inherent feature; property, virtue.
c) degree of excellence; degree of conformance to standard
d) inherent or intrinsic excellence of character or type; superiority in kind.

-definitions imply more of a customer satisfaction concept; thereby not sufficient to translate needs and desires into products and services.

-What is also required is a technical meaning.

Focus on a specification-production-inspection cycle: A technical perspective.

Different technical meanings of Quality may be considered.

a) Descriptive meaning: Defines quality as some characteristic of the good or service.

b) Technical meaning: Quality is defined as degree of excellence in design, specification, and production or implementation.

Quality of Design:

-How well does the design meet its objectives?

-The answer would lie in frequent interaction between the provider and the customer.

Quality of Specification:

-It addresses questions about the effectiveness of design specifications in realizing stated or implied objectives?

-This is a stage at which concepts are turned into drawings, procedures, dimensions, bills of materials etc.

Quality of Conformance:

-It addresses questions about the degree of excellence of conformance of the service or manufactured product to the design specifications.

II Definitions of Quality:

Deming: Quality means, “meeting and exceeding the customers’ needs and expectations - and then continuing to improve”.

Juran: Quality is defined as, “fitness for purpose or use as judged by the user”.

Crosby: Quality is defined as, “conformance to requirements and improving the quality of work life with workers' satisfaction”. Emphasis on zero-defects.

- **The standard definitions on Quality have been given by various institutions such as the BSI, ASQC, EOQC and the ISO among others.**

  The British Standards 4778: Quality is “the totality of features and characteristics of a product or service that bears on its ability to satisfy stated or implied needs.”

  ISO – 8402: Quality is, “ the totality of characteristics of an entity that bear on its ability to satisfy stated or implied needs”.

❖ **ISO–9000:** Quality is, “the degree to which a set of inherent characteristics fulfils requirements,” where requirements means, “need or expectation that is stated, generally applied and obligatory”, and characteristic means, “ distinguishing feature”. It is “the aptitude of the overall intrinsic characteristics of a product, a system or a process to satisfy the demands of clients and other concerned parties”.

The various definitions lays emphasis on the following:

- Conformance to the customer's requirements
- Fitness for use by the consumer
- Meeting or exceeding customer expectations
- Customer satisfaction
- Meeting product specifications

Quality can be quantified as follows:

$$Q=P/E$$

Where Q=Quality
P=Performance
E=Expectations

III Approaches to Quality:

A) Product-based Approach

B) User-based Approach

C) Manufacturing-based/Process and supply led Approach

D) Value-based Approach

E) Transcendence Approach

A) Product-based Approach:

Basic tenets: Quality is attribute dependent; the precise, measurable and part of the characteristics of the product. *Differences in Quality amount to differences in the quantity of some desired ingredient or attribute.*

Proponents: Crosby, Ishikawa, Garvin

Comments: Approach relies on quantification; But it is not easy to clearly identify and quantify attributes of services.

B) User-based Approach:

Basic tenets: Quality is meeting the needs and wants of the user; fitness for purpose. *Quality consists of the capacity to satisfy wants.*

Proponents: Deming, Juran, Feigenbaum, Ishikawa, Garvin

Comments: Approach relies on the organization's ability to determine the customer requirements and then meet them;
Customers have different and varied wants, views of fitness or even different purposes;

C) Manufacturing-based/Process and supply led Approach:

Basic tenets: Quality is conformance to requirements; Conformance to specification. *Quality means conformance to requirements.*

Proponents: Crosby, Taguchi, Garvin

Comments: Approach pre-supposes that the specification is given and unproblematic or that the standards are accepted by everyone for all purposes; This may not always hold good;

D) Value-based Approach:

Basic tenets: Quality is value of money; it is cost to the producer and price to the customer. *Quality is the degree of excellence at an acceptable price and the control of variability at an acceptable cost.*

Proponents: Ishikawa, Garvin

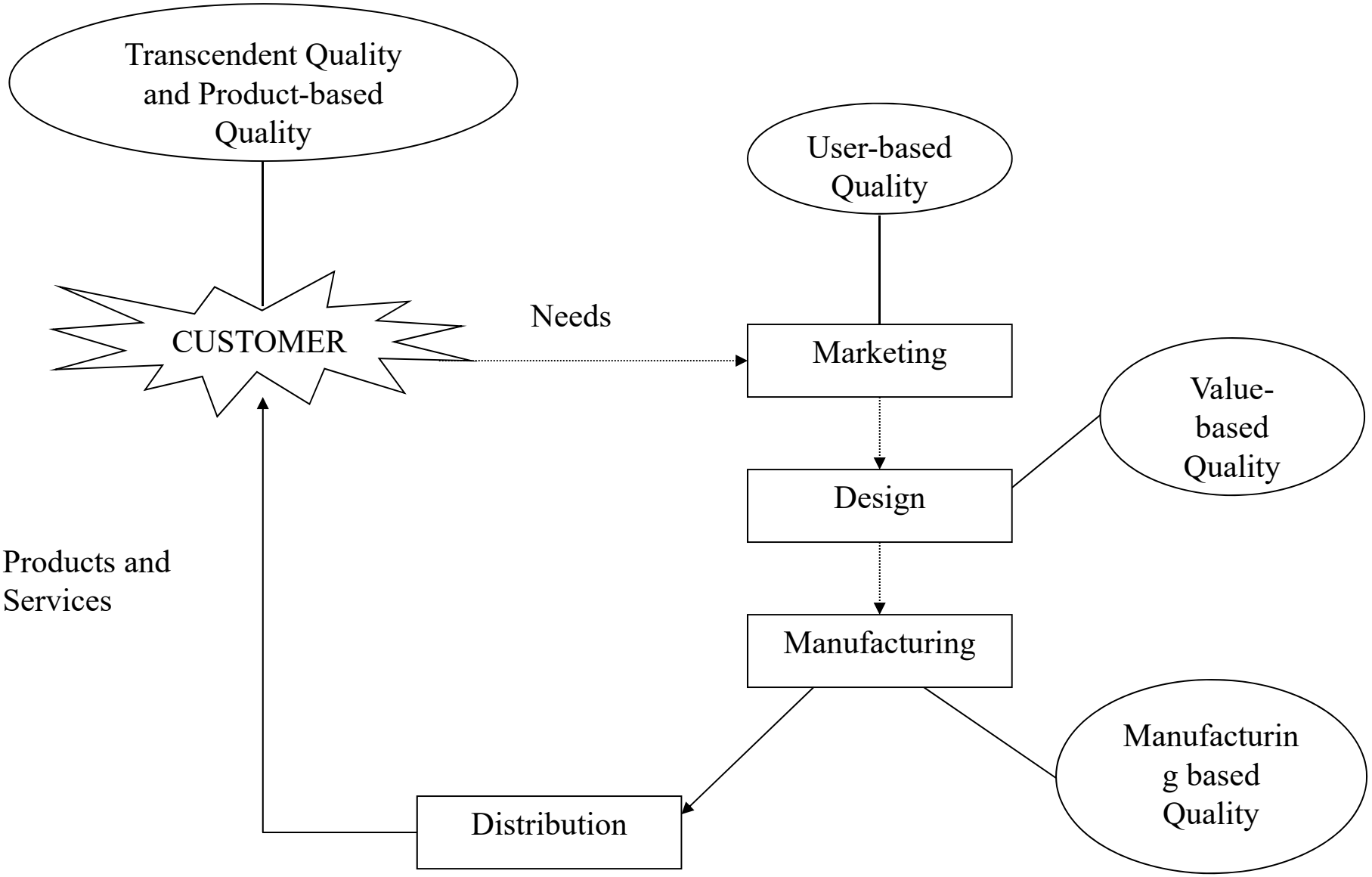
Comments: Focus is external; This approach implies a trade-off between quality, price and availability

E) Transcendence Approach:

Basic tenets: Quality is innate excellence.

Proponents: Garvin

Comments: Little, practical application; Prior identification of determinants of quality is often not possible in the services sector.


Transcendent Quality and Product-based Quality
User-based Quality
CUSTOMER
Needs
Marketing
Value-based Quality
Design
Products and Services
Manufacturing
Manufacturing based Quality
Distribution
Information flow
Product flow

IV Characteristics of Quality:

- Service-life or duration factors: Also called time factors, these include maintainability, serviceability, reliability and endurance.
- Intrinsic factors: These include honesty, integrity, fairness, ethics and customer service provided to or perceived by the user.
- Aesthetics: These include perceived beauty, color, taste, and a host of other semi-tangible parameters.
- Physical factors: These include structural strength, weight, height, density, volume, finish and other items.

V Principles of Quality:

1. Customer focus and customer involvement:

- Employees regularly visit their customers.

- Customers are known and understood.

- Customers' needs are integrated in the activities.

- More is being done than the customer expects.

- Satisfied customers are priority number one.

- Changing customers needs are systematically collected and lead to improvement.

- Preventing complaints instead of reacting to complaints.

2. Consistency of purpose:

An inspiring mission and vision is developed and communicated to all organizational levels.

- SMART-goals are formulated and preserved. Managers are consistent in their behavior regarding these goals.

- Guidance is given to the quality improvement process.

- There is commitment at top management.

3. Involvement of all employees:

- Voluntary total involvement of everyone.

- Teamwork that leverage the knowledge and provides synergy, based on open-communication, respect and trust.

- Skills are developed on the basis of *"Learning by doing".*

- Decisions on the basis of consensus.

- The present situation is open for discussion.

- Investing in knowledge.

- Empowered employees.

- Entrepreneurial approach and leadership skills at all business levels.

4. Act according to fact:

- Work according to facts and not based on rumors or feelings.

- The causes and consequences of problems are analyzed according to "measuring is knowing".

- Goal oriented data is gathered and interpreted accordingly.

- Measurements are based on figures; verify everything with data.

- Quality costs are analyzed.

5. Process oriented:

- Internal customers are also satisfied.

- The process is more important than the results.

- The output is standardized.

- The processes are documented in schemes and standard working procedures.

- Suppliers are regarded as partners and long-term relationships are established.

- The TQM culture is expanded to suppliers.

-Reduction of process variation occurs continuously.

6. Focus on continuous improvement:

- Employees improve themselves and their work and help others improve themselves and the organization.

- Emphasis on problem prevention instead of correction.

- Improvements are based on a cross- functional, structured, and holistic approach, and are continuously documented.

- Multidisciplinary improvement teams are established.

- There is a working climate in which continuous improvement is a way of life.

Quality of product and service:

a) To understand what the customer wants and to provide it, immediately on demand, at the lowest cost.

b) To provide products and services of high quality and reliability consistently.

c) To keep up with the pace of change, technological as well as political and social.

d) To be one step ahead of customer's needs.

Quality Dimensions of a Manufactured Product and Service

Quality Dimension	Mfd. Product (Stereo amplifier)	Service Product (Checking account)
Performance	Signal-to-noise ratio, power	Time to process customer requests
Features	Remote control	Automatic bill paying
Conformance	Workmanship	Accuracy
Reliability	Mean time to failure	Variability of time to process requests
Durability	Useful life	Keeping pace with industry trends
Serviceability	Ease of repair	Resolution of errors
Aesthetics	Oak cabinet	Appearance of bank lobby

Customer quality perceptions and priorities:
Factors influencing customer perceptions of quality:
Example: Automobile characteristics:

Before purchase	At point of purchase	After purchase
Company's brand name and image	Performance specifications	Ease of use
Previous experience	Comments of sales people	Handling of repairs, claims and warranty
Opinion of friends	Warranty provisions	Spare parts availability

EVOLUTION OF QUALITY

- Spoken of using pre-industrial language in ancient classical texts.

- 1700 B.C.: King Hammurabi of Babylon, introduced the concept of product quality and liability into the building industry.

- During the Middle Ages, quality was controlled by long periods of training required by guilds.

- Quality Control had its beginnings in the factory system that followed the Industrial Revolution.

- With the advent of mass production during the 20th century that a systematic approach to quality movement began.

- Taylor: Developed his system of scientific management.

- Fayol: Proposed Division of work and specialization.

- Initially, visual inspection or testing of the product followed manufacture.

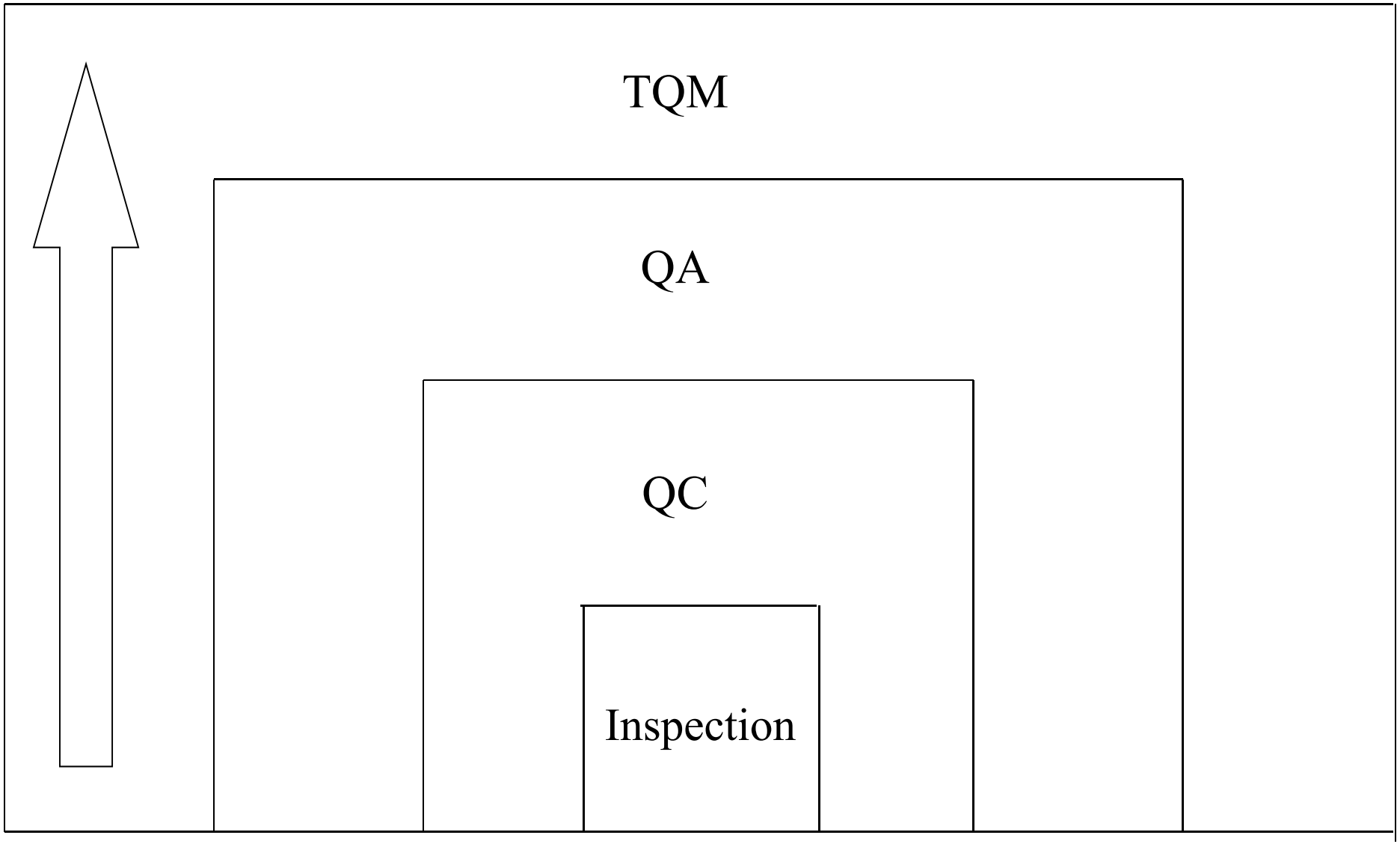
- Methods of statistical quality control and quality assurance were then added.

- 1924: Shewhart developed a statistical chart for the control of product variables: this chart is considered the beginning of Statistical Quality Control (SQC).

- In the same decade, H.F.Dodge and H.G.Romig, developed the area of acceptance sampling as a substitute for 100% inspection.

- Following World War II, the quality of products produced in the US.

- It was during this period that a number of pioneers began to advance a methodology of quality control in manufacturing and to develop theories and practical techniques for improved quality.
  - 1946: American Society for Quality Control was formed.
  - In 1950, Deming gave a series of lectures on statistical methods to the Japanese engineers and CEO's.
  - Juran in 1954 further emphasized management's responsibility to achieve quality.
  - In 1960, the first Quality Circles were formed for the purpose of quality improvement.
- The success of the Japanese manufacturers during the 1960's and 1970's changed the emphasis from a Quality Control approach to a Quality Assurance.
- Finally, the fierce international competition for goods and services during the 1980's and 1990's has led to a Total approach to Quality Management.


TQM
QA
QC
Inspection

Inspection: (1930's to 1950's):

"Activities such as measuring, examining, testing or gauging one or more characteristics of the entity and comparing the results with specified requirements in order to establish whether conformity is achieved for each characteristic." (BS ISO 8402,1995)

- Sorting, grading, reblending
- Error detection
- Rectification

Quality Control (QC)- (1940's and 1950's):

" Operational techniques and activities that are used to fulfill requirements for quality" (BS ISO 8402, 1995).

- Quality Standards
- Statistical quality techniques
- Process performance
- Product testing
- Treating quality problems

Quality Assurance (QA)- (1960's and 1970's):

" All the planned and systematic actions implemented within the quality system and demonstrated as needed to provide adequate confidence that an entity will fulfill requirements for quality". (BS ISO 8402,1995).

- Quality systems (ISO 9000) development
- Quality planning
- Quality policy
- Quality costing
- Problem solving

TQM – (1980's and 1990's):

" Management approach of an organization, centered on quality, based on the participation of all its members and aiming at long term success through customer satisfaction, and benefits to all members of the organization and to society." (BS ISO 8402,1995).

- Involvement of all employees, customers and suppliers
- Empowered employees
- Teamwork
- Quality strategy based on a common mission and vision
- Process oriented
- Performance measurement

Inspection and QC, are based on a detection approach to the management of quality; The emphasis is on the product, procedures, service deliverables and the downstream production and delivery processes.

The stages of QA and TQM are based on prevention, and concentrate on upstream activities in relation to product, service and process design.

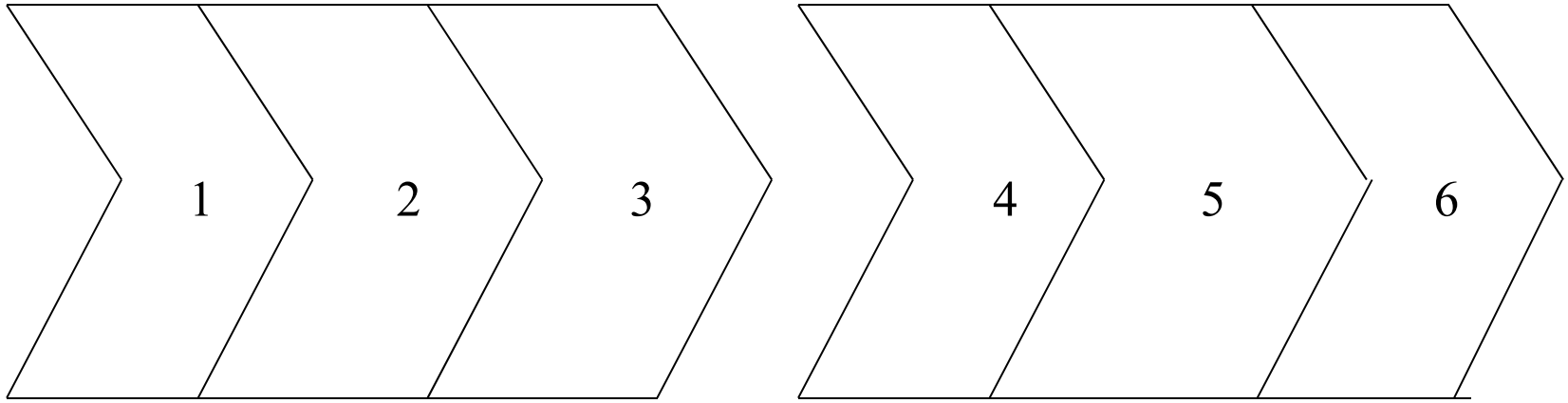
W.E. DEMING:

-Deming defines Quality as a predictable degree of uniformity and dependability at low cost and suited to the market

According to him:

- 96% of the variations have common causes and 4% have special causes.
- Statistics may be used as a management tool and statistical process control as a means of managing variations in a process.

Quality must be built into the product at all stages in order to achieve a high level of excellence.



Deming's Chain Reaction

KEY

1 – Improve Quality

2 – Decrease costs due to less rework, fewer mistakes, fewer delays and snags, and better use of time and materials.

3 – Improve productivity.

4 – Capture the market with better quality and lower prices.

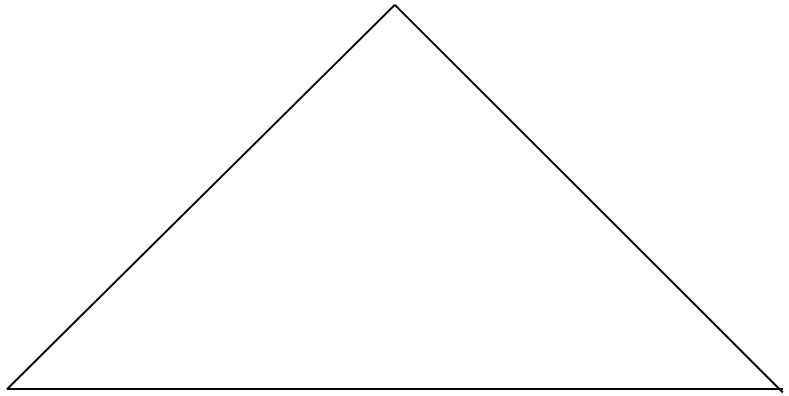
5 – Stay in business

6 – Provide steady jobs and more jobs.

Deming's Fourteen Points:

1. Create consistency of purpose with a plan.
2. Adopt the new philosophy of quality.
3. Cease dependence on mass inspection to achieve quality.
4. End the practice of choosing suppliers based on price or awarding business on the basis of price tag.
5. Identify problems and work continuously to improve the system.
6. Institute modem methods of training and education on the job, including management and statistical tools and techniques.
7. Adopt and institute modern methods of supervision and leadership.
8. Drive out fear, so that everyone may work effectively for the company.
9. Break down barriers between departments.
10. Stop requesting improved productivity without providing such methods to achieve it.
11. Eliminate work standards that prescribe numerical quotas.
12. Remove barriers to pride of workmanship
13. Institute vigorous programme of education, training and self-development.
14. Define top management's permanent commitment to ever-improving quality and productivity.

Management's commitment to improvement
(points 1,2,14)



Improve relationships
(points 4,7,8,9,10,11,12)

Apply the statistical methodology
(points 3,5,6,13)

Deming's Triangle

The deadly diseases:

-Lack of consistency
-Short term profits
-Performance appraisal
-Job-hopping
-Use of only visible figures

The two deadly sins which Deming considers to be most important are the 'evaluation of performance - merit rating - annual review', and 'running a company on visible figures only'.

J. M. JURAN:

-Juran defines quality as fitness for use in terms of design, conformance, availability, safety and field use.

-His philosophy incorporates the point of view of customer.

-Focuses on top-down management and technical methods.

Juran's approach to Quality control and its management is two-sided:

a) Companies mission
b) The role of senior managers.

The Juran Quality Trilogy:

1 Quality planning

2 Quality control

3 Quality improvement

The Juran Quality Trilogy:

1 Quality planning:

a) Identify the customers
b) Determine the customers' needs.
c) Develop product features
d) Establish quality goals
e) Develop a process
f) Prove process capability

2 Quality control:

a) Choose control subjects (what to control)
b) Choose units of measurement
c) Establish measurement
d) Establish standards of performance
e) Measure actual performance
f) Interpret the difference (actual versus standard)
g) Take action on the difference

3 Quality improvement:

a) Prove the need for improvement
b) Identify specific projects for improvement
c) Organize to guide the projects
d) Organize for diagnosis - for discovery of causes
e) Diagnose to find the causes
f) Provide remedies
g) Prove that the remedies are effective under operating conditions
h) Provide for control to hold gains

Ten Steps of Quality Improvement:

- Build awareness of opportunities to improve.
- Set goals for improvement.
- Organize to reach goals.
- Provide training.
- Carry out projects to solve problems.
- Report progress
- Give recognition.
- Communicate results.
- Keep score.
- Maintain momentum by making annual improvement part of the regular systems and processes of the company.

P.B. CROSBY:

He states that quality is free because the small costs of prevention will always be lower than the costs of detection, correction and failure.

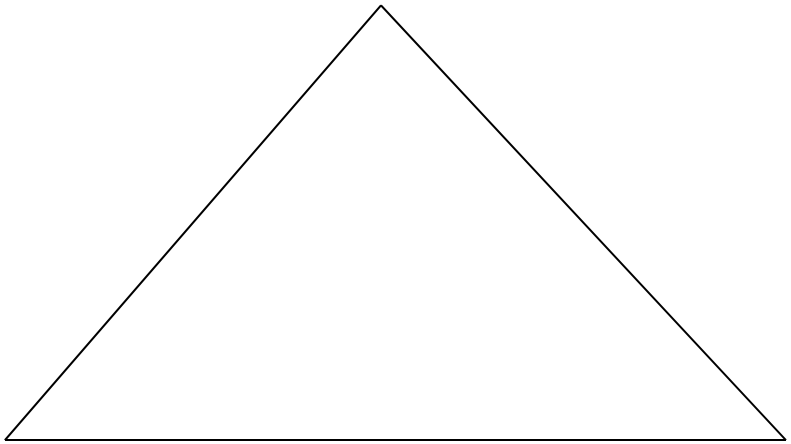
His absolutes of Quality are:

- Quality is defined as conformance to requirements, not "goodness".
- The system for achieving quality is prevention, not appraisal.
- The performance standard is zero defects.
- The measurement of quality is the price of non-conformance.

Crosby's Fourteen Points:

- Management commitment
- Quality improvement team
- Quality measurement
- Cost of quality
- Quality awareness
- Corrective action
- Zero defects planning
- Supervisor training
- Zero defects day
- Goal setting
- Error cause removal
- Recognition
- Quality councils
- Do it all over again

Integrity, Policies



Communication

Systems,
Operations

Crosby's Triangle

A. V. FEIGENBAUM:

He argued that the contribution of the manufacturing function in isolation is not enough for the production of high quality products.

"…… Total Quality Control guides the coordinated actions of people, machines and information to achieve this goal. The first principle to raecognize is that quality is everybody's job".

Feigenbaum's philosophy is summarized in his Three Steps to Quality:

a) Quality leadership
b) Modern Quality Technology
c) Organizational commitment

B. CONWAY:

Considers quality management as the management of the various stages of the development, manufacturing, purchasing and distribution processes with the consideration of economic viability and a desire to improve on various activities to reduce material waste and time wastage.

A list of six guidelines:

1. Human relation skills
2. Statistical surveys
3. Simple statistical techniques
4. Statistical Process Control
5. Imagineering
6. Industrial Engineering

K. ISHIKAWA:

- Credited for the following contributions:
- Quality Control Circles
- Fishbone diagrams or Ishikawa diagrams

According to him, nearly 90-95% of the problems can be solved using elementary statistical techniques. He classified **statistical techniques** in three categories.

1. Elemental statistical techniques

- ❖ Pareto analysis (vital few versus trivial many)
- ❖ Cause and Effect diagram (not a true statistical technique)
- ❖ Histogram
- ❖ Scatter and diagram
- ❖ Graph and Shewhart control chart (SPC chart)

2. Intermediate statistical method

- ❖ Theory of sampling surveys
- ❖ Statistical sampling techniques
- ❖ Methods of experiment design

3. Advanced statistical method (using computers)

- ❖ Advanced experimental design
- ❖ Multivariate analysis
- ❖ Operations research methods

Key elements of his philosophy are:

1. Quality begins with education and ends with education.

2. The first step in Quality is to know the requirements of customers.

3. The ideal state of quality control occurs when inspection is no longer necessary.

4. Remove the root cause, not the symptoms.

5. Quality control is the responsibility of all workers and all divisions.

6. Put quality first and set your sights on long term profits.

7. Marketing is the entrance and exit of quality.

8. 95% of problems in a company can be solved with simple tools for analysis and problem solving.

M IMAI: Originator of Kaizen

-Kaizen means continuous process improvement involving everybody; It is by definition a long-term and long-lasting improvement, the result of a team effort; it is process oriented and actually requires little investment, but great effort, to maintain.

Despite the differences among the experts, a number of common themes arise:

a)Inspection is never the answer to quality improvement.

b)Involvement of and leadership by top management are essential to the necessary culture of commitment to quality.

c)A program of quality requires organization-wide efforts and long-term commitment accompanied by the necessary investment in training.

d)Quality is first.