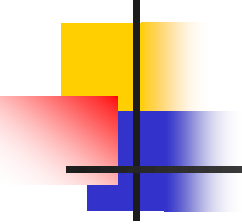


STATISTICAL QUALITY CONTROL (SQC) (IEng 5241)

CHAPTER 1

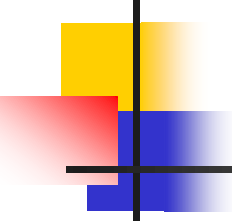
Introduction to quality



outlines

At the end of this chapter the students are able to:

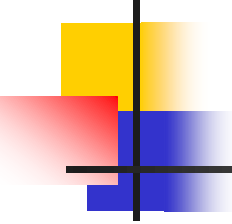
- *Define quality*
- *Discuss quality dimensions*
- *Explain quality objectives*
- *distinguish variation*
- *Discuss quality control*
- *Discuss quality improvement*



WHAT IS QUALITY?

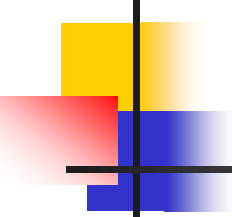
Class discussion 1

What quality for you?



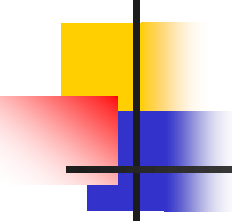
QUALITY... (cont'd)

- In popular use, the word quality suggests:
 - degree of excellence - a Cartier watch, a Rolls- Royce car, and a Christian Dior dress
 - something expensive and conforming to a high, perhaps luxurious, specification.
- However, this is too imprecise and limited idea of quality to be of any use in determining company policy.



QUALITY ... (cont'd)

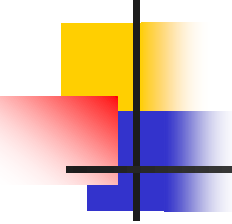
- Different scholars give different interpretations to the term quality:
 - For engineers it is conformance to **specifications**,
 - For users it is fitness for **use**,
 - For marketing it is the degree of excellence at an acceptable price that will influence the **market share**.
 - For customer service a quality product is that with less customer **complaint**



QUALITY ... (cont'd)

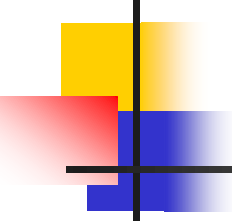
Quality connotes different meaning to different people:

- Quality is **degree of excellence**. (Dictionary)
- Quality is **fitness for use**. (Juran)
- Quality is conformance to **requirements / specifications**. (Crosby)
- Quality should be aimed at the **needs of the customer**, present and future. (Deming)



QUALITY... (cont'd)

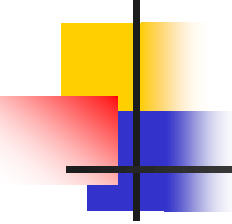
- Quality means best for certain customer conditions. These conditions are: the **actual use** and the **selling price** of the product. (Feigenbaum)
- Quality is providing our customers with products and services that consistently meet their needs and expectations. (Boeing Company)
- Quality is doing the right thing right the first time, always striving for improvement, and always satisfying the customers. (U.S.A. Department of Defense)



QUALITY... (cont'd)

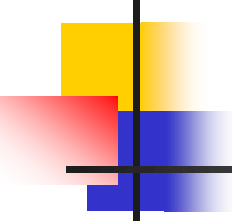
Class discussion & Homework 2

Identify and discuss between the weaknesses and the strengths of the above definitions of quality?



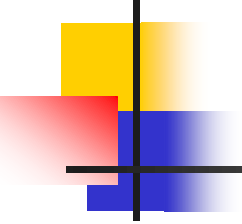
QUALITY... (cont'd)

- The meaning of quality in fact, remains a term that is easily misunderstood.
- The two serious weaknesses of any definition, which is based on conformance to a specification are:
 1. It sets a level which is considered to be 'good enough',
 2. It results in an emphasis on inspection. All the work goes into ensuring that nothing goes out of the specification.



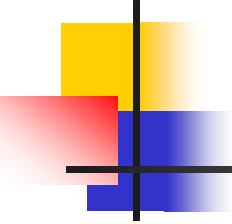
QUALITY... (cont'd)

- Some used the term to refer luxury and merit, and some others to mean excellence and value.
- The term is also being used to qualify a quality product as superior in all aspects to others in its class.



QUALITY... (cont'd)

- But the preferable definitions of Quality is based up on:
 - customer actual experience with the product or service,
 - measured against his requirements - stated or unstated, conscious or merely sensed,
 - technically operational or entirely subjective.

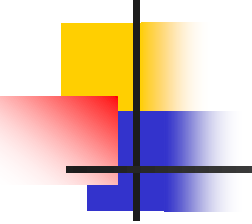


QUALITY... (cont'd)

➤ Product and service quality can be defined as the total composite product and service characteristics of:

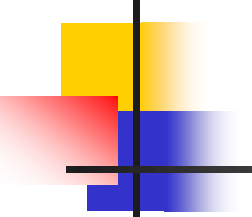
- Marketing,
- Engineering,
- Manufacture, and
- Maintenance through which the product and service in use will meet the expectations of the customer.

(Feigenbaum)



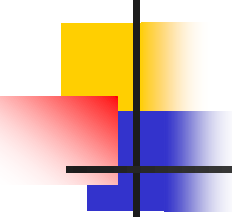
QUALITY... (cont'd)

- Deming says that "Quality should be aimed at the needs of customer, present and future".
- A comprehensive definition of quality is that product or service which fulfills an **aggregate requirement** of customers, in all aspects, at **present** and in the **future** and which customers can buy it.
- Thus, the closer to this conformation indicates the higher the degree of quality.



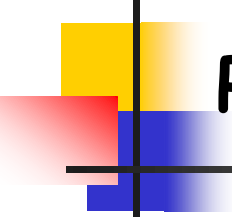
QUALITY... (cont'd)

- British Standard, BS4778 explains it as "The totality of **features** and **characteristics** of a product or service that bear on its ability to satisfy **stated** or **implied** needs".
- *These quality features and characteristics of **products** or **services** are presented through the following **dimensions of quality**.*



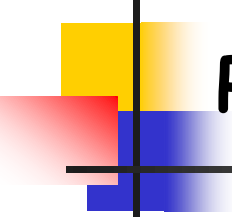
PRODUCTS' QUALITY DIMENSIONS

- **Performance** : (will the product do the intended job?).
 - Potential customer usually evaluate a product to determine if it will perform certain specific functions and determine how well it perform them.
- **Reliability**: (how often does the product fail?)
 - Complex products will usually require some repair over their service life. We should expect that the products will require occasional repairs, but if the products requires frequent repairs than planned, we say that it is unreliable.



PRODUCTS' QUALITY DIMENSIONS... (cont'd)

- **Durability:** (how long does the product last).
 - This is the effective service life of the product customer obviously want products that perform satisfactorily over a long period of time.
- **Serviceability:** (how easy is it to repair a product).
 - There are many industries where the customer's view of quality is directly influenced by how quickly and economically a repair or routine maintenance activity can be accomplished.



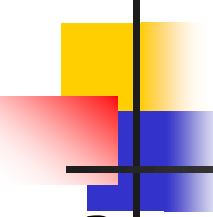
PRODUCTS' QUALITY DIMENSIONS... (cont'd)

➤ **Aesthetics:** (what does the product look like?)

- This is the visual appeal of the product, often taking into account factors such as style, color, shape, packaging alternatives, tactile characteristics, and other sensory features.

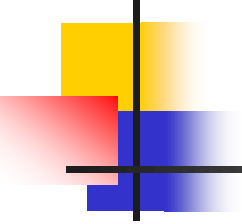
➤ **Features:** (what does the product do?)

- Usually, customers associate high quality with products that have added features: that is, those that have features beyond the basic performance of the competition.



PRODUCTS' QUALITY DIMENSIONS... (cont'd)

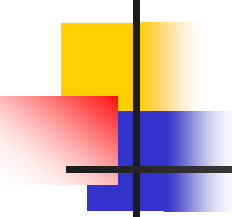
- **Perceived quality:** (what is the reputation of the company or its product?)
 - In many cases, customer rely on the past reputation of the company concerning quality of its products. This reputation is directly influenced by failures of the product that are highly visible to the public .
- **Conformance to standards:** (is the product made exactly as the designer intended?)
 - We usually think of a high quality product as are that exactly meets the requirements placed on it.



SERVICES' QUALITY DIMENSIONS

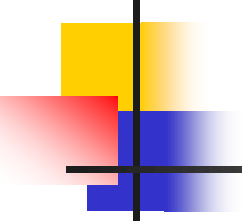
Homework 3

List and discuss services' quality dimensions.



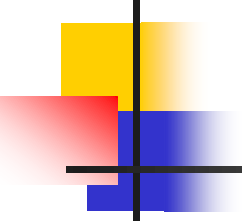
WHAT QUALITY OBJECTIVES?

- Quality is not a goal, which, once reached, can be sustained without constant effort.
- Competitors improve, suppliers slip, customer demands change and increase.
- So, Quality must become the first objective for all managers at all times.



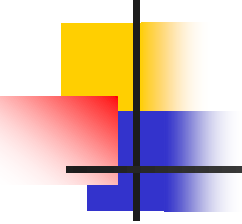
Objectives... (cont'd)

- If quality is introduced and managed correctly, it will:
 - Eliminate waste
 - Cut inventories
 - Improve customer satisfaction
 - Increase competitiveness
 - Increase productivity
 - Enhance profitability.



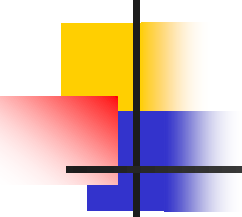
Objectives... (cont'd)

- To produce products/services that consumers will buy happily;
 - Quality dimensions,
 - Costs (i.e. sales price and profit),
 - Delivery (i.e. production volumes and sales volumes), and
 - Safety (including social and environmental factors) must be comprehensively controlled.



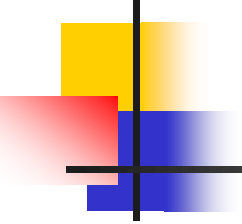
Objectives... (cont'd)

- At the heart of Total Quality are two simple aims, they are:
 - Make things right first time.
 - Work for continual improvement.



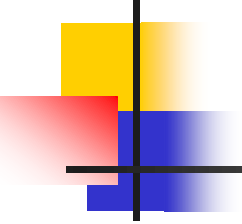
Objectives... (cont'd)

- If a defective product enters in the market, it will cause:
 - customer dissatisfaction,
 - unnecessary expenditure for warranty,
 - Lower competitiveness in the market
 - poor product salability.
- Having a quality product increases market share, resulting in better profits.



Objectives... (cont'd)

- The **central objective** of Quality is to eliminate waste by cutting manufacturing **variance** to the minimum.
- This is **equally applicable** to the **manufacturing** as well as to the **service giving** industries.



PROCESS VARIATION

➤ **Manufacturing variance** can be generated throughout the whole closed loop of the company;

- Marketing
- Engineering
- Purchasing
- Manufacturing Engineering
- Field service and Erection

VARIATION... (cont'd)

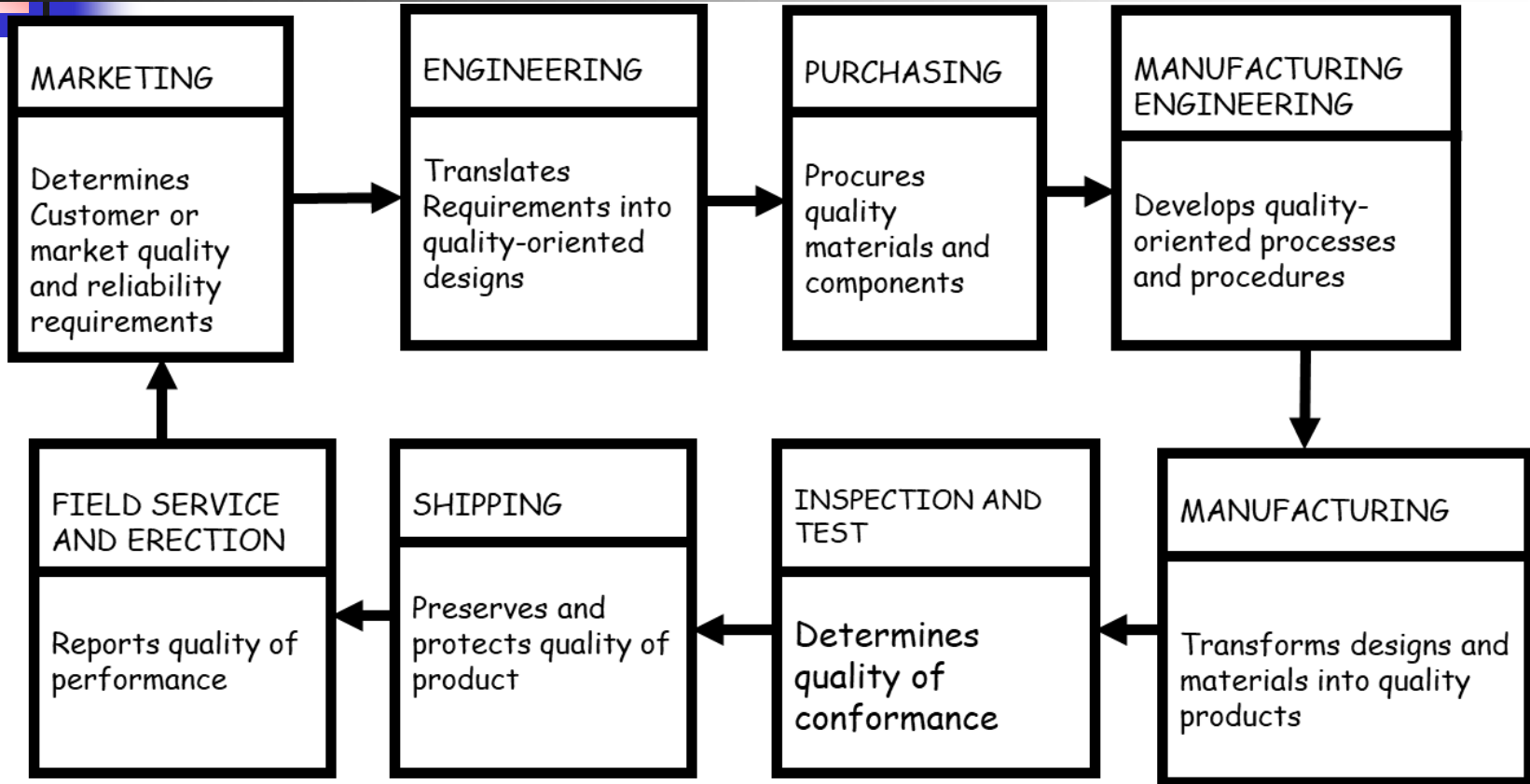
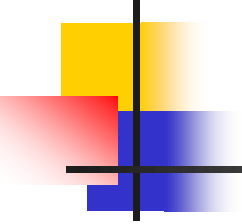


Figure : Close loop of the company's process



VARIATION... (cont'd)

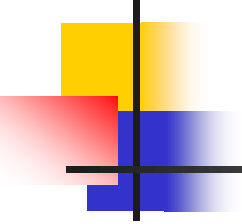
➤ Manufacturing process variations are of **two types**:

1. Random variations - result from intrinsic variability in the process.

- Process is operating normally
- Human variations from cycle to cycle, minor variations in starting materials, machine vibration, surrounding,

2. Assignable variations - indicate an exception from normal operating conditions.

- Operator errors, defective raw materials, tool failures, equipment malfunctions



VARIATION... (cont'd)

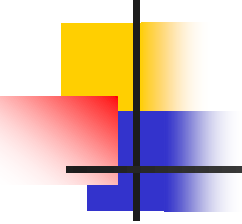
Causes of Variation

Natural Causes

- Inherent to process
- Random
- Cannot be controlled
- Cannot be prevented
- Examples:
 - Weather
 - accuracy of measurements
 - capability of machine

Assignable Causes

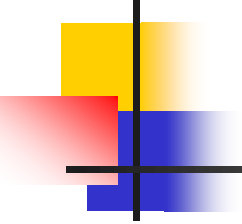
- Exogenous to process
- Not random
- Controllable
- Preventable
- Examples:
 - tool wear
 - "Monday" effect
 - poor maintenance



QUALITY CONTROL

- Quality control is defined as: "A system of methods for the cost effective provision of products or services whose quality is good for the purchaser's requirements".

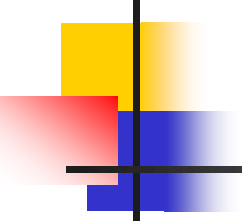
(Ishikawa)



QUALITY CONTROL... (cont'd)

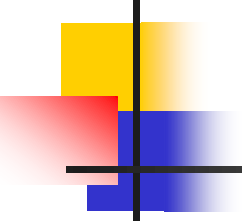
- "Quality control consists of developing, designing, producing, marketing and servicing products and services with optimum cost-effectiveness and usefulness, which customers will purchase with satisfaction".

(Ishikawa)



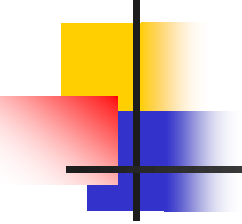
QUALITY CONTROL... (cont'd)

- To achieve quality products/services companies must:
 - Strive to create cooperation among departments,
 - Prepare and implement standards faithfully.



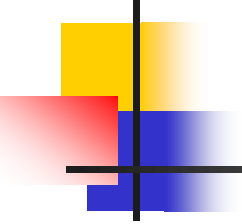
QUALITY CONTROL... (cont'd)

- This can only be achieved through full use of variety of techniques such as:
 - Statistical and technical methods,
 - Standards and regulations,
 - Computer methods, automatic control, and
 - Industrial engineering techniques and market research.



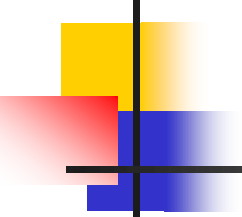
QUALITY CONTROL... (cont'd)

- Since real quality control can be achieved by marshaling all of a company's strengths, this kind of quality control is termed as Total Quality Control (TQC).
- Implementing TQC requires the participation of all departments, the involvement of every employee at all levels and a comprehensive implementation of quality control.



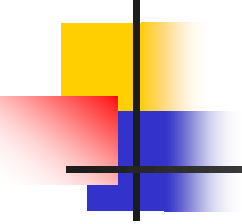
QUALITY CONTROL... (cont'd)

- TQC consists essentially of developing, controlling, and assuring the quality of products and services.
- However, we can expand the definition of TQC to mean improving the quality of everything, i.e. creating a high quality company; high quality man, machine, material and information.



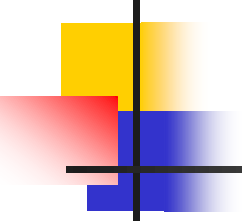
Traditional Quality Control

- Widespread use of statistical quality control (SQC), in which inferences are made about the quality of the population of manufactured parts and products based on a sample.
 - Two principal sampling methods in SQC:
 1. Control charts
 - Graphical technique used to track measured variable of interest over time
 2. Acceptance sampling
 - If the sample passes, the batch is accepted



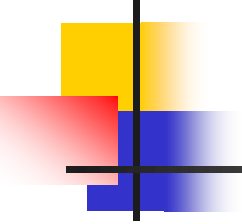
Traditional ... (Cont'd)

- Typical management principles and practices:
 - Customers are external to the organization
 - The sales and marketing department are responsible for customers
 - Company is organized by functional departments
 - Inspection department is responsible for quality
 - Inspection follows production
 - Knowledge of SQC techniques resides only in the minds of the QC experts in the organization



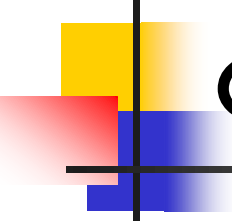
Modern View of Quality Control

- High quality is achieved by a combination of:
 - **Good management** - three objectives of "total quality management":
 1. Achieving customer satisfaction
 2. Continuous improvement
 3. Encouraging involvement of entire work force
 - **Good technology** - traditional statistical tools combined with modern measurement and inspection technologies



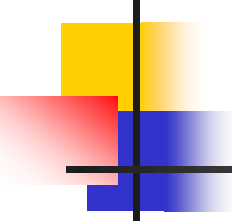
Modern View ... (Cont'd)

- Typical management principles and practices:
 - Quality is focused on customer satisfaction
 - Internal and external customers
 - Quality goals are driven by top management
 - Quality control is pervasive in the organization
 - Quality must be built into the product, not inspected in afterward
 - Production workers must inspect their own work
 - Continuous improvement
 - A never ending chase to design and produce better products



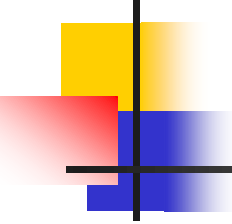
QUALITY IMPROVEMENT TECHNIQUES

- Quality control and improvement involve the set of activities used to ensure that the products and services meet requirements and are improved on a continuous basis.
- Quality improvement is the reduction of variability in processes and products.
- The underlying concept of quality improvement techniques is to ensure, in a cost efficient manner, that the product shipped to customers meets their specifications.



Quality Improvement ... (cont'd)

- Statistical Quality Control is the process of inspecting enough product from given lots to probabilistically ensure a specified quality level.
- Inspecting every product is costly and inefficient, but the consequences of shipping non-conforming product can be significant in terms of customer dissatisfaction.

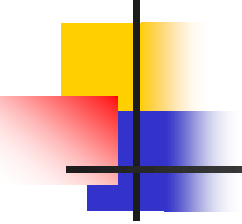


Quality Improvement... (cont'd)

Homework 4

Discuss the following quality philosophies and management strategies:

1. W. Edwards Deming
2. Joseph M. Juran
3. Armand V. Feigenbaum
4. Quality Systems and Standards
5. Quality Awards
6. Six-Sigma



Thank you

