

QUALITY MANAGEMENT
(MSL 71500)
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WEEK: II (Lecture 3 and 4)

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Stages in the Quality Movement

| Identifying characteristics | Inspection | SQC | QA | TQM |
|------------------------------------|-------------------------|--|-------------------------|----------------------------------|
| Primary concern view | Detection | Control | Coordination | Strategic |
| Emphasis | Product uniformity | Product uniformity with reduced inspection | Entire production chain | Market and consumer needs |
| Methods | Gauging and Measurement | Statistical tools and techniques | Programs and systems | Strategic planning, goal setting |

| Identifying characteristics | Inspection | SQC | QA | TQM |
|--|--|---|--|---|
| Role of quality professionals | Inspection, sorting, counting and grading | Application of statistical methods | Quality measurement planning, program design | Goal setting, education, training, consultation |
| Who has the responsibility for quality? | Inspection deptt. | Manufacturing, engineering deptts | All deptts. | Everyone in organization and leadership from senior management |
| Orientation and approach | Inspects in quality | Controls in quality | Builds in quality | Manages in quality |

The Quality Processes:

a) Organization level quality:

- Looking at the organization strategy (vertical definition) and whether it is doing the right things; and looking at operational systems (horizontal systems) and whether they are doing things right.
- Quality centers on meeting external customer requirements.

b) Process level quality:

- Organizational units are classified as functions or departments
- Emphasis is on the set of inputs and outputs, inter-functional activities which are geared towards producing the goods and services that the customer wants.

c) Individual/performer level quality:

- Human performance system.
- Standards for output must be based on quality and customer-service requirements that originate at the organizational and process levels.

I - Quality Control:

QC is the use of techniques mainly statistical to achieve, maintain and try to improve on quality standards of products and services.

As per the definition by ISO, QC means “ all those operational techniques and activities that are used to fulfill requirements for quality”.

It coordinates the links between the following activities:

- Ø Specifications of what is required.
- Ø Designing the products/services required.
- Ø Production, installation/assembly of parts, components, elements of the service/product package.
- Ø Inspection of the product/service package to determine the conformance to customer specifications.
- Ø Monitoring usage/consumption of product/service to feedback the information to improvements wherever possible.

Statistical Quality Control:

This is a technique used to measure the degree of conformance of raw materials, processes and products to previously agreed specifications.

It uses X and R charts for measuring variations (eg. weight, dimensions). An X Chart is used for plotting the average reading against control limits. The range (R) chart plots the difference between the largest and smallest reading.

SQC techniques can be classified into two groups: those concerned with process control and those concerned with product control.

Total Quality Control:

TQC is a business philosophy which groups together manufacturing, engineering, marketing and sales amongst others, linked together by a two-way flow of information.

It is the application of a number of important management principles and the SQC to all stages of planning, design, production, service, marketing, accounting and administration.

II - Quality Assurance:

QA means that the process of checking, correcting and controlling is conducted in such a manner that the manufacturer/service provider is aware that all stages of production are being conducted correctly and that what is planned is what is expected to result in terms of output.

QA also means that there is a set of documentation (a system) which demonstrates the existing standards of quality and reliability.

As per the definition by ISO, QA means,” all the planned and systematic activities, implemented within the organization for quality management, to provide adequate confidence that a product or service will satisfy given requirements for quality.”

III - Total Quality Management:

TQM has been viewed as a customer-focused process, which seeks for continuous improvement and meeting customer's perceptions.

TQM means:

“Total: Every person in the firm is involved;
Quality: Customer requirements are met exactly;
Management: Senior executives are fully committed”.

As per ISO 9004, TQM is a managerial philosophy and company practices which aim to harness the human and material resources of an organization in the most effective way to achieve the objectives of the organization”.

Differences in Quality of Goods and Services:

- a) Customer needs and performance standards are often difficult to identify and measure, primarily because the customers define what they are, and each customer is different. Thus the *dimensions vary* between products and services.
- b) The production of services typically requires a *higher degree of customization* than does manufacturing.
- c) The output of manufacturing products are tangible and visible, while that of services are intangible.

- d) Services are produced and consumed simultaneously, whereas manufactured goods are produced prior to consumption.
- e) Customers are also often involved in the service process and present while it is being performed, whereas manufacturing is performed away from the customer.
- f) Services are generally labour intensive, whereas manufacturing is more capital intensive.

Dimensions of quality:

A. For manufactured products:

Ø Performance: Product's primary operating characteristics.

Ø Features: Secondary characteristics and added features that supplement the product's basic functioning.

Ø Reliability: The probability of a product's surviving over a specified period of time under stated conditions of use

Conformity: Degree to which a product's design and operating characteristics match pre-established standards.

Ø Durability: It is the amount of use one gets from a product before it physically deteriorates or replacement is preferable.

Ø Serviceability: Speed, courtesy and competence of repair. Resolution of problems and controls.

Ø Aesthetics: (A subjective dimension) - how a product looks, feels, sounds, tastes or smells.

Perceived quality: (A subjective dimension)- Subjective assessment resulting from image, advertising or brand name.

B For a service:

- Ø **Time:** How much time must a customer wait?
- Ø **Timeliness:** Will a service be performed when promised?
- Ø **Completeness:** Are all items in order included?
- Ø **Courtesy:** Do front line employees greet each customer cheerfully and politely?
- Ø **Consistency:** Are the services delivered in the same fashion for every customer and every time for the same customer?

Ø ***Accessibility and convenience:*** Is the service easy to obtain?

Ø ***Accuracy:*** Are the services performed right the same time?

Ø ***Responsiveness:*** Can the service personnel react quickly and resolve unexpected problems?

| Before purchase | At point of purchase | After purchase |
|----------------------------------|---------------------------------|---------------------------|
| Store reputation | Service and repair policies | Service Effectiveness |
| Published test results | Support program | Reliability |
| Advertised price for performance | Quoted price for performance | Comparative performance |

TOOLS AND TECHNIQUES IN QUALITY **MANAGEMENT**

The purpose of measuring, recording, analyzing, implementing and controlling within processes is to achieve superior performance.

Tools and techniques generate data which can be analyzed to provide valuable information that can help managers make much more accurate decisions.

Measurement is therefore a necessary continuous activity if a good understanding of business strengths and weaknesses is to be established.

Juran has defined measurement from two perspectives:

(i) A unit of measure:

A defined amount of some quality feature which permits evaluation of that feature in numbers;

(ii) A sensor:

A method or instrument, which can carry out the evaluation and state the findings in numbers, in terms of the unit of measure.

Tools and techniques are therefore the sensors which can be used in every process of business to establish the standard of quality at each stage of each process by ensuring that there is total compliance with customer requirements.

A. WHAT ARE TOOLS AND TECHNIQUES?

The term 'tools and techniques' is used generically to describe practical methods and skills applied to particular tasks to facilitate change and improvement.

Dale et al. (1993) have proposed the following definitions of tools and techniques.

A single **tool** may be described as a device, which has a clear role and defined application. It is often narrow in its focus and can be and is usually used on its own.

A **technique** has a wider application than a tool. A technique may even be viewed as a collection of tools.

While dealing with tools and techniques, ***it is important to highlight the following:***

- There are differences in the terminology used to describe tools and techniques, and the methodology of their deployment.
- In some cases different names are used to describe very similar tools and techniques, and vice versa.
- There is also little attempt to distinguish between a tool and a quality technique.
- For the majority of organization embarking on an improvement process, the use of tools and techniques is the initial thrust.

B. WHY USE TOOLS AND TECHNIQUES?

Tools and techniques can be used in two different ways:

- (i) **Reactive role:** A problem has been identified and a process seeking to solve it is carried out;
- (ii) **Proactive role:** The continuous search for improvement by isolating possible bottlenecks and seeking to solve them through a process using TQM tools and techniques.

Tools and techniques play a key role in TQM. When used effectively, they:

- a) allow processes to be documented, monitored and evaluated,
- b) encourage everyone to become involved in the improvement process,
- c) assess the performance of the process and highlight problem areas,
- d) allow people to solve their own problems and take a closer look at what is happening,
- e) facilitate the development of a mindset of continuous improvement,
- f) provide the means of transferring experiences from improvement activities to everyday business operations,

- g) reinforce teamwork through problem solving,
- h) make a contribution to the achievement of business results,
- l) provide a framework which ensures that the right things are done first time and every time,
- j) assist in visualizing data,
- k) produce countermeasures to abnormalities, and
- l) provide the means by which teams and individuals can demonstrate and measure the progress they are making towards TQM.

C. WHERE TO USE TOOLS AND TECHNIQUES?

Tools and techniques are commonly used to solve problems, undertake projects, demonstrate commitment and facilitate improvement.

Everyone, including managers, should be encouraged to use tools and techniques as a matter of routine in their business activities.

Within an organization, all employees should be able to:

1. Find a use for tools and techniques in their processes,
2. Find opportunities to make improvements and cost savings, outside of quality improvement teams, and
3. Improve the effectiveness of the tools and techniques currently used.

D. PROCESSES:

What are Processes?

A process is any activity/task, which has the following features:

- Converts a set of inputs into useful outputs for internal and/or external use;
- Consumes a set of inputs to provide useful outputs for internal and/or external use;
- Provides a visible link in the customer-supplier chain;
- Resulting outputs are amplified throughout the organization through a synergistic effort.

Process Documentation:

Each activity has to be properly documented to include:

- Process ownership;
- Boundaries for each process should be clearly identifiable;
- The flow of each process has to be well understood;
- Process objectives;
- Process performance;

Process documentation reflects three main points:

- That strengths and weaknesses of the organization are well understood.
- That control over activities is tight, since process ownership/responsibility has been allocated throughout the organization;
- That performance measurement is a distributed but value added activity.

Process improvement:

Process improvement can be considered as the continued effort of transforming organizational weaknesses into strengths, which will contribute towards the achievement of superior performance.

Process improvement therefore comes from an investigative effort into the identification of causes and effects.

Process variation and its causes:

Processes within business organizations are often subject to variation. There are two types of causes of variation - common causes-and special causes.

Common causes of variation:

Random causes; are inherently part of the system (process); affect everyone associated with the process: Some examples include:

- Procedures and methods used;
- Education and training given;
- Machine movement;
- Temperature changes.

Special causes:

Assignable causes; are unrelated to the intended design of the process; Do not affect everyone and only arise because of specific circumstances; They are unpredictable and temporary.

Some examples include:

Tool wear;

Material variation;

Poor maintenance;

Operator performance;

Electric power surge;

New methods, procedures;

Inexperienced or untrained operators.

A process which is only affected by common causes is a stable process, that is a process which is statistically controllable since changes and variations can be predicted over time.

On the other hand, a process which is affected by both special and common causes is unstable regardless of the degree of variation.

Different approaches to the interpretation of variation

| | Variation that indicates good or bad performance | Causes of variation in the process |
|----------------|---|---|
| FOCUS | Outcomes of the process (product/service) | Causes of variation in the process |
| AIM | Classify outcomes as acceptable or not | Provide a basis for action on the process |
| BASIS | What the customer wants or needs | What the process is actually delivering |
| METHODS | Specifications, budgets, forecasts, numerical goals, other tools for judging performance. | Control charts. |

E. TOOLS AND TECHNIQUES VIS A VIS 'CRITICAL SUCCESS FACTORS' :

1. A genuine need to use the tool or technique.
2. Defined aims and objectives for its use and a planned approach' to application.
3. Full management support and commitment at all levels of the business.
4. An environment that is conducive to improvement.
5. Effective, timely and planned training,
6. Available and accurate data, including the appropriate means and methods of measurement.

7. Backup and support from improvement facilitators.
8. Tools and techniques in current use must be employed effectively before attempts are made to introduce others.
9. The temptation to single out one tool or technique for special attention should be avoided.
10. The limitations of how and when tools and techniques can best be used should be understood.
11. Tools and techniques must be used as an integral part of the business operations.

When the critical success factors are in place, the use of tools and techniques provides a means to:

1. Define the issues that are important to the business.
2. Identify the root causes of problems.
3. Develop, test and prototype solutions, and,
4. Implement a permanent solution and build this, as appropriate, into procedures.

F. THE USE AND APPLICATION OF TOOLS AND TECHNIQUES:

There are a variety of means for classifying the tools and techniques used in a process of improvement.

Tools and techniques can be broadly categorized as relating to:

- (1) role
- (2) tasks and activities associated with the improvement process, and
- (3) the stages/steps involved with a process of improvement.

When selecting tools and techniques, there are three main factors that organizations should keep in mind:

- a. The application of any tool and technique in isolation without a plan, framework and long-range management vision will only provide short-term benefits.
- b. No one tool or technique is more important than another; they all have a role to play at some point in the improvement process.
- c. The education and training requirements that underpin the effective use of the tool or technique should be given due care and attention.

Role of Quality Management Tools and Techniques

| ROLES | TOOLS AND TECHNIQUES |
|---|--|
| 1. Checking | Checklists, control plans |
| 2.Data collection/presentation | Check sheets, bar charts, tally charts, histograms, graphs |
| 3. Setting priorities/planning | Pareto analysis, Arrow diagrams, Quality costs |
| 4. Structuring ideas | Affinity diagrams, Systematic diagrams, Brainstorming |
| 5. Performance / capability measurement /assessment | Statistical process control, Department purpose analysis |

| ROLES | TOOLS AND TECHNIQUES |
|---|--|
| 6. Understanding / analyzing the problem/process | Flow charts, Cause and effect diagrams, Process decision programme charts (PDPC) |
| 7. Identifying relationships | Scatter diagrams/regression/correlation, Relations diagrams, Matrix diagrams |
| 8. Identifying control parameters | Design of experiments |
| 9. Monitoring and maintaining control | Mistake-proofing, Failure mode and effects analysis, Matrix data analysis |
| 10. Interface between customer needs and product features | Matrix data analysis |

Dale et al. have identified the common and specific difficulties and issues and their findings are summarized below:

The difficulties and issues relating to all tools and techniques include:

- Resources
- Management commitment
- Detection-based mentality
- Knowledge and understanding
- Resistance to change

The issues relating to specific tools and techniques include:

- Statistical knowledge and analytical skills
- Expenditure
- Visual versus static profile
- Project-based training
- Development of TQM

It is clear that many of the issues and difficulties, both common and specific, encountered with tools and techniques relate to:

- How and when they are taught
- How they are understood
- Lack of skills and knowledge
- Incorrect application of the acquired knowledge
- Believing that they do not apply to managers
- Using them without a framework
- Using them without a purpose or aim, and
- Misinterpretation of the data.

There are also several themes that contribute to any difficulties identified. They include:

1. Poorly designed training and support
2. Being unable to apply what has been learnt
3. Inappropriate use of tools and techniques
4. Resistance to use of tools and techniques
5. Failure to lead by example
6. Inadequate measurement and data handling, and,
7. Not sharing and communication the benefits achieved.

F. KEY INFLUENCES ON THE USE OF QUALITY MANAGEMENT TOOLS AND TECHNIQUES:

Success' factors may be grouped into four broad categories:

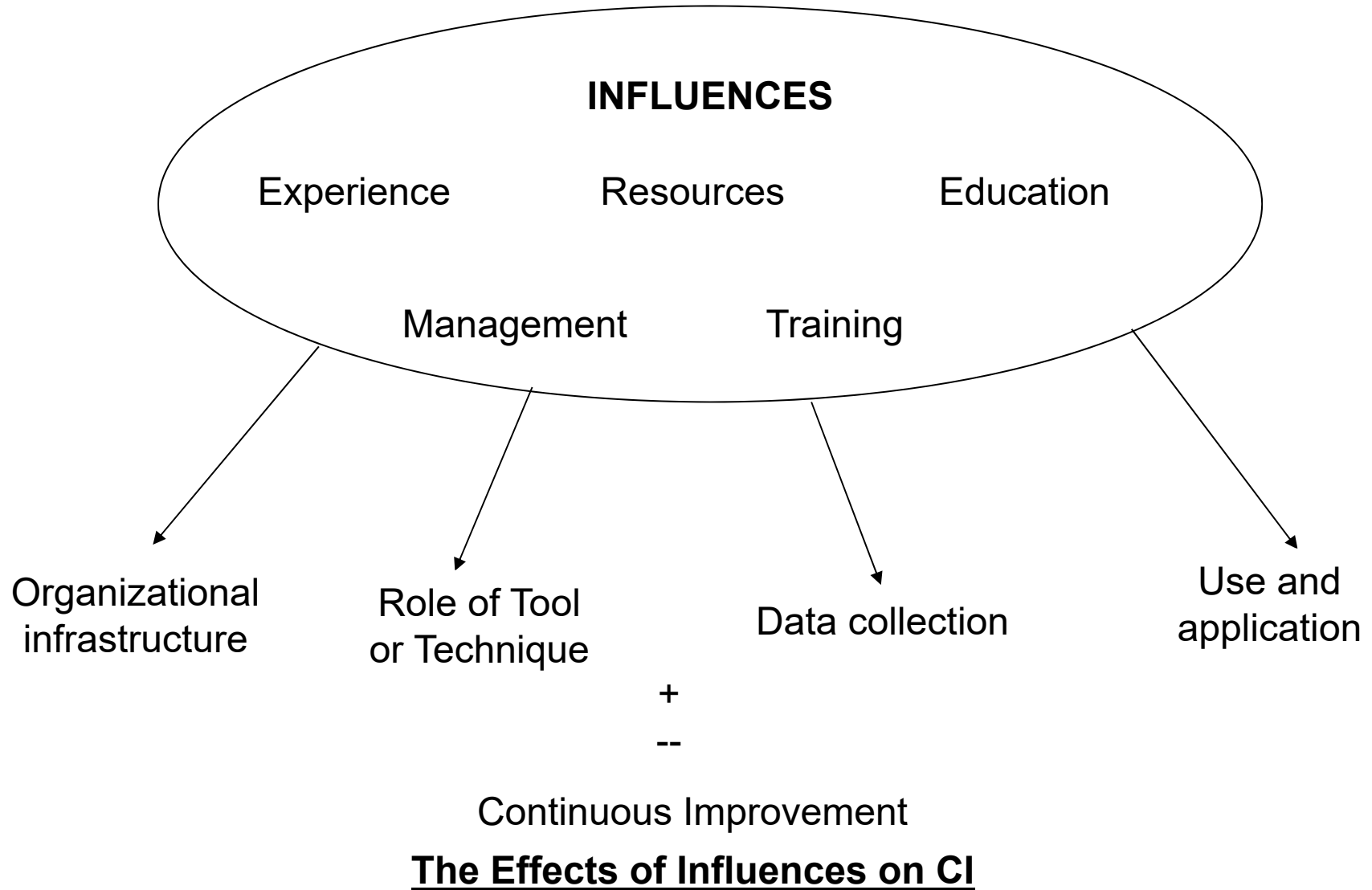
- (1) role of the technique or tool in the improvement process,
- (2) organization and infrastructure of the company,
- (3) data collection, and,
- (4) use and application of the technique or tool.

When linked to this classification, all information points to the fact that each category is subjected to various influences.

These according to McQuarter et al. are:

- Experience
- Management
- Resources
- Education and training

It is the effects of these influences that cause the issues and difficulties associated with quality management tools and techniques.



COMMONLY USED TOOLS AND TECHNIQUES

| The Seven basic Quality Control Tools | The Seven Management Tools | Other tools | Techniques | |
|--|---------------------------------------|------------------------------|--|---|
| Cause and effect diagram/analysis | Affinity diagram | Brainstorming | Benchmarking | |
| Check sheet/ concentration diagram | Arrow diagram/ critical path analysis | Control plan | Departmental purpose analysis (DPA) | |
| Control charts | Matrix diagram | Flow chart/ process modeling | Design of experiments/ Taguchi methods | |
| Graphs/charts | Process decision programme chart | Force field analysis | Failure mode and effects analysis (FMEA) | |
| Histogram/tally chart | Relations diagram | Questionnaire | Fault tree analysis (FTA) | |
| Pareto diagram | Systematic diagram/ tree diagram | Sampling | Pooka yoke (mistake-proofing) | |
| Scatter diagram/regression/correlation | | | | Problem solving methodology |
| | | | | Quality costing |
| | | | | Quality Function Deployment (QFD) |
| | | | | Quality Improvement Teams/quality circles |
| | | | | Statistical Process Control (SPC) |
| | | | | Vendor assessment and rating |

The Seven basic Quality Control Tools

- Cause and effect diagram/analysis
- Check sheet/ concentration diagram
- Control charts
- Graphs/charts
- Histogram/tally chart
- Pareto diagram
- Scatter diagram/regression/correlation

The Seven Management Tools

- Affinity diagram
- Arrow diagram/ critical path analysis
- Matrix diagram
- Matrix data analysis method
- Process decision programme chart
- Relations diagram
- Systematic diagram/ tree diagram

Other tools

- Brainstorming
 - Control plan
 - Flow chart/ process modeling
- Force field analysis
Questionnaire
Sampling

Techniques

Benchmarking

Departmental purpose analysis (DPA)

Design of experiments/ Taguchi methods

Failure mode and effects analysis (FMEA)

Fault tree analysis (FTA)

Poka yoke (mistake-proofing)

Problem solving methodology

Quality costing

Quality Function Deployment (QFD)

Quality Improvement Teams/quality circles

Statistical Process Control (SPC)

Vendor assessment and rating