Chapter 8

TOTAL QUALITY MANAGEMENT (TQM)

Introduction

- Total quality management (TQM) is a management process that ensure that products and services are designed, developed, produced, delivered and supported to meet customer expectations fully (the first time, every time).
- TQM Is formally defined as an interlocking of arrangement of procedure and practices that ensure that all employees in every department are adequately trained and directed to implement aligned improvements in quality, service and total continuously to meet customer expectations.

Introduction (CONT)

- Seven fundamental principle of total quality management:
  - Understand and answer the voice of customer.
  - All people in an enterprise must be totally involved in quality improvement.
  - Continuously strive for zero defect.
  - Design and build quality into the product.
  - Focus on the process.
  - Suppliers are partners in quality.
  - Quality is free.

Case Study: Granite Rock Company

- After studying a case study these are some of TQM practice that made the greatest contribution to Granite Rock Company success.
- Total Quality Management principles used by Granite Rock Company:

Fundamental principles of TQM	Application of the TQM principles at the Granite Rock Company
Understand and answer the voice of the customer	Granite Rock's customers demand high quality and the company responded to this need. The company has systems in place to get feedback from customers and to handle the complaints of customers
All people in an enterprise must be totally involved in quality improvement.	Granite Rock provides training and coaching to workers so that they know how to achieve high quality standards.

Case Study: Granite Rock Company (Cont.)

- TQM principles used by Granite Rock Company (cont.):

Fundamental principles of TQM	Application of the TQM principles at the Granite Rock Company
Continuously strive for zero defect	Granite Rock tries to be ahead of its competition and actually reached the six-sigma level.
Design and build quality into the product	Reliability has been built into the processes of Granite Rock.
Focus on the process	By using computer-controlled processing equipment for mixing batches of concrete Granite Rock managed to cut out human error.
Suppliers are partners in quality	Granite Rock buy materials supplied other manufacturers. It is not stated in the case study whether they require such suppliers to meet the same standards that they have put in place.
Quality is free	Statistical process control has helped the company to reduce variable costs. Costs incurred in resolving complaints are about 0,2% of sales which is lower than the 2% of sales for their competitors.

The voice of the customer

- Understanding of customer need is the first step in TQM.
- TQM is about gaining understanding of what customers need.
- Approaches used in TQM to understand customers and their requirements:
  - Informal customer research – Get information from customers by talking to them.
  - Formal customer research – Identify, measure and understand customers expectations by means of qualitative and/or quantitative techniques.
  - Qualitative research – Free format responses in which word and observations are used.
  - In – depth interviews - Face to face interviews conducted on 1-1 basis or in small groups.
  - Focus group - The focus group technique is the most useful and versatile qualitative research technique for determining the voice of the customer. Group of 7-12 customers, meet for 2 hours to offer viewpoints about their requirements and expectations.
  - Quantitative research – Develop statistically reliable information about customer needs from sample data that can be generalised to larger populations. Usually done by mail and telephone.

Employees' involvement in quality improvement

- TQM is a company wide responsibility.
- Establishing of quality control department, recruiting a quality manager, increase quality standards, employing more inspector and implementing a rework in the industry will not improve quality on their own. All they will do is to increase the cost of quality.

Employees' involvement in quality improvement (Cont.)

- The steps in implementing TQM (total quality management) on an enterprise-wide basis.
  - Set up a quality council or similar group to formulate and implement an enterprise wide quality policy. (A quality council is a cross-functional team comprising members of senior management and the organisational functions.)
  - The quality council should always show total commitment to TQM principles.
  - All people in the organisation should be involved quality and continuous improvement activity.
  - Everyone should be Trained in TQM principles including senior management.
  - Small group called process improvement team (PIT) should be set at shop-floor level that improve processes and solve quality problems.
  - Sufficient time should be allocated to quality training and small group activity.
  - Quality improvements should be monitored.
  - Quality control department should facilitate quality improvement initiatives and couch other in organisation.

Continuously strive for Zero Defect

- **Rules** identified by Richard Sconberger that sustain the habit of continuous quality improvement while aiming for zero defects:
  - Focus on the process
  - Make quality visible
  - Insist on compliance
  - Stop the line
  - Correct you errors
  - Do a 100% check until the process is capable
  - Improve on a project by project basis
- NB: Kaizen is the Japanese word for process variation.

Design and build quality into the product

The TQM process start with the new product development process.

- Quality must be built into the new product
- All participants in new product development must provide quality services to one another so that the customer can see the quality in the product.
- When allocating resources for new product development, the focus should be on meeting customer requirements.
- The prevention of future quality problems is the responsibility of the product development team.
- It is much cheaper to avoid potential quality problems than it does to fix it once they are already embedded in the product.
- Effective design control is therefore important to achieve TQM during product development.
- Designs should:
  - Be fit for purpose, reliable and serviceable
  - Specify methods of measurement and testing
  - Result in products that provide customer satisfaction

Design and build quality into the product (Cont.)

Quality function deployment (QFD)

- Quality function deployment is method that has been successful in analysing customer requirements and building these into product design.
- QFD is a process that can help determine:
  - What a customer's requirements are;
  - What a customer's highest priorities are;
  - Characterises of a product or service.
- Quality function deployment is a formal method for transforming customer requirements into technical requirements.

Design and build quality into the product (Cont.)

Quality function deployment (QFD)

- By Studying the "voice of customer" (VOC) chart on METS-3: page167, be able to explain the role of VOC chart in the new product development process.
  - The importance that the customer places on various needs are rated (1 to 3).
  - The product characteristics that the customer values are identified.
  - The relationship between the VOC and product characteristics can be identified.
- Please read through the example of building quality into the product at Motorola.
  - After reading Motorola example you should understanding of when a process to be at Six Sigma.

Focus on the process

- Traditional approach to quality control was to prevent product being delivered to customer.
- Examining products and scrapping those did not pass or sending them back for rework prevent product being delivered to customer
- One objective of TQM is to replace inspector examining products.
- To achieve the this it is necessary o improve continuously and control the process that design, develop, produce, deliver and support product.
- A process is a repetitive set of interacting activities that user resources to transform a define set of inputs into outputs that are of value to customer.
- The elements of a process are called four M's:
  - Materials (raw materials or components)
  - Manpower (people)
  - Machines (tools, equipment, and facilities)
  - Methods (operating procedure)

Focus on the process (Cont.)

Process variation:

- Process variation is key to TQM
- Process variation is when the quality of the output produced by processes varies.
- Variation due to chance is called variation due to common causes.
- Other variations are due to special causes.
- A key objective of TQM is to identify special causes of variation so that it can be eliminated.
- This means that special-cause and common-cause variation must be separated.
- Special-cause variation can usually be traced to a specific source.

Focus on the process (Cont.)

- Differentiating between common and special causes of variation:

Common causes	Special causes
Variation due to chance	Can be linked to a specific cause. E.g. incorrect tool setting; operator not following procedures
Cannot easily be eliminated because it cannot be traced to a specific source.	Can be traced to a specific source and then eliminated.
To be addressed by employees in charge of the process.	Can be addressed by front-line workers
94% of all causes	6% of all causes

Focus on the process (Cont.)

- Quality improvement tools
  - Process chart - It is used to map activities involved in the manufacturing product or delivery of a service so that value-adding wasteful activities can be identified.
  - Pareto analysis - It is based on the 80/20 rule.
  - Ishikawa diagram - It is also known as the cause-and-effect diagram.
  - Histograms - It indicates the frequency of various events/causes.
  - Run diagrams and correlation diagrams - It is used to identify relationships between events and time, and between problems and causes.
  - Control charts - It is used in statistical process control.
  - Checklist – used to maintain the level of quality.

Suppliers are partner in quality

- The suppliers of raw materials, components and sub-assemblies should ideally also apply TQM principles.
- In TQM programme Suppliers should be treated as partner.
- Strong TQM programme in place and a transfer of TQM knowledge to the supplier will help organisation to meet TQM objectives.
- Long term partnership is often forged by Training suppliers on TQM principles and techniques.

Suppliers are partner in quality (Cont.)

The advantages of establishing single sources of supply:

- Better service can be expected – all the business is provided to one supplier.
- You can develop a more collaborative and information sharing relationship – because you are dealing with one supplier only.
- Better price can be negotiated.
- Monitoring of purchased goods can be reduced.
- If your company wants to provide quality products then the inputs used must also be of good quality.

Quality is free

- “There is a cost attached to doing things wrong, this is called the cost of quality, or COQ. COQ can be thought of as the cost of achieving conformance to quality standards plus the cost of non-conformance. It is the cost of rework, scrap, inspection, warranty claims, testing and similar activities to ensure conformance to quality standards.

Quality is free (Cont.)

- Costs related to quality are usually separated into at least three areas:
  - Prevention costs. These costs are associated with all the activities that focus on preventing defects or non-conformance with quality standards. In many organisations this includes all the people in the quality department who inspect the product, as well as the cost of operators who do their own inspection. Also included in this group are activities to assure supplier conformance.
  - Appraisal costs. These costs are associated with measuring, evaluating or auditing products to assure conformance with quality standards and performance requirements.
  - Failure costs. These costs are associated with evaluating and either correcting or replacing defective products, components or materials that do not meet quality standards. Failure costs can be either internal failure costs that occur prior to the completion or delivery of a product or service; or external failure costs that occur after a product is delivered or a service is provided.
- The basic relationship between the three types of cost is that money invested in prevention and appraisal can substantially reduce failure costs. In addition to reducing expenses, the reduction in external failures results in fewer, dissatisfied customers resulting in fewer product returns, less customer complaints and greater customer loyalty. As a rule of thumb, in a well-managed enterprise, the cost of prevention and appraisal should be one third of the cost of failure. This leads to the conclusion that “quality is free. It’s not a gift, but it is free”.

The ISO quality system standards

Define the ISO 9000 quality standards.

- A written set of standards that define the basic elements of a management system and organization should use to ensure that its products and services meet or exceed customer needs and expectations.
- Study METS-3: page178 – 181 to understand ISO standards.

Conclusion

- Total quality management is a company-wide responsibility.
- Quality is not something that can be added at one point in the value chain – it must be integrated with all the processes through which products and services are produced and distributed.
- A quality control department cannot solely be held responsible for quality
- Quality is of strategic importance and therefore top management should lead TQM initiatives that should focus on preventing quality problems from happening.
- The only way for an enterprise to reach world-class quality standards is for everyone in the enterprise to be totally committed to and involved with quality improvement.

References

- Ref: Management for Engineers, Technologists and Scientists, 3rd edition, by Wilhelm P. Nel