Topic 4: Quality Management and International Standards

Overview

Quality is a strategy that firms use to achieve profitability. Today, it is not just quality but total quality management (TQM) that is the key to attain competitive advantage in firms. Quality cannot come from nowhere, it has to be brought about through compulsion; especially from many sources of challenges such as environment, competition, needs of customers and scarcity of resources. In the global market, there is intense competition leading to much innovations to gain competitive advantage. Firms that have failed to recognise and keep up with these challenges have suffered, while those that have absorbed the quality message have prospered. To attain the expected quality level in firms requires good management to mobilise the whole organisation in its achievement. This is where the concept of TQM becomes the demand for achieving quality in an organisation implying that every part and every level in the organisation must be concerned and involved in quality management. Besides, quality involves the use of information to set standards (such as needs of the customers) and conforming to them. These ideas are captured in the international standard, ISO9000.

Learning Outcomes

By the end of this topic, you will be able to:

1. identify quality is related to product improvements and process improvements.
2. explain that quality improves productivity and saves costs of production.
3. demonstrate the four aspects of cost of quality - prevention costs, appraisal costs, internal failures and external costs.
4. illustrate the need for ethics and quality management for the firm to attain competitiveness.
5. explain the concept of international quality standards and the importance of TQM to meet the quality standards.
6. recognise that there are other approaches to improve quality in terms of productivity and reduction of costs of production such as Just-in-time, Toyota Production System and Lean Operations.

Introduction

4.1 The concept of quality in relation to TQM to gain competitiveness.

4.2 The importance of quality as a strategic factor to build market shares and to reduce costs.

4.3 The cost of quality (COQ) and the related ethics and quality management.

4.4 The concept of international quality standards

4.5 TQM and Dr. W. Edwards Deming.

4.6 The role of inspection

Review of Topic

There are seven questions for the students to work on.

Lecture Notes

1. Quality management

2. JIT, TPS & Lean Operations

**4: (a) Quality Management**

**Quality defined**

Quality is a strategy that firms used to achieve profitability. Today it is not just quality but total quality management (TQM) that is the key to attain competitive advantage in firms. Quality cannot come from nowhere, it has to be brought about through compulsion brought about by challenges from many sources such as environment, competition, needs of customers and scarcity of resources. The critical significance of quality has been well demonstrated in the last quarter of the twentieth century by innovations and competition. Organisations that have failed to recognise and keep up with these challenges have suffered, while those that have absorbed the quality message have prospered. To attain the expected quality level in firms require good management to mobilise the whole organisation in its achievement. This is where the concept of TQM becomes the demand the achieving quality in organisation i.e. every part and every level in the organisation must be concerned and involved in quality management.

Quality is about using information to set standards and then conforming to them. These ideas are captured in the definitions within the international standard, ISO9000. It is defined as

“Quality is the degree to which a set of inherent *characteristics\** fulfils *requirements\*\**.”

\* A *characteristic* is a distinguishing feature. It can be:

* physical such as the strength of a material;
* behavioural such as honesty, courtesy, truthfulness;
* temporal such as reliability, punctuality, availability;
* ergonomic such as physiological or safety related;
* functional such as maximum speed.

*\*\* Requirements* are needs or expectations that are stated, implicit or mandatory. They can have many sources, including those indirectly affected by a transaction. Therefore, an aircraft design should consider the interests of passengers and crew, users of other aircraft and all who may be affected by its flight, or generally implied, requirements are based on common practice among the organisation, its customers and others.

**Why is quality important?**

Quality is a strategic factor that works through quality cycles to build market share and to reduce costs. In an organisation the quality improvement area is divided into two aspects; one relating to *product improvements* to ensure that the products will meet their needs and the other is *process improvements* in terms of conformance to standards.

* Product improvements mean enhancing the purpose in usage. Customers see the benefits of better quality and are prepared to pay higher prices. With increase in demand, the firm’s market share is improved and so is its profitability. The reputation of the firm is also enhanced.
* Process improvements relate to better conformance to specification. The outcomes are better productivity, less scrap and reworks (less wastage) and lower warranty and repair costs. The firm enjoys lower manufacturing costs and reduction in servicing costs. The eventual outcome is the firm attains increased profits.

It is apparent that improving quality can lead to improved productivity and concurrently a lower production cost. It also improves the competitive position of the firm.

Products of poor quality are those with defects. Defects are not free because of the losses in values to the firm. Resources are sued and opportunities of making saleable products are lost. Therefore, the cure to this defective occurrence is to improve the quality in the operational situations/process. It will automatically bring about a reduction in the operating costs, so much so that there will be net gains to the firm. This is what Philip B. Crosby meant when he says that “quality is free”. It also means that whatever inputs are instituted the gain in the productivity will overshadow the cost of the inputs.

See the diagram below sourced from Management of John Naylor (2004) page 169 to recap the above concept:

Improved fitness Improved quality Greater market

for purpose reputation share

**Marketing impact**

Product Customers see the

improvements benefits of better quality Higher prices

Quality

Improvement Increased profits

Programmes

Process improvements Increased productivity

Manufacturing costs

fall

Improved conformance Less scrap & reworks

to specification **Operations impact**

Lower warranty and Servicing costs fall

repair costs

**Importance of Service Quality**

As quality improves, the cost of service tends to reduce because the product demands less repairs and services. However, quality is seen through the eyes of the customers, who only recognise what they get out of the service process but not what the firm puts in. Why then there is a need to provide quality service? The reasons are as follows:

* The satisfied customer will not only do more business in the future but recommend the firm to others.
* On the other hand, the dissatisfied customer will not only reduce profitability directly but also deter new customers.
* Poor service is demoralising for staff. They spend time coping with complaints and are frustrated when nothing seems to be dome to relieve them.
* Lister has listed the effects of poor service:
* For each complaint there may be 26 unresolved problems.
* Of those who do complain, between 50% to 70% will do business again if their complaints are handled effectively.
* Dissatisfied customers will tell between 10 and 20 people whereas satisfied customers tell between 3 and 5.
* Customers stop doing business for the reasons shown in table below:

Reasons for quitting

|  |
| --- |
| Reasons given for quitting (%) |
| Upset at treatment 68  Become dissatisfied 14  Move to competitors 9  Find substitutes 5  Move away 3  Die 1 |

**Cost of Quality (COQ)**

The cost of doing things wrong – i.e. the price of non-conformance.

Four categories are associated with quality:

1. Prevention costs – reducing potential for defective parts or services.
2. Appraisal costs – evaluating products, processes, parts and services and involve testings, inspections and laboratory works.
3. Internal failures – result in production of defective parts or services before delivery to customers (rework, scrap, downtime).
4. External costs – after delivery of defective parts or services (rework, returned goods, liabilities, lost of goodwill, costs to society).

The first three costs can be estimated but not the external costs. In fact, improving the quality of the products or services save costs (labour cost, production cost, material cost and after sales cost).

20 -

Spending on 15 -

quality as %

of sales Total cost

10 -

Prevention cost

5 - Failure cost

Appraisal cost

0

A B C

Ability to meet customers’ requirements

Ethics and Quality Management

The development of poor quality products results not only in higher production costs bit leads to injuries, lawsuits and increased government regulations.

Firms have the ethical conduct not to introduce questionable product into the markets and to accept responsibility for any poor-quality products.

Every organisation has its code of ethics and it is applicable to everyone in the organisation.

**International Quality Standards**

ISO 9000 – quality is so important globally that the world is uniting around this single quality standard. This is the only quality standard with international recognition. Since 1987, a series of quality assurance standards, based on ISO 9000 has been established and it is known as the ANSI/ASQ Q9000 series. The focus of the standards is to establish quality management procedures, through leadership, detailed documentation, work instructions and recordkeeping. These procedures say nothing about the actual quality of the product, they deal entirely with standards to be followed.

To become ISO 9000 certified, organisations go through a 9- to 18-months process that involves documenting quality procedures, an on-site assessment, and an ongoing series of audits of their products or services. To do business globally being listed in the ISO directory is critical.

ISO 14000 – a series of environmental management standards that contain five core elements:

1. environmental management
2. auditing
3. performance evaluation
4. labelling
5. life cycle assessment

The new standard could have several advantages:

* Positive public image and reduced exposure to liability.
* Good systematic approach to pollution prevention through the minimization of ecological impact of products and activities.
* Compliance with regulatory requirements and opportunities for competitive advantage.
* Reduction in need for multiple audits.

This standard is being accepted worldwide, with ISO 14001,which addresses environmental impacts of activities systematically, receiving great attention.

As a follow-on to ISO 14000, ISO 24700 reflects the business world’s current approach to reusing recovered components from many products. These components must be “qualified as good as new” and must meet all safety and environmental criteria.

**Total Quality Management (TQM)**

TQM refers to a quality emphasis that encompasses the entire organisation, from supplier to customer. It stresses a commitment by management to have a continuing companywide drive toward excellence in all aspects of products and services that are important to the customer.

Dr. W. Edwards Deming, a quality expert, used 14 points to indicate how he implemented TQM:

1. Create consistency of purpose.
2. Lead to promote change.
3. Build quality into the product, stop depending on inspections to catch problems.
4. Build long-term relationships based on performance instead of awarding business on the basis of price.
5. Continuously improve product, quality, and service.
6. Start training.
7. Emphasize leadership.
8. Drive out fear.
9. Break down barriers between departments.
10. Stop haranguing workers.
11. Support, help and improve.
12. Remove barriers to pride in work.
13. Institute a vigorous programme of education and self-improvement.
14. Put everybody in the company to work on the transformation.

Deming’s 14 points are reduced to 7 concepts:

1. Continuous improvement – TQM is a never ending process. Deming used the concept of Walter Shewhart’s PDCA (plan, do, check and act) as his version of continuous improvement.
2. Six Sigma – has two meanings in TQM:
3. It describe a process, product or service with an extremely high capability (99,9997% accuracy) – a statistical sense.
4. A programme designed to reduce defects to help lower costs, save time and improve customer satisfaction. It is a comprehensive system – a strategy, a discipline and a set of tools – for achieving and sustaining business success.
5. Employee empowerment – enlarging employee jobs so that the added responsibility and authority is moved to the lowest level possible in the organisation. Building team works and using quality circle (QC).
6. Benchmarking – selecting a demonstrated standard of performance that represents the very best performance for a process or an activity.
7. Just-in-time (JIT) – products or goods delivered just as they are needed. JIT is related to quality in three ways:

* Cuts the cost of quality.
* Improves quality.
* Better quality means less inventory and a better, easier-to-employ JIT system.

1. Taguchi concept – Genichi Taguchi has provided three concepts aimed at improving both product and process quality: quality robustness, quality loss function and target-oriented quality.

* Quality robustness – products can be produced uniformly and consistently in adverse manufacturing and environmental conditions. Remove the effects of adverse conditions instead of the causes. Removing the effects is cheaper than removing the causes and more effective in producing a robust product. In this way, small variation in materials and process do not destroy product quality.
* A quality loss function (QLF) identifies all cost connected with poor quality and shows how these costs increase as the product moves away from being exactly what the customer wants. These costs include not only customer dissatisfaction but also warranty and service cosrs; internal inspection, repair and scrap costs and costs that can best be described as costs to society.
* Target-oriented quality – a philosophy of continuous improvement to bring a product exactly on target.

1. Knowledge of TQM tools – everyone must be trained in the techniques of TQM. Examples of the TQM tools:

* Check sheets
* Scatter diagrams
* Cause-and –effect diagrams: Ishikawa diagram/fish-bone chart.
* Pareto Charts – a method of organising errors, problems, or defects to help

focus on problem-solving efforts.

* Flowcharts
* Histograms
* Statistical Process Control (SPC)

**TQM- influenced Quality Cost Model**

External failure costs

Total cost of quality

Internal failure costs

Cost of quality

Appraisal costs

Prevention costs

Time

(Source: Slack, Chambers, Johnston & Betts (2009), pp 386-9)

TQM emphasizes the importance of prevention, and this has reduced internal failure costs, external failure costs and appraisal costs. However, the prevention costs increase but it may be stepped down as the situation improves. It is apparent that TQM has shifted from a reactive approach to quality proactive, ‘getting it right first time’ approach.

***TQM in Services***

The quality of service is more difficult to measure than the quality of tangible products. Normally the user of the service has his or her preferences in mind. Two possible reasons for the difficulty to ascertain the quality of services are: (1) the intangible differences between products and (2) the intangible expectations customers have of those products. The intangible attributes may not even be defined.

The operations managers address the major aspects of service quality in terms of:

1. The tangible component of many services is important.

2. The service process is related to quality such as reliability and courtesy.

3. The customer’s expectations are the standard against which the service is judged.

4. There are exceptions or problems to be expected and alternate plans must be present to

meet them.

Well-run companies have service recovery strategies. The frontline employees are trained and empowered to immediately solve a problem.

Some examples of quality service:

* reliability
* responsiveness
* competency
* access
* communication
* credibility
* security
* understanding/knowing the customer
* tangibles in the service.

**The Role of Inspection**

For a production system to be operating at the expected quality level, there must be in place a control system. Inspection is a form of control and which can involve measurement, tasting, touching, weighing or testing of the product. Inspection only finds deficiency and defects. It does not add value to the product and is an expensive affair.

When and where to Inspect

1. At the supplier’s plant while the supplier is producing.
2. At the facility upon receipt of goods from the supplier.
3. Before costly or irreversible processes.
4. During the step-by-step production process.
5. When production or service is complete.
6. Before delivery to the customer.
7. At the point of customer contact.

Inspection aids the 7 tools used in TQM. Inspection does not substitute for a robust product produced by a well-trained employee. It is difficult to expect a 100% success in inspection to detect defective pieces of product as there is variability (found experimentally). Even with 100% inspection, inspectors cannot guarantee perfection. Therefore good processes, employee empowerment and source control are a better solution than trying to find defects by inspection. ***It is not possible to inspect quality into the product.***

***Source Inspection***

The best inspection is at the source which could be mean no inspection at all. This source inspection is consistent with the concept of employee empowerment, where individual employees self-check their own work. This is like treating the next step in the process as the customer, ensuring perfect product. This inspection may be assisted by the use of checklists and controls such as a fail-safe device called a ***poka-yoke***, a name borrowed from the Japanese.

A poka-yoke is a fool proof device or technique that ensures production of good units every time. These special devices avoid errors and provide quick feedback of problems. E.g. a diesel gas pump nozzle that will not fit into the “unlead” gas tank opening on the car.

In McDonald’s the French fry scoop and standard size bag used to measure the correct quantity are poka-yoke.

Service Industry Inspection

It can be assigned to a wide range of locations.

Inspection of Attributes versus Variables

When inspections take place, quality characteristics may be measured as either attributes or variables.

Attribute inspection classifies items as being either good or defective. It does not address the degree of failure.

Variable inspection measures such dimensions as weight, speed, size or strength to see if an item falls within an acceptable range.

Knowing whether attributes or variables are being inspected helps to decide which statistical quality control approach to take.

**4: (b) Just-in-Time (JIT), Toyota Production System (TPS) and Lean Operations**

JIT is an approach of continuous and forced problem solving via a focus on throughput and reduced inventory.

TPS emphasizes continuous improvement, respect for people and standard work practice, especially in the assembly line.

Lean operations are to supply to the customer exactly what they want, when the customer wants it, without waste, through continuous improvement.

JIT, TPS and lean operations are part of the manufacturing strategy and when they are implemented, they bring about sustain competitive advantage and result in increased overall returns.

JIT, TPS and lean operations can be distinguished as follows:

1. JIT emphasizes forced problem solving.
2. TPS emphasizes employee learning and empowerment in an assembly line environment.
3. Lean operations emphasize understanding the customer.

These three systems enable managers to address three issues:

1. Eliminate waste - reduce defective parts and no wastage (due to overproduction, queues,

transportation, inventory, motion (movement of equipment or people that adds no value,

over processing and defective product (Ohno’s 7 wastes).

The Japanese came out with the 5Ss:

(1) Sort/segregate - keep what is needed and remove everything else from the work area.

(2) Simplify/straighten - use methods to analyse how to improve work flow and reduce

wasted motion.

(3) Shine/sweep - clean daily; eliminate all forms of dirt, contamination and clutter from

the work area.

(4) Standardize - remove variations from the process by having the standard operating

procedures and checklists; good standards make the abnormal obvious.

(5) Sustain/self-discipline - review periodically to recognize efforts and to motivate to

sustain progress. Use visual intelligence.

2. Remove variability - managers need to remove variability caused by both internal and

external factors.

3. Improve throughput - the movement of materials from beginning to delivery.

**JIT**

It is forced to solve problem by focusing on rapid throughput and reduced inventory.

In JIT materials arrive where they are needed only when they are needed. If any material did not arrive just as needed, then a problem arises. JIT is supposed to reduce waste and avoid delay in order to save cost and to improve throughput. In addition, it is the means to achieve lean operations and rapid response and low cost. At every moment a material is held, an activity that adds value takes place. All these lead to competitive advantage.

However the success of JIT is dependent on a meaningful buyer-supplier partnership. If this partnership is interrupted then the rapid throughput is disrupted and the production comes to a standstill and the cost of production will increase. Therefore close relationships and trust are critical to the success of JIT. The JIT partnerships benefits arise from:

1. Removal of unnecessary activities such as receiving, incoming inspection and paperwork related to bidding, invoicing and payment.
2. Removal of inventory in the plant because the inventory comes in small batches to be used as when required.
3. Removal of having transit store-houses for the inventory by having the suppliers located nearby and to provide frequent small shipments.
4. Obtain improved quality and reliability of stocks/inventory

**\*Conceptual understanding of JIT**

The success of JIT is also dependent on the TPS where workers must continue to learn and become empowered. Learning makes the workers to be more creative and empowerment enables them to be more responsible. Learning comes for interaction with others in the environment and through learning the workers gain knowledge and experience and these help the workers to generate creative ideas while some of them may be creative ideas for innovations to take place. On the other hand empowerment makes the workers to make decisions and to improve on their performance. They then become more responsible for the decisions they have made because they have become co-owners of the decisions they have made. They become motivated to ensure that what they produced would be of better quality and to give better benefits to the customers. With improved quality of the product, the cost of production declines as there are no defective products. This arises from the fact that every part that is brought together and tasks performed to create the final unit of the product is the result of TQM. There is therefore no cost to attain quality i.e. quality is cost free. On the contrary, if there are defective products or wastage of materials, then costs of quality would arise (due to loss of new units, replacement of parts or units and maintenance).

Therefore it is unavoidable that quality is related to JIT, TPS and TQM.

Concerns of Suppliers in the JIT partnerships

1. Suppliers may not want to tie themselves to long term contracts with one customer. They prefer to reduce their risk by diversifying their supplies to others as well.
2. Many suppliers have little faith in the purchaser’s ability to produce orders to a smooth, coordinated schedule.
3. Engineering or specification changes can play havoc with JIT because of inadequate lead time for suppliers to implement the necessary changes.
4. Supplier’s capital budgets, processes or technology may limit ability to respond to changes in product and quality.
5. Suppliers may see frequent delivery in small lots as a way to transfer buyers’ holding costs to suppliers.

Advantages of JIT

1. Reduces waste movement of materials. This is materials move directly to the place where they are wanted.
2. Components move from one point where they are produced to another point where they are used in conveying belts. The production point and the usage point are located close to each other. The cost of transfer from one point to another point is greatly reduced. This is cost saving.
3. The whole layout can adapt to changes in volume, product improvements or even new designs. Equipment is movable. Layout flexibility prevails.
4. The layouts provide sequential operations, workers working together can tell each other about problems and opportunities for improvement and feedbacks are provided for immediate actions to prevent wastage. Machines are able to detect defects and stop automatically when they occur. No defective products are expected from the beginning.
5. The JIT layouts reduce travel distance and inventory.

***JIT Inventory***

JIT inventory is the minimum inventory necessary to keep a perfect system running. The exact amount of goods arrives at the moment it is needed, not a minute before or a minute after.

With the small size of the batches of goods, it is producing good products in small lot sizes. This helps to reduce the cost of inventory as well as reducing problems faced by high levels of inventory.

Furthermore reduced lot sizes lead to reduced setup time and costs.

Effective JIT scheduling improves the ability to meet customer orders, drives down inventory by allowing smaller lot sizes and reduces work-in-process.

Level schedules refer to frequent small batches rather than a few large batches. Therefore products are scheduled so that each day’s production meets the demand for that day.

**Kanban** - the Japanese word for ***card***, which has come to mean “signal”. It is to signal the need for another container of material for the assembly line. The card is then the authorisation for the next container of material to be obtained/pulled from the producing department or supplier. The kanban is a signal that it is time for the next container.

*Advantages of Kanban:*

1. Helps to meet schedules.
2. Reduces the time and cost required by setups.
3. Economical material handling.
4. Small batches allow only a very limited amount of faulty or delayed material.
5. Problems are immediately evident.
6. Kanban system suppresses poor quality, obsolescence, damage, occupied space, committed assets, increased insurance, increased material handling and increased accidents of goods.
7. it uses standardized, reusable containers that protect the specific quantities to be moved. They reduced weight and disposal costs, generate less wasted space in trailers and requires less labour to pack, unpack and prepare items.

***JIT Quality***

JIT and quality are related in three possible ways:

1. JIT cuts the cost of obtaining good quality. (JIT forces down inventory and therefore fewer bad units re produced and fewer units must be reworked. I.e. inventory hides bad quality, JIT exposes it.)
2. JIT improves quality. (As JIT shrinks queues and lead time, it keeps evidence of errors fresh and limits the number of potential sources of error. It gives an early warning for quality problems so fewer bad units are produced and the feedback is immediate.)
3. Better quality means fewer buffers are needed and therefore, a better, easier-to-employ JIT system can exist.

**TPS (Toyota Production System)**

It has three components:

1. Continuous improvement - it means building an organisational culture and instilling in its people a value system stressing that processes can be improved. It implies that improvement is an integral part of every employee’s job and therefore improvement is a continuous thing and this process is known as ***kaizen***.
2. Respect for people - workers in Toyota are recruited, trained and treated as ***knowledge workers.*** TPS engages people in both mental and physical capacities. They are empowered to stop machines and processes when quality problems exist. Top people recognise that employees know more about their jobs than anyone else.
3. Standard work practice -:

* Work is completely specified as to content, sequence, timing and outcome.
* Internal and external customer-supplier connections are direct, specifying personnel, methods, timing and quantity.
* Product and service flows are to be simple and direct. Goods and services are directed to a specific person or machine.
* Improvements in the system must be made in accordance with the ‘scientific method’ at the lowest possible level in the organisation.

Lean Operations

While TPS is internally focused, lean operation is externally focused on the customer. Therefore understanding what the customer wants and ensuring customer input and feedback are the starting points for lean production.

Lean operations means identifying customer value by analysing all the activities required producing the product and then optimizing the entire process from the customer’s perceptive.

Building a Lean Organisation

It is found that organisations that focus on JIT, quality and employee empowerment are often lean producers. They are only interested in activities that add value to the customer. They minimised waste through continuous learning, creativity and teamwork - seeking perfection.

1. They eliminate waste through JIT.

2. They build systems that help employees produce a perfect part every time.

3. They reduce space requirements by minimising travel distance.

4. They develop partnerships with suppliers, helping them to understand the needs of the

ultimate customer.

5. They educate suppliers to accept responsibility for satisfying end customer needs.

6. They eliminate all but value-added activities.

7. They develop employees by constantly improving job design, training, employee

commitment, teamwork and empowerment.

8. They make jobs challenging, pushing responsibility to the lowest level possible.

9. They build worker flexibility through cross-training and reducing job classifications.

**Lean Operations in Services**

JIT, TPS and lean began in factories but are now also used in services throughout the world.

Suppliers - every restaurant deals with its suppliers in a JIT basis. Those that do not are usually unsuccessful.

Layouts - Lean layouts are required in restaurant kitchen where cold foods must be served cold and hot food hot.

Inventory - drive inventory to nearly zero.

Scheduling - adjusting to customer demand.