Total quality management: the second industrial revolution

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Abstract *This article describes the concept and basic approach to total quality management. Quality is examined and explained in the context of continuous customer's satisfaction and total quality management by involving everyone's commitment to achieving quality at a low cost. Different stages of total quality management in practice are suggested and various techniques to implement these are also discussed. It has been implied that the present quality revolution through the process of 'Total Quality Management' has created the 'Second Industrial Revolution' for the survival of the fittest.*

Introduction

In the aftermath of World War II, American industry loaded with success, did not want to listen to Dr Edward Deming's quality philosophy. In 1950, he was sent to shattered post-war Japan by the MacArthur Government—as an adviser to the Japanese census. While he was there he met some of the members of JUSU (The Union of Japanese Scientists and Engineers) with the intention of helping them to rebuild their industry. He spoke to some of the Japanese senior managers about his quality philosophy. He told them that most of their organizations' problems lay in the process used in getting things done and suggested statistical information and process control to trace the errors back to their sources. At the same time Dr Joseph Juran was also stressing to the Japanese the customers' point of view of a product's fitness for use, and was advocating extensive training and hands-on management to satisfy customers' requirements.

The Japanese industrialists listened to Drs Deming and Juran and learned from their teaching. The result was that they captured markets all over the world. Within mere months productivity increases were being reported in Japan, within years such increases were commonplace. The Japanese miracle had been truly launched.

Today, Japanese companies are not just competitive but they are dominating the world market and true to Dr Deming's prediction the rest of the world is seeking protection from them.

It is common knowledge that the first industrial revolution has encouraged mass production and as a result many of the individual skills and craftsmanships were destroyed. The attitude of the managers and workers was also changed from 'quality' to 'quantity at high speed' involving only limited specialized type of work. This change in attitude took away both the incentive and pride for workers to take responsibility for the quality of their

work. To compensate for the individual's pride of quality work organizations began to appoint quality inspectors to weed out defective goods from the mass production in order to provide the customers with acceptable quality products.

However, the quality inspectors did not have any involvement in stopping defective goods at the early stage and therefore had no influence in cost-cutting exercises. In fact quality inspection has encouraged people to expect defective articles and in turn has created a 'hide-out' for those escaped defective goods.

Nevertheless, the present process of the total quality management guided by Deming and others has brought about the quality revolution of 'prevention rather than detection' creating the Second Industrial Revolution to equip the organization for survival in the world market.

In 1970, the oil crisis forced Japan to eliminate waste in the use of all resources as a matter of survival. This involved the consideration of all organization personnel to work towards one common objective. In the true sense then total quality management was launched providing an ultimate way of quality thinking shared by everybody in the organization.

So, what are these quality philosophies of Deming which have given birth to the 'Total Quality Management' and have created the 'Second Industrial Revolution'? They are the following list of 14 points for management: (see Deming, 1986; Neave, 1987).

(1) *Constancy of purpose*. Create constancy of purpose for continual improvement of product and service.

(2) *The new philosophy*. Adopt the new philosophy. We are in a new economic age, created in Japan.

(3) *Cease dependence on inspection*. Eliminate the need for mass inspection as a way to achieve quality.

(4) *End 'lowest tender' contracts*. End the practice of awarding business solely on the basis of price tag.

(5) *Improve every process*. Improve constantly and forever every process for planning, production and service.

(6) *Institute training on the job*. Institute modern methods of training on the job.

(7) *Institute leadership*. Adopt and institute leadership aimed at helping people and machines to do a better job.

(8) *Drive out fear*. Encourage effective two-way communication and other means to drive out fear throughout the organization.

(9) *Break down barriers*. Break down barriers between department and staff areas.

(10) *Eliminate exhortations*. Eliminate the use of slogans, posters and exhortations.

(11) *Eliminate targets*. Eliminate work standards that prescribe numerical quotas for the workface and numerical goals for people in management.

(12) *Permit pride of workmanship*. Remove the barriers that rob hourly workers, and people in management, of the right to pride of workmanship.

(13) *Encourage education*. Institute a vigorous programme of education and encourage self-improvement for everyone.

(14) *Top management commitment*. Clearly define top management's permanent commitment to ever-improving quality and productivity.

Some of these 14 points are very simple in concept and nowadays they are widely accepted by quality improvement practitioners. Many people have now realized that the objective of quality improvement is not to screen out bad products but to build-up knowledge from the production process to reduce defects completely.

Even in recent times most people have blurred ideas about quality and some of them still like to equate quality with expense. However, we know that it is possible to pay a high price for an inferior product or service and at the same time one can easily obtain high quality goods and services at a lower price.

However, there is no doubt in our minds that the quality has now been used as a modern competitive weapon and to manage it we must understand it clearly. Modern concept of quality is defined as conformance to requirements and requirements are defined as the task to be accomplished in meeting customer needs. Quality cannot be inspected into the products or services, the customer's satisfaction must be designed into the whole system. The conformance check then makes sure that things go according to plan. In general total quality management is defined as follows:

Quality—is to satisfy customer's requirements continually.
Total quality—is to achieve *quality* at low cost.
Total quality management—is to obtain *total quality* by involving everyone's daily commitment.

The ability to fulfil the customer requirement is essential not only between two companies but with the same company. There exists in every organization, every department, every section and even every small unit a series of customers and suppliers. The secretary of a department is a supplier to the head of the department. She has to meet her customer's requirements.

Quality as a process

Quality is a continuous process that can be broken anywhere in the system of supply and customer service. By letting every person know how their activities help fulfil customer's requirements, the organization can motivate their employees and suppliers to provide quality consistently. They must also realize that throughout the organization they will have both internal customers and suppliers similar to those outside the organization.

In general a process helps to change a set of inputs (i.e. resource, equipment, material and methods etc.) into desired outputs in the form of products or services. It is obvious that for certain aspects of an organization there will be various processes taking place, for example an organization may be involved in budgetary processes, accounting processes, salary and wage processes, costing processes, production processes, etc. Each process in every organization can be described by a proper investigation of the inputs and outputs of that organization. This will help to determine the action to be taken for the improvement of quality.

The people who recently visited various quality companies in Japan and USA will tell you that the central philosophy of all these companies is 'Kaizen' or loosely translated from the Japanese 'continuous improvement' and the quest for quality is a continuous cycle. The process on which continuous improvement is based is generally known as the Deming wheel, although I have heard that the wheel was originally suggested by Shewhart. However, this wheel shows a continuous movement in a certain direction as shown in Fig. 1. The idea behind this is that the input which generates activities with measurable output are processes and the perfection of the process is the ultimate objective.

In Deming's wheel the *plan* defines the process which ensures documentation and sets measurable objectives against it. The *do* executes the process and collects the information required. The *check* analyses the information in suitable format. The *act* obtains corrective action using total quality management techniques and methods and assesses future plans.

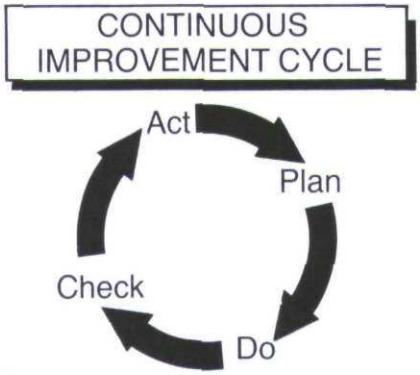

Figure 1. *Plan-Do-Check-Act diagram.*

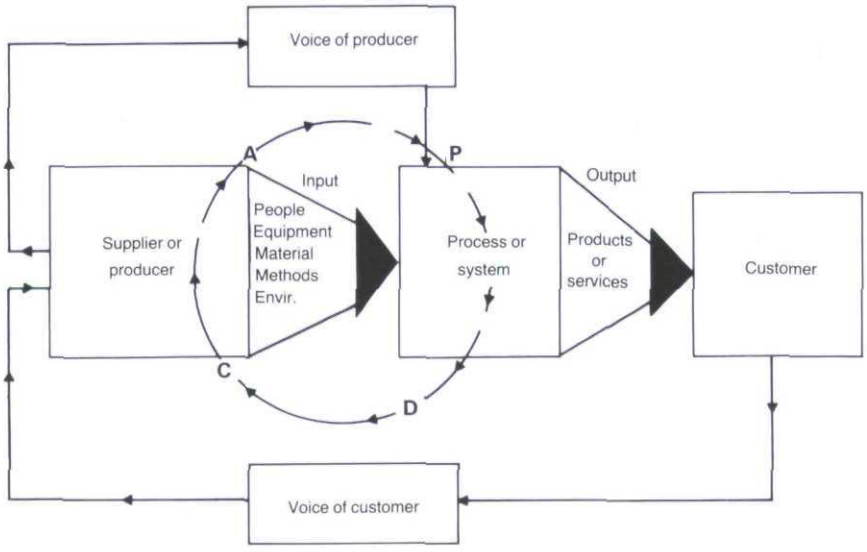

Figure 2. *Supplier/customer—continuous improvement interface.*

At the end of each cycle the process is either standardized or targets are adjusted based on the analysis and the cycle continues.

The link between customer/supplier with process improvement can be seen in Fig. 2 above.

Total quality management approach

As we know that many organizations in the United States of America are now also quality performers and there is a very good chance of a 'gripping' effect on the markets of European organizations that do not follow the quality improvement process. These United States organizations that have already achieved substantial advantage in their domestic markets by keeping the Japanese organization at a distance, are now well equipped to develop their market in Europe where the companies are just waking up to the quality improvement revolution. Quality is now more of a survival kit for many European companies and

without proper care and consideration they will be squeezed by the United States of America and Japan.

In developing quality performance, various organizations in the United States did not follow completely the Japanese method of quality improvement, instead they have considered the country's basic cultural issues in order to achieve the required quality in every aspect of their activities. By introducing quality improvements in this way they have developed quality ethics in their own organization with their own quality culture. Many European organizations still believe that the quality is much too costly to achieve and difficult to justify. Some of the old-fashioned British organizations still think that, beyond a certain point, investing in quality is no longer profitable and is subject to the loss of diminishing returns, i.e. the cost of eliminating all errors cannot be justified by the savings made. Such thinking fails to see quality as a strategic issue and fails to understand that the quality is a much broader issue than just making the product properly. The consequences of such a miopic approach may be the loss of customer goodwill, and loss of market share. However, those organizations who have achieved quality excellence will tell you that the increased productivity and reduced cost from quality production processes or service operations almost adequately cover the investment required by the organization.

Another general misunderstanding about the quality is that it is only concerned with objects. This is not true, as we know that banks, hotels and retail shops have already recognized the fact that the quality of service is a crucial factor in the customer's decision to be a regular customer. Manufacturing companies are also beginning to understand the necessity of quality of service to retain customers, and need of well-trained, obliging and well-informed staff to maintain the quality of service. It is not only the person with the direct involvement with the customer that has to demonstrate these qualities, but also the other host of support persons who must have the same goals of fulfilling the customer's needs.

Overcoming these misunderstandings requires a proper structure of quality management development and can be obtained by the 'Total Quality Management' approach which is both a practical working process and a quality philosophy for the organizations committed to growth and survival. From the outset the total quality management approach starts with the vision that a concentrated management action can improve the quality of services and products of the organization, at a very competitive cost satisfying customer's need and increasing the market share. This increased market share will be stable because it has been earned with the help of solid customer's goodwill and not by gimmicky advertising.

To develop the total quality management process the organization has to be guided through the seven basic rules of action and is given by the following principles and actions:

Principles	*Actions*
The approach	Management-led
The scope	Company wide
The scale	Everyone is responsible for quality
The philosophy	Prevention not detection
The standard	Right first time
The control	Cost of quality
The theme	Continuous improvement

Total quality paralysis

The rewards of establishing a quality company are immense. Look at the growth, profitability and image of Marks & Spencer and British Airways through focusing on quality. Any

company in any industry can follow their path and share their success provided its management is serious about meeting customer requirements. Total quality management is the route to creating a quality company and requires complete commitment and dedication from the top.

It also requires strength of leadership and willingness to listen and learn and accept suggestions from wherever they come and to make changes.

To start with, a Managing Director will find the task of quality improvement across the whole company daunting and he will get very little comfort from the teachings of the quality gurus. Just deciding where to begin is so difficult that they may never get off the starting block. The condition is so common it even has a name 'Total Quality Paralysis'! However, how to overcome total quality paralysis can be seen in the following section.

A company experience

Recently, (Whiston, 1988) in order to develop their quality improvement process, the ICI Chemicals & Polymers division looked at the offerings of the three main quality experts, i.e. Crosby, Juran and Deming. All of them were from the United States and had a strong client-base approach. Crosby's approach helped them to understand about (a) defect prevention, (b) the stress on the individual, (c) clear customer focus and an education programme for all in the organization. Juran's method taught them the project-approach to problem diagnosis and solution and concentration on continual improvement, whereas Deming's emphasis on measurement and the importance of education were also totally in sympathy with the ICI culture.

After very careful consideration ICI decided to initiate their improvement process with the Philip Crosby approach recognizing that the work of the other quality experts would very quickly come into their thinking. They decided to adopt the Crosby approach utilizing his 14 steps process as given below:

1. Management commitment
2. Quality-improvement team
3. Measurement
4. Cost of quality
5. Quality awareness
6. Corrective action
7. Zero defects plan
8. Quality education
9. Zero defects day
10. Goal setting
11. Error cause removed
12. Recognition
13. Quality councils
14. Repeat

Once the management training had been completed to a significant degree ICI launched their own quality improvement process. At the early stage of the process they did not see the need to adopt all the 14 steps of Crosby. It seemed to them that some of the Crosby's steps had more emphasis in the UK scene than anywhere else.

With the increased understanding of the quality improvement process ICI felt confident to develop their own brand of quality improvement process. Their view of educational needs were modified and they were in a position to select appropriate education packages from the various consultants.

They started their quality improvement process using an American consultant and gradually brought into their process other US and non-US consultant packages. However, they also rediscovered the old British productivity film 'Right first time' which in general highlights so many of the points of the whole range of quality gurus and realized that the final approach they had adopted was not really an imported process.

Various stages of total quality management

The process of implementing total quality management in an organization can be developed in the following four stages:

(i) *Identification and preparation*

- Identifying and collecting information about the organization in the prime areas where improvement will have most impact on the organization's performance.
- Preparing the detailed basic work for the improvement of all the organization's activities.

(ii) *Management understanding and commitment*

- To make sure that the management understands the objective and methodology of total quality management and are prepared to adopt them all the time.

(iii) *Scheme for improvement*

- Identify and resolve quality issues by involving all management and supervision in a proper scheme of training and communication.

(iv) *New initiative, new target and critical examination*

- Start new initiative with new targets and take the complete improvement process to everybody indicating supplier and customer links in the quality chain.
- Obtain information about progress and consolidate success.

It is often easy to see that some companies have failed to improve their quality by starting the total quality management approach at the third or fourth stages. Without the data to make informed decisions, without total commitment from the top, without the strength of a united and co-ordinated middle management, it is hardly surprising that the company has failed. There are no by-passes for this total quality management approach but to go through every stage.

Cultural change

To create a quality organization it requires a comprehensive cultural change in order to provide the required management shift for the improvement of quality. The following points illustrate the requirements in management approach in organizations just embarked on the quality path. They are:

(1) Managing Director's commitment in quality issues.
(2) Senior management's commitment for customer, supplier and staff contact.
(3) Management action for real improvement of the attitude of the work force.
(4) Every department's commitment to total quality.
(5) Satisfying customer's requirements through quality improvement.
(6) Customer and suppliers relationships exist in everybody.
(7) Everybody's commitment to quality improvement.
(8) Trade-off between quality and cost.
(9) Error-free work as a standard.
(10) Quality to be designed and managed.
(11) All costs are challenged to eliminate wasteful activity.
(12) Manager's role to support his team.
(13) Barriers to customer satisfaction are systematically eliminated.
(14) Trained people to do the job and seek further improvement.
(15) People are rewarded on quality of work and improvement.

We are all both suppliers and customers. The only place you can exert any control over the cycle in relationships with suppliers is with people inside your organization. The place to start is your own doorstep. Put your own house in order then you are in a position to demand improvements from others in the chain.

An essential part of building any quality programme must be the education and training of staff. The main objective is not only to include training on the quality philosophy and tools, but also developing a common language and preparing employees to promote the quality concept. One of the aspects of total quality management is that the decision must be based on data and not on the management's wishes. Data is a powerful resource to understand where the problems originate and also help to diffuse emotions and blame.

Techniques for total quality management

Some of the specific techniques that can help you achieve 'Total Quality Management' are given below. The list is far from exhaustive, but includes a sufficient number to promote the total quality management programme in an appropriate way.

Many of the techniques suggested here can be applied to only one of the four specific stages of the Total Quality Management process described earlier.

(1) Customers' perception surveys.
(2) Cost of quality statement.
(3) Steering group.
(4) Quality co-ordinator.
(5) Top team workshops.
(6) Total quality seminars.
(7) Departmental purpose analysis.
(8) Quality training.
(9) Communication techniques.
(10) Improvement action team.
(11) Task force.
(12) Job development.
(13) Quality circles.
(14) Suggestion schemes.
(15) Help calls.
(16) Visible data.
(17) Process management.
(18) Statistical process control.
(19) Process capability.
(20) Foolproofing ('pokaoki').
(21) Just in time (JIT).

Total quality improvement can be achieved rapidly by the proper use of the appropriate quality techniques. However, no techniques can replace the systematic approach of the total quality management process to create a quality company. Choosing the right kind of techniques for the total quality management process is one of the vital roles of senior management and the degree of success will depend on their skill.

Quality improvement team

To provide continuous improvement in every aspect of work it is necessary to develop quality improvement teams. They will provide the foundation for companies to create the necessary culture to give employees a structured environment in which to work together towards improving quality of products and services and team work. The quality improvement team can be developed on the basis of the following principles:

(i) People's pride—giving employees incentive and pride for their work.
(ii) Customer's need—fulfilling the customer's requirements at all times.
(iii) Management by information—perform analysis on information to identify improvement area.
(iv) Plan-Do-Check-Act (PDCA)—quality improvement cycle of the Deming model.

Conclusion

The understanding of total quality management is becoming clear as more and more organizations embark on quality improvement process. Some of these organizations pass through a phase where what has to be done becomes very clear to them. However, the present complexity of the business prevents them from realizing their downhill situation before it is too late. Normally, it takes a detailed understanding of total quality management to bring clarity to the objectives and activities which characterize most business.

The Japanese started total quality management from scratch after World War II. For the rest of the world the total quality management impetus may be loss of market share, an unexpected take-over bid or final notice from the customer to become a quality supplier.

A company's ability to respond to the requirements of customers actually depends on its internal operations and is based on its people. Nothing can therefore be achieved without people and when adopting total quality management it is essential that the first job is to motivate employees. Whatever the motivation, there are now many companies that have used the concept of total quality management to overcome their problems successfully. The turnaround at Jaguar is an example of what can be achieved within a reasonable period of time. Another example is Rank Xerox who lost two-thirds of their market to the Japanese, but managed to reverse their decline and increase their market with the help of total quality management. JCB, sandwiched between Case and Caterpillar in the West and Komatsu in the East, used the total quality management approach to keep its entire share of the international market.

If these organizations can survive and achieve success, so can you. At present there are many organizations committed to the total quality management path and on their way to becoming 'Total Quality Organizations'.

There is no longer any question about the issue of quality as the market-place has shown its requirements. To compete, produce and survive, quality must improve and the improvement must extend to every level of every operation in the organization. To ignore total quality management is to invite insolvency.

CAN YOU AFFORD NOT TO BE A TOTAL QUALITY ORGANIZATION?

References

DEMING, W.E. (1986) *Out of the Crisis* (Massachusetts Institute of Technology, Centre for Advanced Engineering Study).

NEAVE, H.R. (1987) Deming's 14 points for management: framework for success, *The Statistician*, 36, pp. 561–570.

SMITH, S. (1986) How to Take Part in the Quality Revolution—A Management Guide (London, PA Management Consultants).

WHISTON, J. (1988) Are American quality systems right for the UK? *Proceedings of the International Conference on Total Quality Management*, IFS Stat. Kempton, Bedford, UK, pp. 97–104.