SECTION A: QUALITY AS A COMPETITIVE PRIORITY

2.1. Introduction

As the 21st century begins, the corporate world is faced with challenges and opportunities that are both demanding and exciting. While companies continue to downsize and increase productivity in order to reduce cost so that they are able to compete globally, it is imperative that a futuristic perspective is assimilated into the corporate world. In this respect, according to World Executive Digest (1995), the issue of quality is one of the top priorities of management worldwide (Magsaysay, 1995).

Organizations everywhere are growing increasingly conscious of the competitive potential of quality. Quality has been an important issue since the industrial revolution too. In the age of mass production, to produce a large number of interchangeable parts is one of the major requirements which a company should hold in order to satisfy the tremendous demands from the production lines. Quality has become an issue because standards are now contractually defined whereas previously they were vague and unmonitored. Competition focuses not only on price but also quality.

Companies competing across borders are required to undertake efforts to ensure their products meet the highest quality standards. Incorporation of quality concept into their overall strategy becomes a necessity to sustain competitive advantage. In the past few years, many organizations implemented Total Quality Management (TQM) to enhance the quality of their products and services. TQM is referred to as a systematic and integrated approach towards obtaining customer satisfaction through continues improvement in all areas of operation, product and services (Yeoh, 1992; Tenner & DeToro, 1992).

Interest in TQM has been growing since the 80s and is continuing today in both industrialized and newly industrialized countries (Tuckman, 1995; Cheong, 1994; Yew, 1996). Loss of competitiveness in market share and profits by many American and European firms to their Japanese competitors has fuelled the surge in interest in quality management.
2.2. **Evolution of Quality**

The concept of quality first began in the manufacturing organizations producing physical, tangible products (Tenner & DeToro, 1992). It is a by-product of the emergence of mass production system that caused an increase in scale and volume of production. Nevertheless, quality applies equally to the service businesses as it relates to the overall experience a customer has with a company besides how the product is made. Quality is defined and measured differently, largely dependent on one’s viewpoint. Different writers and experts in quality have different definitions of quality.

Quality has many dimensions. The dimensions of quality are nothing, but the various features of a product or service as follow:

1. **Product Quality**
   - Functionality
   - Reliability
   - Usability
   - Maintainability
   - Efficiency
   - Portability

2. **Service Quality**
   - Quality of customer service
   - Quality of service design
   - Quality of service delivery

Quality of a product or service in simple terms is, its suitability for use by the customer. Quality has to be perceived by the customer. Perception of the supplier is also important, but the customer experience of quality of a product or service is more important. Quality does not mean an expensive product; on the contrary, it is fitness for use by the customer.
To summarize, quality is the result of an ongoing improvement that encompasses product, service, process and people which will meet customer expectations and lead to customer satisfaction. The quality movement began in a systematic way in the United States during the late 1920’s with the work of Walter Shewhart. The first modern quality revolution occurred in the United States during the World War II years after which it declined in this country until the early 1970’s. The second quality revolution occurred in Japan in the 1950’s with the work of W. Edwards Deming, Joseph Juran, and Armand Feigenbaum and contributed to Japan’s emergence as a symbol of quality. The third quality revolution began in the United States during the early 1970’s when the work of Deming, Juran, Feigenbaum and Phillip Crosby was finally recognized and put into practice in this country.

During each of these revolutions attention was paid to just “quality.” The first modern definition of quality was offered by Shewhart during the first quality revolution. Most modern formal definitions trace back to the second quality revolution--primarily to the work of Juran and Feigenbaum. During the third quality revolution, David Garvin weighed in with a comprehensive analysis of the meaning of quality. The American Society for Quality has published its definition of quality. But as we have seen these efforts to define quality are by no means the first.

Quality Movement in India:

India has a long tradition of achieving high standards in several fields. Architectural wonders like the “Taj Mahal” and the “Konark temple” are testimony to the rich cultural heritage that imbued quality in its output. Similarly many other products like jewelry, textiles, artistic and ornamental articles exhibited high quality and as a result were the highly traded merchandise with other countries of the world. For several centuries Indian trade flourished on these products. Engineering industries that were set up and run under the colonial rule quickly established a name for quality. As reported by Piramal (1997) business families like Tata, Birla, Godrej, and Sarabhai, to name a few, started and operated several industries which have now become conglomerates and household names in India. In fact some of these names are synonymous with high quality products and trust worthiness.
However, the post-independent era did not witness any spectacular improvement regarding the quality of goods and services produced in the country. According to Agrawal (1993) due to protected business environment many positive attributes of the Indian industry have been lost and weaknesses have surfaced. These weaknesses based on the study are: lack of trust and credibility in the working system, lack of clarity/seriousness for achieving target, lack of precise observance of rules and norms, low quality of supplies and components, lack of consciousness of time as money, viewing only short term benefits ahead of long term goals, politicalization of labor unions, lack of accountability for actions, lack of management commitment, lack of national quality policy, inadequate economic resources, lack of indigenous technology, inadequate infrastructure, preferring quantity to quality, lack of team spirit, cartel formation, and sellers’ market. All these factors resulted in quality getting a low priority and consequently Indian products were constrained to serve only the domestic market being not able to compete in the international markets. India, in spite of possessing huge scientific and technical manpower, could not produce world-class products acceptable in the international markets.

2.3. **Quality Assurance (QA)**

Quality assurance includes the planned and systematic activities implemented within the quality system, and demonstrated as needed, to provide adequate confidence that an entity will fulfill the requirements for quality. A quality assurance system based on the fact that all functions share responsibility for quality, provides an effective method of acquiring and maintaining desired quality standards. The quality assurance department cannot assume the sole and direct responsibility for quality, but should support, advise and audit the work of the other functions. The actual control of quality during operations must rest squarely on the shoulders of production and operation managers who must ensure that all the appropriate techniques are applied for ensuring quality during production processes.

The purpose of quality assurance is to fulfill the quality requirements of an entity, i.e. product or service, with adequate confidence by the supplier. This requires implementation of all the activities planned for building quality into the product. Such
planned activities are to be implemented systematically within the purview of a documented quality system. Building quality into the products requires the following:

a) **Quality of Design**

b) **Quality of Conformance**

c) **Quality of Performance**

d) **Quality of Service**

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**a) Quality of Design:**

It refers to how well the product or service has been designed to meet the current and future requirements of customers and add value to all the stakeholders. The stakeholders for any organization are: customers, employees, suppliers, owners, and society.

Quality of design involves all activities that will result in a successful design. It necessarily includes finding out the customer’s requirements.

**b) Quality of Conformance:**

This indicates the consistency in delivering the designed product. Product quality in turn depends on the quality of all processes in the organization. Therefore, it involves all activities that will ensure the conformance of the products to its requirements consistently.

**c) Quality of Performance:**

Quality of performance indicates the performance of the end product. This in turn depends on the quality of design (including the reliability of the product) and quality of conformance.

**d) Quality of Service:**

Selling a product is not the end of the business. It is the quality of associated services rendered that adds value to the product. Quality of services involves all activities that will enable the customer to procure and use the product without any hassles.
It may be noted that Quality Assurance (QA), is much more involved activity than mere inspection or Quality Control (QC). In fact Quality Control is one of the activities of Quality Assurance.

2.4. Quality Audit

According to ISO 8402, Quality Audit is defined as "A systematic and independent examination to determine whether quality activities and related results comply with planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve objectives." The quality audit or survey is an appraisal of the quality system of an entire plant. The quality survey is analogous to an accounting audit. The account audit checks the books of accounts to establish the truthfulness of final accounts reported to the share holders. The quality audit evaluates the product, the inspector and the system for achieving product quality. It checks the adequacy of the system of handling quality function.

2.4.1. Scope of Quality Audit

Quality Audit covers various aspects:

1. Policies and procedures regarding:
   (a) Operators
   (b) Quality control
   (c) Administration.

2. Operating effectiveness involving:
   (a) Records, interpretations, corrective action,
   (b) Equipment control.
   (c) Inter-departmental co-ordination,
   (d) Assessment of product quality.
3. System Effectiveness covering:

(a) Storage and Handling practices.

(b) Field complaints and corrective action.

(c) Tool and Gauge control

(d) Product design changes.

4. Engineering specifications.

2.5. Quality Management Systems

Quality management calls for continuous improvement, which may happen due to changes in the way the employees perform their duties, the operation of the machinery, innovative changes to the methods, etc. Changes and improvements cannot be consolidated in the absence of a proper system in the organization. ISO 9000 standards virtually forced the organization to evolve a system for managing quality in the organization. The companies have to fulfill the requirements stipulated in the standard for certification. These requirements are well formulated and are in the interest of the organizations. Thus, the ISO 9000 standards help the organizations to establish a documented system, which will not give rise to different interpretations by different employees. It will bring an order in the organization. Therefore, the first step towards TQM could be certification by an independent certifying body under the relevant ISO 9000 standard. Such an approach has been taken by many organizations. If an organization is certified under ISO 9000 standard, then it can continuously improve the system. It will be rather easier for a company, which got certified under ISO 9000 to improve. If an organization does not have a system, it will be difficult to identify what changes are required. But if the company has a documented system and procedures, with trained people, then it will definitely be easy to find out where they are lacking, so that they can take appropriate corrective and preventive actions. Therefore, ISO 9000 is an important tool in the journey towards TQM. Every organization should understand the requirements of ISO 9000 standards and establish a quality system meeting ISO requirements.
2.5.1. Need for Quality System:

To assure the quality one has to ensure the quality. To ensure the quality it is necessary to make systematic controls at every stage and also to take critical review of efforts and achievements of the company with respect to quality of the product. For making systematic controls, co-operation of every employee is needed, since quality depends on every person working in the organization as already explained in spiral of progress in quality. Every employee’s involvement is utmost important in understanding the problems, findings solutions and implementing them. All these actions would lead to maintain and improve quality and reliability of the product. The manufacturer can assure the quality of the product and can guarantee its performance with full confidence: Sound quality assurance system thus helps to maintain / improve the quality of the products and hence the reputation of the firm and better customer relations. Poor assurance quality system results in a production of products or services that are poor in quality and reliability. Hence, efforts are directed towards developing standards on quality system.

2.5.2. Need for Standardization:

Sound quality assurance system makes it essential for the industries to maintain uniform quality system standards. Company standardization is now an important effective management tool for improving quality and productivity. Quality and standardization are the two essential pre-requisites for a company to market its products and services in the competitive business environment. Quality thus begins with standards.

Quality uncompresses safety, reliability, durability performance and acceptability of products by consumers. Hence quality needs are to be built in to the product during research, design, development and production and in fact the foundation on which quality is built is the standards.

Standardization is temporary crystallization of the best acceptable solution to a recurring problem, formulated in a scientific and systematic fashion by pooling the knowledge of all those who are concerned with the problem, and is subjected to review and revision by common consent. Standardization promotes the optimum overall economy, taking due account of functional and safety requirements. It also deals with
other aspects like variety reduction in size, type and grade of products through rationalization, introduction of alternative material, form or process and cost saving without affecting function or quality.

2.5.3. International Standards Organization (ISO)

As quality became a major focus of business throughout the world, various organizations developed standards and guidelines. Terms such as quality management, quality control, quality system and quality assurance acquired different meanings in different countries, within a country and even within an industry.

A revolution occurred in 1987 in the management of quality world wide when the International Standards Organization (Geneva, Switzerland) bought out a set of standards pertaining not to the quality of products but rather to the practice of quality assurance methods within a company. Termed as ISO 9000 standards, these proved their value rather quickly and went global. Many countries worldwide, including India have adopted them as their own standards to benchmark quality management practices.

ISO 9000 was originally issued as a series of six internationally agreed-upon standards to guide and audit a company's quality management practices. Named as ISO 9000, ISO 9001, ISO 9002, ISO 9003, ISO 9004, and ISO 14000, each standard contains specific guidelines pertaining to a certain segment of quality-related activities. ISO 9000 Series can be briefed as follow:

ISO 9000: Helps companies determine which standard of ISO 9001, 9002 and 9003 applies.

ISO 9001: Outlines guidelines for companies that engage in design, development, production, installation, and servicing of products or services.

ISO 9002: Similar to ISO 9001, but excludes companies engaged in design and development.

ISO 9003: Covers companies engaged in final inspection and testing.

ISO 9004: The guidelines for applying the elements of the Quality Management System.

ISO 14000: Standards for Environmental Management System (EMS).
These standards are the minimum acceptable level of standards that a supplier's quality management practices should meet, in order to receive the "ISO 9000 accreditation or certification". Several additional standards have been issued subsequently by ISO, including a major revision of the original series done in 1994. Today, this series covers such varied activities as design, manufacturing, software development, service activities, auditing, calibration of equipments and methods, for improving quality.

An ISO certificate does not guarantee that the processes or the products are of the highest quality, it only states that there is a system in place which provides confidence that the organization will be consistent in their management processes. Because of the need to describe procedures and to keep track of non-compliances, ISO is often seen as a bureaucratic process involving manuals and record keeping.

ISO 9000 is neither a mandatory system nor a government regulation. However, it is a very important customer regulation. It provides assurance to a wide variety of customers about an organization’s quality assurance methods and quality management practices. European Economic Community (EEC) was the first to adopt this standard formally as the requirement suppliers should meet in order to do business in Europe. ISO 9000 registration or accreditation is not a permanent certificate. An audit of the organization’s quality management system must be done by a competent agency (called the assessor) once in three or six months in order for the organization to retain its accreditation. More details are given in the appendix1.

2.5.4. ISO 9000 and TQM:

ISO 9000 is a subcomponent of TQM and a good start on the TQM path. ISO 9000 is only the minimum required quality standard that a supplier must demonstrate to receive the ISO 9000 accreditation TQM by contrast is much more comprehensive. TQM links quality to customer satisfaction by requiring action on four essentials. The quest for certification to the ISO 9000 quality standards is a relatively recent growth phenomenon throughout the world. A large number of organizations are also moving down the TQM path.
According to Sun (1999), European companies usually implement ISO 9000 more often than TQM, while in the United States, Japan, Brazil, and Canada ISO 9000 certification is not so accepted. Sun (1999) also analyzed differences in performance depending on the chosen quality system and found that the group with better results was composed of companies that were using ISO 9000 and TQM jointly, supporting the findings of Ismail and Hashmi (1999). Both studies agree that the order of implementation is not relevant at the time of obtaining better results, which could contradict the accepted wisdom of ISO as a good first step toward TQM. The authors conclude that the certification complements the TQM system, and the decision on the convenience of which system to implement first should be taken according to the company’s situation.

Using a sample of companies from Singapore, Quazi and Padibjo (1998) state that companies often start with an ISO system and later slowly move toward TQM. Escanciano, Fernandez, and Vazquez (2000) believe this is because companies get results from registration and this prompts managers to pursue higher levels of quality. Another important factor is when a company has decided to implement the ISO system motivated by internal conviction that it will be beneficial for management, which supports previous literature about the positive relationship between motivation and certification results (Meegan and Taylor 1997; Huarng, Horng, and Chin 1999; Hughes, Williams, and Ryall 2000; Gotzamani and Tsiotras 2002).

Do companies applying ISO have higher levels of TQM than companies that are not applying it? Is the certification advantageous for companies in order to attain a TQM system? In this sense, Sun (2000) points out that certified companies have higher levels in some TQM dimensions: quality information, product quality assurance, process management, and cooperation with customers. However, the author does not find any difference regarding quality planning, employee participation, and human resource management. Gotzamani and Tsiotras (2001) find differences in most TQM aspects except flexibility and human resource management. Rao, Raghu-Natham, and Solis (1997) show in a big sample comprising American, Mexican, and Indian companies that certified companies have higher levels of TQM than non-certified companies. However, a recent replication of this research in Singapore (Quazi, Wing Hong, and Tuck Meng
2002) did not find any difference in TQM levels, nor did another study in England (Taylor and Wright 2003).

Assuming that ISO 9000 certified companies could have higher levels of quality management except for those related to human resource management or quality planning, it could be argued that these companies should have better results, derived from a better management system. However, based on previous research that supports the finding that the most important dimensions at the time of getting better results from TQM are the “soft” ones (Powell 1995; Anderson and Sohal 1999; Dow, Samson, and Ford 1999; Samson and Terziovski 1999), it could also be argued that certified companies will not produce these better results.

Terziovski, Samson, and Dow (1997) considered TQM implementation as a contingent variable at the time of getting results from certification. They concluded that ISO 9000 certification does not have any effect on performance when implemented with TQM nor when implemented alone. In similar research in Australia, Rahman (2001) reached the same conclusion.

Finally, Najmi and Kehoe (2001) found that the group of ISO certified companies in their sample did not have better performance, contrary to the group applying TQM that had better results than the other companies. The philosophy of TQM is dynamic, based on continuous improvement and change and usually aims at the highest quality in processes, products and services. It has much to do with culture and the attitudes and behavior of everyone in the organization, trying to make use of knowledge of employees as much as possible. Table 2-1 gives a comparison between ISO and TQM.
Table 2.1. Differences between ISO and TQM

<table>
<thead>
<tr>
<th>ISO 9000 Certification</th>
<th>TQM Approach</th>
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<tbody>
<tr>
<td>Standardization of activities</td>
<td>Continuous improvement</td>
</tr>
<tr>
<td>Audits to ensure compliance</td>
<td>Self-assessment to find opportunities for improvement</td>
</tr>
<tr>
<td>Statistical tools as techniques</td>
<td>Statistical tools to understand variation in processes</td>
</tr>
<tr>
<td>Bureaucratic because of written down procedures &amp; quality manual</td>
<td>Culture orientation &amp; high involvement of people</td>
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<tr>
<td>Responsibility of quality (assurance) manager</td>
<td>Responsibility &amp; role of top management</td>
</tr>
<tr>
<td>Conformity to specifications</td>
<td>Customer satisfaction &amp; customer enlightenment</td>
</tr>
<tr>
<td>ISO certification gives a concrete Goal</td>
<td>A never ending TQM journey</td>
</tr>
<tr>
<td>Internal orientation on processes</td>
<td>Orientation on organization &amp; relations within &amp; outside the organization</td>
</tr>
<tr>
<td>Focusing on quality goals based on internal capabilities</td>
<td>Focusing on goals based on external benchmarks</td>
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</table>

The relationship between ISO and TQM can be illustrated by placing ISO in the perspective of the award models (e.g., the Australian Quality Awards model, the US Malcolm Baldrige National Quality Award model, the European Quality Award model). The overlap between the ISO criteria and the criteria of these award models covers mostly the processes category of the award models. From the viewpoint of ISO, processes have to be described in procedures and defects have to be handled in a way also described in a procedure. The TQM view of processes is much more focused on understanding them and reasons for variations. Developing ‘profound knowledge’ as was the message of Deming (1986). Thus, ISO and TQM have different goals and different perspectives. Generally speaking, ISO 9000 is part of the total quality concept and may or may not be seen as a pre-requisite for broader issues of quality. There are also different reasons why companies seek one or both of these.
2.5.5. Other Quality Systems

The ISO 9000 system is designed as a simple system that could be used by any industry. Other systems have been developed that are specific to a particular industry such as automotive or aerospace. These systems use the ISO 9000 as the basic framework and modify it to their needs. There are some other quality systems which called “sector-specific standards” as follow:

1) Automobile Industry
   a) QS 9000
   b) ISO/TS 16949
2) Aerospace Industry - AS 9100
3) Telecommunication - TL 9000

One of the problems with the “sector-specific standards” is the need for suppliers with customers in different industries to set up quality systems to meet each sector’s requirements. For example, a packaging supplier that services the aerospace, automobile, and telecommunications industries would need to set up its system to accommodate not only ISO 9000 but some other standards. In addition, the Registration Accreditation Board (RAB) points out that sector-specific standards have created a need for specialized auditors and training courses. On the positive side, the standardization of requirements beyond ISO 9000 makes compliance by key suppliers and implementation by major customers much easier.

1) Automobile Industry
   a) QS 9000:

This is a document specifying quality system requirements for automotive sector. Standards generally refer to the documents released by standardization bodies either national or international. This document is released by three automobile manufacturers in the USA, namely; Chrysler Corporation, Ford Motor Company, and General Motor Corporation. It is entitled Quality System Requirements – QS 9000.

This standard was developed in September 1994 by the three big US automobile manufacturers - Ford, Chrysler and General Motors to define their fundamental quality
expectations for suppliers of production and service parts and materials. QS 9000 is an interpretation and extension of ISO 9000 for automotive suppliers. The goal of the automobile manufacturers was to develop fundamental quality systems that provide for continuous improvement, emphasizing defect prevention and the reduction of variation and waste in the supply chain.

The QS 9000 document distribution and training coordination is handled by the Automotive Industry Action Group (AIAG). The purpose of QS 9000 is to define the fundamental quality system expectations of the three automobile majors, and truck manufacturers and other companies engaged in manufacturing parts and materials. These companies are committed to working with suppliers to ensure customer satisfaction beginning with conformance to quality requirements and continuing with reduction of variations and waste to benefit the ultimate customer.

QS 9000 is based on ISO 9000 and includes all ISO 9000 requirements. It provides specific guidelines for the automobile industry. It goes well beyond ISO 9000 standards by including additional requirements such as continuous improvement, manufacturing capability, and production part approval processes. QS 9000 not only states what must be done, but often how to do it? Many of the concepts in the Malcolm Baldrige National Quality Award Criteria are reflected in QS 9000.

There are three sections in QS 9000:

(i) Common requirements, which include the exact test of ISO 9001 and the addition of automotive/heavy trucking requirements.

(ii) Additional requirements covering production part approval process, continuous improvement and manufacturing capabilities.

(iii) Customer specific requirements that are unique to Ford, Chrysler and General Motors.

Registration under QS 9000 standards will also achieve ISO 9000 registration, but ISO-certified companies must meet the additional QS 9000 requirements to achieve QS certification.
b) ISO/TS 16949:

This standard is entitled Quality Systems Automotive Suppliers – particular requirements for the application of ISO 9001. It harmonizes the supplier quality requirements of the US big three (Ford, Chrysler and General Motors) as provided in QS 9000 with the French, German and Italian automakers. The standard has been approved by Asian automakers. The goal of this technical specification is the development of fundamental quality systems that provide for continuous improvement, emphasizing defect prevention, and the reduction of variation and waste in the supply chain.

There are three basic levels: (1) ISO 9001, (2) sector-specific requirements, and (3) company-specific requirements, and if appropriate levels for division-specific and part-specific requirements. It is assume that this standard will show the same rate of improvement as QS 9000.
SECTION B: TQM PRINCIPLES AND IMPLEMENTATION

2.6. Evolution of TQM

TQM has been defined as both a philosophy and a set of guiding principles that represents the foundation of a continuously improving organization. It integrates fundamental management techniques, existing improvement efforts and technical tools in a disciplined approach. Berry (1991) defined the TQM process as a total corporate focus on meeting and exceeding customer’s expectations and significantly reducing costs resulting from poor quality by adopting a new management system and corporate culture. In short, emphasis must be given towards achieving excellence in organizations. However, there is no standard method as to how TQM should be implemented in a company. As Kanji (1996) pointed out, the way of life of an organization committed to customer satisfaction through continuous improvement varies from organization to organization and from one country to another, but has certain principles that can be implemented to secure market share, increase profits and reduce costs.

In the early 1900s, F.W. Taylor, the 'Father of Scientific Management', emphasized on quality by including product inspection and gauging in his list of fundamental areas of manufacturing management. G.S. Radford's contributions were notions of involving quality consideration early in the product design stage and linking together high quality, increased productivity and lower costs.

In 1924, W. Shewhart introduced statistical control charts to monitor production. Around 1930, H. F. Dodge and H. G. Romig introduced tables for acceptance sampling. World War II caused a dramatic increase in emphasis on quality control. Soon after, US Universities started training engineers in the industries in the use of statistical sampling techniques and professional quality organizations such as American Society for quality control started emerging in the US. During the 1950s, the quality movement evolved into quality assurance. W. Edwards Deming introduced Statistical Quality Control (SQC) methods to Japanese manufacturers to help them to rebuild their manufacturing base and to enable them to compete in the world markets.

At about the same time, Joseph Juran began his 'cost of quality' approach, emphasizing accurate and complete identification and measurement of costs of quality.
In the mid 1950s, Armand Fiegenbaum proposed Total Quality Control (TQC) which enlarged the focus of quality control from manufacturing to include product design and incoming raw material.

During the 1960s, the concept of "Zero-defects" gained favour. Philip Crosby, who was the champion of “Zero defects" concept focused on employee motivation and awareness. In the 1970s, quality assurance methods were used in services such as government operations, health care, banking etc. In the late 1970s, there was a dramatic shift from quality assurance to a strategic approach to quality. The ‘reactive’ approach of finding and correcting defectives in products manufactured was changed to a 'pro-active' approach of focusing on preventing defects from recurring altogether. This new strategic approach closely linked quality to productivity and profits. In addition, this approach placed greater emphasis on consumer satisfaction and involved all levels of management as well as workers in a continuing effort to increase quality.

The TQM Movement in India

The TQM initiatives were first set by the Confederation of Indian Industries (CII) in the early 1980s, in its pioneering effort in promoting awareness about quality among Indian industries. The work done by CII in this direction is well documented in Deccan Herald Advertising Feature (1993) and also in The Standards Engineer (1996). In 1982, quality circles took birth in India, and some of the companies to launch quality circles first were Bharat Electronics Limited, Bangalore, and Bharat Heavy Electricals Limited, Trichy. In 1986 the CII then known as CEI (Confederation of Engineering Industries), invited Professor Ishikawa to India, to address industry people about quality. Later in 1987, a TQM division was set up by the CII. This division owes its foundation to 21 companies who agreed to support the cause by pooling resources and pledging to start the journey to TQM. Chief executives of these companies formed the National Committee on Quality, and quality month was declared to be an annual event. CII also launched the first newsletter on quality.

In 1987 and 1988, the CII invited the Juran Institute to India to conduct three training workshops, and then in 1989 a team from India attended the Deming Seminar in London. Study teams organized by the CII were taken to Japan and the USA to study
quality practices. During 1990, the CII consolidated and focused on training, and in February 1991, an Indian company with the assistance of the CII, obtained the first ISO 9000 certification in India. The CII organized the launch of the National Quality Campaign led by the Prime Minister of India in May 1992. It is around this time, the process of globalization and liberalization was started in the country, bringing a new dimension to the business and industrial sectors. From then on, a new line of thinking in terms of quality, productivity, and competitiveness has begun.

Since 1993, the CII has been organizing The Quality Summit every year. This provides an opportunity for all business leaders, and higher level managers of member and non-member organizations of the CII to network, learn, and contribute through experience sharing, and listening to the experts who gather there. The National Productivity Council (NPC) has set up a TQM and Benchmarking Division in New Delhi, and offers TQM implementation services, which include modular training programs and consultancy services.

In 1996, the Government of India announced the setting up of the Quality Council of India, (QCI) with the Industry Ministry bringing in half the seed capital of Rs. 1.5 crores. The rest of the seed capital will be contributed by the corporate sector. The setting up of a national agency for quality certification is part of the World Trade Organization (WTO) agreements, under which member countries will not trade in non-certified products two years down the line. The corporate sector too was demanding the setting up of an internationally recognized quality council as it found the certification process from foreign agencies too expensive. Besides, it would save vital foreign exchange for the country. The QCI will be entrusted with monitoring and administering of the National Quality Campaign and will also oversee the effective functioning of the National Information and Enquiry Services.

Many Indian companies are beginning to realize that “customer focus” is an absolute requirement of TQM. Jain (1996), while writing on TQM in India, states that companies are paying closer attention to consumer feedback in order to tailor products to meet customer needs and are using a wide variety of methods that include benchmarking with rival products, regular customer meetings, and even engaging market research
companies to collect consumer feedback on their product range and after sales service. Two specific cases are worth mentioning. Escorts Limited, an automobile manufacturing company, based on the feedback from customers and dealers changed the delivery route to ensure safe and quick delivery. Similarly, J.K. Synthetics, based on feed back from customer meetings, focused on standardization of quality parameters, and started after-sales service. This resulted in the sales rise from 220 tones in first quarter of 1995 to 632 tones in the last quarter of the same year, an impressive growth in the sales by three times the previous value.

According to a report published in Business Today (1998), some Indian companies are being guided by Yoshikazu Tsuda, a counselor at JUSE (Union of Japanese Scientists and Engineers) in their quest for total quality. Some of these companies are Sona Steering, Jai Bharat Maruti, GKN Invel, Asahi Float Glass, Brakes India, Lucas TVS, India Pistons, and India Piston Rings. Further, as stated in The Economic Times (1998), six-sigma technique, which is considered to be a classic TQM technique, is being practiced by several Indian companies notable among them being Wipro, a well recognized name in the field of information technology.

A significant achievement by an Indian company due to its practicing TQM principles is reported by Sridharan (1998). The Indian company Sundaram Fasteners located near Chennai, India, has received the Best of Best Vendors Award consecutively for two years during 1996 and 1997, for its supply of metal radiator caps to General Motors, USA. The award was given to the company for its consistent zero defects rate, 100 percent reliability in delivery schedules, and lowest price. The company is the only supplier to General Motors, USA from India out of its 3,000 supplier companies scattered all over the globe.

2.7. Concepts of TQM

Over the past few decades, quality gurus such as Deming (1986), Juran (Juran and Gryna, 1993), Crosby (1979), Feigenbaum (1991), and Ishikawa (1985), the primary authorities of total quality management (TQM), have developed certain propositions in the field of TQM, which have gained significant acceptance throughout the world. Their insights provide a good understanding of the TQM philosophy, principles, and practices.
After careful study of their work, it has been found that these quality gurus have different views about TQM, although some similarities can be found. Worldwide, there are several Quality Awards such as the Deming Prize (1996) in Japan, the European Quality Award (1994) in Europe, and the Malcolm Baldrige National Quality Award (1999) in the United States of America. Each award model is based on a perceived model of TQM. However, the three award models are different from each other and each has its own characteristics. In the field of TQM implementation, much research has already been conducted, different researchers adopting different definitions of TQM. The concept is still a subject of debate (Easton and Jarrell, 1998), still a hazy and ambiguous concept (Dean and Bowen, 1994). So far, TQM has come to mean different things to different people (Hackman and Wageman, 1995).

TQM may be defined as a continuous quest for excellence by creating the right skills and attitudes in people to make prevention of defects possible and satisfy customers/users totally at all times. TQM is an organization-wide activity that has to reach every individual within an organization. Oakland (1989), has defined TQM as follows: “Total Quality Management (TQM) is an approach to improving the effectiveness and flexibility of business as a whole”. It is essentially a way of organizing and involving the whole organization; every department, every activity, every single person at every level. TQM has been based on the quest for progress and continual improvement in the areas of cost, reliability, quality, innovative efficiency and business effectiveness. Pfau, L.D. (1989) states that TQM is an approach for continuously improving the quality of goods and services delivered through the participation of all levels and functions of the organization. Tobin views TQM as the totally integrated effort for gaining competitive advantage by continuously improving every facet of organizational culture. Deming provides an operational definition of TQM which gives a motivational meaning to the concept. Sink states that TQM can be successful only if the operational definition is translated into strategies by the leadership of the organization and which are crystallized into actions and communicated to all the people with conviction and clarity.

However, TQM may also be viewed functionally as an integration of two basic functions, i.e. total quality control and quality management. Total quality control is a
long-term success strategy for organizations. Customer satisfaction, employee satisfaction, product quality assurance in all its stages, and continuous improvement and innovation, are the main ingredients of total quality control; whereas quality management is a way of planning, organizing and directing that will facilitate and integrate the capabilities of all employees for continuous improvement of anything and everything in an organization to attain excellence. Thus, TQM in an organization brings all the people together to ensure and improve product-process quality, the work environment and working culture. Sohal et al.(2000), have explained that the continuous improvement in quality has to come from an integrated approach of controlling quality via action plans in different operations of the business cycle. They have identified five elements such as customer focus, management commitment, total participation, statistical quality control and systematic problem solving. Zaire has mentioned that TQM can be formulated in terms of the three important aspects of continuous improvement, value-added management and employee involvement. Price and Gaskill (1990) have identified three dimensions of TQM. They are:

a) The product and service dimension:

The degree to which the customer is satisfied with the product or service supplied;

b) The people dimension:

The degree to which the customer is satisfied with the relationship with the people in the supplying organizations;

c) The process dimension:

The degree to which the supplier is satisfied with the internal work processes, which are used to develop the products and services supplied to the customers.

TQM philosophy advocates the use of the above mentioned concepts and techniques to ensure that an organization can meet the needs of its customers on a continuous basis. To do this effectively an organization must link the concept of continuous improvement to the technique of value improvement. Value improvement can be defined as the ability to meet, or exceed, customer expectations while removing unnecessary cost.
2.8. Elements of TQM

TQM is application of a number of activities with perfect synergy. The various important elements of TQM are: customer-driven quality, top management leadership and commitment, continuous improvement, fast response, actions based on facts, employee participation, and a TQM culture.

2.8.1. Customer-driven quality:

TQM has a customer-first orientation. The customer, not internal activities and constraints, comes first. Customer satisfaction is seen as the company's highest priority. The company believes it will only be successful if customers are satisfied. The TQM Company is sensitive to customer requirements and responds rapidly to them. In the TQM context, “being sensitive to customer requirements” goes beyond defect and error reduction, and merely meeting specifications or reducing customer complaints. The concept of requirements is expanded to take in not only product and service attributes that meet basic requirements, but also those that enhance and differentiate them for competitive advantage.

Each part of the company is involved in Total Quality, operating as a customer to some functions and as a supplier to others. The Engineering Department is a supplier to downstream functions such as Manufacturing and Field Service, and has to treat these internal customers with the same sensitivity and responsiveness as it would external customers.

2.8.2. TQM leadership from top management:

TQM is a way of life for a company. It has to be introduced and led by top management. This is a key point. Attempts to implement TQM often fail because top management doesn't lead and get committed - instead it delegates and pays lip service. Commitment and personal involvement is required from top management in creating and deploying clear quality values and goals consistent with the objectives of the company, and in creating and deploying well defined systems, methods and performance measures for achieving those goals. These systems and methods guide all quality activities and encourage participation by all employees. The development and use of performance
indicators is linked, directly or indirectly, to customer requirements and satisfaction, and to management and employee remuneration.

2.8.3. Continuous Improvement:

Continuous improvement of all operations and activities is at the heart of TQM. Once it is recognized that customer satisfaction can only be obtained by providing a high-quality product, continuous improvement of the quality of the product is seen as the only way to maintain a high level of customer satisfaction. As well as recognizing the link between product quality and customer satisfaction, TQM also recognizes that product quality is the result of process quality. As a result, there is a focus on continuous improvement of the company's processes. This will lead to an improvement in process quality. In turn this will lead to an improvement in product quality, and to an increase in customer satisfaction. A number of new improvement methodologies were evolved in Japan. The following are some of them.

a) Juran's Trilogy
b) Kaizen
c) Kaizen Blitz
d) 5S Practice
e) The Seven Deadly Wastes
f) Business Process Reengineering (BPR)

a) Juran's Trilogy

Juran brings out that good financial results are achieved in an organization through three managerial processes namely, planning, control and improvement.

Juran suggests similar analogy for better quality results. The quality trilogy consists of the same three managerial processes and aimed at improving quality of products and services. They are:

- Quality Planning
- Quality Control
- Quality Improvement
b) **Kaizen**

Kaizen is a Japanese word. It means gradual, orderly and continuous improvement. Kaizen does not need any capital investment, but it requires time and efforts of every employee in the organization, right from the top management. Continuous improvement is achieved through improving the current way of manufacturing and eliminating waste.

These practices can be employed by any organization located anywhere in the world. Kaizen calls for never ending improvements. This means that improvement is not a one-time activity, but a continuous activity. After some time, once the process is stabilized, the employees will be able to find out some more scope for improvement.

c) **Kaizen Blitz**

Kaizen Blitz, on the contrary, is a quick improvement methodology. A large number of organizations embark upon Kaizen Blitz (events) to unleash employee creativity and dramatically improve the operations overnight. Usually the kaizen blitz is completed in a single week. The solutions are implemented quickly.

While the Kaizen in the traditional sense is aimed at creating a perfect production line, the goal of Kaizen Blitz is simply to create a better production line. However, in the recent past, large number of organizations in the US and Europe and around the world organize Kaizen Blitz.

d) **5S Practices**

The *Kaizen* toolbox includes the 5S for improving workplace effectiveness. 5S is rather a management tool focused on fostering and sustaining high quality housekeeping.

The 5S practices are:

1. Sort
2. Straighten
3. Scrub
4. Systematize
5. Standardize
The Japanese equivalent names for the five practices start with the alphabet “S”. Thus, these are known as 5S practices.

The purpose of 5S tools are given in Table 2.3.

**Table 2.2. 5S Tools**

<table>
<thead>
<tr>
<th>5S Tools</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seiri (sort)</td>
<td>Separate out all unnecessary things and eliminate them.</td>
</tr>
<tr>
<td>Seiton (straighten)</td>
<td>Arrange the essential things in order, so that they can be easily accessed.</td>
</tr>
<tr>
<td>Seiso (scrub)</td>
<td>Keep machinery and working environments clean.</td>
</tr>
<tr>
<td>Seiketsu (systematize)</td>
<td>Make cleaning and checking as a routine practice.</td>
</tr>
<tr>
<td>Shitsuke (standardize)</td>
<td>Standardize the previous four steps.</td>
</tr>
</tbody>
</table>

*e) The Seven Deadly Wastes*

Elimination of waste is a major component of the continuous improvement approach. Wastes cannot be totally eliminated but can be reduced to the minimum. There is also a strong emphasis on prevention rather than detection, and an emphasis on quality at the design stage. The customer-driven approach helps to prevent errors and achieve defect-free production.

Toyota, the Japanese automobile manufacturer, identified the following seven types of wastes as the most common in industries.

1. Waste from overproduction
2. Waste of waiting time
3. Transportation waste
4. Processing waste
5. Inventory waste
6. Waste of motion
7. Waste from product defect
g) **Business Process Reengineering (BPR)**

BPR is "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvement in critical, contemporary measures of performance, such as cost, quality, service and speed".

BPR is undertaken essentially to result in a quantum jump in performance processes. BPR is synonymous with innovation because it is more than just automating or applying Information Technology to the existing processes or operations. It will bring in benefits to all the stakeholders of the organization. Very high achievements are expected out of BPR. The steps involved in BPR are similar to those in TQM. However in reengineering, much bigger results are expected and not incremental improvements. There is a lot of debate as to whether BPR is an alternative to TQM. TQM and BPR neither contradict nor compliment each other because they are two parts of the same approach. Therefore, total quality is an objective, TQM is a means to achieve it and BPR is an important tool within the TQM technology. While BPR is a tool, TQM is an umbrella concept involving many other strategies.

2.8.4. **Fast response:**

To achieve customer satisfaction, the company has to respond rapidly to customer needs. This implies short product and service introduction cycles. These can be achieved with customer-driven and process-oriented product development because the resulting simplicity and efficiency greatly reduce the time involved. Simplicity is gained through concurrent product and process development. Efficiencies are realized from the elimination of non-value-adding effort such as re-design. The result is a dramatic improvement in the elapsed time from product concept to first shipment.

2.8.5. **Actions based on facts:**

The statistical analysis of engineering and manufacturing facts is an important part of TQM. Facts and analysis provide the basis for planning, review and performance tracking, improvement of operations, and comparison of performance with competitors. The TQM approach is based on the use of objective data, and provides a rational rather than an emotional basis for decision making. The statistical approach to process
management in both engineering and manufacturing recognizes that most problems are system-related, and are not caused by particular employees.

In practice, data is collected and put in the hands of the people who are in the best position to analyze it and then take the appropriate action to reduce costs and prevent non-conformance. Usually these people are not managers but workers in the process. If the right information is not available, then the analysis, whether it be of shop floor data, or engineering test results, can't take place, errors can't be identified, and so errors can not be corrected.

2.8.6. Employee participation:

A successful TQM environment requires a committed and well-trained work force that participates fully in quality improvement activities. Such participation is reinforced by reward and recognition systems which emphasize the achievement of quality objectives.

On-going education and training of all employees supports the drive for quality. Employees are encouraged to take more responsibility, communicate more effectively, act creatively, and innovate. As people behave the way they are measured and remunerated, TQM links remuneration to customer satisfaction metrics.

2.8.7. A TQM culture:

It is not easy to introduce TQM. An open, cooperative culture has to be created by management. Employees have to be made to feel that they are responsible for customer satisfaction. They are not going to feel this if they are excluded from the development of visions, strategies, and plans. It's important they participate in these activities. They are unlikely to behave in a responsible way if they see management behaving irresponsibly - saying one thing and doing the opposite.
2.9. Approaches to TQM

Although many individuals have made substantial contributions to the theory and practice of quality management, three individuals—Dr. W. Edwards Deming (1986), Dr. Joseph Juran (Juran and Gryna, 1993) and Phillip B. Crosby (1979)—are regarded as the "management gurus" in the quality revolution. These three "quality gurus" together along with Feigenbaum (1991) and Ishikawa (1985) led the development of the current set of management tools within total quality management.

2.9.1. Deming’s Approach to TQM

The theoretical essence of the Deming approach to TQM concerns the creation of an organizational system that fosters cooperation and learning for facilitating the implementation of process management practices, which, in turn, leads to continuous improvement of processes, products, and services as well as to employee fulfillment, both of which are critical to customer satisfaction, and ultimately, to firm survival (Anderson et al., 1994). Deming (1986) stressed the responsibilities of top management to take the lead in changing processes and systems. Leadership plays in ensuring the success of quality management, because it is the top management’s responsibility to create and communicate a vision to move the firm toward continuous improvement. Top management is responsible for most quality problems; it should give employees clear standards for what is considered acceptable work, and provide the methods to achieve it. These methods include an appropriate working environment and climate for work-free of faultfinding, blame or fear. Deming (1986) also emphasized the importance of identification and measurement of customer requirements, creation of supplier partnership, use of functional teams to identify and solve quality problems, enhancement of employee skills, participation of employees, and pursuit of continuous improvement. Anderson et al. (1994a) developed a theory of quality management underlying the Deming management method. They proposed that: The effectiveness of the Deming management method arises from leadership efforts toward the simultaneous creation of a cooperative and learning organization to facilitate the implementation of process-management practices, which, when implemented, support customer satisfaction and
organizational survival through sustained employee fulfillment and continuous improvement of processes, products, and services.

The means to improve quality lie in the ability to control and manage systems and processes properly, and in the role of management responsibilities in achieving this. Deming (1986) advocated methodological practices, including the use of specific tools and statistical methods in the design, management, and improvement of process, which aim to reduce the inevitable variation that occurs from “common causes” and “special causes” in production. “Common causes” of variations are systemic and are shared by many operators, machines, or products. They include poor product design, non-conforming incoming materials, and poor working conditions. These are the responsibilities of management. “Special causes” relate to the lack of knowledge or skill, or poor performance. These are the responsibilities of employees. Deming proposed 14 points as the principles of TQM (Deming, 1986), which are listed below:

1. Create constancy of purpose toward improvement of product and service, with the aim to become competitive and to stay in business, and to provide jobs.

2. Adopt the new philosophy. We are in a new economic age. Western management must awaken to the challenge, must learn their responsibilities, and take on leadership for change.

3. Cease dependence on mass inspection to quality. Eliminate the need for inspection on a mass basis by building quality into the product in the first place.

4. End the practice of awarding business on the basis of price tag. Instead, minimize total cost. Move toward a single supplier for any one item, on a long-term relationship of loyalty and trust.

5. Improve constantly and forever the system of production and service, to improve quality and productivity, and thus constantly decrease costs.

6. Institute training on the job.

7. Institute leadership. The aim of supervision should be to help people and machines and gadgets to do a better job. Supervision of management is in need of overhaul, as well as supervision of production workers.
(8) Drive out fear, so that people may work effectively for the company.

(9) Break down barriers between departments. People in research, design, sales, and production must work as a team, to foresee problems of production and in use that may be encountered with the product or service.

(10) Eliminate slogans, exhortations, and targets for the workforce asking for zero defects and new levels of productivity. Such exhortations only create adversarial relationships, as the bulk of the causes of low quality and low productivity belong to the system and thus lie beyond the power of the workforce.

(11) (a) Eliminate work standards (quotas) on the factory floor. Substitute leadership. (b) Eliminate management by objective. Eliminate management by numbers, numerical goals. Substitute leadership.

(12) (a) Remove barriers that rob the hourly worker of his right to pride of workmanship. The responsibility of supervisors must be changed from sheer numbers to quality. (b) Remove barriers that rob people in management and in engineering of their right to pride of workmanship. This means, inter alia, abolishment of the annual or merit rating and of management by objective.

(13) Institute a vigorous program of education and self-improvement.

(14) Put everybody in the company to work to accomplish the transformation. The transformation is everybody’s job.

2.9.2. Juran’s Approach to TQM

TQM is the system of activities directed at achieving delighted customers, empowered employees, higher revenues, and lower costs (Juran and Gryna, 1993). Juran believed that main quality problems are due to management rather than workers. The attainment of quality requires activities in all functions of a firm. Firm-wide assessment of quality, supplier quality management, using statistical methods, quality information system, and competitive benchmarking are essential to quality improvement. Juran’s approach is emphasis on team (QC circles and self-managing teams) and project work, which can promote quality improvement, improve communication between management and employees coordination, and improve coordination between employees. He also
emphasized the importance of top management commitment and empowerment, participation, recognition and rewards.

According to Juran, it is very important to understand customer needs. This requirement applies to all involved in marketing, design, manufacture, and services. Identifying customer needs requires more vigorous analysis and understanding to ensure the product meets customers’ needs and is fit for its intended use, not just meeting product specifications. Thus, market research is essential for identifying customers’ needs. In order to ensure design quality, he proposed the use of techniques including quality function deployment, experimental design, reliability engineering and concurrent engineering.

Juran considered quality management as three basic processes (Juran Trilogy): Quality control, quality improvement, and quality planning. In his view, the approach to managing for quality consists of: The sporadic problem is detected and acted upon by the process of quality control; The chronic problem requires a different process, namely, quality improvement; Such chronic problems are traceable to an inadequate quality planning process. Juran defined a universal sequence of activities for the three quality processes, which is listed in Table 2.3.

Juran defined four broad categories of quality costs, which can be used to evaluate the firm’s costs related to quality. Such information is valuable to quality improvement. The four quality costs are listed as follows:

- Internal failure costs (scrap, rework, failure analysis, etc.), associated with defects found prior to transfer of the product to the customer;
- External failure costs (warranty charges, complaint adjustment, returned material, allowances, etc.), associated with defects found after product is shipped to the customer;
- Appraisal costs (incoming, in-process, and final inspection and testing, product quality audits, maintaining accuracy of testing equipment, etc.), incurred in determining the degree of conformance to quality requirements;
• Prevention costs (quality planning, new product review, quality audits, supplier quality evaluation, training, etc.), incurred in keeping failure and appraisal costs to a minimum.

Table 2.3. Universal Processes for Managing Quality

<table>
<thead>
<tr>
<th>Quality Planning</th>
<th>Quality Control</th>
<th>Quality Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establish quality goals</td>
<td>Choose control subjects</td>
<td>Prove the need</td>
</tr>
<tr>
<td>Identify customers</td>
<td>Choose units of measure</td>
<td>Identify projects</td>
</tr>
<tr>
<td>Discover customer needs</td>
<td>Set goals</td>
<td>Organize project teams</td>
</tr>
<tr>
<td>Develop product features</td>
<td>Create a sensor</td>
<td>Diagnose the causes</td>
</tr>
<tr>
<td>Develop process features</td>
<td>Measure actual performance</td>
<td>Provide remedies, prove remedies are effective</td>
</tr>
<tr>
<td>Establish process controls, transfer to operations</td>
<td>Interpret the difference</td>
<td>Deal with resistance to change</td>
</tr>
<tr>
<td></td>
<td>Take action on the difference</td>
<td>Control to hold the gains</td>
</tr>
</tbody>
</table>

2.9.3. Crosby’s Approach to TQM

Crosby (1979) identified a number of important principles and practices for a successful quality improvement program, which include, for example, management participation, management responsibility for quality, employee recognition, education, reduction of the cost of quality (prevention costs, appraisal costs, and failure costs), emphasis on prevention rather than after-the-event inspection, doing things right the first time, and zero defects.

Crosby claimed that mistakes are caused by two reasons: Lack of knowledge and lack of attention. Education and training can eliminate the first cause and a personal commitment to excellence (zero defects) and attention to detail will cure the second. Crosby also stressed the importance of management style to successful quality improvement. The key to quality improvement is to change the thinking of top managers—get them not to accept mistakes and defects, as this would in turn reduce work expectations and standards in their jobs. Understanding, commitment, and communication are all essential. Crosby presented the quality management maturity grid,
which can be used by firms to evaluate their quality management maturity. The five stages are: Uncertainty, awakening, enlightenment, wisdom and certainty. These stages can be used to assess progress in a number of measurement categories such as management understanding and attitude, quality organization status, problem handling, cost of quality as percentage of sales, and summation of firm quality posture. The quality management maturity grid and cost of quality measures are the main tools for managers to evaluate their quality status. Crosby offered a 14-step program that can guide firms in pursuing quality improvement. These steps are listed as follows:

(1) Management commitment: To make it clear where management stands on quality.

(2) Quality improvement team: To run the quality improvement program.

(3) Quality measurement: To provide a display of current and potential nonconformance problems in a manner that permits objective evaluation and corrective action.

(4) Cost of quality: To define the ingredients of the cost of quality, and explain its use as a management tool.

(5) Quality awareness: To provide a method of raising the personal concern felt by all personnel in the company toward the conformance of the product or service and the quality reputation of the company.

(6) Corrective action: To provide a systematic method of resolving forever the problems those are identical through previous action steps.

(7) Zero defects planning: To investigate the various activities that must be conducted in preparation for formally launching the Zero Defects program.

(8) Supervisor training: To define the type of training those supervisors need in order to actively carry out their part of the quality improvement program.

(9) Zero defects day: To create an event that will make all employees realize, through a personal experience, that there has been a change.

(10) Goal setting: To turn pledges and commitment into actions by encouraging individuals to establish improvement goals for themselves and their groups.
(11) Error causal removal: To give the individual employee a method of communicating to management the situation that makes it difficult for the employee to meet the pledge to improve.

(12) Recognition: To appreciate those who participate.

(13) Quality councils: To bring together the professional quality people for planned communication on a regular basis.

(14) Do it over again: To emphasize that the quality improvement program never ends.

2.9.4. Comparison of the Three Major Quality Philosophies

Crosby's Basic Elements of Improvement include determination, education and implementation. Determination means that the top management must take quality improvement seriously. Everyone should understand the “Absolutes of Quality Management” which can be accomplished only through education. Finally, every member of the management team must understand the implementation process.

Unlike Deming & Juran, Crosby's program is primarily behavioral. He emphasizes using management and organizational processes rather than statistical techniques to change corporate culture and attitudes. Like Juran and unlike Deming, his approach fits well within the existing organizational structures.

Crosby's approach, however, provides relatively few details about how firms should address the finer points of quality management. Even though Deming, Juran and Crosby, view quality as imperative in the future competitiveness of Western Industry, they have significantly different approaches to implementing organizational change. In each philosophy, quality clearly requires a total commitment from everyone in an organization. Many managers view quality as a set of tasks to be performed by specialists in quality control. Other managers view quality as a process in which many people at the operating level from a number of functional areas of the organization are involved. Still, some other managers view quality as an ideology or philosophy that pervades the entire organization.

In spite of the differences in their perspectives, the philosophies of Deming, Juran and Crosby are more alike than different. Each views top management commitment as an
absolute necessity, demonstrates that quality management practices will save money, not cost money, places responsibility for quality on management, not the workers, stress the need for continuous, never-ending improvement, acknowledges the importance of the customer and strong management-worker partnerships and recognizes the need for and difficulties associated with changing the organizational culture.

2.9.5 Feigenbaum’s Approach to TQM

Feigenbaum (1991) defined TQM as: An effective system for integrating the quality development, quality-maintenance, and quality-improvement efforts of the various groups in a firm so as to enable marketing, engineering, production, and service at the most economical levels which allow for full customer satisfaction. He claimed that effective quality management consists of four main stages, described as follows:

- Setting quality standards;
- Appraising conformance to these standards;
- Acting when standards are not met;
- Planning for improvement in these standards.

The quality chain, he argued, starts with the identification of all customers’ requirements and ends only when the product or service is delivered to the customer, who remains satisfied. Thus, all functional activities, such as marketing, design, purchasing, manufacturing, inspection, shipping, installation and service, etc., are involved in and influence the attainment of quality. Identifying customers’ requirements is a fundamental initial point for achieving quality. He claimed that effective TQM requires a high degree of effective functional integration among people, machines, and information, stressing a system approach to quality. A clearly defined total quality system is a powerful foundation for TQM. Total quality system is defined as follows:

The agreed firm-wide operating work structure, documented in effective, integrated technical and managerial procedures, for guiding the coordinated actions of the people, the machines, and the information of the firm in the best and most practical ways to assure customer quality satisfaction and economical costs of quality.
Feigenbaum emphasized that efforts should be made toward the prevention of poor quality rather than detecting it after the event. He argued that quality is an integral part of the day-today work of the line, staff, and operatives of a firm. There are two factors affecting product quality: The technological—that is, machines, materials, and processes; and the human—that is, operators, foremen, and other firm personnel. Of these two factors, the human is of greater importance by far. Feigenbaum considered top management commitment, employee participation, supplier quality management, information system, evaluation, communication, use of quality costs, use of statistical technology to be an essential component of TQM. He argued that employees should be rewarded for their quality improvement suggestions, quality is everybody’s job. He stated that effective employee training and education should focus on the following three main aspects: Quality attitudes, quality knowledge, and quality skills.

2.9.6. Ishikawa’s Approach to TQM

Kaoru Ishikawa was a Japanese quality authority until his death in 1989. He acknowledged Deming's and Juran's influence in his thinking. However, Dr. Ishikawa must be recognized for his own contribution to TQM. He was instrumental in the development of the broad outlines by Japanese quality strategy, the concept of Company-Wide Quality Control (CWQC), the audit process used for determining whether a company will be selected to receive the Deming Prize, team-based problem solving and a variety of problem solving tools that he thought any worker could use. He was responsible for the initial deployment of Quality Control Circles—small groups of employees that meet regularly to plan and carry out process changes to improve quality, productivity and the work environment.

He also developed Ishikawa cause and effect charts or fish-bone diagrams: Like Deming, Juran and Feigenbaum, Ishikawa also emphasised on quality as a way of management. He influenced the development of participative, bottom-up view of quality, which became the trademark of the Japanese approach to quality management. Some key elements of his philosophy are:

(1) Quality begins with education and ends with education.

(2) The first step in quality is to know the requirements of customers.
(3) The ideal state of quality control occurs when inspection is no longer necessary.

(4) Remove the root cause, not the symptoms.

(5) Quality control is the responsibility of all workers and all divisions.

(6) Do not confuse means with the objectives.

(7) Put quality first and set your sights on long-term profits.

(8) Market is the entrance and exit of quality.

(9) Top management must not show anger when facts are presented by subordinates.

(10) Ninety-five percent of problems in a company can be solved with simple tools for analysis and problem solving.

(11) Data without dispersion information (variability) are false data.

2.9.7. Overview and Criticism of Quality Philosophies

Each quality guru whose contributions to TQM were discussed in this chapter has his own knowledge base and interests. Each has worked in different situations and several have contributed in contrasting eras. This naturally has influenced the way their ideas have developed. T seems that there is a great diversity in their philosophies, principles and methods.

There are two main areas of focus of the various philosophies discussed earlier. They are:

(i) The technical needs of quality control and

(ii) The human dimension of quality management.

Technical needs of prediction and control are met largely by statistical and quantitative methods. The philosophies of some quality gurus cover technical needs from design right through to inspection of the final product.

Management of the human dimensions of organization is not clearly provided for in these quality philosophies. The gurus mention their interest in managing people, but offer a few tangible principles and virtually no applicable methods. Quality Control Circles (QCC) provide the clearest exposition to generate motivation, autonomy and
creativity through an approach that is clearly defined. While QCCs target groups of people (i.e., employees), individuals have been targeted by the management method like "quality of work life" (QWL) which is not a part of the quality philosophies of quality gurus. "Quality of work life" shifts the key perspective to the individual worker as regards, his/her potential and skills and feeling about the job. It promotes meaningful recognition for workers and members of organizations as individuals. "Employee suggestion schemes" and "job-enrichment programs" are other management methods to complement the quality philosophies discussed.

2.10. **TQM Tools and Techniques**

TQM involves application of the right tools in the organization for the continuous improvement of quality. Therefore, each organization may require a different mix of tools and techniques depending on the business, quality of employees, culture and the customer profile. Some of the tools and techniques those are available for TQM implementation as follows:

1) Statistical Process Control (SPC)
2) Taguchi Methods
3) Benchmarking
4) Just –In –Time (JIT)
5) Quality Function Deployment (QFD)
6) Total Productive Maintenance (TPM)
7) Failure Mode and Effect Analysis (FMEA)
8) Six Sigma
9) New Management Tools

**2.10.1. Statistical Process Control (SPC)**

The quality of a product or service depends on the quality of process employed. Therefore, every organization needs to establish a set of well-defined processes for manufacturing of products or design of services. The quality of a process has to be designed and controlled. The aim of statistics based process control is to produce products and services with quality consistently. The application of statistics to quality control has enabled quick analysis and control of quality in all types of businesses.
Application of the tools in the process helped in arriving at solutions to the problems, as well as taking preventive actions. Application of statistical process control and quality control tools, which are known as SPC tools, are therefore very important for continuous improvement in the TQM journey. SPC is a tool to control variations and thereafter reduce them continuously.

The seven Quality Control (QC) tools are very useful for ensuring process quality and thereby end product quality. These tools are:

1. Process Flow Chart
2. Cause and Effect Diagram
3. Check Sheet
4. Scatter Diagram
5. Pareto Chart
6. Histogram
7. Control Charts

2.10.2. Taguchi Methods

The concept of minimizing losses was also born in Japan due to their specific need. They have to add value to imported materials and export products with maximum added value. Low loss in a process is as good as adding efficiency to a process. Thus, every industry must understand quality loss function evolved by the Japanese Quality Guru, Taguchi and minimize losses. Many companies around the world have saved hundreds of millions of dollars by using the method in diverse industries such as automobiles, telecommunications, electronics, software, etc. Thus Taguchi's techniques are important ingredients of TQM.

Taguchi developed the concept of quality loss function. In contrast to the Western countries, Taguchi works in terms of quality loss rather than quality. He used loss function to measure quality. The loss function is defined as “loss imparted by the product to the society, from the time the product is shipped”. This loss includes not only the loss to the company through the cost of rework or scrap, maintenance cost and warranty
claims, but also the cost to the customers through poor product performance, down-time due to equipment failure and poor reliability. Loss functions enable calculations of social loss, when products deviate from the target value. Taguchi developed many loss functions with different equations to suit different applications.

2.10.3. Benchmarking

In the criteria for MBNQA award, the word 'benchmarking' appears 200 times. This shows the importance of benchmarking for continuous process improvement and TQM. Benchmarking will help in identifying the current level of performance of the processes in the organization and bringing them up to the level of the best processes. Benchmarking can be used to compare product features also.

Benchmarking is a process of comparison of two or more products, services, processes or organizational practices. Business process benchmarking is comparing a business process with the best process in that area. The dictionary meaning of benchmark is "standard or point of reference". Benchmarking has been in vogue in the computer industry for quite some time. Benchmarking computer systems involves executing a set of common programs developed by independent agencies to ascertain the relative performance of computers of various makes. They essentially compute the time taken to carry out certain standard computations such as sorting. There are two categories of benchmarking as follow:

(a) Problem based benchmarking

(b) Process based benchmarking

2.10.4. Just –In –Time (JIT)

The JIT system was developed at the Toyota Motor Company in Japan. The JIT concept was then first transferred to the U.S. about 1980. Since then, many leading corporations in the US have implemented JIT and it has achieved widespread use around the world.

The roots of the JIT system can probably be traced to the Japanese environment. Owing to lack of space and lack of natural resources, the Japanese have developed an aversion to waste. They view scrap and rework as waste and thus strive for perfect
They also believe that inventory storage wastes space and ties up valuable materials. Anything that does not contribute to value to the product is viewed as waste.

JIT is defined as "a philosophy of manufacturing based on planned elimination of all waste and continuous improvement of productivity. It encompasses the successful execution of all manufacturing activities required to produce a final product, from design engineering to delivery and including all stages of conversion from raw materials onward. The primary elements of JIT are to have only the required inventory when needed, to improve quality to zero defects, to reduce lead times by reducing set-up times, queue lengths and lot sizes, to incrementally revise the operations themselves and to accomplish these things at minimum cost”.

JIT is a philosophy of continuous and forced problem solving. With JIT, supplies and components are "pulled" through a system to arrive where they are needed and when they are needed. When good units do not arrive in time (just as needed), a "problem" has been identified. This makes JIT an excellent tool to help operations managers add value by driving out waste and unwanted variability. The specific goal of JIT manufacturing is to provide the right quality level at the right place. Customer demand always determines what is right. JIT tries to build only what internal and external customers want and when they want it.

2.10.5. Quality Function Deployment (QFD)

As organizations realize the importance of customer delight, they trust QFD as the solution to plan products and services to meet the customer’s current and future, stated and unstated needs. It is increasingly being recognized as the right methodology for ensuring that “voice of the customer” is taken note of and efforts of the entire organization are directed towards it. QFD is a structured and systematic approach to ensure that the voice of the customer is heard during the design of the process, product or service. The tool was developed in Japan in the late 1960s when they moved from reverse engineering to product development based on originality. Many Japanese companies such as Mitsubishi, Toyota etc. use QFD extensively.
**Toyota’s definition of QFD is:**

“QFD is a method for developing a design quality aimed at satisfying the consumer and then translating the consumer’s demands into design targets and major QA points to be used throughout the production phase”.

QFD is an effective tool for eliciting customer’s stated and implied requirements. Since QFD for a product will be developed through brainstorming. It brings together the talents of every employee. It is also an effective quality-planning tool. The tool enables conversion of customer need into specific quality plans. Thus, it is one of the essential TQM tools to be used in the industry.

**2.10.6. Total Productive Maintenance (TPM)**

Maintenance of plant and machinery deserves importance since idle or defective machinery means loss of money. In developing countries a large number of equipment lie idle, due to want of spares or lack of competent persons to repair the items or the cost of repair is comparable with a new replacement. Since maintenance requires specific skills in troubleshooting and the operators don’t have skills to maintain or repair the equipment on their own, some organizations have separate maintenance departments. In such cases the operators of the machinery don’t care about maintenance leading to more down time of the equipment. Unless the equipment is always in proper working conditions, the organization will undergo losses. Total Productive Maintenance (TPM) was also evolved in Japan to take care of this important aspect of business. Increased productivity is the hallmark of TPM and hence TPM is a part of TQM since the former has a bigger role to play in satisfying customers and shareholders of an organization.

The goal of TPM is continuous improvement in up time of the equipment by harnessing the skills of every employee leading to the growth of the organization. The goal is to involve every employee in upkeep of plant and machinery. The measure of TPM is the actual percentage of time the equipment was used for regular production.
2.10.7. Failure Mode and Effect Analysis (FMEA)

TQM strategy for success of organizations is to design in quality and reliability in the products or services early in the development cycle. Failure Mode and Effect Analysis (FMEA) is a methodology for analyzing potential reliability problems early in the development cycle where it is easier to take actions to overcome these issues, thereby enhancing reliability through design. FMEA is a bottom up approach. It is used to identify the potential actions to mitigate the failures. A crucial step is anticipating what might go wrong with a product due to failure of its parts. While anticipating, every failure mode of every component may not be possible, the development team should formulate a comprehensive list of potential failure modes.

FMEA is defined as "a systematic group of activities intended to: (a) Recognize and evaluate the potential failure of a product/process and the effects of that failure, (b) Identify actions that could eliminate or reduce the chance of the occurrence of potential failure".

It is a reliability evaluation / design technique and it examines the potential failure modes within a product or a system. In order to determine the effects on the equipment each potential failure mode is classified according to its impact on the mission success (successful operation of the system) as well as personnel and equipment safety.

2.10.8. Six Sigma

TQM was born in America to overcome the Japanese competition. In the 1990s, ISO 9000 standards created a new wave of quality. Thereafter, Motorola in order to give a sharper focus to TQM, embarked on six sigma. Thus, six sigma is very much in the ongoing tradition of quality control. However, dramatic process improvement is the goal of six sigma. Some believe that Motorola gave the name six sigma to their special TQM initiative. Six sigma can even be considered as a methodology of implementing TQM. Six sigma is an innovative approach to continuous process improvement and a TQM methodology.

Six sigma can be defined as "a business process that allows organizations to drastically improve their bottom line by designing and monitoring every day business
activities in ways that minimize waste and resources while increasing customer satisfaction”. Although six sigma is a statistical technique, it was combined with a new methodology to control the processes at Motorola to result in dramatic improvements in the process.

Six sigma provides the highest impact opportunities for improvement. It reduces quality costs tremendously. Six Sigma is a data driven methodology. It tries for perfection in the entire organization. Six sigma focuses on variations and finally the root cause for the variation and reducing the variation, so as to achieve ‘zero' defects' manufacturing. Six sigma projects get attention of top management and are aimed at showing dramatic savings in cost. It enables improvement of process capability, defect prevention, stability and predictability of the processes and variation reduction. It is also a TQM strategy. Six sigma is a methodology for disciplined quality improvement. It is felt that since quality improvement is the prime ingredient of TQM, many companies find, adding a six sigma program to their current business system covers almost all the elements of TQM.

2.10.9. New Management Tools

In addition of the seven QC tools that have been discussed earlier the Japanese developed seven more tools in their second wave of quality. These tools are called the New Seven Management Tools. The tools are useful for process, product and system improvement. The tools can be used by the middle and top management of organizations to find causes of problems and solutions to the same. In comparison with seven QC tools, the new seven tools are qualitative in nature unlike the former which are data oriented. These tools are further oriented towards assisting the teams in finding solutions and innovative management ideas. They are also called graphical tools. These tools are used along with brainstorming by teams of employees. The tools are meant for improving the processes.

These tools can also be used for strategic planning, organizing complex projects in the most optimal manner and new product development. The tools initially developed and used extensively in Japan were popularized by an organization called GOAL / QPC
in USA. A large number of firms are now using the new seven tools for management and deriving immense benefits.

Following are the new seven management tools:

1. Affinity Diagram
2. Relationship Diagrams
3. Tree Diagram
4. Matrix Diagram
5. Prioritization Matrix
6. Activity Network Diagram
7. Process Decision Program Chart

2.11. TQM Awards (Models)

To accelerate and facilitate application of TQM in the industry a number of quality awards are given in various countries periodically, generally on an annual basis. Certification under ISO 9000 is not a quality award, but a quality certification. There is no limit to the number of organizations, which could receive the ISO 9000 certification. If an organization fulfills the requirements of the ISO 9000 standards, it will be certified by a certifying agency. But the quality awards are limited in number. These awards are given to a few successful organizations practicing TQM principles. The award criteria provide guidelines for organizations to evolve and practice TQM in their organizations. An organization receiving any of these national awards will indicate that it is practicing TQM and has achieved substantial success in the implementation of the same. The awards are given in an objective oriented manner. They stipulate marks for each one of the quality characteristics, thus indirectly indicating the relative importance of each one of the criteria. Some of the popular awards are the Deming Prize in Japan, Malcolm Baldrige National Quality Award (MBNQA) in USA, The European Quality Award (EQA), Canadian Awards for Business Excellence, Australian Quality Awards and Rajiv Gandhi National Quality Award in India.
2.11.1. The Deming Award:

Although, Deming hailed from USA, the award is instituted in his name in Japan to appreciate his contribution for the Japanese quality movement. It was instituted in the year 1951 by the Union of Japan Scientists and Engineers (JUSE) in recognition of outstanding achievement in quality strategy, management and execution. The aim of the Deming Prize was to motivate the companies to embrace Company Wide Quality Control (CWQC). CWQC and TQM are synonymous. The Deming prize evaluates:

- Company policy and planning
- Organization and its management
- Quality control education and dissemination
- Collection, transmission and utilization of information on quality
- Analysis
- Standardization
- Control
- Quality Assurance
- Effects
- Future plans

The Japanese Deming Prize is awarded to companies with outstanding TQM. This prize is given for the overall performance of the company. Five years after a company has received the Deming Prize, it is eligible to compute for the Japan Quality Control Prize. The Deming Prize is accepted to be one of the top most recognition for quality of organizations in Japan and elsewhere. Thus, Deming Prize is the oldest of Quality Awards internationally. The award is also given to industries outside Japan.

2.11.2. Malcolm Baldrige National Quality Award (MBNQA)

The Malcolm Baldrige National Quality Award was established by the US Congress in 1987 to promote better quality management practices and improved quality results by the American industry. In many ways, it is the American equivalent of Japan's "Deming Prize". It is one of the most powerful catalysts of total quality in the US and also throughout the world. The award's "Criteria for Performance Excellence" establish a framework for integrating total quality principles and practices in any organization. The
award is administered by the National Institute of Standards and Technology and only US-based companies are eligible for the award.

Malcolm Baldrige was the Secretary of State for Commerce in USA during the year 1981 to 1987. The award lays emphasis on customer satisfaction. The award criteria were revised in the year 1992. The Malcolm Baldrige award is given to three categories of organizations as given below:

- Manufacturing
- Service
- Small Business

Up to two awards may be given for each one of the categories every year. The small business is defined to be independently owned organization with less than 500 full time employees. MBNQA has been continuously giving awards from the year 1988. MBNQA criteria are widely circulated, although only few of the organizations that think they stand a chance may apply for the award.

It has to be noted that MBNQA gives a system of measurement for implementation of TQM. At the initial reading, awarding of marks may appear to be unwarranted, although it is very essential to compare different organizations claiming to practice TQM. The striking feature of MBNQA is its emphasis on strategic planning and linkage between strategic planning and quality planning. In other words, if quality is good, it should result in better business results. If quality is good, but it does not lead to better business results, then it would not be considered as a TQM organization. Therefore, the aim of TQM is “in essence a way of managing the organization” including the profits. MBNQA criteria can be treated as a TQM assessment guide. The organization could evaluate themselves based upon the MBNQA criteria and determine, where they stand and whether they are making progress.

2.11.3. European Quality Award (EQA)

Fourteen Western European nations have jointly formed the European Foundation for Quality Management (EFQM) in the year 1988. The mission of EFQM is aimed at accelerating the acceptances of quality as a strategy for global competitive advantage.
The European Quality Award was presented for the first time in the year 1992 and is awarded to the most successful TQM organization in Western Europe.

The European Quality Award was designed to increase awareness throughout the European Community and businesses, of the growing importance of quality to their competitiveness in the global market and also to improve their standard of lift. Two parts of the European Quality Award are; The European Quality Prize, given to the companies that demonstrate excellence in quality management practice by meeting the award criteria and the European Quality Award, awarded to the most successful applicant.

Applicants must demonstrate that their TQM approach has contributed significantly to satisfying the expectations of customers, employees and other constituencies. The assessment is based on customer satisfaction, business results, processes, leadership, people satisfaction, resources, people management, policy and strategy and impact on society.

Results including customer satisfaction, people (employee) satisfaction and impact on society, constitute a high percentage of the total score. These are driven by "Enablers", the means by which an organization approaches its business responsibilities. The results criteria, consists of people satisfaction, customer satisfaction, impact on society and business results.

2.11.4. Canadian Awards for Business Excellence

The Canadian Awards for Excellence instituted by Canada's National Quality Institute (NQI) stimulate and support quality-driven innovation within all Canadian enterprises and institutions including business, government, education and healthcare. The major categories and items within each category are;

(i) Leadership: Strategic direction, leadership involvement and outcomes.

(ii) Customer focus: Customer's voice, management of customer's relationships, measurement and subsequent outcomes.

(iii) Planning for improvement: Development and content of improvement plan, assessment and outcomes.
(iv) People focus: Human resources planning, participatory environment, continuous learning environment, employee satisfaction and outcomes.

(v) Process optimization: Process definition, process control, process improvement and outcomes.

(vi) Supplier focus: Partnering and outcomes.

2.11.5. Australian Quality Awards

Those awards are characterized by the Australian Quality Awards Foundation, a subsidiary of the Australian Council. The assessment criteria address leadership, strategy and planning, information and analysis, people, customer focus, processes, products and services, and organizational performance.

It is evident from this model that leadership and customer focus are the drivers of the management system and enablers of performance. The key internal components of the management system are strategy, policy and planning, information and analysis and people. Quality of process, product and service is focused on how work is done to achieve the required results and obtain improvement.

Organizational performance is the outcome of the management system. The framework emphasizes the holistic and interconnected nature of the management process. The criteria are benchmarked with the Baldrige Criteria and the European Business Excellence Model.

2.12. TQM and Organizational Performance

One of the most rigorous studies on the relationship between TQM practice and firm performance is by Powell (1995). The study examines TQM as a potential source of sustainable competitive advantage. The findings suggest that most features generally associated with TQM, such as quality training, process improvement, and benchmarking, do not generally produce advantage, but that certain tacit, behavioral, imperfectly imitable features can produce advantage. The author concludes that these tacit resources, and not TQM tools and techniques, drive TQM success, and those organizations that acquire them can outperform competitors with or without TQM.
Ettlie (1997) examined the quality, technology, and performance relationship. It was found that technology significantly moderated the association of research and development (R&D) intensity and TQM with market share, controlling for industry category. In high-technology firms, R&D intensity was significantly associated with market share; in low technology firms, TQM was significantly associated with market share. R&D intensity and TQM were significantly and inversely related.

The performance elements include quality performance, operational and business performance indicators. Some but not all of the categories of TQM practices were particularly strong predictors of performance. The categories of leadership, management of people and customer focus were the strongest significant predictors of operational performance.

An empirical study (Easton and Jarrell, 1998) compared financial performance of TQM and non-TQM firms. The researchers reported an improved financial performance for the TQM firms. However, many researchers state that to be globally competitive, firms should not only use productivity measures based on financial perspective (e.g. return on assets, and return on sales), but should also view their operations from internal business and customer perspectives (The General Accounting Office Study (GAO), 1990). The GAO Study (1990) categorizes performance measures for a manufacturing firm in three groups:

(1) Financial measures;

(2) Measures from customer perspective; and

(3) Measures from internal business perspective.

The financial measures of performance according to the study are: market share, sales per employee, return on assets, and return on sales. The measures of performance from customer perspective are: overall customer satisfaction, customer complaints, customer retention, order-processing time, defects produced, reliability, and cost of quality. Finally, the measures of internal business perspective are: employee satisfaction, attendance, turnover, safety/health, and employee suggestions received.
Nanni et al. (1990) also consider financial indicators as efficiency measures with limited usefulness in a global economy which “seems to be moving toward time-based competition”. According to these researchers, a performance measurement system should complement a firm’s strategic goals. Hence, the last two categories (measures from customer perspective and measures from internal business perspective) are needed to tie performance measures to corporate strategies and long-term vision. As stated earlier, the basic tenets of a TQM philosophy are: customer focus, continuous improvement, and employee participation. Thus, for a firm implementing TQM philosophy, the last two measures of performance (measures from customer perspective and measures from internal business perspective) become even more critical than financial measures.

2.13. TQM Implementation

A drawback of much of the research is a lack of a theoretical framework of TQM implementation, to assist in comparing the various approaches studied. The approaches developed by Deming, Juran, and Crosby show that there are somewhat different ideas of how total quality management should be implemented into an organization. The processes which each guru used while identifying factors of TQM were different in each case. TQM, as stated earlier, is a major socio-technical system and an organization-wide intervention. As such, TQM must be approached in a systematic, pragmatic, well-thought-through fashion.

TQM has been widely implemented throughout the world. Many firms have arrived at the conclusion that effective TQM implementation can improve their competitive abilities and provide strategic advantages in the marketplace (Anderson et al., 1994a). Several studies have shown that the adoption of TQM practices can allow firms to compete globally (e.g., Easton, 1993; Handfield, 1993; Hendricks and Singhal, 1996, 1997; Womack et al., 1990; American Quality Foundation and Ernst & Young, 1991). Several researchers also reported that TQM implementation has led to improvements in quality, productivity, and competitiveness in only 20-30% of the firms that have implemented it (Benson, 1993; Schonberger, 1992). A study conducted by Rategan (1992) indicated that a 90% improvement rate in employee relations, operating procedures, customer satisfaction, and financial performance is achieved due to TQM
implementation. However, Burrows (1992) reported a 95% failure rate for initiated TQM implementation programs; Eskildson (1994) and Tornow and Wiley (1991) reported that TQM implementation has uncertain or even negative effects on performance. Longenecker and Scazzero (1993) indicated that achieving high product quality and pursuing successful TQM implementation are highly dependent on top management support. However, Motwani et al. (1994) reported that there is no association between top management support for quality and the level of product quality achieved. Many researchers suggested that effective product design can lead to the improvement of product quality (e.g., Gitlow et al., 1989; Juran and Gryna, 1993), whereas Motwani et al. (1994) reported that there is no relationship between systematic product design and the level of product achieved.

Sink, D.A. (1991), has suggested the following approach to the design, development and implementation of TQM:

- **Stage 0**: understanding the organizational system.
- **Stage 1**: developing a strategic plan for the TQM effort.
- **Stage 2**: planning assumptions.
- **Stage 3**: specifying strategic objectives.
- **Stage 4**: specifying tactical objectives.
- **Stage 5**: implementation planning.
- **Stage 6**: project management.
- **Stage 7**: measurement and evaluation.
- **Stage 8**: evaluation, accountability, follow through, ensuring effective implementation.

Luchsinger and Blois (1990), outline the TQM implementation plan of AFSC (Air Force System Command) as:

- Awareness and commitment;
- Incorporation into the acquisition process;
- Assessment of progress;
- Elimination of barriers.
According to Oakland (1989), the task of implementing TQM can be daunting. The first decision is where to begin. This can be so difficult that many organizations never get started; this has been called TQP (Total Quality Paralysis). Oakland proposes 13 steps to TQM:

1) Understanding of quality.
2) Commitment to quality.
3) Policy on quality.
4) Organization for quality.
5) Measurement cost of quality.
6) Planning for quality.
7) Design for quality.
8) System for quality.
9) Control of quality.
10) Teamwork for quality.
11) Capability for quality.
12) Training for quality.
13) Implementation of TQM.

Endosomwan and Savage-Moore (1991), propose a four-stage model to help organizations understand their TQM posture for the Malcolm Baldrige National Quality Award criteria and the TQM improvement process as:

**Stage 1**: current organizational environment assessment.

**Stage 2**: development of quality improvement strategy.

**Stage 3**: assessment of education and training needs.

**Stage 4**: implementation of quality strategy.

However, implementation of TQM is not an easy task as it requires a total change in organizational culture, shifting of responsibility to management, and continuous participation of all in the quality improvement process. Matherly and Lasater (1992), point out the roadblocks in implementation of TQM in hospitals as: lack of participation of managers; overlapping of responsibilities of leadership; limited resources; fear of change; work overloads.
Luchsinger and Blois (1990), propose two cautions while implementing TQM: lack of commitment to change efforts; lack of accountability structure. Burstein and Sedlack (1983), find the major challenges to TQM implementation efforts in federal agencies: lack of comprehensive quality improvement education; uneven top management support; lack of customer orientation; lack of clarity in measurement systems; scant resources for required investment.

One necessity to achieve a successful implementation is that the managers present discuss and motivate why the TQM way of working is better than the present one. The new way of working in the organization has to be implemented by means of systematic procedures based on properly chosen methodologies that are understood and accepted by all parties involved (Ljungstro¨m, 2000). Therefore, studying the process of implementation includes the setting of goals toward which the implementation is directed.

2.13.1. TQM Implementation in Manufacturing

In developed countries such as the UK, USA and Japan, total quality management has been a topical issue for many years in all business sectors, particularly the manufacturing industry. However, in a developing country like India, even though it has successfully developed substantial manufacturing industry in the last two decades, TQM has made little impact.

In manufacturing systems quality management focuses primarily on technical issues such as equipment reliability, measurement of defects and statistical quality control techniques (process control). But today quality management has penetrated into other areas such as product design, research and development, human resources practices (employee empowerment) team work and organizational culture and the like. Quality management pervades through the entire organization (company wide quality control).

Prasad et al. (1996) carried out an illuminating comparative benchmarking study of US companies and their Mexican subsidiary plants. These authors make it clear that some US companies have consciously employed a dual strategy of moving manufacturing facilities to developing countries where labour costs are lower, and then applying advanced quality management practices to these plants, in order to avoid the
quality problems suffered by the indigenous manufacturing industry. According to the benchmarking results described in this article, which was based on the Malcolm Baldrige Award criteria, this strategy has been successful in achieving competitive quality performance.

Idris et al. (1996) conducted a survey of Malaysian manufacturing companies already registered to ISO 9000, with a view to examining their status as regards TQM implementation. Less than a third of the responding companies claimed to have TQM, but there was a strong minority claiming to have made substantial progress towards total quality practices. These authors also describe the Malaysian SIRIM model of total quality training for a company, which is multi-step process involving the adoption of such practices as a quality improvement process, Quality Control Circles (QCC) and TPM.

Singapore is a country which has taken a disciplined strategic approach to achieving manufacturing success, which extends to the quality area. Singapore companies have adopted ISO 9000 series standards. Quazi and Padibjo (1998) describe the progress from ISO 9000 standards to TQM implementation among SMEs in Singapore, assisted by a government initiative.

Samson and Terzirovski (1999) used a large database of 1,024 usable responses from Australian and New Zealand manufacturing organizations to examine the relationships between TQM practices, individually and collectively, and firm performance. The study showed that the relationship between TQM practice and organizational performance is significantly in a cross-sectional sense.

Based on 698 usable responses from Australian and New Zealand manufacturing organizations, Dow et al. (1999) employed confirmatory factor analysis (CFA) to identify nine quality practices. Nine quality practices include workforce commitment, shared vision, customer focus, use of teams, personnel training, co-operative supplier relations, use of benchmarking, advanced manufacturing systems, and use of just-in-time principles.

Kifayah Amar and Zuraidah Mohd Zain, (2002) conducted another study on barriers to implementing TQM in Indonesian manufacturing organizations. Out of a total sample size of 364 selected organizations identified for a multi-response survey, 78
organizations responded. The analysis identified 11 pertinent factors acting as barriers that are most frequently faced by the local organizations. These are issues related to human resource, management, attitude towards quality, organizational culture, interdepartmental relations, raw materials, machines and equipment, information, method and training.

Ozdan Bayazit, (2003) carried out a study on TQM practices in Turkish manufacturing industry based on a survey among 100 large companies. The key finding from the research is that a growing number of companies in Turkey are willing to implement TQM to generate competitive advantages. It was also found that important factors for a successful implementation process are upper management support, employee involvement and commitment, customer focus, quality education and training, team work and use of statistical techniques.

Salaheldin Ismail Salaheldin, (2003) conducted a study on implementation of TQM strategy in Egyptian manufacturing firms. The study aims to explore the critical resisting and driving forces that inhibit or promote the implementation of total quality management (TQM) strategy in Egypt, in an attempt to determine whether TQM can be implemented effectively in this developing country. A force-field analysis was used for identifying the salient factors affecting TQM implementation in Egypt. The findings indicated that forces that promote or prohibit TQM implementation obtained in one developing country might be generalizable to another less developed country. The investigation identified some driving forces that promote the implementation of TQM strategy by the Egyptian manufacturing firms.

G. Karuppusami and R. Gandhinathan, (2006) identified critical success factors of total quality management by using Pareto analysis. The authors discussed even though there has been a large number of articles published related to TQM in the last few decades, only a very few articles focused on documenting the critical success factors (CSFs) of TQM using statistical methods. An examination of 37 such TQM empirical studies resulted in compilation of 56 CSFs. Implementation difficulties exist to operationalize such a large number of CSFs in organizations. The study analyzed and
sorted the CSFs in descending order according to the frequency of occurrences using the quality tool “Pareto analysis”. A few vital CSFs were identified and reported.

2.13.2. TQM Implementation in Automotive Industry

In manufacturing industries, automotive companies are more interested in implementing TQM. There are two main reasons: first, automotive vehicle production is the largest manufacturing activity in the world with over 50 million cars produced annually (Maxton and Wormald, 1995), secondly, increasing global competition over the past decade has forced automotive companies to improve quality and efficiency. Therefore, they are more willing to implement TQM in order to improve quality, and in turn to continue in the running, i.e. staying competitive. Strong competitive pressure has forced many automotive industries to embrace TQM actively in order to survive and succeed in business. Therefore, TQM is found to be well established in the automotive industries compared to other sectors of the economy.

Two studies of total quality management (TQM) practices have focused on automotive suppliers. Ahire et al. (1996) conducted a survey of automobile components manufacturers in the US. Firms in the study were classified based on the implementation of 11 TQM practices and having a formal TQM program. The study explored the relationship between TQM implementation and self-reported perceived product quality performance compared to competition. The findings showed that compared to non-TQM firms, TQM firms reported higher product quality. In addition, high-performance TQM firms reported a higher intensity of execution on nine quality practices compared to low-performance TQM firms.

In a follow-on study, data from the US sample were combined with self-reported data from a survey of Canadian automobile components manufacturers (Ahire and O’Shaughnessy, 1998). The results showed that greater customer focus, supplier quality management, and employee empowerment were related to higher perceived product quality. Although, top management support was not directly related to perceived product quality, the findings suggest that top management commitment affects the implementation of other management practices.
Seungwook Park, et al., (2001) carried out a study on quality management practices and their relationship to buyer’s supplier ratings in the Korean automotive industry. The research explores if quality management practices are different among suppliers whose performance is rated high, medium, or low by a common buying company and identifies which specific practices contribute to the differences. The entire population of first-tier suppliers to a Korean auto assembler was surveyed to measure use of quality management practices. No statistically significant differences were found when suppliers were categorized based on conformance quality. However, when categorized based on overall rating, the highest rated suppliers were found to emphasize process management and employee satisfaction to a greater degree than the lowest rated suppliers.

Shari mohd.Y and Elaine Aspinwall, (2001) have conducted a case study on the implementation of TQM in the UK automotive SMEs. They described the methodology and findings of four industrial case studies conducted on the implementation of TQM in automotive small and medium-sized enterprises (SMEs). They indicated that the SMEs used in the study had approached TQM without the help of any specific framework, but they had implemented the numerous quality initiatives or programs on a “slice by slice” approach. It was found that three common aspects were emphasized in each case when adopting TQM.

Jayanta K. B., (2003) carried out a study on TQM in an automotive supply chain in the U.S. The author described how a TQM approach can be implemented for achieving supply chain quality management in manufacturing industry and used the automotive industry in the U.S. as an example.

A. Kakuro, (2004) conducted a study on the effectiveness of ‘Science TQM’, a new principle of quality management at Toyota. The author proposed stratified task team activities as one form of the new quality management principle Science TQM and discussed the significance and effectiveness of strategic team activities based on cooperation and creation. The study attempts to promote strategic team activities with Toyota as a model by practicing Science TQM for the evolution of quality management technologies.
Baba Md Deros, et al., (2006) conducted a study on benchmarking implementation framework for automotive manufacturing SMEs. The researchers described the need for a framework and its relationship with benchmarking and TQM then proposed benchmarking implementation frameworks. The frameworks were categorized into two broad types based on the different writer's background and the approach on how they view the benchmarking implementation process. The researchers suggested a conceptual framework for benchmarking implementation dedicated to the automotive manufacturing SMEs. This framework guides them through from the start to end of the benchmarking process. The framework was validated at six pilot case study companies, which gave useful comments and suggestions regarding the usefulness and applicability within the SMEs context.

2.14. TQM Implementation in Indian Organizations

Many TQM activities in Asia were started in private companies as total quality control (TQC). These were mainly Japanese companies with investments in manufacturing plants throughout Asia. Feigenbaum, who suggested that high-quality products are more likely to be produced by total quality control rather than by manufacturing working alone, expounded the principles of TQC. These principles, gradually gave way to Total Quality Management (TQM) when firms realized that responsibilities for quality are company-wide, and resided with the management.

As mentioned earlier, in India the TQM initiatives were first set by the Confederation of Indian Industries (CII) in the early 1980. Later in 1987 TQM took off after the formation of a consultancy, Quimpro, which actively promoted quality management in the industries.

R. Jagadeesh, (1999) has done a study of TQM in India. He has tried to identify the causes for poor quality of products and service, and the gaps that exist between the expectations and the outcome after adopting the TQM practices. He has concluded that there is still a long way to go for Indian companies to receive the stamp of acceptance for their products at international level.

Chan and Quazi, (2000) have conducted a comparative study of quality management practices at a national level in nine Asian countries including India, from
1960 onwards. Quality Control Circles (QCCs), which worked well in Japan, were first adopted as the quality improvement practice. Between 1970s and 1980s, these countries had very active QCC activities. As more complete quality management systems were developed, TQM (late 1980s) and ISO 9000 (1992) widely accepted in these countries. The development and adoption of a comprehensive quality management system were slower in certain countries. Singapore and South Korea were ahead in the implementation of quality management practices with the adoption of global and world-class standards. Malaysia was quite close behind. Philippines had a few years of experience with its national quality award and were moving towards world-class very soon. Thailand had yet to form such an award but like the other countries, had already ISO 14000 in place. Indonesia and India have yet to move on to world-class quality standards while Bangladesh and Brunei were the furthest behind in the implementation of quality management practices. For the quality management system to permeate the industries, the mobilization of national quality or productivity bodies is required to promote and advance quality management practices. South Korea, Singapore, Malaysia and Philippines had done that very well.

India also had National Productivity Council as early as 1958 and the country has one of the oldest standards institute in Asia. Although product quality was important, QCC was not a major quality initiative in India.

V.K. Khanna, et. al., (2002) conducted a study on causal relationships for a TQM index for the Indian automobile sector. Based on the Malcolm Baldrige National Quality Award model, the authors developed causal relationships among the different variables that represent enablers and results operating within 44 identified feedback loops. Of these loops, 33 are positive and 11 are negative. The resulting causal loop diagram provides an insight into understanding the dynamic interactions among TQM subsystems which helps identify proactive action in implementing the TQM philosophy.

Misra, (2003) had another study on the effectiveness of TQM initiatives in Indian organizations with attention to Agfa-Gevaert company’s success in total quality. The multinational company, Agfa-Gevaert, with it’s branch in India, has a firm belief that “total quality management” (TQM) aimed at continuous efforts to control and improve
their services, company processes. Agfa-Gevaert recognizes total quality as a major component of its worldwide strategy. Dedication to the customer, wide-ranging know-how, innovation and quality are the hallmarks of Agfa. Quality at Agfa is total, covering not only the products but also the service and administration that support them.

Similar success stories of TQM implementation are many - Xerox, Motorola, Milliken, Nucor Steel, to name a few. But, there are only a few Indian companies successfully implementing TQM. Why are Indian companies not able to replicate the success of these Western Corporates?

In order to find reasons for this poor show in quality, the TQM Cell of SRF Ltd conducted a study on the effectiveness of TQM initiatives in Indian organizations. At least 26 companies were researched and some interesting findings emerged. All the organizations started their TQM initiatives in their factories. It seems to be the most logical place to start from. But most organizations do not get much benefit out of this approach. One FMCG Company started TQM effort in its manufacturing unit. Two years later they found that there was no significant impact on their market share due to the initiative. Why? Because manufacturing is not the only key to competitive advantage for an FMCG. A concerted effort in marketing is also a key differentiating function. Organizations need to understand the key business processes in their industry and then adopt the tools of TQM that suits them best.

Iyer and Seshadri, (2004) illustrate quality improvement by focusing on one company in India, Rane Brake Linings (RBL). RBL is a division of the Rane group, an automotive components company with a sales turnover of $131 million and 4600 employees. In 2002, RBL won the prestigious Deming prize. The Deming prize, awarded by the Japan Union of Scientists and Engineers (JUSE), was the culmination of a three-year journey for RBL, which began with a visit by professor “Tsuda” from Japan. RBL’s TQM journey began with the choice of professor “Tsuda” as their coach in 1999.

RBL decided to focus on Policy Deployment and Daily Routine Management (DRM) to achieve their TQM implementation. As a result, RBL redefined its management of processes for New Product Development System, Manufacturing Quality, Supplier Quality and Customer Quality.
TQM implementation created tangible and intangible benefits for RBL. Intangible benefits included role clarity so that each person understood their role in the organization, their suppliers and customers, and their metrics. Plant in process rejections at RBL decreased from 2.1 per cent of total pieces to 0.85 per cent of total pieces produced. Sales per employee went up from $22000 to $40000. Number of employee suggestions went from 280 to 7500 during the period. In other words, TQM brought about dramatic and measurable improvement across many specific metrics that would impact the company.

Dinesh Seth and Deepak Tripathi, (2005) conducted a study on relationship between TQM and TPM implementation factors and business performance of manufacturing industry in Indian context. The objective of the study was to examine the relationship between factors influencing the implementation of TQM and TPM and business performance for the following three approaches in an Indian context: TQM alone; TPM alone; both TQM and TPM together. The research identifies two sets of factors which are critical for the effectiveness of TQM and TPM: universally significant factors for all the three approaches like leadership, process management and strategic planning; and approach-specific factors like equipment management and focus on customer satisfaction. The study also highlights the complexities involved in implementing TQM and TPM together.

2.15. Barriers to TQM Implementation

Successful introduction and sustenance of TQM can be elusive. A survey conducted by the Forum Corporation of 685 executives who initiated TQM indicated that, in spite of considering customer satisfaction as the top priority by most organizations, many have not gone past the TQM awareness stage and thus have failed to achieve the desired purpose (Cherkasky, S.M. 1992). Some studies show that TQM implementations fail in about 70 per cent of US firms (Newhard, S. 1992). Several factors account for the dissipation of the TQM effort in industrialized countries. These include a lack of sufficient involvement and commitment of senior executives in the TQM effort; limiting TQM implementation only to selected activities and not using it throughout the organization; expecting quick results; failure to accept the culture change required for successful TQM implementation; not committing sufficient resources; failure
to tailor the process to the specific situation; and failure to empower individuals and teams (Chang, R. 1993 & Doyle, K. 1992).

Successful TQM implementation requires a through understanding of critical success factors for TQM implementation, barriers to achieving these factors, and managerial tools and techniques to overcome these barriers. Research in developed countries listed top management commitment to TQM, training for TQM throughout the organization, customer focus and continuous improvement, and a focus on employee involvement and empowerment (Clinton et al., 1994; Vermeulen & Crous, 2000) as the key determinants of successful TQM implementation.

TQM implementation failure has been attributed to two main barriers. The first barrier is organizational context, such as rigid organizational culture inflexible and highly bureaucratic organizational structure and authoritarian management style. That is, the failure of TQM implementation is not due to external factors but due to failure of management to establish the proper system for its implementation (Shin et al., 1998; Wilkinson et al., 1995). This perspective argues that often managers are not fully aware, or perhaps ignore, what it takes to implement TQM successfully and achieve high performance.

The second is the cultural barrier, because TQM implementation involves a paradigm shift in management values and attitudes and it should fit the national culture of the firm if it is to be implemented successfully (Sohal et al., 1998; Tata et al., 1999). Research on the culture barrier argues that management values differ significantly across national cultures, that management is culture-specific and that managerial practices, such as TQM, must be tailored to fit local culture (Bartlett & Goshal, 1992; Trompenaars, 1994).

While many firms in developing countries have sought to adopt TQM, their implementation has not been successful (Djerdjour & Patel, 2000). The central focus in recent publications on TQM on the examples of and reasons why TQM programs fail or do not work has led to the implicit conclusion, that TQM programs do not work (Biberman, 1995). Most researchers have cited the reason for TQM’s failure to be implementation. However, most of the writing has concentrated on problems at the
organizational level. For example, a major problem in implementing TQM is getting everyone in the organization to move in the same direction (Biberman, 1995). Other often cited problems include: the lack of goals, insufficient knowledge, poor planning, lack of management commitment, lack of proper training, failure to use the right framework, lack of resources, lack of effective measurement, the incompatibility of attitudes of top management and workers.

Other research has focused on individuals within an organization. For example, Reger et al. (1994) suggest that each person’s response to an idea involves the cognitive process of interpretation, attribution and inference. This means, that managers who propose the idea for quality improvement are convinced that it works and assume that employees will think so too (Reger et al., 1994). In reality, however, this is not the case, as workers are more likely to draw their own inferences. For example, employees working in different parts of the same organization have different work related beliefs. They exhibit different perceptions, make different attributions and use different cognitive orientations.

Candido and Morris (2000) describe TQM failure, as the expression of differing desires, wants, needs and feelings at individual levels within the organization. However, the underlying causes of failure in the implementation of TQM may go beyond individual beliefs, expectations, cognitive processes of interpretation, perceptions, feelings, and desires to more deeply rooted unconscious archetypical projections on the part of each individual in the organization.