3.1 INTRODUCTION

TQM became one of the familiar management systems based upon the goal of continuous organisational improvement by following a path that was determined by the leader of the organisation\(^1\). One of the key requirements in the TQM model was the identification of a process for performance measuring and benchmarking, and an evaluation of how effectively the organisation was supporting the customer with their business practices. For HE, to effectively use TQM, the College or University must first identify the Students as the customers as they were the ones who have entered into a contract for a service with the College. Through the application of TQM, HLIs could evaluate how well they were supplying their service and look for ways to improve performance\(^2\). This chapter focuses on the concept and techniques of TQM in HE, applicability of SERVQUAL and Six Sigma DMAIC Methodology in HE.

3.2 BASIC APPROACHES OF TOTAL QUALITY MANAGEMENT

TQM requires six basic concepts:
- A committed and involved management to provide long-term top-to-bottom organisational support.
- An unwavering focus on the customer, both internally and externally.
- Effective involvement of the business and production process.
- Continuous improvement of the business and production process.
- Treating suppliers as partners.
- Establish performance measures for the processes\(^3\).
3.3 TOTAL QUALITY MANAGEMENT FRAMEWORK

*TQM* begins with the knowledge provided by gurus of quality: Shewhart, Deming, Juran, Feigenbaum, Ishikawa, Crosby and Taguchi\(^4\). **FIGURE 3.1** shows the framework for the *TQM* systems.

**FIGURE 3.1**

Total Quality Management Framework

3.4 AWARENESS OF TOTAL QUALITY MANAGEMENT

An organisation will not begin the transformation to TQM until it is aware that the quality of the product or service must be improved. Awareness comes about when an organisation loses market share or realises that quality and productivity go hand-in-hand. It also occurs if TQM is mandated by the customer or if management realises that TQM is a better way to run a business and compete in domestic and world market.

Automation and other productivity enhancements might not help a corporation if it is unable to market its product or service because the quality is poor. The Japanese learned this fact from practical experience. Prior to World War II, they could sell their products only at ridiculously low prices, and even then it was difficult to secure repeat sales. Until recently, corporations have not recognised the importance of quality. However, a new attitude has emerged the quality first among the equals of cost and service.

Quality and productivity are not mutually exclusive. Improvements in quality can lead directly to increased productivity and other benefits. Quality improvement is not limited to the conformance of the product or service to specifications; it also involves the inherent quality in the design of the system. The prevention of the product, service, and process problems is a more desirable objective than taking corrective action after the product is manufactured or a service rendered5.

3.5 QUALITY

The word Quality is derived from a Latin word ‘Qualis’, which means “what kind of”. It reflects a variety of meanings and entails different things to different
people. It is a stamp of approval, a desire, or a goal to achieve. Everybody wants to acquire something well done, as perfect as possible and that is where the quality is meaningful and relevant to industry and organisations in general.

Quality is an elusive attribute, an attribute of values, which cannot always be measured and quantified. Quality of life, for example, has a somewhat abstract connotation covering varied aspects like health, education, living conditions, the physical environment and the mental state. The quality of a product, on the other hand, can be described in terms of prescribed standards that are easily measurable.

According to Juran, “Quality is fitness for use or purpose”. Deming defines quality as “a predictable degree of uniformity and dependability at low cost and suited to market”. In general, quality is one which satisfies customers’ needs and continuously keeps on performing its functions as desired by customers as per specified standards.

The task of defining quality is a very complex assignment, and is even more difficult when one enters the field of education. In education, a “product” is not referred to in the same way as it is in industry. In the field of education, it is about working with human beings, and customers are no longer individuals but society at large. Quality is a goal set repeatedly in the education policies of all countries, however, each country and each society has a different concept of education, and therefore the understanding of quality may differ between countries.

3.6 DEFINITION OF QUALITY

Quality can be defined in many ways. It is in the eye of the customers. It can be seen, felt and measured. The quality gurus, experts and researchers have given
various definitions on quality. Garvin (1984)\textsuperscript{11} has classified the definition of quality into five major groups. Those were transcendent, product-based, user-based, manufacturing-based, or value-based. Others defined quality as fitness for use (Juran and Gryna, 1988)\textsuperscript{12}, conformance to requirement (Crosby, 1979)\textsuperscript{13}, conformance to specification (Gilmore, 1974)\textsuperscript{14}, meeting and/or exceeding customers’ expectation (Parasuraman, et al. 1985)\textsuperscript{15}, performance over expectation (Besterfield, 1999)\textsuperscript{16}, zero defect (Crosby, 1979)\textsuperscript{17}, products’ or services’ ability to perform to its intended function without harmful effect (Taguchi, 1986)\textsuperscript{18}. Although there is no universally accepted definition of quality and seems to be no consensus definition even though most of these definitions are correlated, but there exists similarities and common elements.

In the area of education, Cheng (1995)\textsuperscript{19} defined Education Quality as “The character of the set of elements in the input, process, and output of the education system that provides services that completely satisfy both internal and external strategic constituencies by meeting their explicit and implicit expectations”. Harvey and Green (1993)\textsuperscript{20} proposed five ways of thinking about quality in education. Firstly, quality is regarded in terms of excellence. Secondly, quality is perfection or consistency. Thirdly, quality is fitness for purpose. Fourthly, quality is value for money and finally, quality is transformation processes that have value-added activities.

3.7 QUALITY GURUS

A guru, by definition, is a good person, a wise person and a teacher. A quality guru should be all of these, plus have a concept and approach to quality within business that has made a major and lasting impact. The gurus mentioned in this
section have done, and continue to do and in some cases, even after their death. The implementation of *TQM* has been strongly influenced by the writings of Deming (1986)$^{21}$, Juran (1993)$^{22}$, Feigenbaum (1993)$^{23}$, Ishikawa (1993)$^{24}$ and Crosby (1989)$^{25}$, which helped us to understand the essence of *TQM*.

### 3.7.1 W. Edwards Deming (1900-1993)

William Edwards Deming was born in Sioux City, Iowa, USA. His mathematics teacher at high school encouraged him to go to University, despite his parents’ meagre resources. Eventually he received a Ph.D. degree at the Yale University, in the field of Theoretical Physics.

Among many jobs that were offered to him after University, Deming chose to carry out laboratory research in the Department of Agriculture. He worked there for ten years, on the development of nitrate fertilizers. At that time, the yields in agriculture had made big progress thanks to a new science, modern Statistics. In addition, Deming used to give lectures on Statistics at the Training Institute founded by the Department of Agriculture.

In 1939, Deming joined the Bureau of the Census in Washington. His knowledge of Statistics was helpful in the development of a new kind of survey, based on sampling. The statistical techniques of the Census developed by Deming were adopted worldwide. In 1946, he retired from the administration and worked as a consultant in Statistical Studies and later he became a Professor of Statistics at New York University.

During the Second World War, Deming stayed in Washington and used his knowledge for the service of the Arms Industry. Jointly with his friend Walter A. Shewhart, a statistician, a member of the technical staff of the Bell Telephone
Laudoratories, has organised management seminars at the Stanford University with the aim of improving productivity and the quality of military equipments. This project was the outcome of studies they had been making together since 1938. Their conclusions were radically opposed to the Taylor's management principles. Several thousands of engineers and managers from arm factories made a trip to Stanford and attended the seminars. As the senior executives did not fully involve, the project had only a limited impact.

The Japanese industry adopted the Deming management theories immediately and ten years later Japanese products started to flood into America. The American consumers were attracted by products’ quality. It's a turning point in world history.

Until 1980, Deming's theories had been prohibited in American companies because their leaders had remained unquestioning followers of Taylor's management principles. The American CEOs could not ignore him anymore. At the request of many senior managers, Deming started to give four day seminars open to the public where he explained his ideas in front of several hundred people. From 1981 to 1993, he gave 250 seminars. He also gave many lectures in American companies which had adopted his management philosophy. Under his influence, the management style has profoundly changed for a few years in the United States, even if much progress has still to be done.

The Deming's teaching deals with management, not only with quality. Contrary to a generally accepted idea, his goal was not to improve the present style of management by adding a new component, but to transform management practices from top to bottom. According to Deming, management means having the processes
under control, coordinating the operations and preparing the future in a company. He said that management does not concern only production and service companies but also public administration and education.

Finally, it is important to see that the Deming's style of management is extremely favourable to social cohesion. Incidentally, the Deming's style of management contributes to improving human relations in society by softening the climate of violence and fear that is raging in companies\textsuperscript{26}.

3.7.2 Joseph M. Juran (1904-2008)

Joseph M. Juran is characterised by a remarkable span and an extraordinary intensity. He has been called the "father" of quality, a quality "guru" and the man who "taught quality to the Japanese". He is recognised as the person who added the human dimension to quality, broadening it from its statistical origins to what we now call TQM. At 16, he entered the University of Minnesota and graduated in 1920 with a degree in Electrical Engineering. His industrial career began at Western Electric where they placed him in the inspection department. By 1937, he was the head of the Industrial Engineering Department.

He wrote the standard reference work on Quality Control, first published in 1951. In 1954, he delivered a series of lectures to Japanese managers which helped set them on the path to quality. The classic book, Managerial Breakthrough, first published in 1964, presented a more general theory of QM, comprising Quality Control and Quality Improvement. It was the first book to describe a step-by-step sequence for breakthrough improvement, a process that has become the basis for quality initiatives worldwide. In 1979, Juran founded the Juran Institute to create new
tools and techniques for promulgating his ideas. The first new tool was Juran on Quality Improvement, a pioneering series of video training programs. Also in that year, he helped with the creation of the Malcolm Baldrige National Quality Award, testifying before Congress and serving on the Board of Overseas.

Nearly thirty years after his first visit to Japan, Emperor Hirohito awarded him Japan's highest award that can be given to a non-Japanese, the Order of the Sacred Treasure. It was bestowed in recognition of his contribution to "the development of Quality Control in Japan and the facilitation of U.S. and Japanese friendship".

The Quality Trilogy, published in 1986, identified a third aspect to quality management, quality planning. In addition to these accomplishments, there is Juran's seminal role as a teacher and lecturer, both at New York University and with the American Management Association. He also worked as a consultant to businesses and organisations in forty countries, and has made many other contributions to the literature in more than twenty books and hundreds of published papers²⁷.

3.7.3 Armand V. Feigenbaum (1922-Actual)

It’s difficult to hear the word ‘Quality’ without thinking of Armand V. Feigenbaum, the man who coined the term Total Quality Control (TQC) known today as TQM and for more than 60 years has shaped its development. TQC, a foundation of modern management, has been widely accepted as a viable operating philosophy in all economic sectors. Its commercial success is indisputable when faced with its large number of proponents throughout the global business community.
Using financial performance as an indicator of poor quality, Feigenbaum was one of the first engineers to speak management’s language. He was also one of the world’s first true quality professionals. In 1937, he began his career with General Electric (GE) as an apprentice tool maker and management in the turbine, engine and transformer group.

In 1958, Feigenbaum was occupying the position of corporate executive at GE headquarters in New York. From that position, he developed and administered the company’s combined worldwide manufacturing operations and Quality efforts. He worked at GE until his retirement in 1968.

During his 31-year career at GE, Feigenbaum found time to serve as a president of American Society for Quality (ASQ). He is also an honourary member and helped found the International Academy for Quality. Even now, in his late 80s, Feigenbaum continues to promote quality concepts, working with his brother, Donald, at their company General Systems Company, in their home town of Pittsfield, MA. With A.V. Feigenbaum serving as CEO, the company serves global clients, designing engineering systems and implementing proprietary TQM systems\(^2\).

3.7.4 Kaoru Ishikawa (1915-1989)

Kaoru Ishikawa is probably best known for the quality tool named for him: the Ishikawa diagram, also known as the “Fishbone or Cause and Effect Diagram”. As one of the seven basic quality tools, the diagram identifies many possible causes for an effect or problem and can be used to structure a brainstorming session.

But Ishikawa accomplished much more than just developing the fishbone diagram concept. He graduated from the University of Tokyo with an engineering
degree in applied chemistry and later went back to teach as an associate professor. Ishikawa wrote 647 articles and 31 books, including two that were translated into English: Introduction to Quality Control and What Is TQC? The Japanese Way.

Ishikawa joined the Quality Circles Research Group at the Union of Japanese Scientists and Engineers (JUSE) in 1949, and developed and delivered the group’s first basic Quality Control course. At JUSE, he embarked on his quest for Quality Control. Ishikawa was the premier quality pioneer in Japan and was largely responsible for translating the W. Edwards Deming’s and Joseph M. Juran’s early lessons into an approach to quality improvement geared specifically toward the Japanese. He was involved in efforts to promote quality ideas throughout Japanese industry and amongst consumers. For more than 30 years, Ishikawa served as chairman of the quality control committee for the National Conference in Japan and played a central role in expanding the scope of the conference.

While the idea of focusing on the customer is still the fundamental element of quality and has become the norm, it was Ishikawa who drove home the point that customers are the only reason for a business to exist. The fishbone diagram and quality circles were some of the most important tools Ishikawa developed, but his key role in helping create a quality strategy specific to Japan may be his most important quality contribution. The Japanese approach focuses on broad involvement in quality not only top to bottom within an organisation, but also start to finish in the product life cycle\(^{29}\).
3.7.5 Philip B. Crosby (1926-2001)

Philip B. Crosby’s initial foray into the quality field was in 1952, close on the heels of his military service in Korea. In the nearly five decades that followed, he became widely renowned in business circles as a guru of QM. He stressed the importance of “doing it right the first time”, laid out the road map to quality improvement in his 14 step approach and established the four absolutes of quality. But amongst a lengthy list of accomplishments, Crosby is perhaps best known for promoting a standard of excellence based on nothing-the concept of zero defects.

Eventually, the concept spread to other organisations. “Everywhere it was presented, the defect rates dropped, morale improved, and there was a feeling of accomplishment”, Crosby wrote. “Ideas for preventing problems emerged by the batch”.

The idea had its share of detractors who claimed the standard was unattainable and that the costs incurred in striving for it were too extreme. Eventually, Crosby took that pursuit of perfection to International Telephone and Telegraph (ITT), where he spent 14 years as Vice-President in charge of corporate quality before founding Philip Crosby Associates (PCA) and embarking on the consulting stage of his career. In 1979, his final year at ITT Crosby penned his seminal work, quality Is Free, which laid out his 14 steps to improvement. That same year, he was elected the 30th President of ASQ.

Crosby maintained a place of prominence in the quality world until his death in 2001, but through PCA, his teachings have reached leaders at some of the top companies in the world, including General Motors, Motorola, Xerox and Hewlett-Packard\textsuperscript{30}.
3.7.6 Walter A. Shewhart (1891-1967)

Known as the father of Statistical Quality Control (SQC), Walter A. Shewhart successfully combined the disciplines of statistics, engineering and economics, and put statistical theory to work to address industry needs. Some have argued that Shewhart’s work led a quality revolution in the first part of the 20th century and launched the quality profession.

Shewhart received bachelors’ and master’s degrees from the University of Illinois, and he received a Doctorate in Physics from the University of California at Berkeley in 1917. He taught at the Universities of Illinois and California, and he briefly headed the Physics Department at the Wisconsin Normal School in La Crosse, now known as the University of Wisconsin-La Crosse. From 1918 to 1924, Shewhart worked as an engineer at Western Electric and Bell Telephone Laboratories. Later, he served in the War Department, the United Nations and the Government of India. He was also active with the National Research Council and the International Statistical Institute. Shewhart is best known for developing the control chart, a simple but highly effective tool that represented an initial step toward what Shewhart called “the formulation of a scientific basis for securing economic control”.

“Shewhart simulated theoretical models by marking numbers on three different sets of metal-rimmed tags”, Ellis R. Ott wrote in a tribute to Shewhart in 1967. His 1931 landmark work, Economic Control of Quality of Manufactured Product, is considered the most complete and thorough explanation of the basic principles of Quality Control. In 1939, he wrote Statistical Method from the viewpoint of Quality Control, in which he first discussed a problem-solving concept that eventually became the basis for the Plan-Do-Check-Act cycle, a four-step process for quality improvement.
3.8. DIMENSIONS OF QUALITY

According to Gronroos (1990)\textsuperscript{32}, there are three groups of Quality Dimensions, which are Technical Quality, Functional Quality and Corporate image. This classification also supported by Lehtinen and Lehtinen (1991)\textsuperscript{33} that proposed the similar Quality Dimensions which are Physical Quality, Interactive Quality and Corporate Quality.

Ghobadian et al. (1994)\textsuperscript{34} indicated the categorisation of Quality Dimensions is different from those that proposed by recent researchers. They proposed “outcome” and “process” as the Dimensions of the Quality. They have differentiated between those dimensions, which are associated with the quality of the outcome of the service, and those that relate to internal processes within the organisation. The importance of the process dimensions from the customer’s viewpoint depends on the extent to which they participate in the process. The Dimensions of Quality in HE can be focused on three categories, which are product, software and service. The dimensions of quality can be established by a flow chart suggested by David A. Garwin (1988)\textsuperscript{35}.

Quality has nine dimensions. These dimensions are somewhat independent; therefore, a product can be excellent in one dimension and average or poor in another. Very few, if any, products excel in all nine dimensions. For example, the Japanese were cited for high quality cars in the 1970s based only on the dimensions of reliability, conformance, and aesthetics. Therefore, quality products can be determined by using a few of the dimensions of quality. Marketing has the responsibility of identifying the relative importance of each dimension of quality. These dimensions are then translated into the requirements for the development of a new product or the improvement of an existing one.
TABLE 3.1 shows these NINE dimensions of quality with their meaning and explanations.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Meaning and Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance</td>
<td>Primary product characteristics, such as the brightness of the picture</td>
</tr>
<tr>
<td>Features</td>
<td>Secondary characteristics, added features, such as remote control</td>
</tr>
<tr>
<td>Conformance</td>
<td>Meeting specifications or industry standards, workmanship</td>
</tr>
<tr>
<td>Reliability</td>
<td>Consistency of performance over time, average time for the unit to fail</td>
</tr>
<tr>
<td>Durability</td>
<td>Useful life, includes repair</td>
</tr>
<tr>
<td>Service</td>
<td>Resolution of problems and complaints, ease of repair</td>
</tr>
<tr>
<td>Response</td>
<td>Human-to-human interface, such as the courtesy of the dealer</td>
</tr>
<tr>
<td>Aesthetics</td>
<td>Sensory characteristics, such as exterior finish</td>
</tr>
<tr>
<td>Reputation</td>
<td>Past performance and other intangibles, such as being ranked first</td>
</tr>
</tbody>
</table>


3.9 QUALITY IN HIGHER EDUCATION

According to Lindsay, A (1994)36 “Quality in HE is a nebulous notion. Its attributes are complex and intangible. It remains highly resistant to assessment by means other than judgements that represent personal values, as much as professional standards”. “Quality in the context of HE can be defined as judgement about the level of goal achievement, and the value and worth of that achievement”37.

In the present knowledge era, when HE is fast becoming a business, most Students, and the Parents, would most likely identify quality with ‘value for money’.
With public funds becoming scarce, and fees spiralling, for these stakeholders, Quality Education is one that ensures employment, a quick return on the money ‘invested’ and continued income thereafter. Governments, at least when justification of public expenditure is required, fall back upon performance indicators like number of graduates, completion rates and first destination in employment\textsuperscript{38}.

Rona-Tas (2001)\textsuperscript{39} argues that the modern society focuses on creating, sustaining and improving the quality of life. Therefore good \textit{HE} is that which optimally contributes to the betterment of the quality of life. Good quality education should produce individuals who:

- Are able to work with maximum effectiveness and thereby contribute to the economy.
- Make effective use of, and also generate, knowledge for the ‘knowledge society’.
- Develop individuals having the capacity to enhance social and cultural values.

\textbf{3.10 TOTAL QUALITY MANAGEMENT}

\textit{TQM} is about creating a quality culture where the aim of every member of staff is to delight their customers, and where the structure of their organisation allows them to do so. It is about providing the customer with what they want, when they want it and how they want it. It involves moving with changing customer expectations\textsuperscript{40}.

\textbf{FIGURE 3.2} depicts the process of \textit{TQM} in Organisation
TQM is both a philosophy and a set of guiding principles that are the foundation of a continuously improving organisation. The four essential elements of TQM are continuous process improvement, people orientation, quantitative methods, and customer focus. Total in this context means the involvement of everyone and everything in the organisation in a continuous improvement effort. Quality is total customer satisfaction. The customer is everyone who is affected by the product and is defined in two ways: the customer as the
ultimate user of the product known as the external customer, and the customer as the next process in the organisation, known as the internal customer; TQM focuses on satisfying both. Management should be understood as the leadership of an organisation that creates and maintains a TQM environment. Managers are the leaders of this initiative\textsuperscript{41}.

Wilkinson and Witcher (1993)\textsuperscript{42} summarised TQM as having three major requirements as follows:

- **Total**: Functional integration and teamwork at all levels in the organisation through Institutional management.
- **Quality**: Strict adherence to the requirements specified by customers ensuring use of appropriate tools, techniques and processes.
- **Management**: Creation of enabling environment, commitment of senior management and provisioning of adequate support facilities.

### 3.11 EVOLUTION OF TOTAL QUALITY MANAGEMENT

The evolution of TQM as a new management philosophy is attributed to changing business environment, demanding customers and the resource constraints. The evolution of TQM has taken decades in many organisations all over the world. The evolution of quality has moved from control driven to culturally driven quality. Feigenbaum advanced the concept of TQC integrating quality into all functional areas with minimum cost ensuring customer satisfaction.

The evolution of quality has passed through four distinct stages; inspection, SQC, quality assurance, and strategic QM. The inspection stage emphasised performance to established standards. During the inspection stage, the main focus was uniform
product quality. In this stage, the quality control has stressed inspection to avoid defects.

In **SQC** stage, the processes were evaluated using statistical techniques to assess quality and to minimise non-conformance. During the quality assurance stage the focus changed to controlling quality at all stages of the processes throughout the organisation. The quality became an integrated approach and the responsibility of all functional areas of the organisation. The strategic **QM** stage envisaged quality as a competitive advantage. The stage aimed at **CQI** at all levels and at all times; aligning organisation to customers’ needs (both internal and external) and pursuing customer focused strategy. The evolution of **TQM** has primarily been guided by the emerging realities and organisational needs for a new paradigm to align the organisation with environmental realities to achieve development, growth, competitiveness and sustainability.

### 3.12 PRINCIPLES OF TOTAL QUALITY MANAGEMENT

Dean and Bowen (1994)\(^4^4\) have noted that **TQM** is identified by its principles and its implementation can only be achieved through these principles that signify this philosophy. Burr (1993)\(^4^5\) opined that **TQM** initiatives, despite having various names, share the same principles. Quality experts and researchers identified salient principles that encompass **TQM** philosophy. These are:

- Top management leads the **TQM** initiatives through visible commitment to this philosophy through words and deeds.

- Total employees involvement is vital for the success of **TQM**. This involvement must be based on voluntary commitment to excel and to make the organisation best and competitive.
Customer focus is the foundation of this philosophy. All efforts should be directed to design and provide products and services that meet and exceed customers’ expectations.

Strategic planning is vital to integrate and align organisational systems and processes with external environment and the customers’ needs.

This philosophy emphasises system approach. All interrelated processes should be managed as a system to achieve organisational efficiency and effectiveness.

Training of managers and employees is essential to achieve TQM objectives. Training should focus on need for TQM, its fundamentals, and quality tools. Participation of top management in training is also vital to get the desired results.

Focus on teamwork is essential. Cross functional, vertical and horizontal teams provide an ideal opportunity to employees to work together to achieve quality objectives.

Continuous improvement of products, services and processes is important for the organisations to remain competitive. The reassessment of all processes must become organisational philosophy. All employees must know that this would enable them to continuously improve the quality and meet the ever-changing customers’ needs. Employees inputs need to be Institutionalised and their efforts in continuous improvement must be acknowledged.

Due priority should be given to process improvement. Organisations need to identify horizontal and vertical processes, simplify them and provide ownership to those who manage the process.

Statistical methods must be used to eliminate errors and achieve standardised products and services.

Prevention of defects and problems is critical. This would save cost. All employees must be encouraged to anticipate problems and come up with viable solutions.
Cultural change is vital to initiate and sustain TQM initiatives. Constant monitoring of environment is important with a view to adapting to the changes.

The performance should be aligned with quality goals. The rewards system should be fair and equitable.

Partnership should be established with suppliers, customers and other external and internal stakeholders to harmonise the efforts to achieve quality objectives.

Management by facts is important to formulate objectives and rational decisions. All decisions should be based on hard evidence that is analysed and disseminated throughout the organisation.

Continuous self-assessment is necessary to provide a control mechanism to evaluate the existing performance against established benchmarks, identify the gaps and initiate appropriate response to bridge the gaps.

These principles provide the foundation of TQM philosophy. The application of these principles in an integrated manner enables organisations to achieve and sustain competitiveness.

3.13 OBSTACLES OF TOTAL QUALITY MANAGEMENT

Many organisations, especially small ones with a niche, are comfortable with their current state. They are satisfied with the amount of work being performed, the profits realised, and the perception that the customers are satisfied. Organisations with this culture will see little need for TQM until they begin to lose market share.

Once an organisation embarks on TQM, there will be obstacles to its successful implementation. They are given below:
Lack of Management Commitment.

Inability to change organisational culture.

Improper planning.

Lack of continuous training and education.

Incompatible organisational structure and isolated individuals and departments.

Ineffective measurement techniques and lack of access to data and results.

Paying inadequate attention to internal and external customers.

Inadequate use of empowerment and teamwork.

Failure to continually improve\textsuperscript{47}.

3.14 BENEFITS OF TOTAL QUALITY MANAGEMENT

According to a survey of manufacturing firms in Georgia, the benefits of \textit{TQM} are improved quality, employee participation, teamwork, working relationships, customer satisfaction, employee satisfaction, productivity, communication, profitability and market share\textsuperscript{48}.

\textit{TQM} is a good investment as shown by a ten-year study by Hendricks and Singhai. They showed that there is a strong link between \textit{TQM} and financial performance. The researchers selected a group of 600 publicly traded organisations that had won awards for effectively implementing \textit{TQM}. They then selected a control group similar in size and industry to the award winners. Performance of both groups was compared during the five years after winning the award. No difference was shown between the two groups prior to the award\textsuperscript{49}. 
3.15 TOTAL QUALITY MANAGEMENT IN HIGHER EDUCATION

Quality authorities like Joseph Juran, Edward Deming and Philip Crosby have put forth several approaches to improve company performance. These approaches are embodied in a set of QM practices, known as TQM. QM presents a strategic option and an integrated management philosophy for organisations, which allows them to reach their objectives effectively and efficiently, and to achieve sustainable competitive advantage. Similarly, the TQM practice plays a pivotal role in enhancing the quality in HLIs.

Where the quality of schooling is good, parents are motivated to send their children. Adult learners lose interest in education if it does not result in relevant and useful knowledge. The quality of education is therefore a factor in ensuring that education is likable and meaningful to everyone. Students need to know how to cope with change, with many different relationships, with lots of information, and with diversity and differences. So teaching and learning must give learners the tools for life. Education must lead to outcomes where learners feel confident in using the knowledge and skills they have acquired. Education is also about developing behaviour based on positive values understanding and respect for other people, for their rights, for the natural world, for the past and the future. Only education of this kind will lead to social & economic benefits which countries & individuals hope for50.

3.16 SERVICE QUALITY

According to Edvardsson and Thomasson51, “Quality is fulfilling expectations and needs from the staff and the owners. Customer expectations are based on their needs, their earlier experiences of the service in question and the reputation the service has in the market”. SERVQUAL perceptions are formed and changed in a
social process. Society receives and interprets impressions in the present, reinterpret previous perceptions, and form future expectations of quality. These expectations can be developed as service specific measurements. Zeithaml has defined five commitments, to which two have been added by Stamatis. The commitments mentioned by Zeithaml and Stamatis are:

- **Reliability** is the ability to provide what was promised, dependably and accurately. Never over promise and always keep your promises.
- **Responsiveness** is the willingness to help customers and provide prompt service. Always get the definition of prompt from the customer.
- **Assurance** is the knowledge and courtesy of employees and their ability to convey trust and confidence.
- **Empathy** is the degree of caring and individual attention provided to customers.
- **Tangible** is the physical facilities and equipment and the appearance of personnel.
- **Competition** is the ability to assess what the competitor is doing. When evaluating or researching the competition, it is important to know the service that they are providing, the cost of that service, their opportunities and their customers.
- **Management Leadership** is the art of influencing people to progress with cooperation and enthusiasm to accomplish a mission\(^{52}\).

There has been a significant focus on *SERVQUAL* during the past few decades. Researchers’ interest in *SERVQUAL* is based on its contribution in reducing costs, increasing customer loyalty and profitability. Customer and not the provider decide the quality of service. The customer feelings about the quality are the determinant of customer satisfaction. *SERVQUAL* is an attitude that results from comparison of expected service level from perceived performance. The consumer
evaluation of actual performance with the expected performance results in perceived SERVQUAL. Kordupleski, Rust & Zahorik (1993)\textsuperscript{53} gave a suitable definition of SERVQUAL as the “extent to which the service, the service process and the service organisation can satisfy the expectations of the user”\textsuperscript{54}.

**FIGURE 3.3** depicts the Gap Model of SERVQUAL.

**FIGURE 3.3**

Gap Model of Service Quality

3.17 SERVICE QUALITY IN HIGHER EDUCATION

Quality is the ability of the Institution to fulfil its task and to achieve its goals. In the past two decades, service companies have started to realise what their manufacturing counterparts had already realised, i.e. that they are in a competitive battle for customers who increasingly seek quality in market offerings and that the quality won’t improve unless it is measured. The same applies to HLI. Market forces are increasingly influencing HE sector. Since education is a service industry and thus exhibits all of the classical service features, there is some merit in implementation of SERVQUAL measurement instruments within the context of HE.

3.18 ACCREDITATION

Accreditation is defined as “the recognition accorded to HLI by some agency or organisation which sets up standards or requirements that must be complied with in order to secure approval”. Liston (1999) defines accreditation as “an evaluation of whether an Institution qualifies for a certain status. The status may have implications for the Institution itself (e.g. permission to operate), and/or its Students (e.g. eligibility for grants) and/or its graduates (e.g. qualified for certain employment). Accreditation is sometimes used in India as synonymous with Quality Assurance. Stella and Gnanam (2001) describe Quality Assurance as “the European version of the American process of Accreditation”. In terms of a global perspective, accreditation has basically three main purposes,

- First, to formulate educational norms, conduct assessments and recognise Institutions that comes up to certain minimum standards;
- Second, to assure quality standards through self-regulatory and external control mechanisms; and
• Third, to keep Students, public and prospective employers informed of the quality of education being imparted by HLIs.

The accreditation system provides useful service not only to the Students and the public but also to the Institutions themselves. To the student, it provides a certificate that the Institution or programme being considered by him/her has been evaluated and found satisfactory; to the public, including potential employers, it gives the assurance that the Institution concerned, besides enhancing its reputation and strengthening its case for financial support, it provides a stimulus for self-evaluation and self-improvement. More significantly, accreditation has generated amongst Institutions and systems, a healthy competition for providing quality education.

Accreditation systems (and bodies) are of two types namely Institutional and specialised. Institutional accreditation is conducted by national and regional accreditation agencies and it looks at the Institution as a total operating unit. It focuses attention on the general characteristics of the Institute such as its objectives, infrastructure, faculty and resources. Specialised (or professional) accreditation relates to specific, profession-related programmes and is also referred to as programme accreditation58.

3.19 ACCREDITATION – INDIAN SCENARIO

During the seventies and eighties of the last century the need to monitor the teaching and research process in the HLIs was realised and there were a series of discussion in India regarding the formulation of an appropriate mechanism of accreditation. The ‘Programme of Action’ relating to the NPE (1986), called for the development of “a mechanism for accreditation and assessment for maintaining and
raising the Quality of HLIs”. This has led to the establishment of the NAAC, under the umbrella of UGC, in 1994; the National Board of Accreditation (NBA) under the AICTE, also in 1994; and an Accreditation Board (AB) under the Indian Council of Agriculture Research, in 1996. Distance Education programmes in all disciplines are monitored by the Distance Education Council (DEC), constituted under the Indira Gandhi National Open University (IGNOU) Act, 1985. In the case of professional education, the establishment and recognition of Institutions is regulated by different professional associations including all the AICTE, the Medical Council of India (MCI), the Indian Nursing Council (INC), the Dental Council of India (DCI), the Pharmacy Council of India (PCI), Council of Architecture, and the Bar Council of India (BCI).

3.20 NATIONAL ASSESSMENT AND ACCREDITATION COUNCIL

NAAC, with headquarters at Bangalore, is responsible for accreditation of Universities and Colleges in India. It presently undertakes Institutional and Departmental evaluation. The principle objectives of this council are to:

- Grade HLIs and their programmes;
- Stimulate the academic environment in these Institutions,
- Help the Institutions in realising their academic objectives, and
- Promote changes, innovations, self-evaluation and accountability in HE.

At NAAC, the process of assessment and accreditation is undertaken in three stages:

- First, the preparation of a self-study report by the Institution undergoing assessment;
- Second, the validation of the report through a peer-team visit; and
- Third, a review of the peer-team’s evaluation,
The self-study report to be validated by the peers is the most important exercise of the entire process. For the purpose of grading, seven parameters are considered. These are: Curricular Aspects; Teaching, Learning and Evaluation; Research, Consultancy and Extension, Infrastructure and Learning Resources; Student Support and Progression; Governance and Leadership and Innovative Practices. The Institutions in India cannot be credited with one Assessment procedure. The NAAC has prescribed different types of assessing the Institutions in India. The NAAC has evolved Criterion-wise differential weightage for three types of HLI's such as University, Autonomous College/Institutions and Affiliated/Constituent Colleges.

3.21 SIX SIGMA

Six Sigma measures the capability of a process to perform defect-free work. Six Sigma means a failure rate of 3.4 parts per million or 99.9997% perfect; however, the term in practice is used to denote more than simply counting defects. Six Sigma can now imply a whole culture of strategies, tools, and statistical methodologies to improve the bottom line of companies. The objective of six sigma is to improve profits through variability and defect reduction, yield improvement, improved consumer satisfaction and best-in-class product / process performance.

3.22 APPLICATION OF TOTAL QUALITY MANAGEMENT IN INDUSTRIES

TQM was implemented by many industries in Japan and US. In 1960, the first quality control circles were formed for the purpose of quality improvement. In the late 1980s, the automotive industry, other industries and also the Department of Defense have implemented the SPC. The Malcolm National Quality Award was established and became the means to measure TQM. Genechi Taguchi introduced his concepts of
parameter and tolerance design and brought about a resurgence of Design of Experiments as a valuable quality improvement tool.

Emphasis on quality continued in the auto industry in the 1990s, when the Saturn automobile ranked first in customer satisfaction in 1996. In addition, ISO 9000 became the worldwide model for a QM system. ISO 14000 was approved as the worldwide model for environmental management systems. The new millennium brought about increased emphasis on worldwide quality and the internet. Both the manufacturing industries such as Toyota and Ford and Educational Institutions have implemented TQM in their day-to-day activities.62

3.23 APPLICATION OF TOTAL QUALITY MANAGEMENT IN TOYOTA MOTOR CORPORATION

Toyota Motor Corporation is the world’s seventh largest company and the second largest global car manufacturer. At Toyota, all employees have two roles: their own job and quality assurance. On each vehicle production line, a cord, known as the Andon cord, runs along the length of the line. If a line worker notices anything unusual, such as a defect, they pull this cord and the line stops. The team then concentrates all of their effort on correcting the defect before the line starts up again.

Toyota invented the concept of Just in Time in 1938 (often described as ‘Just in time, stop the line’). The objective was not simply to reduce inventory, as is often thought, but to avoid building up too much stock with defects which would have to be written off or corrected. Just in Time and this culture of quality evolved into the Toyota Production System and it’s more generic equivalent, Lean Manufacturing, which is the benchmark for manufacturing organisations across the globe.
Toyota introduced **TQM** as long ago as 1961, for the continuous improvement. These concepts and the associated culture are practiced in every aspect of Toyota’s operations, including information systems. Toyota’s Information Systems Methodology (**ISM**) and Information Systems Project Methodology (**ISPM**) represent the Toyota principles. But they have not been institutionalised to the same degree as processes used in other parts of the business. In 2007, they introduced the IBM Rational Unified Process (**RUP**) to manage Business and Software Architecture and application development. **RUP** in fact resembles the Toyota Production System in many ways, with its focus on quality and team interaction and its architecture-centric approach.

Toyota work closely with IBM Global Services to ensure that the Kaizen principle of continuous improvement is applied to the management of its information systems. The implementation of the **RUP** in any organisation is challenging and the time before it begins to produce positive results varies significantly, but is frequently measured in years rather than months. Working with IBM, Toyota tailored **RUP** to suit the environment (a pre-requisite of any **RUP** adoption programme), but the difficulties in institutionalising the process is due to their limited experience and skills.

The implementation of **RUP** was further complicated to operate within the boundaries of **ISM** and **ISPM** which provides the interface to Toyota methods and the organisation in general. Part of Toyota’s philosophy is the concept of the ‘Extended Enterprise’, wherein they develop long-term relationships with suppliers, which specifically targeted at mutual innovation. Though this was an integral part of all business and manufacturing operations, it is immature within information systems.
This was a weakness, given a policy that it is better to buy something of proven quality than to risk developing something new. Toyota’s first production pilot of RUP was the new Vehicle Management System which “1Tech” had been engaged to implement some 12 months into the. At the time of 1Tech’s engagement the project was well behind schedule and over budget.

1Tech’s own Open Source Integration Methodology (1TechOSIM) is based on RUP and soon became clear to Toyota that compared to their own implementation; the method was mature and was additionally backed up by the skills of the 1Tech team. 1Tech were therefore asked to extend their engagement to mentor and train Toyota staff for efficient use of RUP.

1Tech identified the lack of methods to manage Information Systems supplier engagement and the introduction of third party components and proposed the adoption of the Evolutionary Process for Integrating COTS-based Systems, a methodology defined by the Software Engineering Institute and generally considered to represent best practice. Following a review of the current status of the ISM and ISPM methodologies with the resident IBM Global Services team, 1Tech was asked to integrate all of the Information Systems processes so that boundaries and interfaces were clearly defined and the whole could operate as a single, seamless entity, accessible to all information systems personnel.

1Tech worked with project and programme management to reconstruct the critical vehicle management system project, replacing the existing function-driven approach with one that was risk driven and architecture-centric according to RUP principles. This resulted in the identification of elements which represented the
highest risk and focused on the need to eliminate these risks early so that the effects they might have on project timescales could be mitigated.

The number of elements with high architectural risk was significant due to the number of interfaces to legacy systems which were needed. The development of instances of each commenced immediately and the risks were either eliminated or, where major problems occurred, the need to focus and reschedule effort on their resolution was identified. 1Tech analysed the use of the four information systems methodologies (ISM, IDSPM, RUP and EPIC) and produced a process architecture which integrated them into effectively a single process.

The integrated processes, along with guidelines, templates and other supporting materials, were defined and published by 1Tech as a web site for Toyota’s intranet using IBM Rational Method Composer, allowing each member of the information systems community, whether acting in a project, support or management role, to instantly see how they were expected to interact with their colleagues and the processes they should follow. 1Tech developed custom training material and trained all information systems staff, including senior management, via modular courses aimed at transferring skills appropriate to the needs of each individual. This was supplemented by ‘on-the-job’ coaching, a technique which is itself a core Toyota philosophy. Training customisation and delivery, and process analysis, tailoring and integration, were completed within 3 months.

3.24 APPLICATION OF TOTAL QUALITY MANAGEMENT IN TAMKANG UNIVERSITY

Tamkang University was founded in 1950 as the Tamkang Junior College of English by Mr. Chang Ching-sheng and his son Dr. Clement C. P. Chang. Tamkang
University was the first Private College in Taiwan. It became the Tamkang College of Arts and Sciences in 1958, before being renamed as Tamkang University in 1980. As one of the first-established schools of HE, Tamkang University now has four campuses such as the Tamsui Campus, the Taipei Campus, the Lanyang Campus, and the Cyber Campus and ten Colleges, with a total of over 28,000 Students, more than 2,200 faculty and staff members, and over 220,000 alumni.

Tamkang is a University of ideals, vision, and creativity. It perceives the pursuit of excellence and on-going innovation as the primary means of achieving sustainable management. In the 60 years since its foundation, Tamkang University has focused on developing academic research, teaching, and learning services with an innovative spirit. It was the first university in Taiwan to employ TQM, which was introduced in 1992, and in the same year it set up the Committee of Educational QM. In 2006, the Tamkang Quality Award was initiated to recognize outstanding departments committed to TQM. It has generated impressive results and garnered positive public feedback.

3.25 CONCLUSION

TQM can be applied to business and industry; but it has been recently introduced and experimented in HE. Many Universities and Colleges apply TQM as a tool to enhance the quality of HE. TQM in HE means improving the quality of courses input instructional process, resource management processes and structures as well as student support service output and linkages with world of work and other organisations. TQM need to be implemented in all Colleges and Universities even if there is no accreditation or certification, to take the bull of internationalisation by the horns. The faculty and staff will be experiencing the pleasure of working in tight time schedule, whether accredited or not.
In this chapter, the researcher has explained about the Concepts and Techniques of *TQM, SERVQUAL* Dimensions in *HE* and the Six Sigma Techniques in *HE*. The next chapter presents the results of the analysis carried out to estimate the Students’ perception on *NAAC* Quality Dimensions. The tools such as Reliability Analysis, One Sample ‘t’ test, Independent Sample ‘t’ test, Discriminant Analysis, Multivariate Analysis and ANOVA followed by DUNCAN Multiple Range test are adopted for the purpose of identifying the present quality status from the Students’ viewpoint.
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