



IMPLEMENTING TQM INCLUDING A UKAS AND ISO9001 SYSTEM IN AN ACADEMIC ORGANISATION

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Dr. Rehman has considerable experience of management skills and academic leadership, particularly in the management of people and resources; and the successful implementation of learning, research and commercial activities.

Dr. Rehman has strengths in a varied number of administrative, business and scientific related disciplines. In his career, he has demonstrated leadership not only in management and administration, but also in teaching and medical research. This has led to a significant expansion in overseas collaboration through associated programme generating revenue of more than £ 8 million.

He has been Director of Studies, Director of Postgraduate Studies, Director of Dental and Biomaterial Taught Programmes, Quality Manager of the IRC in Biomedical Materials, Programme Director for MBA and MSc programmes in the largest Department of Materials at that time (2006) in the UK. In addition, He is also the Executive Director and founder of the IRC in Biomedical Materials (only of its kind) in Pakistan.

He has been member of both the faculty boards and academic boards of QMUL for more than 6 years. In addition, he has more than 12 years experience of developing and implementing a quality system accredited and registered for ISO9001 and ISO17025 (please see details below). He was the first person to establish, implement and regulate an ISO9001 and ISO17025 accredited quality system in an academic institution, the only system of its kind in Europe. It covered the quality control, enhancement, training of staff and research students for more than 400 people. In addition, he devised Standard Operating Procedures (SOPs) for Postgraduate Training and Assessment, a model which was later adopted in the new Graduate School of QMUL. He was also member of the CEN committees for ISO.

Dr. Rehman developed and coordinated the MBA and MSc in Technology Exploitation and Management, MSc in Project Management. In 2004, the MBA programme which he devised and managed was described as one of the most innovative programmes in the country by the Independent Newspaper¹.

<http://www.independent.co.uk/student/postgraduate/mbas-guide/meet-the-material-girls-and-boys-562334.html>¹



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ABSTRACT

Purpose:

In order to effectively improve the education industry in a proper way to fit the changes and developments that can be imposed by the current era of globalisation and information technology, all parties, including staff and students should work within a framework that supports to fulfil the requirement of a Total Quality Management (TQM) system. This research focuses on the implementation of TQM in an academic environment and outlines the benefits that were reaped. The higher education sector is a crucial nerve for any country, as it is an integral part of developing an infrastructure of a Nation.

A number of authors and researchers have written papers regarding the theories and implementation of TQM in different industries such as manufacturing and services, while very little information are available regarding the implementation of TQM in an academic organisation. This paper provides an overview of the evolution and changes in the academic environment (Interdisciplinary Research Centre in Biomedical Materials, Queen Mary University of London) owing to modern technologies, the evolution of science and technological intuitiveness, which represent a norm in all industries. Moreover, no longer the role of the managers are only maintaining the order and daily routine, but they are responsible to drive the development and comprehensive changes and continual improvement to meet the needs of society and customers requirements.

Design/methodology/approach:

This paper is directed towards an experience that helps in identifying and developing a suitable TQM model which may be adopted by education sector to streamline the processes and find the non-conformities to improve the quality of education and suggesting corrective and preventive actions to solve or / and eliminate problems in the system. A growing number of organisations use quality management as a strategic foundation for achieving a competitive advantage and education sector should employ these techniques for better management structure. Management structure based on effective process management is an integral part of the quality system and is described in this paper. Therefore, one of the main aims of this study was to find out; "Does Management structure

based on effective process management exists and how it can be implemented within an academic environment.

Findings:

The proposed TQM model provides the basis of excellence in the education sector and covers all angles and aspects of an organisation and its operations addressing the hard and soft issues of quality and it advocates Performances improved through better Planning, and the management of People and the Processes in which they work. These are the keys in delivering quality products and services to customers. These four (Ps) are important for delivering quality products and services to customers. The early frameworks of TQM involved three Cs, Culture, Communication and Commitment, which we can never underestimate as they are the foundation of the TQM framework. These are the "soft foundations" which encase the hard necessities of planning, people and processes.

In an academic sector, a combination of both the 4Ps and Cs is required. Implementation of this in the IRC at QMUL was a classic example, where huge benefits were reaped from the TQM implementation. It took more than 4 years for the system to mature, processes and procedures to be streamlined and bring about the changes in the culture.

Relevance/contribution:

Due to the TQM framework, the research and development, training and teaching was improved. The journey of research and development to commercialisation was shortened and was very successful. A company by the name of "Abbonetics" was formed for the production of bone replacement materials and there came the time when the IRC secured more than 85% share of the World market for ear implants. This work was further extended and new products through continuous improvement cycle were introduced. Abbonetics became Appatech and it was taken over by a commercial venture group for £14 million. The company at this stage moved out of QMUL buildings and was set up at a purpose built site and became among the top 20 fastest growing companies in UK.

Most recently in July 2010, it was taken over by Bexter Inc. (US) for an amount of US\$380 million of which QMUL share is 35%. This is a classic and successful example of Education sector benefiting from the implementation of TQM framework.

Key Words:

Total Quality Management, Higher Education Sector, technology management, biomedical materials, ISO9001, UKAS

INTRODUCTION:

The search for new management paradigms is not a recent phenomenon. Over a sustained period of time, many management writers and thinkers have continuously strived for better methods of achieving time, cost and quality objectives (Seymour and Low, 1990). In a study reported in literature about the relationship between quality management practices and the performance of small and medium size enterprises (SMEs) in Ghana, (Fening et al 2008) found support for the argument that quality management practices improve organizational performance in both large and small businesses in any part of the world.

Many authors and researchers have written papers regarding the theories and implementation of Total Quality Management (TQM) in different industries such as manufacturing and services; while relatively little information is available regarding the implementation of TQM in an academic organisation. This paper provides an overview of the evolution and changes in the academic environment (Interdisciplinary Research Centre in Biomedical Materials, Queen Mary University of London as a case study) owing to modern technologies, the evolution of science and technological intuitiveness, which represent a norm in all sectors. Moreover, no longer the role of the managers are only maintaining the order and daily routine, but they are responsible to drive the development and comprehensive changes and continual improvement to meet the needs of society and customers requirements (Narag and Kakkar, 2007), (Douglas et al, 2003), (Srdoc and Bratko, 2005), (Angel et al, 1998), (David and Bramford, 2005).

Every organisation has different cultures, history, leadership, and style. Also, in an era of technological development, and globalisation there are huge demands from customers for better quality of work either it is related to processing or service sector. In order to satisfy its customers, each organisation including universities has to develop itself according to its capabilities, and customer requirements (Hirota and Carlos, 2000), (Oakland JS, 1995), Oakland JS, (2006). So, this study provides some important issues associated with the implementation of total quality management (TQM) in an academic environment.

Effective organizational management requires data to support decision making. Managers need data for measurement and control, similar to an aircraft pilot monitoring the cockpit displays (command, control and communications centre for that unit). Similarly, the Higher Education Academic Organisations have evolved as one of those organisations who have a complicated system because the parties that are involved in the activities usually are huge, therefore, the needs for proper system to manage and monitor all processes and guide both the staff and students become the priorities of a successful education sector. Also, the tools used to measure quality is very important when it is used periodically to follow trends of the quality of service and to know what should be done to improve this service, through analysis of customers complains and suggestions, Oakland JS, (2006), Doherty GD, (2004).

Achieving the quality in an academic organisation can not be achieved only through our knowledge of the wishes and needs of beneficiaries such as researchers, immediate

customers (students) and the employed staff members. In order to effectively improve the education industry in a proper way to fit the changes and developments that can be imposed by the current era of globalisation and information technology, all parties, including staff and students should participate and support to fulfil the requirement of Total Quality Management System and identify a route to knowledge transfer and protect the intellectual properties at the right time, prior to commercial exploitation. (Cruickshank M, 2003).

Thus, this paper is directed towards an experience that helps in identifying and developing a suitable TQM model which may be adopted by an academic institution/organization to streamline the processes and find the non-conformities to improve the quality of education and suggesting corrective and preventive actions to solve or / and eliminate problems in the system. According to Srdoc, et al. (2005)⁵, TQM is an approach that their organisations use to serve their customers' ever-changing customer needs, and generate profits for their stakeholders. A growing number of organisations use quality management as a strategic foundation for achieving a competitive advantage and education sector should employ these techniques for better management structure. Management structure based on effective process management is an integral part of the quality system. Therefore, it is essential to find out; "Does Management structure based on effective process management exists (Cullen et al, 2003), Deming WE., (1993)".

THE CONCEPT OF TOTAL QUALITY MANAGEMENT SYSTEM:

Total Quality Management is a system focusing on customer satisfaction through a concept of "continuous improvement". This concept emerged after the 1980s with the purpose of developing and expanding quality management strategy by adding more aspects related to quality. Most of the literature indicates that the interest in the TQM concept at the level of production began in USA, but it was only there in theoretical terms. It got implemented in practice in JAPAN after World War II in order to improve the quality of industrial production consistently and comprehensively. The growing intensity of global competition, especially from Japan, led the US to follow Japanese strategy. This happened when Hewlett-Packard criticised US chips manufacturers for poor products quality comparing with their Japanese competitors (Grant D. et al., 2002), (Grant D. et al., 2004), Oakland JS, (2006).

The Total Quality Management concept is one of the modern management concepts which helped to increase the competitiveness between organisations. This has resulted from the level of customer awareness which helps them to select a product or service of high quality and at a reasonable price. For all of these reasons, the management of most organisations encourage the adoption of a TQM concept (Samuel KM, 1994).

The implementation of a TQM system requires taking a long and deep breath and the winners are those who can struggle to the end. It has been reported that 91% of 70 companies using TQM admitted that, their quality improved when compared with their

competitors). In general, TQM is a way for managers to improve the effectiveness, flexibility, and competitiveness of a business as a whole (Hewitt. and Clayton, 1999).

Total Quality Management (TQM) is considered by researchers an important approach in quality and business performance improvement in the higher education sector, and therefore growing number of universities are adopting TQM. (Hides M., et al 2004), (Hwarng and Teo 2001) discussed the Implementation of EFQM Excellence Model, and concluded in their study that the TQM has been recognised as a successful management philosophy in higher education, translating customers' voices into operational requirements - a QFD application in higher education.

The United States and European education system has understood that current practice and conceptual frameworks of Quality Assurance in Education is matured and is constantly improving the quality of education (Jackson, N. 1996).

When considering industry in general, The United States and Europe have woken up little late, after the competitiveness of Japanese manufacturing in the early 80's. There is no doubt that most of Japanese products are better quality, and lower cost than US and European products, which may be a result of Japanese manufacturers understanding the TQM concepts earlier than others (Zetie S, 2002),. But, it is other way around in US and Europe when it comes to education sector, as these countries stream lined their processes and procedures and that is the reason, Higher education is well developed and very profitable business in the west (Hides M., et al 2004), (Hwarng and Teo 2001).

Quality Assurance (QA) and Quality Control are both very critical terms. According to the Manual of Professional Practice for Quality in the Construction Project, "Quality Assurance (QA) is a program covering activities necessary to provide quality in the work to meet the project requirements. On the other hand Quality Control (QC) is the specific implementation of the QA program and related activities", (Arditi and Murat 1998).

Total Quality Management system is an integrated system of methods, principles, and best practices that provide a framework for organisations to strive for excellence in the everyday process. To become a world class competitor, companies need a model to integrate continuous improvement tools into system that involves participative cross-functional implementation. The various models proposed by experts may support organisations in the TQM implementation process. There are two important examples of some models which have recently been proposed. One is the TQM-efficient model (TQMEF), proposed by Kakkar and Narag (2007), and aimed at recommending a TQM model for Indian organisations, as shown in (figure 1). The other is that of the Leicester Business School which developed a TQM Excellence Model, named 'LETQMEX', as shown in figure (2), which aims at providing a step- by-step improvement opportunity for firms which are committed to satisfying customers better through TQM.

Case Study:

Sharing the Experience of the Quality Systems at the IRC in Biomedical Materials, Queen Mary University of London

The Centre

The Interdisciplinary Research Centre (IRC) in Biomedical Materials was created in 1991 with core funding from the Science and Engineering Research Council, now the Engineering and Physical Sciences Research Council.

The IRC is based around a central site at Queen Mary University of London. . There are staffs in allied laboratories at Saint Bartholomew's and the Royal London School of Medicine and Dentistry, the Royal Free and University College Medical School, and the Institute of Orthopaedics at the Royal National Orthopaedic Hospital.

Aims and Objectives:

The overall aim of the IRC was to develop a second generation of implant materials for orthopaedic, cardiovascular and dental applications. Particular emphasis was placed on the innovation of novel biomaterials and prostheses, which were analogues of natural tissues and structures. It was intended that the IRC should establish a national focus for the future development of biomedical materials in the UK, create an interface with other IRCs, industry and the Health Service and provide education and training relevant to biomedical materials. A private limited company, Abonetics Limited, was established to provide a commercial mechanism for the IRC. This was later on renamed as Abonetics 2000, followed by a takeover by a capital venture consortium and rebadged as Apatech and more recently in July 2010, the company ApaTech acquired by Baxter International Inc. for US\$330 million. Formed in 2001, ApaTech is a spin-out company, founded on technology invented at the Interdisciplinary Research Centre in Biomedical Materials at QMUL.

The Interdisciplinary Research Centre in Biomedical Materials aimed to provide a stimulating, supportive and safe environment for creativity and innovation which was efficiently to serve both the immediate and long term requirements of the Centre.

It was highlighted at that stage that it is necessary that we consistently produce conforming products and service at the optimum level. The device to accomplish this is the use of defect prevention techniques in our operating department, such as, manufacturing, quality control, purchasing, sales and purchase.

Therefore, within the quality system the IRC defined its aims to use the best possible practices in:

- Development of personnel as scientists, engineers, technologists and technicians.
- Provision of equipment and facilities of adequate quality for the intended purposes.

- Project selection, initiation, planning and execution.
- Experimental design and methodology.
- Data evaluation and interpretation.
- Communication of results and data.
- Development and fostering of links with relevant centres of expertise.
- Provision of biomedical materials to external organisations.
- Scrutiny and maintenance of the quality of the products and services provided by external contractors.
- Monitoring the achievements in relation to those requirements.

In pursuance of this Quality Policy the IRC achieved and maintained United Kingdom Accreditation Service (UKAS) Accreditation for its laboratory testing in order to ensure the precision, accuracy and validity of the data that are generated and the results that are produced.

The ISO9001 registration covered training of PhD students at all sites of the IRC. In the next phase, the quality system was extended to Department of Biomaterials in Relation to Dentistry, London Hospital Medical College and in the final phase procedures were adopted by the graduate school of QMUL.

Scope of ISO9001 Registration:

The ISO quality system was added on to the existing NAMAS accreditation covering the area of:

- Research in Biomedical Materials Science and Technology
- Training of Postgraduates in Research and
- Production of Biomedical Polymers, Ceramics and their Composites for Commercial and Research Applications.

Both the ISO9001 and UKAS systems were developed within the framework of TQM with the main aim and objective to continue improving the quality of training provided to students, methods used for production and tests used for characterisation through the pathway described in Figure 3 and the infrastructure developed is presented in Figure 4.

DISCUSSION:

Total Quality Management Awareness

Even the concept of TQM is relatively new in Academic Institution or organization sector, but the level of awareness of TQM has increased over the last few years. There is a lack of understanding of the main purpose of TQM, and a confusion of the concept with other quality concepts such as ISO. Consequently, at times it seems a little difficult to incorporate or merge ISO with any other system. It was learnt during the implementation process that ISO on its own can not be successfully implemented in an academic sector. There is a need

to develop a framework that can provide a “totality” concept. Therefore, a framework constituting of ISO and UKAS accreditation system was developed which satisfied the needs of an academic organisation.

It is very much appreciated that there are many benefits of having ISO, such as the focus on quality, the emphasis on how the work should be implemented and the true categorisation of many elements of it. Those companies that did not think about these benefits in the first place did not really understand that quality management is a serious business and considerable attention should be paid to such factors as the time and money to be spent.

For the development and implementation of successful Total Quality Management framework, spreading the awareness of TQM is important, especially in the earlier stages due to the fact that every person in the organisation must learn the concept before it is applied. They have to know what will happen next and to do this; they have to be a part of TQM system. There is no doubt that the implementation of any projects especially in the Higher education sector, go through a loop or circle and to achieve the goal, the circle should be closed. If it remains open, it means that it will not be possible to finish the projects tasks within a specific time and on a suitable budget. Therefore, training of both the staff and students is extremely important.

In relation to TQM awareness within the organisation, top management must be committed and give support to TQM. Without the active participation of top management, the TQM effort will fail, and the top management must convince themselves that TQM is the right course to follow. In addition to this, top management should expect some type of resistance against changes especially from old staff members, who have been working according to a mind-set rather than methodology and “culture barrier” becomes a major obstacle, they close their minds for any new process for development so it becomes more difficult for top management to clarify and explain the benefit of TQM by training, team meeting, and awareness meeting. Head of departments / directors need to play an important role here – they need to own the system for the effective implementation.

The selection of the UK higher education sector to be used as a benchmark for this research has emerged for many reasons. The higher education sector in UK has a rich history and very well established education system with defined standard operating procedures and well lubricated processes which earns it a major position in the World.

The UK education system has a strong foundation and experience, but still there are tremendous benefits of TQM implementation within the university sector, especially where research and development is taking place. These benefits are:

- TQM achieves real cost savings arising from fewer errors, consequent reduced cost wastage and reduced defect liabilities.
- It also leads to greater client (student and staff) satisfaction which, in turn, enhances the prospect of better positioning in the league tables.

- Greater job satisfaction can be obtained for the staff and students. This leads to high morale and productivity.
- Effectiveness will be achieved through systematic and logical analysis of the processes; improved communications; feedback at various stages of the processes; and audits at strategic intervals.
- TQM provides the psychological tool to condition employees to the correct “continuous improvement” or Kaizen attitude required for their work.
- As a powerful management device, TQM forges total participation by all parties at every stage of the life cycle of the building process.
- A well defined system encourages research and development at all levels, which is an integral part of The EFQM Excellence Model.

Figure 5, represents the non-prescriptive framework of the full excellence model. This framework is based on nine criteria, almost 50% are 'Enablers', which cover what an organisation does, and 50% are 'Results', which cover what an organisation achieves or, in other words, Results are caused by Enablers. Leadership driven policy and strategy are necessary to aid customer, employee and favourable society results, and besides these people partnerships, resources and processes are directed towards ultimate excellence in key performance results. The delivery of these results enables the drive towards innovation and learning, which can be directly applicable to a higher education sector.

The EFQM publication for the new millennium of the so-called 'Excellence Model' captures much of the learning and provides a framework which an organisation can use by following these ten steps:

- ◇ Set direction through leadership
- ◇ Establish the results they want to achieve
- ◇ Establish and drive policy and strategy
- ◇ Set up and manage appropriately their approach to processes, people, partnerships and resources
- ◇ Deploy the approaches to ensure achievement of the policies, strategies and thereby the results
- ◇ Assess the 'business' performance, in terms of customers, their own people and society results
- ◇ Assess the achievements of key performance results
- ◇ Review performance for strengths and areas for improvement
- ◇ Innovate to deliver performance improvements
- ◇ Learn more about the effects of the enablers on the result.

The important issue from the EFQM model is that the EFQM model focuses more on the impact on society, compared with the construction industry. It can be stated that the education industry has a great impact on the community and socialites through training and education.

SUMMARY:

The TQM model provides the basis of excellence in the education sector and covers all angles and aspects of an organisation's operations. It is based on the excellent work done during the last century. Oakland (2006), presents a new model for TQM that addresses the hard and soft issues of quality and it advocates performances improved through better planning, and the management of people and the processes in which they work. These are the keys to delivering quality products and services to customers. These four Ps are important in to delivering quality products and service to customers. The early frameworks of TQM involved three Cs, culture, communication and commitment, which we can never underestimate as they are the foundation of the TQM framework. Oakland adds these are the "soft foundations" which must encase the hard necessities of planning, people and processes.

In an academic sector, a combination of both the 4Ps and Cs is required. Implementation of this in the IRC at QMUL was a classic example, where huge benefits were reaped from the TQM implementation. It took more than 4 years for the system to mature, processed and procedures to be streamlined and bring about the changes in the culture.

Due to the TQM framework, the research and development, training and teaching was improved. The journey of research and development to commercialisation was shortened and was very successful. Intellectual property protection through innovation at the right time was a key to commercial exploitation. A company by the name of "Abbonetics" was formed for the production of bone replacement materials and there came the time when the IRC secured more than 85% share of the World market for ear implants through Smith and Nephew Inc., USA.

This work was further extended and new products through continuous improvement cycle were introduced. Abbonetics became Appatech and it was taken over by a commercial venture group for £14 million. The company at this stage moved out of QMUL buildings and was set up at a purpose built site and became among the top 20 fastest growing companies in UK.

Most recently in July 2010, it was acquired by Baxter International Inc. (Baxter International Inc. a global, diversified healthcare company) for \$330 million of which QMUL share is 35%. This is a classic and successful example of Education sector benefiting from the implementation of TQM framework.

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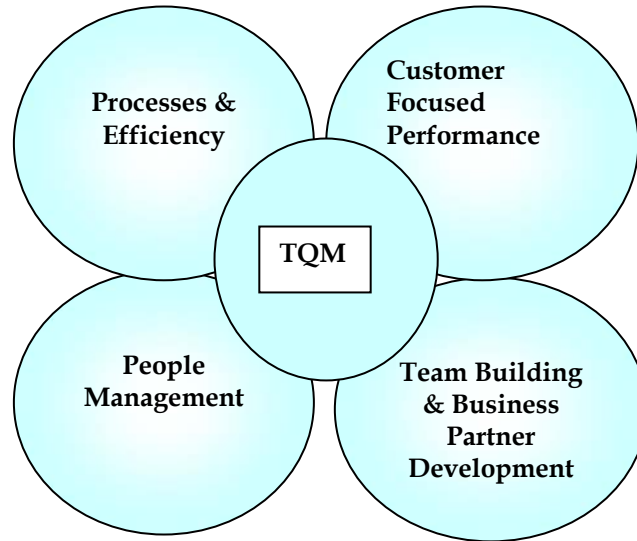
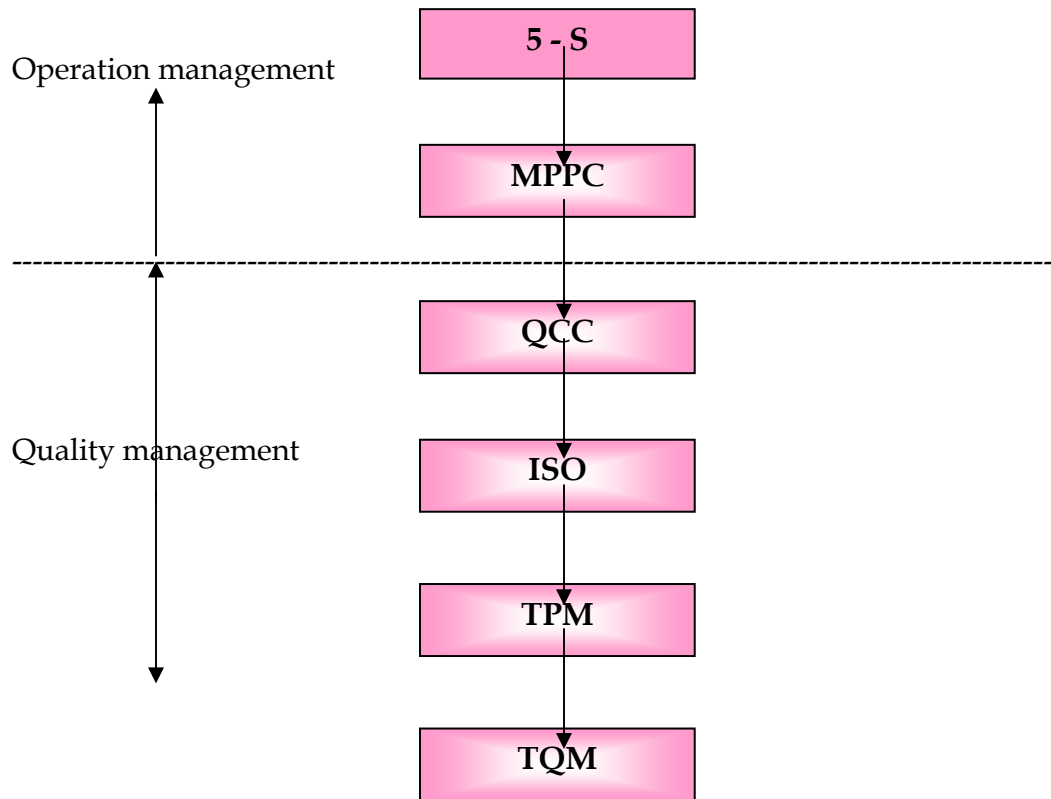


Figure (1): TQMEF (TQM-efficiency) model

Source: S. Kakkar and A.S. Narag, *Recommending a TQM model for Indian organizations*, *The TQM Magazine* Vol. 19 No. 4, 2007, pp. 328-353



Key:

- 5-S - Seiri, Seiton, Seiso, Seiketsu, Shitsuke
- MPPC - Marketing, Production and purchasing control
- QCC - Quality Control Circles
- ISO - ISO 9000 Series
- TPM - Total Productivity Maintenance
- TQM - Total Quality Management

Figure (2): The LETQMEX MODEL

Source: Samuel KM.Ho and Christopher K.H. Fung, (1994), Developing a TQM Excellence Model, the TQM Magazine, vol. 6, pp. 24-30

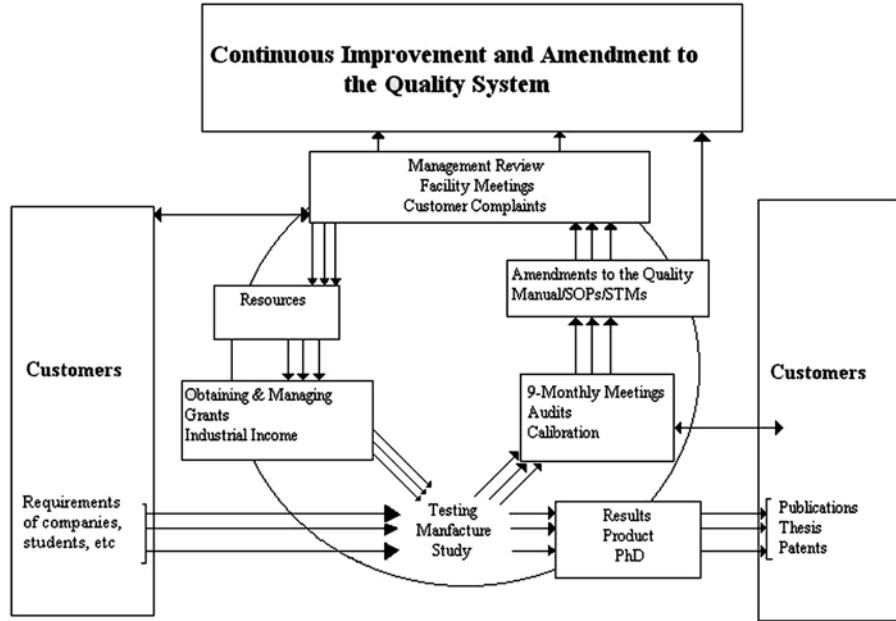
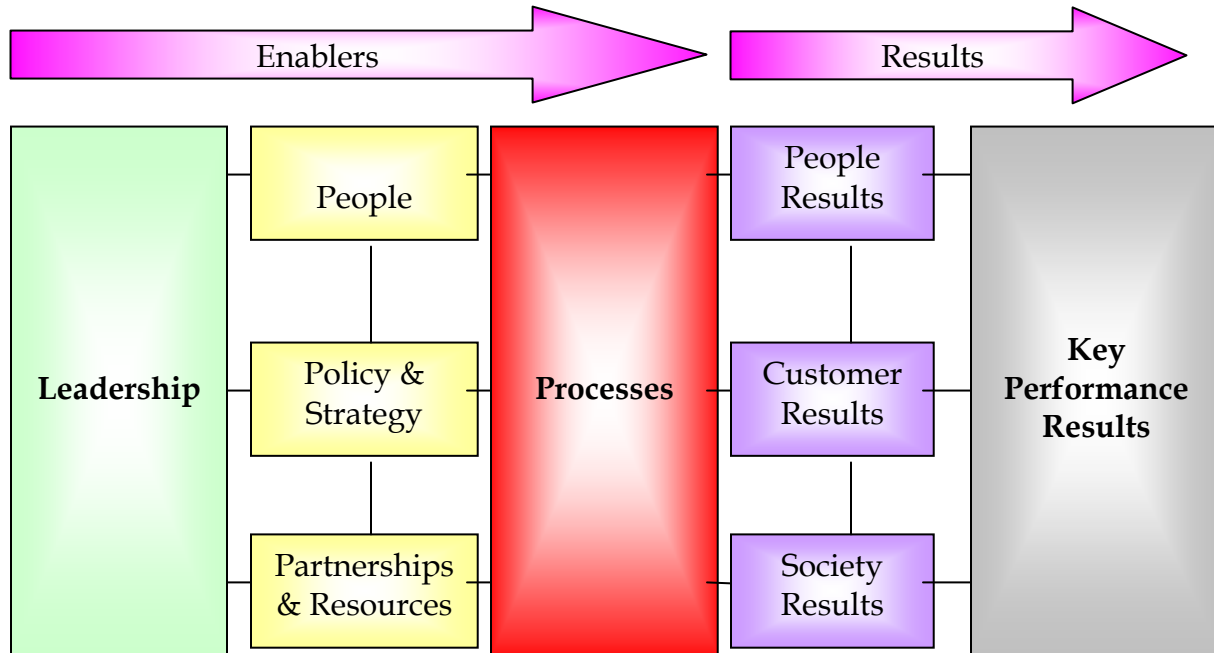


Figure 3: Continuous Improvement cycle for the IRC Quality System

Figure (5): The EFQM Excellence Model



Source: Oakland, J, Marosszeky, M., (2006), Total Quality in the Construction Supply Chain, Butterworth Heinemann, UK