TQM implementation Concepts and Tools/Techniques

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Abstract

Quality has become one of the most important competitive strategic weapons and many organisations have realized that it is a key to developing products and services that support continuing success. Total Quality Management (TQM) is a management system that takes into consideration all the areas of the operations in an organization. Quality systems are designed to set a clear direction for organizations to follow, enabling understanding and involvement of employees towards a common goal. The aim of business is long-term profitability and earnings are achieved by satisfying customers while keeping production cost at a minimum. Total quality management (TQM) is a popular management philosophy and practice designed to enhance productivity and quality, reduces waste, and increase customer satisfaction (Powell 1995). There are four major core concepts of TQM that should be well understood. These core concepts are continuous improvement, customer orientation, defect prevention and universal responsibility. TQM tools help organizations to identify, analyze and assess qualitative and quantitative data which are relevant to their business. These tools can identify procedures, ideas, statistics, cause and effect concerns and other issues relevant to their organizations. Each of the tools can be examined and used to enhance the effectiveness, efficiency, standardization and overall quality of procedures, products or work environment.

Key Words: Total Quality Management, TQM Implementation, TQM Tools/Techniques

Introduction

To survive in today's global, complex, changing and challenging business environment, most companies and industries implement quality management principles in their manufacturing and service operations, because quality has become a strategic weapon. The concept of quality has become a strategic weapon and has been growing rapidly for the past several decades. Quality has become so popular these days such that consumers in both developed and developing countries have all become aware of the concept and expect companies to produce/manufacture quality products or provide quality services. By producing and manufacturing quality products and providing quality service, companies around the world are able to keep their customers. Quality has been defined by Karapetrovic and Willborn (1997) as "the ability of a product to satisfy stated or implied requirements" (p. 287). Flynn Schroeder and Sakakibara (1994) define quality management as "an integrated approach to achieving and sustaining high quality output" (p. 342). Quality systems are designed to set a clear direction for organizations to follow, enabling understanding and involvement of employees towards a common goal. To produce quality products or provide quality services means companies have to implement what is called Total Quality management systems, principles, concepts in their manufacturing operations. And the proper implementation of TQM systems has been linked to high organizational performance.

Several studies (Bou and Beltran, 2005; Easton and Jarrell, 1998; Hendricks and Singhal, 2001; Eriksson and Hansen, 2002; Lin and Chang, 2006; Fuentes, Montes, ad Fernandez. 2006; Hasan and Kerr, 2003) have concluded that there is a high correlation between TQM and performance in organizations big and small operating in developed as well as developing countries. It has become one of the most popular and important competitive strategic weapons and many organizations have realized that it is a key to developing products and services that support continuing success. Fening (2012) stated "in recent decades, the practice of quality management has been identified and awareness has been created as one of organization's most important key ingredient for success and global competitiveness" (p.1). The aim of business is long-term profitability and earnings are achieved by satisfying customers while keeping production cost at a minimum. The use of quality tools and techniques provides long-term dividends through lower costs and productivity improvement. According to Wessel and Burcher (2004), "quality management in general deals with permanently redirecting a company's macro and micro operations towards the needs of internal and external customers' (p. 264). Total Quality Management is seen as a tool to improve organizational performance in both large and small organizations and in any part of the world. Bergman and Klefjö (2007) stated that Total Quality Management (TQM) means a constant endeavor to fulfill, and preferably exceed the customer needs and expectations at the lowest cost, by continuous improvement work, to which all involved are committed, focusing on the process in the organization. As competition increases and changes occur in the business world, there is the need to have a better understanding of quality. Top managers need to understand and apply quality philosophies to achieve high performance levels in products and processes and to face the challenges of new global competition. Dow, Samson, and Ford (1999) concluded "the relationship between quality practices and superior quality outcomes is a fundamental and defining element of the whole concept of quality management" (p 2.). Consumers demand high quality levels of products or services at reasonable prices to achieve value and customer satisfaction. (Evans, 1996) said, "quality management practices today simply represent sound management practices and that practices once regarded as quality management activities are now viewed as generic management activities" (p. 43). With increased competition, organizations have recognized the importance of quality system implementation in maintaining effectiveness in a volatile business environment. Meeting the needs and desires of the customer is critical and must be done much better and efficiently than it has been done in the past. More managers than ever before are focusing on quality as a way of increasing productivity, reducing costs, and meeting customer needs. These managers are beginning to understand the importance of continuously improving the quality of their services and products as a means of achieving these goals through the application of Total Quality Management (TQM) principles.

The purpose of this current study is to identify, examine and remind TQM professional and managers some of the most important TQM concepts and tools/techniques that can be applied in the implementation of quality systems in all organization and industries (big and small) so as to be able to gain competitive advantage in today's complex and changing business environment

Review of Existing Research Literature

Daft (1997) defines Total Quality Management (TQM) "as a concept that focuses on managing the total organization to deliver quality to customers and identifies employee involvement, focus on the customer, benchmarking and continuous improvement as the four significant elements of the concept" (p.61). (Evans and Lindsay, 1993) stated that TQM "implies that quality is not solely a control or technical issue but that must be addressed from the perspective of strategic management" (p. 33). Grosbois, and Kumar (2009) defined TQM as the holistic management approach that integrates all the organizational activities to satisfy customers' needs and meet their expectations towards achieving overall organizational objectives. Academic research literature relating to TQM is relatively recent as the academic community initially ignored quality management. Early articles on TQM were mainly descriptive case studies, which were often written with the purpose of advancing diffusion of the discipline (Kujala, 2002). As such, researchers did not take an analytical approach to identifying boundary conditions for successful TQM programs. In the mid-1990's, the discipline began to be taken more seriously and many respected mainstream organisational research journals included TQM related studies. This new interest changed the direction of TQM for the academic community. As a result, there is an extensive and growing body of knowledge about the structure, implementation and impact of quality management practices. There has been intensive research into identifying critical elements of TQM as well as their connection to management theory. The external environments which should be taken into account when an organization is thinking of implementing TQM are social, legal/political, technological and economical. The internal environmental factors also include leadership, the people, strategy and policy, processes, suppliers and customers (Evans and Lindsay, 1999).

Total quality management (TQM) is a popular management philosophy and practice designed to enhance productivity and quality, reduces waste, and increase customer satisfaction (Powell 1995). Total Quality Management is an approach to improving the effectiveness and flexibility of organizations as a whole. Effectiveness, means doing the right thing first time. It is basically a way of improving and involving the whole organization; every department, every activity, every single person at every level. For an organization to be truly effective, it requires that each part of it must work properly together, recognizing that every person and every activity affects, and in turn is affected by, others (Miller 1996). Spencer (1994) also describes TQM as one of the essentials in revitalizing a company's competitive position and as a result has drawn the attention of many market leaders all over the world. According to McDermott *et al*. (1993), fundamental to creating a TQM environment is the development of corporate vision, the guiding principles and total quality strategies to work toward the vision. The mission statement acts as a compass that gives the organization a macro-sense of direction and creates alignment.

Shin *et al*. (1998) also assert that TQM is not a short-term fix and hence a never-ending commitment is required. The quality transformation toward TQM starts with the awareness of quality management principles and concepts in an organization. Dale *et al*. (1997) advocate that an enterprise management system is organized in a cross-functional way with matrix management structures to expedite and co-ordinate across cross-functional interfaces. Besides, a more flattened organizational structure is often preferred, as with less social distance between manager and workers (Bounds *et al*., 1994). According to Zeitz and Johannesson (1997), others view TQM broadly, as a general management philosophy (e.g., Deming, 1986). Zeitz and Johannesson (1997), define TQM as consisting of those features that (a) pertain to core elements of the formal TQM program, (b) are significantly under the control of top managers, and (c) are generally included in formal TQM literature on program design and implementation.

TQM Implementation Concepts

There are four major core concepts of TQM that should be well understood. These core concepts are continuous improvement, customer orientation, defect prevention and universal responsibility which are explained in the subsequent sections.

Continuous Improvement: Bhuiyan and Baghel (2006) define continuous improvement as 'a culture of sustain improvement targeting the elimination of waste in all systems and processes of an organization (p. 761). Continuous Improvement (CI) of all operations and activities are the heart of TQM. The first step in quality improvement is for people to look at their work in terms of being part of a continuous process. 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 organisation's processes. This will lead to an improvement in process quality which in turn leads to an improvement in product quality and finally to an increase in customer satisfaction. CI is a term used to describe process improvement that takes place in incremental steps. It is a relentless effort to add value for the customer. The critical component of continuous improvement is called six sigma, which uses DMAIC (Define, Measure, Analyze, Improve and Control) process to improve an organisation's quality initiatives (Carey, 2006). The define phase documents the opportunity from both business and customer perspectives whilst the measure phase deals with the way data is utilized to understand processes and their current performance. The analyze phase searches for key factors or critical data and improves phase deals with the development of solutions for the critical data points. The control phase is for implementing the solutions and control plans for maintaining the improvements achieved. This process should be driven from the top and implemented from the bottom (Goyal and Patel, 2006).

Customer Orientation: Understanding and meeting customer expectations is a challenging proposition and requires processes that support continuing progress toward the goal of meeting customer expectations. Customer satisfaction is seen as the organisation's highest priority because the organisation believes it will only be successful if customers are satisfied (Drucker, 1994). In TQM context, being sensitive to customer requirements goes beyond defect and error reduction to include listening to the customers. Customer orientation focuses on dynamic interactions between the organisation and the customers as well as competitors in the market.

It involves a continuous improvement in business processes (**http://en.wikipedia.org/wiki/Customer_orientation**). There are seven key behaviours that strongly indicate customer orientation attitudes. These are as follows:

1. Thinking and talking about clients a lot
2. Continually assessing the customers' perception
3. Resolving priority issues in favour of the customer
4. Making amends to customers for poor treatment
5. Employing a "whatever it takes" policy to satisfy special needs
6. Redesigning processes, re-deploying resources and turning sacred cows out to pasture when they get in the way of service quality.

Defect Prevention: The objective of defect prevention is to identify defects and take corrective actions to ensure they are not repeated over the subsequent iterative cycles. It can be implemented by preparing an action plan to minimize or eliminate defects, generating defect metrics, defining corrective action and producing an analysis of the root causes of the defects. Defect prevention can be accomplished by actioning the following steps (**http://en.wikipedia.org/wiki/defect_tracking**):

1. Calculating defect data with periodic reviews using test logs from the execution phase
2. Identifying improvement strategies
3. Escalate issues to senior management or customer where necessary
4. Draw up an action plan to address outstanding defects and improve development process
5. Undertake periodic peer reviews to verify that action plans are being adhered to
6. Produce regular reports of defects

Universal Responsibility: A universal responsibility concept deals with the fact that quality is not only the responsibility of the inspection department but is everyone's. Quality should be totally pervasive and that every workgroup in the business should be concerned with seeking ways to improve the quality of their own product or service. A successful TQM environment requires a committed and well-trained workforce that participates fully in quality improvement activities. Such participation is reinforced by reward and recognition systems which emphasizes the achievement of quality objectives. Employees are encouraged to take more responsibility, communicate more effectively, act creatively and be innovative. These will let the employees be better motivated and satisfied with their jobs.

Leadership and Commitment: TQM has to be introduced and led by top management. Evans (1996) emphasized the leadership of an organization that promote quality and high performance "create a strategic vision and clear values which serve as a basis for all business decisions at all levels of the organization and that the vision and values revolve around customers" (p 43). Attempts to implement TQM without the commitment of leadership will fail. The commitment and personal involvement from the top management in creating and deploying clear quality values and goals consistent with the objectives of the organization will motivate the employees to put in their best for achieving those goals. The development and use of performance indicators should be linked directly or indirectly to customer requirements and satisfaction and to management and employee remuneration. To be successful in promoting business efficiency and effectiveness, TQM must start at the top with for instance, the chief executive officer or equivalent. The most senior directors and management must also demonstrate that they are serious about quality. The middle management must have a particular important role to play since they must not only grasp the principles of TQM but go on to explain them to the people for whom they are responsible. Only then will TQM spread effectively throughout the organisation.

TQM Implementation Tools/Techniques

TQM tools help organizations to identify, analyze and assess qualitative and quantitative data which are relevant to their business. These tools can identify procedures, ideas, statistics, cause and effect concerns and other issues relevant to their organisations. Each of the tools can be examined and used to enhance the effectiveness, efficiency, standardization and overall quality of procedures, products or work environment. According to Quality America, Inc. (Re Velle, 2003) the number of TQM tools come in various forms, such as brainstorming, focus groups, checklists, charts, graphs, diagrams and other analysis tools. The following explain some of the most common TQM tools in use today, and Ishikawa has been credited for the introduction of some of these tools.

Cost of Quality (COQ): The first approach of TQM implementation is for the organization to determine why it needs to carry out TQM and consists of the establishment of the COQ. Giakatis, Enkawa and Washitani (2001) mentioned that COQ was classified into three main categories as Prevention/Improvement, Appraisal Cost and Failure Cost.

Pie Charts and Bar Graphs: Pie charts and bar graphs are used to identify and compare data units as they relate to one issue or the whole, such as budgets, population distribution, and extent of the use of funds and so on. An example is shown in figure 1 overleaf.

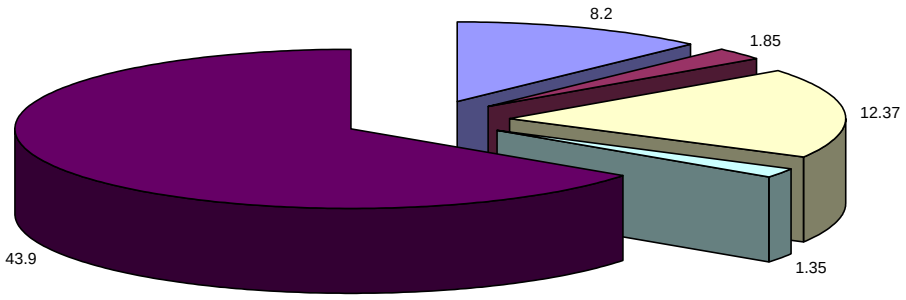

Figure 1. An example of pie chart.

Histograms: Histograms are used to illustrate and examine various data element in order to make decisions regarding them. It is by far the most common used technique for frequency distribution. According to Materla and Cudney (2017), "a quality improvement team can utilize a histogram to identify the most frequently-occurring problems during the patients' treatment cycle from several issues, such as medical errors, data errors and delays, among others' (p.12). They are effective when comparing statistical, survey, or questionnaire results as illustrated in figure 2.

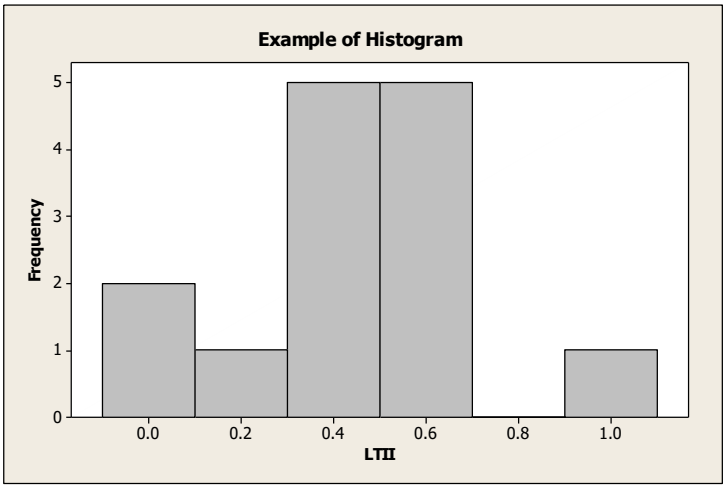

Figure 2. An example of histogram.

Run Chart. Run chart follows a process over a specific period of time, such as accrual rates and track high and low points in its run and ultimately identify trends, shifts and patterns as shown in figure 3 overleaf.

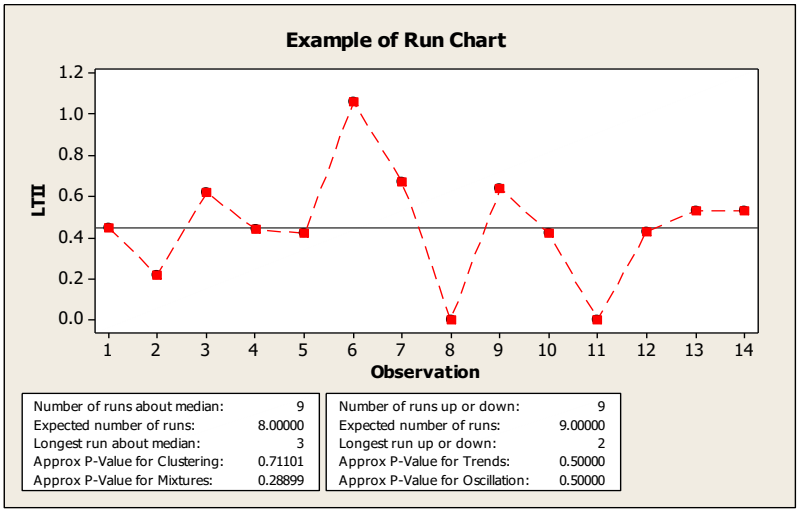

Figure 3. An example of a run chart.

Pareto Chart: A pareto chart indicated in figure 4 rates issues according to importance and frequency by prioritizing specific problems or cause in a manner that facilitates problem solving. It also identifies groupings of qualitative data, such as most frequent complaint, most commonly purchased preservation aid and so on in order to measure which have priority. It can be scheduled over select periods of time to track changes.

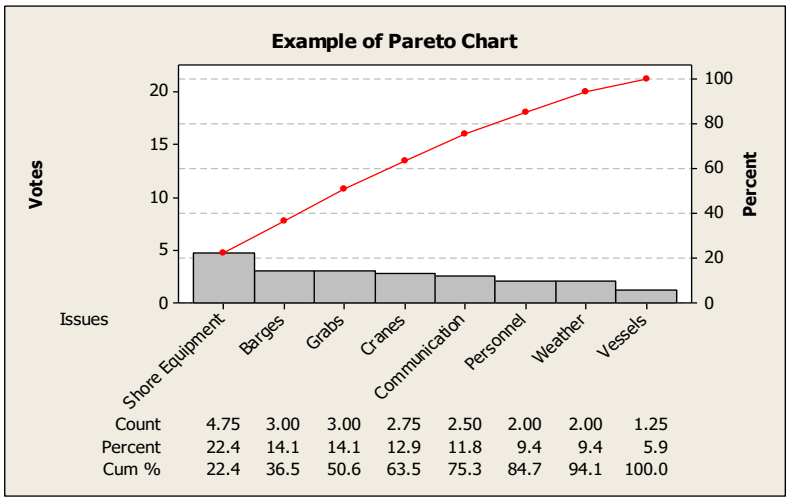

Figure 4. An example of a pareto chart.

Force Field Analysis: Force field analysis is used to identify driving and restraining forces occurring in a chosen process in order to understand why that particular process functions as it does. For example, identifying the driving and restraining forces of a change going on in an organisation. It also identifies restraining forces that need to be eradicated or driving forces that need to be improved in order to function at a higher level of efficiency.

Cause and Effect, Ishikawa or Fishbone Diagram: The cause and effect diagram is illustrated in figure 5. It is also known as the Ishikawa diagram or the fishbone diagram. It is a multiple level of potential causes (inputs) and ultimate effects (outputs) of problems or issues that may arise in the course of business. It may be confusing if too many inputs and outputs are identified.

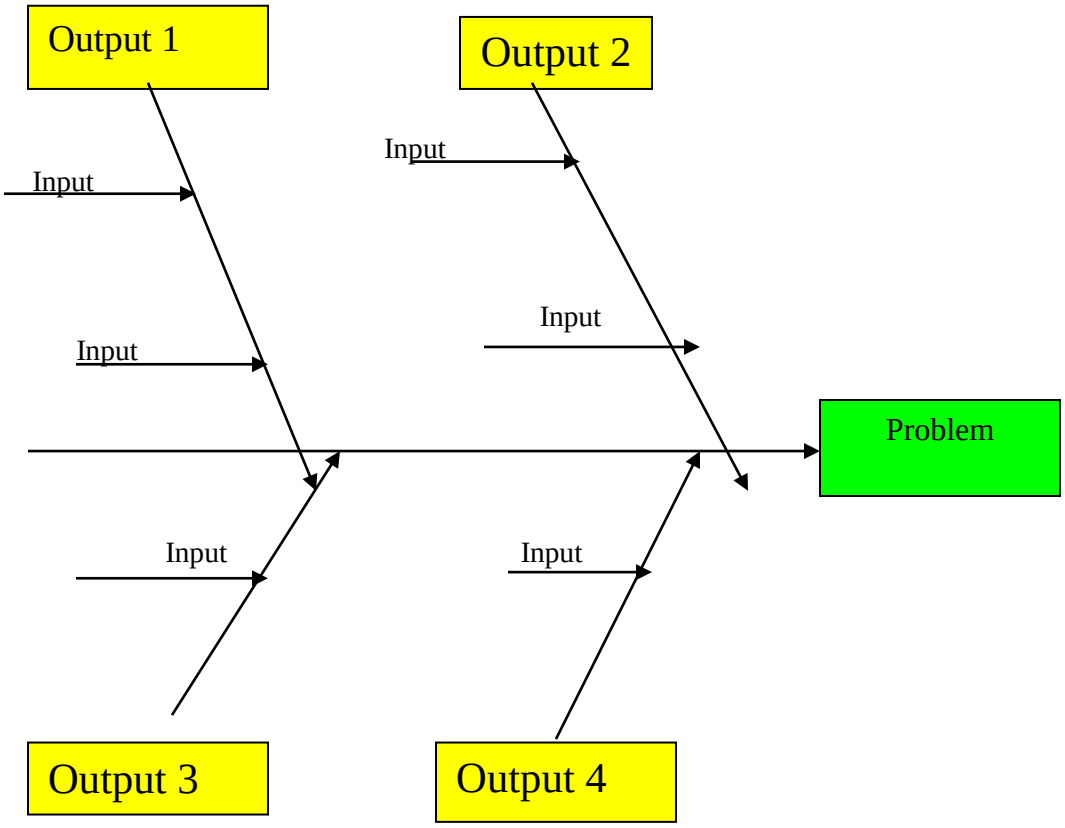

Figure 5. An example of Cause and Effect Diagram

Brainstorming and Affinity Diagrams: Teams use creative thinking by employing brainstorming techniques and affinity diagrams to identify various aspects surrounding an issue. An affinity diagram can be created using anything from enabling software to post-it notes organized on a wall.

Tree Diagram: Tree diagram is used to identify the various tasks involved in a full scope of a project. It can be used to identify hierarchies, whether of personnel or business structure and also inputs and outputs of a project, procedure or process. An example is shown figure 6.

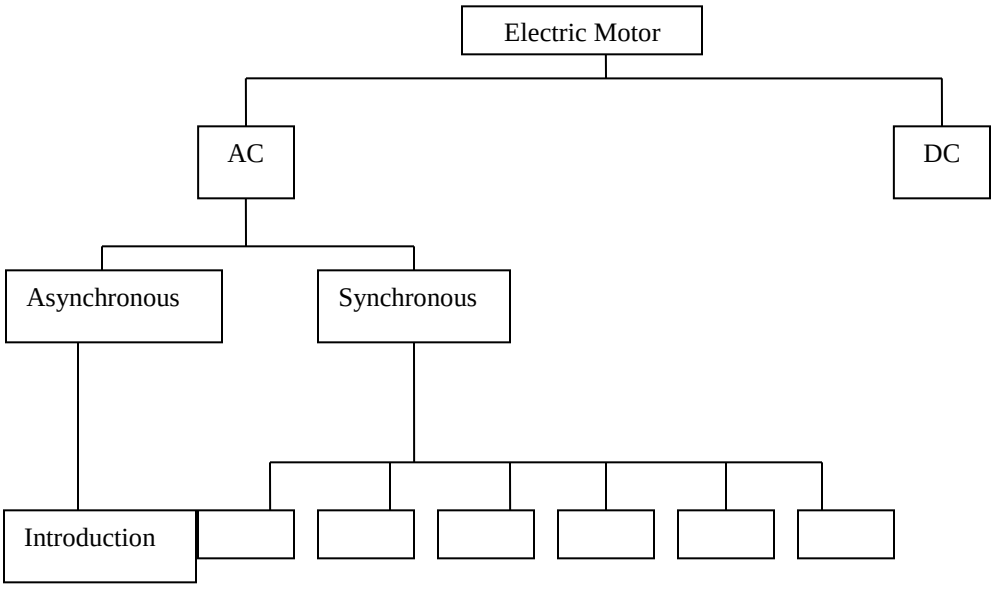

Figure 6. An example of Tree Diagram.

Flowcharts and Modeling Diagrams: A flow chat is a diagrammatic representation of the nature and the flow of work in a process. Flowchart and modeling diagrams assist in the definition and analysis of each step in a process by illustrating it in a clear an comprehensive manner (figure 7 illustrated). They identify areas where workflow may be blocked or diverted and where workflow is fluid. They also identify areas where steps need to be added or removed to improve efficiency and create standardized workflow.

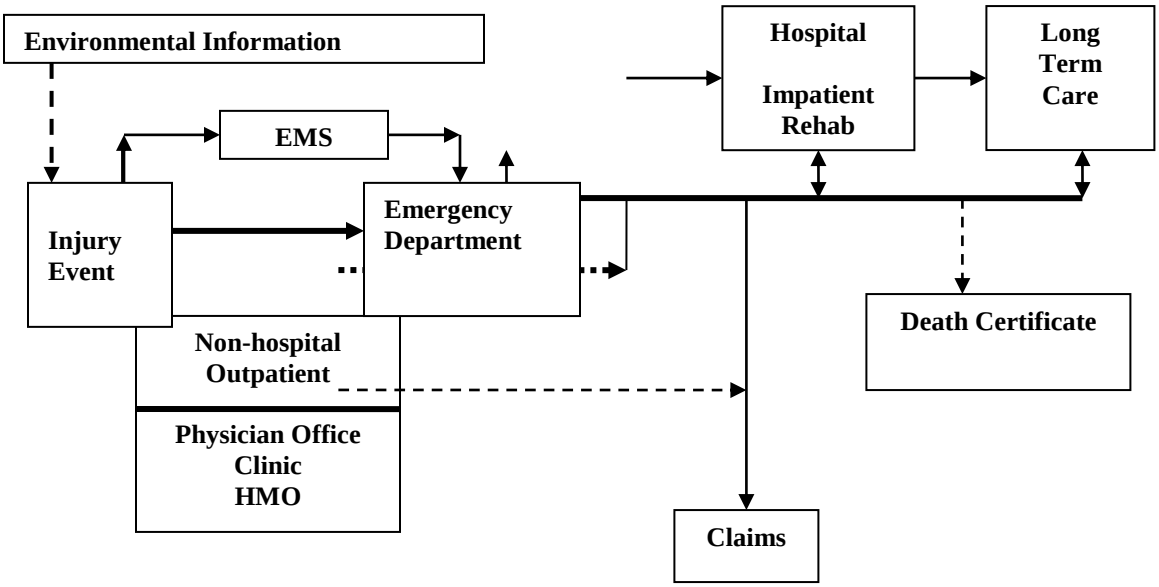

Figure 7. An example of Flowchart and Modelling Diagram.

Scatter Diagram: Scatter diagram is used to illustrate and validate hunches an discover cause and effect relationships, as well as bonds and correlations between two variables. It can also be used to chart the positive and negative direction of relationships.

An example of scatter diagram is illustrated in figure 8.

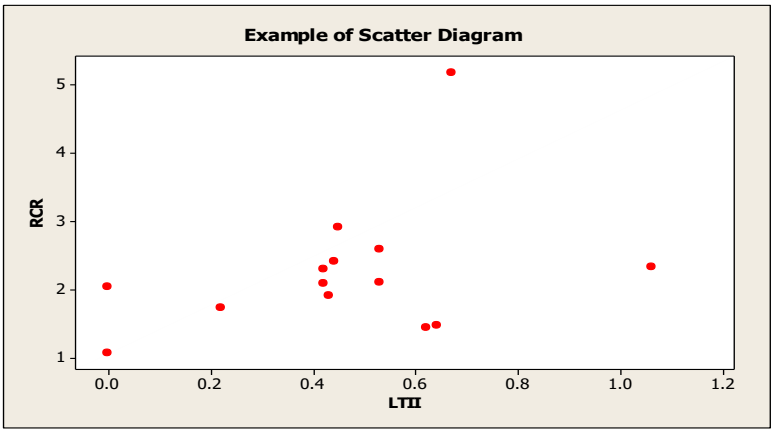

Figure 8. An example of scatter diagram.

Plan-Do-Check-Act: The Plan-Do-Check-Act style of management is where each project or procedure is planned according to needs and outcome, tested, examined for efficiency and effectiveness and then acted upon. This is a cyclical style to be iterated until the process is perfected.

Overcoming the Barriers to TQM Success

The problems encountered in TQM implementation are numerous and are called barriers to TQM implementation (Kanji, 1996). They are unlimited and so show up in all business sectors. It is, therefore important for all organisations to understand and avoid these barriers both before and during TQM implementation. These barriers are discussed in details below.

Lack of Management Commitment: All types of organizations experience low employee participation and interest in their TQM programs when management commitment is missing at any level. If employees see discrepancies in what management says and what it actually does, they will lose interest and faith in TQM (Hyde, 1997). For successful implementation, the management team must have a clearly communicated purpose for adopting TQM, be consistent in its application of TQM principles, and not treat it as the latest management fad.

Inability to Change Organizational Culture: Many have found out that changing an organisation's culture to reflect TQM is difficult and requires a lot of time. First, the fear of change must be removed from the organisation, poor labor-management relations must be resolved and the organisation's focus must change from the status quo. Unfortunately, organisations are impatient and often focus on the quick fix for obtaining results (Reeves and Bednar, 1994). Top management must identify and deal with inconsistencies in the organisation and focus on adhering to the principles of the new organisation. It is therefore, useless for management to sell TQM to the staff and then revert to its old ways of doing business.

Improper Planning: Another barrier is created by a lack of clarity in the implementation plan and the failure to promote open dialogue among the participants. Three components of a successful TQM plan are obtaining organisation-wide commitment, communicating organisation vision, mission, and goals and providing open communication about the organisation's new focus. A time frame should be developed and posted in public areas so that everyone remains focused on TQM. The plan should remain flexible so that adjustments and improvements can be made as the culture evolves.

Lack of Continuous Training and Education: Training and education is an ongoing process that facilitates continuous quality improvement in any organisation. Leaders involved in the TQM implementation should identify the educational needs of the organisation and be creative in meeting those needs efficiently and cost-effectively. Training and education should be both formal and informal. Lack of training and education will hinder the progress of TQM implementation.

Incompatible Organizational Structure: Autocratic organizational structure and management policies can lead to TQM implementation problems. If organisational structure is a problem, part of the planning process should be to restructure with a defined purpose and explicit expected outcomes. TQM success would be realized by managers who use TQM principles in line with the organisational structure of the organisation (Reeves and Bednar, 1993).

Ineffective Measurement Techniques/Lack of Access to Data and Results: Having no measurement process or ineffective measurement techniques, failing to maintain accurate and reliable data and failing to provide sufficient access to data run counter to TQM principles. The data must be credible and reliable otherwise decision makers will be unable to make appropriate and proper decisions. Quick, easy access to data is important and data retrieval must be efficient and not time consuming or labor intensive. Decision makers must also receive training in data analysis and interpretation so that the measurement system will serve its intended purpose.

Paying Inadequate Attention to Internal and External Customers: Organizations must pay attention to both their internal and external customers so that they can understand the needs and expectations of the customers. Too often, managers assume they know what customers need and expectation which results in misdirected efforts and investments.

Inadequate Use of Empowerment and Teamwork: Complacency in teams will inhibit TQM progress. Ineffective teams that fail to stay focused or complete their tasks are a big expense to organisations. To be effective, teams need trained facilitators, a mission or purpose and a time frame for completing projects. The mission of the team must not be overwhelming. Some tasks might need to be broken down into manageable phases. Whenever possible teams' recommendations and solutions are implemented it will send a powerful, positive message to employees about the importance of empowerment and teamwork (Morris and Haigh, 1996??)

Conclusions

Quality has become one of the most important competitive strategic weapons and many organisations have realized that it is a key to developing products and services that support continuing success. Total Quality Management (TQM) is a management system that takes into consideration all the areas of the operations in an organization. Quality systems are designed to set a clear direction for organizations to follow, enabling understanding and involvement of employees towards a common goal.

It is only through the implementation and practice of quality management that firms will see the need to produce quality products. This paper has also contributed to the body of knowledge and a better understanding of the field of Total Quality Management. The tools/techniques can be used by TQM professionals and managers in any organization or industry for the successful implementation of quality systems and to achieve high performance. This study has contributed to the understanding and use of TQM tools for TQM implementation. TQM which was traced to the late 1950s has been the leading force in shaping and spreading quality management ideology and practices in modern business management. TQM tools help organizations to identify, analyze and assess qualitative and quantitative data which are relevant to their business. These tools can identify procedures, ideas, statistics, cause and effect concerns and other issues relevant to their organizations. Each of the tools can be examined and used to enhance the effectiveness, efficiency, standardization and overall quality of procedures, products or work environment. Quality awareness can be initiated by quality education and training and supported by structural and progressive change of management systems. While an appropriate quality culture keeps the management system operating smoothly and improving consistently, a good management system in turn nurtures the growth of organizational quality culture.

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