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GENERATING VALUE WITH TQM AND SIX SIGMA

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ABSTRACT

The purpose of this study is to analyze the impact of Six Sigma and TQM approaches inside organizations and if they are being used appropriately in order to support their future challenges. Organizations today are faced with ongoing challenges to their ability to continue to provide positive results to its shareholders so that it is possible to anticipate the needs of their customers. We aim to understand whether there is added value for the companies that are using both methodologies.

Keywords: quality, six sigma, TQM, total quality management, lean management, EFQM.

INTRODUCTION

Quality has continued to evolve over the past decades and an example of this is the TQM (Total Quality Management) philosophy which evolved into a model that allows the accomplishment of the expected results to all stakeholders (Green, 2006). For that TQM focused mainly in the continuous improvement of processes, with the aim of improving the quality of products and services to ensure the satisfaction of its customers (Yang, 2009).

The implementation of the TQM philosophy enables organizations to improve customer satisfaction, productivity and consequently increase the profitability of their businesses (Tanninem, 2010). However the option for implementing TQM must be carefully planned and weighted by the management in order to decrease the risk of failure. To avoid this it is essential that management considers its implementation, only when the organization understands its real meaning and its impact on the organization's culture (Zbaracki, 1998). Those organizations that already have their quality management system (QMS) Certified with ISO 9001, have already taken a first step towards the TQM philosophy, since they already have a culture of good practices inside the organization (Candido, 2011). Most cases of failures in implementing TQM resulted from improper application of their principles (Green, 2006).

For Cândido (2011) the implementation of TQM is no more difficult to implement than other models of business strategy. The appearance of the 6 Sigma methodology introduced a structured way for organizations to improve products and processes, enabling cost reduction (Klefsjo, 2001). 6 sigma methodology is based on several aspects of continuous improvement initiatives already existing (Antony, 2009). The introduction of the DMAIC concept and "green belt" and "black belt" training which are synchronized with the five main points of the standard ISO 9001:2008 (Karthi, 2012). The 6 sigma methodology as well as the ISO 9001 certification have helped the continuous improvement inside the organizations (Karthi, 2012), allowing organizations to move towards a new approach of business excellence by integrating the lean management with 6 sigma (Alsmadi, 2010).

SIX SIGMA

The global market is currently complex and competitive, as a result of the globalization of markets, driving the companies into making efforts to produce products and services of high quality at a low cost in a short period of time (Alsmadi, 2012). In order to help companies, more than 69 initiatives, related to quality, emerged all over the world during the second half of the last century. Among them, the Statistical Process Control (SPC), Quality Circles (QC), Total Quality Management (TQM), Benchmarking, Quality Management Systems (QMS), ISO 9000, Quality Management System (QMS) Standard emerged, as well as other initiatives that have created a visible impact in worldwide businesses (Dedhia, 2005).

More recently an initiative that would bring big gains for organizations has appeared, and it is continuingly being implemented by large global companies today, known as the Six Sigma methodology, which was created by Motorola Inc. in the U.S. around 1985. Bill Galvin, Motorola's CEO, who was committed to Six Sigma, highlighted the need to extend the Six Sigma to all activities in the company, which contributed to its success and expansion (Dedhia, 2005).

Although Motorola originally developed Six Sigma, General Electric improved and refined the concept (Akbulut-Bailey, 2012) during its internal implementation. Several U.S. companies subsequently adopted Six Sigma, including Allied Signal (Arnheiter, 2005). With the emergence of Six Sigma only during the 80's, Swink (2012) have referred to it as a relative newcomer to be included in programs of existing process improvement. The term Six Sigma appears in order to be known as a target value to be achieved, suggesting the value of 3.4 defects per million opportunities (DPMO).

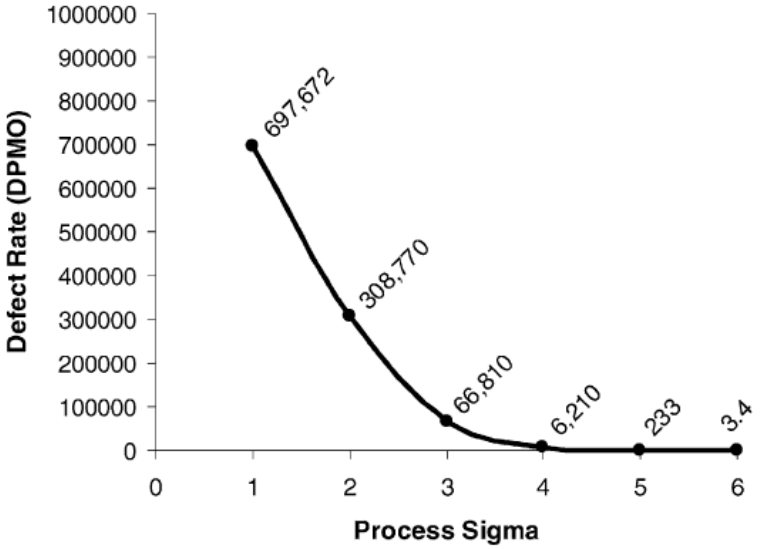

Fig. 1 Defect rate (DPMO) versus Process Sigma Level (Linderman, 2003)

We can easily see that a company working with 3.4 defects per million opportunities (DPMO) has production processes with 99.99966% of products / services according to customers' specifications. This allows the company increasing the level of customer satisfaction, and therefore increasing the profits, thereby strengthening their business and ensuring a return on the implemented investment (AlSagheer, 2011). Six Sigma focuses on measuring the quality of the product / service, reducing variation, leading to improvement and cost reduction.

Currently, adopting Six Sigma does not mean that the company produces high-quality products, but also that it is a company with high availability, reliability, performance, delivery and after-sales service (Arnheiter, 2005).

The Six Sigma becomes the most widely accepted tool for quality improvement in organizations (Tanik, 2012), being described as a strategic innovative philosophy and methodology for problem solving (Dedhia, 2005). The organizations that decide to adopt a Six Sigma program only as a statistical tool in order to solve their complex problems are sentenced to fail, because they have a weak link with the strategic objectives of the business (Kumar, 2011).

The Six Sigma establishes goals that are challenges for the organizations and also changes the perceptions of all associates about their performance limits. Using the targets not only changes the associates' behavior, but also their perceptions about change management (Linderman, 2003).

The top management involvement in Six Sigma improvement projects is important, because the associates have a better perception regarding internal culture about quality. The commitment of top management in these projects shows the importance for the company and generates a greater motivation for the associates (Davison, 2007; Zue, 2008; Linderman, 2006).

Despite the advantages already demonstrated by several companies, there are entrepreneurs who continue to fight against changes, expressing doubts about the return on the investment regarding Quality Management (Zue, 2008). They reported that investments in the Quality Management area / Six Sigma benefit organizations, since they allow significant improvements of the quality of their products and services. In 1999 the General Electric Company has spent over half a billion in Six Sigma initiatives and received more than two billion in benefits in the fiscal year (GEC, 1999). Kumar (2008) developed an interesting work research, in which they try to demystify the seven most common myths about Six Sigma related to the fact that the organizations try to use these reasons for not adopting the Six Sigma methodology.

(1) It is a trend;

(2) It is statistics;

(3) It is only applicable in production processes;

(4) It is effective in large organizations;

(5) It is the same as TQM;

(6) It requires an infrastructure and intensive training;

(7) It is not profitable;

Kumar (2008) report that the Six Sigma methodology is not a methodology that can be neglected, but a new way of life for organizations that want to grow and prosper in the market. This is a real business strategy based on an objective decision-making and problem solving, which is based on real meaningful data.

The current environment imposes on the companies low profit margins, shorter delivery time, which has led to an increasing adoption and use of a variety of management systems, methodologies and tools - including ISO 9001, Total Quality Management (TQM), Hoshin Management, Six Sigma and Balanced Scorecard (BSC), which always have quality as the main focus. Yang (2009) states that the objective of integrating models like TQM, Six Sigma

and others, is always the pursuit of organizational excellence. During the past three decades, the ISO 9001 certifications have allowed the companies pursuing continuous quality improvement. At the same time, Six Sigma has driven companies in pursuit of "zero defects". These circumstances have forced the companies to integrate ISO 9001 certification with the Six Sigma approach (Karthi, 2012). However, before starting implementing any model of quality management, it is important to always have two kinds of decisions: what to do and how to do it (Sousa, 2002).

The emergence of Six Sigma was largely due to the companies' needs of improving their quality in the production of their complex products with large number of components. Unfortunately this situation recorded a high number of non-conforming products. At this time the Six Sigma approach has a broader and long-term strategic business (Arnheiter, 2005).

The Six Sigma methodology has evolved into a powerful business strategy of excellence that offers several benefits for organizations, such as an increase in their business profitability through reducing operating costs, process variability, cycle time and number of customer complaints (Alsmadi, 2012). Six Sigma is a methodology that aims to instill continuous improvement inside the organizations, which is the main pillar of Total Quality Management (TQM). There are many organizations that consider implementing Six Sigma, which means that they now have all or most of all the TQM elements (Lucas, 2002).

In Six Sigma methodology, knowledge acquisition occurs through a process of intentional knowledge, using formal methods of improvement. The targets set by the company serve as a controller of human action and teams motivation to improve projects (Linderman, 2006). The improvements result from the statistical analysis in order to find the root cause of the quality problems. The Six Sigma methodology is more than a quality control program with another name, it is a quality system that aims at reorganizing the whole approach in all aspects: productivity, communication, involvement at all levels and external activities (Fursule, 2012).

The unpredictability of production on a day-to-day basis, along with sudden problems of daily life in the workplace and the changes in their market, are pushing the Six Sigma methodology and DMAIC to be a dynamic process (Tanik, 2012). The Six Sigma not only allows the problem solving through a scientific method called DMAIC, but also stresses that the process of problem solving should be indexed to the company's strategy to maximize the company's profits (Chang, 2012). There are two major methodologies used in Six Sigma: DMAIC and DMADV. The Six Sigma DMAIC is a process that defines, measures, analyzes, improves and controls the existing processes, while Six Sigma DMADV defines, measures, analyzes, designs and verifies new processes or products that are searching for the quality level in line with Six Sigma (Akbulut-Bailey, 2012).

Organizations that implement the Six Sigma methodology have benefits in three dimensions: reducing the rate of products non-conforms, reducing operating costs and increasing value for customers and shareholders (Kumar, 2008). Swink (2012) settle that the benefits gained by organizations that have adopted the Six Sigma have compensated the investment. Swink (2012) recognize an increase in profitability in the company due to the adoption of Six Sigma, which essentially results in significantly reducing the indirect costs.

According to Kumar (2008) Six Sigma will continue to grow as a management powerful initiative to achieve and maintain operational excellence and service, and Zue (2008) recommend that for future research, the study of the interaction of Quality Management practices and Six Sigma, with Lean in a model of "organizational excellence".

THE INTEGRATION OF SIX SIGMA WITH LEAN

The Lean philosophy began with Toyota in Japan and has been implemented by many large U.S. companies, including Danaher Corporation and Harley-Davidson (Arnheiter, 2005). Rother and Shook in 1999 developed the Value Stream Mapping (VSM) with a target to be able to display the flow of value to the customer in the production area allowing to identify waste. Later Sá (2011) have proposed a model alternative to VSM designated "Waste Identification Diagrams" (WID), which allows waste to be more easily visualized in three dimensions.

Kumar (2011) refer to easing the understanding of business, processes and identifying opportunities for improvement, if the organization has already prepared their VSM. The implementation of ISO 9001 or the adoption of Lean, has largely smoothed the implementation of Six Sigma.

The lean Philosophy aims at reducing waste and improving the efficiency of processes, in order to have continuous production flow without interruption. Six Sigma is used when companies want to reduce the variance in order to improve performance, with the objective to reduce costs, cycle time and quality improvement. Dedhia (2005) states that the Lean and Six Sigma philosophy has a major financial positive impact on organizations, but to achieve success it is necessary to make sure that there is active support from the top management. The reduction of losses can be doubled when the Lean and Six Sigma philosophy is applied in a coordinated method.

Fursule (2012) also argue that simultaneously applying of Six Sigma and Lean has allowed better results than the option of separate implementation (Fursule, 2012). Twelve years ago, Johnson Technology Inc. began adopting the Lean and Six Sigma, with the aim of improving their processes. The adoption of these two methodologies, which took the name of "Lean Six Sigma" (LSS), allows reducing stock, increasing the production, improving quality, increasing customer satisfaction and increasing the market share.

Since Johnson Technology Inc. started implementing LSS, sales increased from $30 million to $205 million, while maintaining approximately 500 associates (Akbulut-Bailey, 2012).

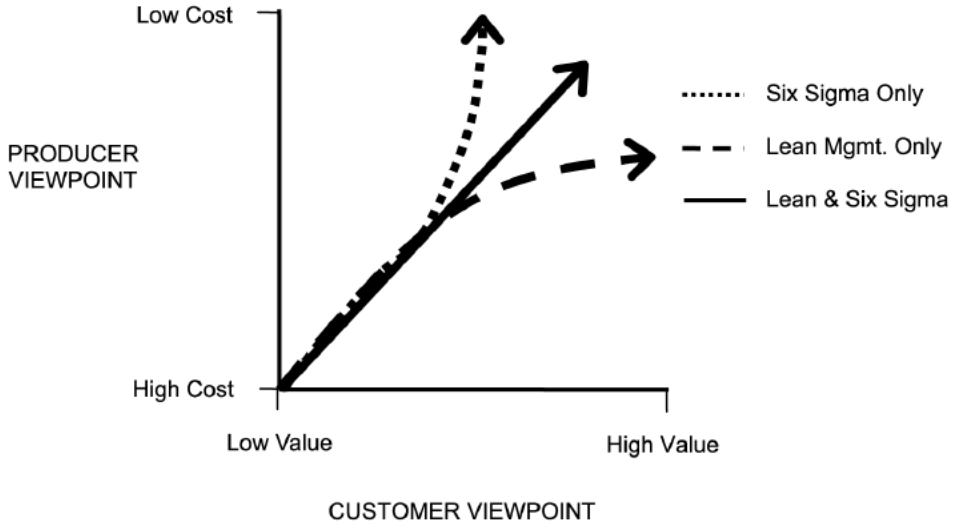

Fig.2 Nature of competitive advantage (Arnheiter, 2005)

Arnheiter (2005), in the previous figure, show the trends of Lean and Six Sigma in companies when applied separately, and when they are applied simultaneously (LSS). From that analysis we can see a clear advantage of applying LSS. The LSS is considered a powerful business strategy, as it allows organizations to reduce waste and process variability, and increase the quality of their business processes with the use of statistical tools (Lyu, 2009).

Although the definitions of TQM, Six Sigma and Lean are different, they share the same goals: reducing waste, increasing customer satisfaction and financial results. Despite Lean is slightly different from TQM and Six Sigma, Andersson (2006) also support the idea that there are great advantages in the simultaneous adoption of its concepts, because they are complementary. Andersson (2006) go even further and state that Six Sigma and Lean are excellent roadmaps, and that they can be adopted individually or combined together with the values of TQM. The TQM and Six Sigma highlight the need for companies to meet the customer requirements for the development of the product / service. Six Sigma allows studying and eliminating the origin of the variations of the processes, which allows a reduction in waste and inefficiency of the process, allowing costs reduction and profitability growth (Shafer, 2012)

GENERATING VALUE WITH TQM

In 1980 the new management practices related to the TQM philosophy began to emerge in the U.S., in a response from its industrial sector to a global competition where the Japanese company imposed its management methodologies, supported by high quality of their products and services. The implementation of TQM allowed immediate cost savings for organizations. However in developing new products, the benefits were only visible in a medium and long term. Easton shows, with his study, that positive results appear after five years from the beginning of the TQM implementation. The study also shows a sustained improvement to the overall organization in the long term (Easton, 1998).

TQM became a very popular concept in the beginning of the 1990s among researchers and experts, in order to describe how organizations should work to obtain better performance and customer satisfaction. In addition, TQM is often associated with the prominent figures within the field of quality management, for example, Deming and Juran.

In response to the great challenges that companies are facing in achieving high levels of quality, they are implementing the TQM methodology as a support pillar to achieve and maintain high levels of performance in their business environment. (Gouranourimi, 2012).

It is a jump from quality management, where the inspection of product quality for total quality management has been a challenge for organizations. TQM is a framework that supports the organizations to follow the path for business excellence with involvement of all associates at all levels of the organization (Mallur, 2012). In general, TQM is seen as a targeted approach to adding value to the customers by improving their satisfaction and by producing higher quality goods and services. TQM can also be seen as a philosophy where the whole organization is involved in continuous improvement processes (Fotopoulos, 2009). The effort to improve organizational processes is not only some departments' responsibility, but of all associates. The implementation of TQM without the engagement of top management can jeopardize the success of its implementation (Satish, 2001).

Reactive quality management or proactive quality management can be a big test for those organizations that need to reinvent their services or products and create and maintain higher levels of satisfaction with their customers. To be proactive means to understand what the

competitors and markets are doing. Identifying the benchmarks and learning from them is crucial to generate the suitable added value for all stakeholders. These benchmark activities must be the key to identify what the missing pieces are in an internal puzzle that keeps a sustainable advantage for the company.

The phrase "Quality is Free", created by Crosby in 1979 underlies the importance of the associates in problem solving that their processes deliver. This phrase applied today might be described as a warning, to all the leaders, that the quality of a product or service is the result of total quality of organization, which should be measured by its results, but also by the perception that all stakeholders have about them. At this time, the communication with these associates was an issue for many organizations because they do not understand what it means to communicate in a clear way, and did not consider receiving their suggestions for a continuous improvement.

Today we can see the mass access to education, and there are highly skilled talents in the market who they need to engage in the management of organizations. The management in organizations must continuously enhance the participation of all the associates in improvement processes inside and outside of an organization. The organizations need to continue giving all associates the space for motivation, and enabling them to use their skills and knowledge for the benefit not only for them, but also for their stakeholders. The support of top management, involvement and commitment of associates, customers focus and skills were the main factors that contributed to the success of TQM. The most important achievements after TQM implementation were better quality, better costumer perception, a cost reduction, on time delivery, increased profitability and an increase market share (Fotopoulos, 2009)

The quality of leadership, the quality of their associates and the quality of their processes are dimensions that should be considered by organizations that aspire to grow, achieve and sustain outstanding results. The customer focus, the continuous improvement and teamwork are also considered important values to the success of TQM. TQM is also a method to increase the competitive advantage, but implementing TQM comprises some patience, because changing the organizational culture implies having time until maturity is reached. Customer orientation and continuous improvement processes are the keys to TQM success (Dodangeh, 2011).

The customer relationships have become increasingly complex in global markets, interpreting and understanding their perceptions and needs requires that the organizations continuously reinvent their products and services to meet the constant demand of innovative solutions from the customers. To meet these challenges the organizations have to understand the basis for managing with agility, and attract new talents to enable them to anticipate and understand the environment that surrounds it.

The main pillar of TQM is recognizing that associates are the organizations' main assets. Their contribution in the continuous improvement process is important. The quality provided to the customer is the result of a series of processes, where many associates are involved. Using their knowledge in innovation processes should be continuously used for benefit of the organization (United Nations Industrial Development Organization, 2007).

The absence of involvement and commitment of the top management in TQM programs is one of the most important barriers to success of the TQM. Implementing this methodology without the clear support of the administration is the way to a decisive strategic failure. Implementing this approach requires some available resources that top management must provide to support this organizational change. If the management team does not get involved,

you cannot involve all associates in this mission, which will weaken the successful implementation of TQM in the organization (Soltani, 2005).

The implementation of TQM should be a strategic option for organizations. Continuous learning should be the approach that helps the organization achieve its objectives and continuously achieve sustainable competitive advantage. The TQM provides a strategic philosophy of integrated management for organizations, allowing them to achieve their goals effectively and efficiently, and to achieve a sustainable competitive advantage (Boyne, 2002).

With the involvement of all associates in continuous improvement process, the organizations need to have mechanisms that recognize and reward the associates because without the associates, there would be no organizations and no TQM. To implement employee recognition schemes based on a transparent performance evaluation and fair processes fosters the participation of all associates in continuous improvement activities with more responsibility and satisfaction. Motivated associates lead to reduced rates of absenteeism and sustain a better customer relationship. A committed employee with the organization's values has an attitude of greater cooperation with customers (Ascigil, 2005).

TQM is a model where the empowerment is given to the associates, and it is a philosophy of the entire organization that focuses on a systematic and continuous quality improvement of products, processes and services. In recent decades, TQM has been adopted worldwide, because TQM is an effective method to improve business performance (Kajiwara, 2009).

The constant search for excellence in business is one of the objectives of TQM. The work of Deming drove the development and consolidation of this methodology. Learning, business ethics, social responsibility are now also used in TQM concepts. Beyond these values integrity, transparency and honesty are also considered values practiced by excellent management (Aşcıgil, 2007).

The associates involvement, empowerment and professional development plans that allow the acquisition of new key competencies to perform their work are also associated with TQM principles. The industrial sector played a key role in the development of the philosophy of TQM, supporting their process improvements. The organizations' demand for new solutions in a production of its products led them to implement TQM as a management tool. In general, the industry sector has pioneered the implementation of TQM methodology. It was first adopted in large enterprises and, only later, by small businesses and by service organizations (Pino, 2008).

Al-Swidi, Crosby, Deming, Juran, Feigenbaum, Taguchi, Ishikawa, Groocock, with their contributions, allowed the TQM concept to gain a sustained growth over the last few years. Total Quality Management (TQM) is a management philosophy that considers all aspects of an organization. It has been gaining an increasing attention of researchers to explain how TQM can improve organizational performance in today's competitive global environment.

TQM has been considered a critical factor of competitive advantage for manufacturing and service organizations as a driver for innovation, a factor for successful change and cultural development. The associates commitment, continuous improvement and innovation are also important elements of the TQM approach.

Specifically, some critical factors of TQM as leadership, people management, process management, customer focus, have a strong effect on organizational performance. Basically, TQM is a management philosophy that continuously seeks to fulfill the customers' needs (Al-Swidi, 2011).

Cwiklicki (2010) showed in his study that Taguchi methods, Shainin methods, QFD (Quality Function Deployment), FMEA (Failure Mode and Effect Analysis) and FTA (Fault Tree Analysis) are widely used in quality planning and allow the organizations to produce with a low level of failures in their services or products. In his research he identified that 23.5% of the organizations use the Just-in-Time approach, and in second place with 21.6% are the organizations that have implemented TQM approach. These results show the importance that this methodology represents for Japanese firms in the continued pursuit of excellence.

Toyota is recognized as a reference in the TQM implementation (Cwiklicki, 2010), and it is one of the most successful companies in the world, and it has implemented the TQM as a strategic success factor in consolidating its business. The total quality management is considered essential in the competitive global market for them. The success of Japanese companies in the global market starts with the government support policies and support by the higher level of quality achieved with the support of gurus as where Deming took a prominent position.

The essence of the Deming management philosophy, which has contributed to the improvement of products and services is based on Japanese problem solving, in order to reduce costs and quality improvements, to help the organizations to gain market share from competitors (Miyagawa, 2005).

The organizations need to balance the creativity with the standardization that allows space for the creativity and innovation in order to develop new products and services with the involvement of all the talents in the organization. This approach requires flexible leaders that play a key role in promoting the adequate environment to support the generation of new ideas that can influence and shape the future of the organization.

The EFQM foundation has been a very important driver on spreading and promoting a culture inside the organizations that accepts the challenge of implementing a culture of total quality management. The EFQM foundation promotes guidance for those that have a dream to achieve higher levels of excellence. The EFQM Excellence Model, RADAR and Fundamental Concepts of Excellence are three components that were developed by organizations for organizations that help them invent new ways of working towards excellence.

The EFQM model is one of the tools used to help the organizations implement the TQM methodology successfully, and the self-assessment approach enables the organizations with a process that helps them, in a systematically way, identify areas for improvement and implement them successfully based on the best practices or benchmarks.

Miyagawa and Yoshida with his study showed that Japanese companies installed in the Chinese territory using the TQM, show better results, supporting the value of TQM in improving business performance. This study demonstrates that companies that operate in Japan or abroad, considerer using the TQM philosophy as a critical factor of success.

Deming's principles have helped the Japanese organizations on the path of sustained excellence. The Chinese government realized it was important that their industries would improve the quality of their products to be able to export to the global market and, in order to sustain these improvements, promoted various forms of implementing TQM in their companies as a pillar of the business excellence.

RESULTS AND CONCLUSIONS

When Motorola developed Six Sigma in 1986, a set of tools and strategies for process improvement that provided a common worldwide language for measuring quality, the U.S Congress established the Malcolm Baldrige National Quality Award in 1987 and a group of leading European companies founded the European Foundation for Quality Management (EFQM) in 1987 we can take this as a reaction from European and American organizations in defining new excellence management standards for their organizations allowing sustaining outstanding results and allowing it to increase its competitiveness against Japanese competitors.

The ability to anticipate changes in their environment, promoting a culture of excellence in which all assets of the organization are involved in the production of outstanding results has led many organizations to implement management methodologies based on TQM and Six Sigma. These methodologies have helped organizations develop their organizational capability to shape the future, inspire and involve their people to identify opportunities for creativity and innovation for their products or services that allow the organization to deliver continuous value propositions for their key stakeholders.

TQM and Six Sigma are both widely used process improvement tools and both produce excellent results. The main difference is that TQM is focused on the continuous improvement of processes whereas Six Sigma is focused on reducing process variation and it's normal for organizations to only use Six Sigma when the process is mature and variations become the focus. One of the most widely used TQM methodologies in Europe and some Arabic countries like Dubai is the European Excellence Model designed by EFQM.

Today, more than thirty thousand organizations in Europe are using the European Excellence Model in their management. The EFQM Model is a comprehensive framework to improve and develop all aspects of the business of an organization.

This model is one of the most comprehensive frameworks to improve and develop all aspects of the business of an organization. Based on the model, the organizations perform regular EFQM assessments that give them feedback for continuous improvement based on the best practices used by different organizations.

Another example of the importance of TQM implementation in most European countries is the National Excellence Awards. The objective of these awards is to recognize the best performing organizations, whether private, public or non-profit that used the EFQM Excellence Model in their environment.

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