

Role of Critical Success Factors Related to Six Sigma in Quality Management in Organizations

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ABSTRACT

Six Sigma is a popular tool (Anthony & Coronado 2002) as well as a well driven strategy which has been employed for reducing variability in processes (Anthony et al. 2007), thus increasing the quality of the finished product and reducing cost of after sale care of products (Harry & Schroeder 2005). The organizations have benefitted in cutting costs of processes (Ehie & Sheu 2005), by employing tools and techniques of total quality management systems, where six sigma is one component. It was first introduced in Motorola in 1986, and it has since been employed by many other corporations as well, to statistically improve performance as well as quality of products and processes. Many corporations have employed this approach and have benefited from them. Although all corporations are not able to create successful processes with employment of Six sigma, there are nevertheless many examples of projects that have benefitted from it as well. This paper systematically reviews the critical factors which influence success related to six sigma. This tool is also critically reviewed to find its importance in quality management in organizations.

Keywords

Six Sigma, Quality Management, Success factors, Organizations.

1. INTRODUCTION

Six Sigma was first introduced by Motorola in 1980s, to drive out the variability and wastage in processes, and to include quality in the products manufactured. Bill Smith, in Motorola, started this process by promoting the philosophy of Total Quality Management (TQM) (Anthony & Coronado, 2002). Six Sigma uses the principles and methods of TQM. Since Motorola, many organizations have come forward and adopted the approach to become "Six Sigma companies". They have done so by implementing training and management practices in the projects that they have undertaken. As the industry is now based upon Six Sigma's postulates, it is of utmost importance that the academic contributions should be assessed, so that its implementation becomes easier than it has been before (Badri et al. 1995). Six Sigma is a method driven approach to decrease the defects in the organization. It is a strategy that focuses on requirements of customers, enhance productivity while keeping the requirement in mind, and provide financial success nevertheless. Six Sigma statistically means that there are only 3.34 defects in one million opportunities (Anthony & Coronado 2002). This tool warrants that the company knows the processes in and out, so that the chance of mistakes becomes less. The Six Sigma brings sigma statistic, sigma measure and performance benchmark together, to assess the quality of the processes, making the element a quantifiable asset (Zu et al. 2008). Thus,

it gives the company a yardstick to measure their process' quality and gives them a chance to improve for the benefit of the customers as well as the company itself (Harry & Schroeder 2000). There have been many companies that have reported success in their processes, after employing the six sigma tool (Swami & Prasad 2010). As there is fierce competition among the corporations for the top spot, employment of Six Sigma to improve quality by implementing the tool in their research and development wing has become the norm. Six Sigma is not a one-time process that guarantees quality; it is a continuous movement towards achieving perfection and quality in the processes undertaken and the product created (Anthony & Coronado 2002). Six sigma is one of the most critical processes, along with being the costliest one in terms of adaptation. However, majority of corporations and managers use this tool to improve their product's quality and thus enhance the satisfaction of their clients. This is mainly done to retain the loyalty of the customers and emerge as a world class company among the competitors. Six Sigma is widely used in corporations established in the field of IT services, banking, engineering research and hardware manufacture and production (Badri et al. 1995). Six Sigma can be employed by a variety of methods, but it is successful in the event that the factors responsible for its success are determined well before its application. This is because if the success factors are not analyzed and the process fails, the time, money and intellectual assets invested in the project will be wasted. Hence, the organizations that employ Six Sigma to improve the quality of any process or product it develops need to study the critical factors that are inherently related to that improvement in quality (Black & Potter 1996).

2. PROBLEM STATEMENT

Six Sigma is a strategy as well as a tool to assess quality standards of the company's processes and products, and it has factors that drive towards success or failure of those same processes and products. However, a one-time implementation of Six Sigma does not warrant assured quality standards of the company. The processes need to be assessed periodically and there needs to be a continuous effort towards the achievement of perfection (Harry & Schroeder 2000). To achieve this, the company needs to produce products and offer services that carry on satisfying customers and their needs, as well as meeting the requirements of the market and remaining in trend. The company furthermore, needs to be vigilant at all times and be aware about the changing market scenario. Apart from this, the company needs to be flexible enough to introduce quick changes in the organizational as well as production structures. This requires in-depth analysis of the structure of the production process and constant updating of organizational work ethic (Badri et al. 1995). Thus, Six Sigma's challenge is being in the position to be able to

constantly measure company's present performance against the ever changing requirements of customer and trends of market, even while being on the edge to develop the abilities of the organizational for creating something out of the box to be at the top of the game among the competitors. If a company is able to perform this feat, then the company is said to be a well modelled company, abiding by the rules of Six Sigma. To achieve this, the company needs to be aware of the critical factors for providing quality and gaining success. This review, thus, attempts to study these critical factors in an attempt to guide companies that aspire to become the next "Six Sigma Company" (Black & Potter 1996).

3. AIM AND OBJECTIVES

The main aim of this review is to study the role of critical factors that are related to the successful implementation of six sigma process to gain quality management in any company. It also aims to study how these factors affect the process' success or failure in the organization. The objectives of this review are:

- a. To understand the critical factor associated with the implementation of the six-sigma process.
- b. To find out how these factors are associated with the success of any process it is being applied to.
- c. To study the main importance of these factors, and how they affect the quality.
- d. To explore the ways quality is achieved in management with the implementation of Six Sigma.
- e. To know how the organization can contribute towards the achievement of quality, which departments can help in six sigma implementation and how a company can acquire the status of Six Sigma company.

4. LITERATURE REVIEW

4.1 Role of Six sigma in Quality Management

Sigma is a measurement for the statistical concept of normal distribution, which was introduced by Frederick Gauss (Chakrabarty & Tan 2009). Walter Andrew Shewhart was the person who, in 1922, introduced the concept of Three Sigma to measure the output variation of a process (Chakrabarty & Tan 2007). Six Sigma is the concept for the development and quality improvement of management processes. It was developed by the philosophies of Edwards Deming and Joseph Juran (Sadraoui et al. 2010). Six sigma's main strength comes from its correct implementation, as it involves components of both management as well as technical aspects (Mahanti & Antony 2009). Management vertical of Six Sigma includes choosing right personnel for the conduction of the program, choosing the correct process parameters, and providing education and training to the persons (Mahanti & Antony 2009). On the technical vertical, the tools and processes are taken into account. These statistical tools are used for process improvement, which aims to reduce the output variation and improve quality (Mahanti & Antony 2009). Six Sigma is responsible for increasing the figures on a balance sheet of a company. It has been seen in organizations like Motorola, Allied Signal and General Electric that Six Sigma implementation has helped them in improving quality by reducing defect levels, decreasing time for introduction of new products, decreasing costs of manufacturing and increasing savings up to \$1 billion. These management and technical components represent the critical factors which are

important to the success of a Six Sigma implementation. Thus, the main role of Six Sigma is to improve the level of quality by decreasing the chances of mistakes in the production of products and implementation of processes. Six Sigma helps in effective quality management, betterment of services to the customers, enhanced returns to the company and effective control over the process variables while manufacturing and processing of products and services. To enhance the effectiveness of Six Sigma implementation, identification of critical success factors is a must (Rahman et al. 2010).

4.2 Overview of critical success factors for implementation of Six Sigma

The success of any process is due to the factors and critical process variables that are present upon its implementation. If the process variables are optimized carefully, the success of a process is certain. There have been many studies that have researched into critical factors involved in successful implementation of Six Sigma in quality management. Anthony & Coronado (2002) carried out a study titled "Key ingredients for the successful implementation of Six Sigma Program". They conducted a Cronbach's alpha test on the companies based in the United Kingdom to find out the key ingredients for their success. All the companies chosen were practicing the Six Sigma approach. A questionnaire was developed for the study that had two main sections, one pertaining to the background of their respective companies and the second concerning the key ingredients they believed were responsible for their success. The respondents were quality directors, project and quality managers of the companies based in UK. 300 questionnaires were sent out and the result was generated from the 111 questionnaires that were satisfactorily completed. Results showed that the metrics used by companies practicing principles of six sigma are process capability, defect rates, customer complaints, percentage of scrap and, cost of poor quality. These metrics were used to improve the process in the companies and were used as a metric to calculate their quality level in the market. The key ingredients found in the survey are as follows: commitment and involvement of management; understanding the principles, tools and techniques, and methodology of Six Sigma; relation of six sigma to business strategy; relation of six sigma to customers; process of selection, tracking and reviewing of projects; cultural and organizational structure; training and skills relating to project management; and linking of six sigma to employees as well as suppliers. Another study carried out by Anthony et al. (2007) titled "Six Sigma in Service Organizations", conducted a postal survey involving questionnaire where the questions were framed by conducting literature survey on TQM and Six Sigma. The questionnaires were designed by framing questions sourced from the literature survey done. These questionnaires were sent to 200 service companies in the United Kingdom, which were using Six Sigma strategies. The industries included were of a variety of sectors, including healthcare, IT, insurance, recruitment consultancy etc. The respondents were Black belts and Six Sigma champions, general and quality managers, HR managers and employees. These respondents were asked to rate the factors in the questionnaire on a scale of 1 to 5, based on how likely their organization used that factor. The results showed that the sigma quality level of organizations surveyed was around 2.8 (approximately 98,000 DPMO). The main critical success factors were found to be: focus on customers; involvement and commitment of management, business strategy's link with six sigma; skills of project management team; organizational culture; and understanding the

methodology of Six Sigma. These factors are required for successful implementation, processing and utilization of Six Sigma strategy. Critical success factors were also studied by Swami & Prasad (2010) in the study titled “Critical Success factors for Six Sigma Implementation”. The objective of their study was to find out the critical success factors of implementation of Six Sigma and to understand their importance in quality management. This study was conducted in the months of October to December 2009, and the respondents of this survey were belt holders of Six Sigma (24 black belts, 10 green belts and 18 yellow belts, respectively) in industries based in Hyderabad and Secunderabad, India. Questionnaires were developed and 52 out of 60 questionnaires distributed were used to infer findings for the study. The questionnaire expected the respondents to express views regarding the strategy of Six Sigma, its concept and the main success factors they think are important for quality management. Critical factors like quality commitment, top management and their leadership skills, strategic planning, system for developed training, voice of customer and intent to satisfy customers were also mentioned so that the respondents could rate them to get a consensus for quality management. These factors were also mentioned so that the authors could also infer whether or not any change is observed in the success parameters of a process by enhancing quality by Six Sigma; and whether there exists any relationships among these factors to drive quality to higher levels. Results of this study revealed that the factors which were rated as being critical success factors for implementation of six sigma strategy are strategic planning (before quality implementation), commitment of leaders for leadership, work culture of the organization, implementing the feedback received from VoC (Voice of the Customer) and contribution of effective process parameters. A study carried out by Leong & Teh (2012) titled “Critical Success Factors of Six Sigma in Original Equipment Manufacturer Company in Malaysia”. This paper’s main aim was to understand the importance of critical success factors in the implementation of Six Sigma for quality management. The five factors that were studied were– involvement of top management, their commitment towards perfection, education and training of employees to develop qualified and skilled labour, inclusion and teamwork to conduct processes, the organizational culture, and infrastructure of the organization. Survey was conducted and data was collected from 102 employees including the heads of various departments, executives, and other employees from a famous company of Malaysia. The company selected was the one which has implemented Six Sigma approaches in their processes since 1996. Data analysis was done by multiple regression analysis. The findings of the study showed that involvement and commitment of top management was positively related to implementation of Six Sigma. The same was seen in case of training and education. On the other hand, teamwork was one factor that was negatively correlated with Six Sigma implementation. This study was an important one to observe the critical success factors of Six Sigma. These factors were also important for the implementation and adoption of Six Sigma in practice in industries and organizations. The findings of these studies were a way to provide a basic knowledge to gain insight in the implementation of Six Sigma. The industrial management needs to focus on the involvement of their management executives and ensure their commitment to the process. Training of employees is also important so that the implementation of Six Sigma is effective. There is a lot of effect seen when top management involves them in the project and effective training is imparted. This study also reveals that

organizational culture needs to be conducive of implementation of Six Sigma. Teamwork is seen to inhibit the successful implementation of Six Sigma in the industry.

Table 1. Summarize the findings of the table with author name

S.No.	Author and Year	Findings
1	Anthony & Coronado (2002)	Critical success factors found were– commitment and involvement of management; understanding the principles, tools and techniques, and methodology of Six Sigma; relation of six sigma to business strategy; relation of six sigma to customers; process of selection, tracking and reviewing of projects; cultural and organizational structure; training and skills relating to project management; and linking of six sigma to employees as well as suppliers
2	Anthony et al. (2007)	The main critical success factors were found to be– focus on customers; involvement and commitment of management, business strategy’s link with six sigma; skills of project management team; organizational culture; and understanding the methodology of Six Sigma.
3	Swami & Prasad (2010)	The critical success factors for implementation of six sigma strategy were– strategic planning (before quality implementation), commitment of leaders for leadership, work culture of the organization, implementing the feedback received from VoC (Voice of the Customer) and contribution of effective process parameters.
4	Leong & Teh (2012)	This study revealed that involvement and commitment of top management as well as training and education was positively related to implementation of Six Sigma. Conversely, teamwork was one factor that was negatively correlated with Six Sigma implementation

5. CONCLUSIONS

Six Sigma and its implementation have been widely considered to be a stepping stone of a business towards attainment of perfection. The strategy to improve business, to gain better profits and to achieve excellence through service rendered is the main aim of Six Sigma implementation. This implementation is the basis for achievement of quality management. Six Sigma refers to the use of statistical as well as non-statistical tools to improve quality in the processes undertaken by companies of varied fields. Use of Six Sigma strategy is gaining much popularity organizations aiming to provide world class services to the customers. Even manufacturing companies are concentrating on six sigma strategies so that they can achieve maximum profits on the amount and time they have invested in production. The reviews on this topic have revealed that the present as well as

future focus of implementation of Six Sigma will gain popularity and will be the main reason for financial benefit in the different sectors. This review has brought forth the main critical success factors that are present and find implications in the strategies of Six Sigma in service settings. The role of Six Sigma in organizations helps them to succeed better professionally, gain better returns and have a good image in the market. It has been observed that leadership and work culture is the main factor responsible for the success of the organization. This critical factor highlights that until organizations doesn't follow good leadership policies and not change their organizational culture, it cannot aim to see itself as a "Six Sigma company". Other success factors for quality management through Six Sigma are effective process management, which includes process operations, suggestion of employees along with customer feedback. Customer satisfaction and loyalty is the main aim of a company and striving for quality is to gain this satisfaction and loyalty. Six Sigma process plays a very important role in ensuring these factors to an organization. Customer feedback, when taken positively and changes implemented, leads to the success of the organization and high level of customer satisfaction. Thus, the critical success factors of six sigma implementation are more or less similar to the other management success factors, with some basic differences. The main point that differentiates Six Sigma is the inclusion of metrics and tools for training. The implementation of the process of Six Sigma is tough, and to achieve it is a matter of pride and honor for the company

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