A Review On Issues For Implementation Of Six Sigma By Small And Medium Enterprises

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Abstract- The present work is an attempt to capture the issues for implementation of Six Sigma and improve understanding with the Six Sigma philosophy in small medium enterprises as well as to document issues such as barriers and critical success factors and also listed benefits for implementation of Six Sigma and to highlight important issues which affects the performance of an organization through a systematic literature review. The methodology includes focusing key research papers related to Six Sigma in small medium enterprises (SMEs) and then reviewing each paper identified.

Keywords – Six sigma, SMEs, Critical Success Factors (CSFs), barriers, benefits of Six Sigma.

I. INTRODUCTION

All the organizations need to improve their production, product, services and management processes in order to survive long time in the market. This can be achieved by minimizing defects, improving processes, reduction in process variability, increasing customer satisfaction, reduction in costs, increased profits, improve product quality and enhance productivity [1]. Earlier, organizations used many improvement tools and techniques to fulfill their needs but now a day, Six Sigma initiative has been used as the latest management tool to enhance the performance of an organization or reorganize old quality management practices. At first glance Six Sigma focuses on quality management approaches [2]. After many years of experience with quality initiative such as TQM and Six Sigma, there is now according to scientific research in regard to the experience of many industries implementing tools and techniques or major programs such as Six Sigma. Researchers all over the world have found that successful implementation of Six Sigma involves targeting on a small number of high purchase particulars. Incorporating ingredients from the work of some quality innovators, Six Sigma aims for virtually error free business performance [3].

Six Sigma programme developed in 1980s by Bill Smith, Motorola engineer as a response to the requirement for reducing defects and improving quality of their products. The CEO, Bob Galvin, was impressed positively by the ahead of time successes, and under his leadership, company Motorola began to implement Six Sigma over the organization, focusing on manufacturing processes and systems [4].

Motorola built Six Sigma as improvement initiative in process and product both. The Six Sigma concept was enormously successful at Motorola. It has been calculated that they reduced defects on semiconductor devices by 94% between 1987 and 1993. Recently, Six Sigma has disperse widely beyond Motorola and has become a programme for getting higher corporate business performance by both reducing costs, improving quality and extending markets for services and products. Thousands of organizations both small and large has been adopted Six Sigma for getting benefits. Many organizations across the world have benefited by implementation of this programme and it has enhanced quality of product and improved the customer satisfaction. Few decades' history of Six Sigma program reveals that if it is implemented smoothly and properly then it can give very high rate of return on their investment. The world-class organizations such as Johnson & Johnson, General Electric, Honeywell, Motorola, and many more others have adopted Six Sigma and the output put or results achieved by them are known

to the world [5]. Increase competition in world organizations has led to a pressure on profit margins, and the small industries more focus on cost and their leaders are trying to become more and more cost efficient and organizations think about adopting the Six Sigma program such that they can enhance their performance or effectiveness to a larger extent.

Firstly, Six Sigma program places a main focus on bottom-line impact in savings of hard dollar. Six Sigma project will be approved when the team of experts determines the savings generated from the project. Second, Six Sigma has been implemented very successful in both human aspects (training, culture change, customer focus, etc.) and process aspects (variation reduction, process stability, capability, etc.) of continuous improvement. Third, Six Sigma methodology (define-measure-analyze-measure-control or DMAIC) links the customer, tools and techniques in a successive manner. Finally, Six Sigma develops a great infrastructure for training of champions, black belts, master black belts, green belts and yellow belts [6].

Although Six Sigma has been implemented with great success in many large organizations, there is still less documented evidence of its implementation in smaller organizations. Due to increase importance of supply chain management issues in global market environment, large firms are mostly dependent on small medium sized enterprises (SMEs) for providing of high quality products and/or services at low costs. The continuously increasing demand for high quality products at low prize and highly capable business processes by large organizations has left no choice on the SMEs to consider the introduction of six sigma business strategy.

The paper is mainly focused to capture the issues for implementation of Six Sigma and improve agreement with the Six Sigma philosophy in small medium and enterprises as well as to document benefits, barriers and critical success factors for implementation of Six Sigma and to highlight critical issues which affects the performance of an organization through a systematic literature review.

II. Small and Medium Enterprises

A. What are SMEs? –

SMEs are defined as independent, non-subsidiary firms which employ fewer than a given number of employees. According to national statistical systems, this number varies. In the European Union, the upper limit is 250 employees. However, some countries set the limit at 200 employees, while the US considers SMEs to include firms with fewer than 500 employees. Small firms are generally those with fewer than 50 employees, while micro-enterprises have at most ten, or in some cases five, workers. Financial assets are also used to define SMEs. In the European Union, SMEs must have an annual turnover of EUR 40 million or less and/or a balance-sheet valuation not exceeding EUR 27 million.

B. Strengths of Small and medium enterprises –

Strengths of Small and medium enterprises are as follows [6, 28]-

1. Flexible system and hence changes can be innovated quickly.
2. Flat with fewer departmental interfaces and some layers of management.
3. Top management extremely visible and hence furnish leadership.
4. Tend to have high employee allegiance.
5. Operatives and managers are directly involved with the customers.
6. Very fast carrying into action and implementation of decisions.
7. Focus on training programs.
8. Culture of learning new and change accordingly rather than control.
9. It is people oriented.
10. More innovative to understand and meet customers' demand.
11. Likely to deploy improvements and achieve quick benefits.

C. Weaknesses of Small and medium enterprises –

Weaknesses of Small and medium enterprises are as follows [6, 28]-

1. Focus is on operations instead of planning.
2. Low degree of standardization and formalization
3. There are chances to lay off employees by management when the work becomes unsatisfactory.
4. In IT sector, there is limited investment
5. Due to some constraints such as budget and resources, no bonus or reward programs in many cases.
6. Lack of planning with strategy.
7. For short-term profitability, Decisions are generally made as per responsibility.
8. Lack of knowledge, resources and time; no specific budget for training.

9. It is not systems oriented.
10. Extent of staff development programs and training is limited in SMEs.

III. Critical Success Factors of Six Sigma Implementation in SMEs

Critical success factors (CSFs) are those factors that are critical to the success of any organization, it means that if objectives of any organization depended on the factors are targeted; the organization must fail [7], according to the many researchers critical success factors defined in various ways in literature [8, 9, 10]. Critical success factors play very important role for implementation of Six Sigma in various industries which can save huge amount of money after its implementation.

Factors for implementation of Six Sigma those are critical to the success of any organization identified from literature and listed below [6, 11, 12, 13, 14]-

1. Management commitment, involvement and participation
2. Linkage between Six Sigma and employee
3. Communication
4. Linkage between Six Sigma and customer
5. Better selection of project
6. Linkage between Six Sigma and supplier
7. Linkage between Six Sigma and business strategy
8. Management skill
9. Infrastructure of an organization
10. Training and education
11. Cultural change
12. Knowledge of Six Sigma Methodology

As per the survey of various industries by the researchers and stated that the management commitment, involvement and participation, Linkage between Six Sigma and business strategy and Linkage between Six Sigma and customer of an organization are ameliorate critical success factors for successful implementation of Six Sigma within UK manufacturing SMEs in comparison with others [6]. Organizations mainly focus on those critical factors which are playing more important role than others.

Indian automobile sectors proposed various critical success factors such as linking Six Sigma to customers; training; linking Six Sigma to customers; project prioritization and selection are ranked as topped by the survey of Six Sigma implementation and followed by cultural change and project management skills came. Involvement of management and understanding Six Sigma methodology put up. Organizational infrastructure and linking Six Sigma to business strategy are also ranked as more significant than linking Six Sigma to suppliers and employees. This indicates that Six Sigma programme in organizations have not linked to its suppliers and employees [24]. Sambhe R. U. et. al. [25, 26] moved on implementation of Six Sigma in medium sized Indian automotive companies. They considered various CSFs for their study; analysis indicates that team selection and top management commitment and leadership for Six Sigma project were ranked as most critical factors for successful Six Sigma implementation.

Rajeshkumar U. Sambhe [29] criticized the success factors of implementation of the Six Sigma and highlighted critical success factors consideration at disparate scenario, criteria of project selection for Six Sigma initiative to achieve extreme profits from the business.

Burton and Sams [27] documented sixteen key essentials, which were said to be critical success factors in implementing Six Sigma. These are identification of the need, provide leadership support and commitment, develop Six Sigma strategy and a plan for deployment, link to the business strategy and plan, incorporate organization wide scope, develop communication and awareness effort, make proper investment in resources, focus on customer and results, implement regulated program management, structure around the organization's needs, build a teaming and employee involvement culture, manage controversy and confrontation, implement a structured project closeout process, demand frequent measurement and feedback, provide recognition and rewards and leverage successes and stay the course. They conceive that these success factors have to be in place for implementing Six Sigma successfully, not just use of Six Sigma tools and DMAIC methodology.

It can be seen that identified critical success factors always help in implementation of Six Sigma in SMEs and questionnaire constructed for the survey of these factors by many researchers [6, 13, 14, 15], these questions mainly based on those factors which are placed above and distributed it to indentified small medium enterprises for evaluation of research gaps in critical success factors. To fill these gaps is the new challenge for researchers. Data for analysis can be collected from various industries by either online survey or structured and semi structured interview conducted or both methods. Collected data can be analyzed by statistical software, researchers has been

differentiate CSFs involvement in SMEs [6] and identified most severe CSFs for implementation of Six Sigma in small medium enterprises.

IV. BARRIERS OF SIX SIGMA IMPLEMENTATION IN SMEs

Since its origin Six Sigma tools and techniques has been generally applicable and concerned with large organizations. Some growing medium size organizations have also benefited from Six Sigma tools and techniques. These organizations are getting huge cost savings and satisfactory growth by Six Sigma implementation. However, application of Six Sigma program is less evident in the literatures in small medium enterprises due to many barriers for implementing Six Sigma by SMEs include lack of proper guidance from executives cultural change, lack of knowledge and skills of the system to take initiative for improvement, lack of resources, poor selection of projects, cost issues, and low training from high level executives [5].

From the survey in UK small medium sized enterprises [14] it can be said that lack of resources was critical barrier to Six Sigma implementation in SMEs followed by others such as poor participation of employee, lack of training and knowledge, internal resistance, lack of executive commitment etc. also played very important role in Six Sigma implementation by SMEs [6, 13]. To make the framework more suitable and applicable for SMEs, the organization had reduced various issues, which have been incorporated into each phase of the six sigma methodology. Lack of knowledge was also most important barrier for implementation of Six Sigma program [16].

The basic of Six Sigma methodology was developed by "Juran Tribology" used to attain most beneficial quality results. After successful implementation of Six Sigma, it helps organizations to minimize defects in all processes, products and services and concentrating on the financial matter of an organization. Six Sigma projects call for lot of skilled persons and expertise to run efficiently or effectively. It is very necessary to know Six Sigma and their methodology at different stages of an organization for saving huge amount of money.

All organizations need to improve their performance and require cultural change for remain competitive in the market but employees of their organization may not be satisfied to change the culture. Due to cultural change many problems and issues arise within an organization should be managed by excellent manager for successful implementation of initiative.

The key barrier to the implementation of Six Sigma in small medium enterprises has become lack of training and guiding for successful completion of project, training program for each employee should be started by company but training program was too costly for SMEs [17]. Now a day, it is very easier in SMEs to get better external resources for guidance without paying more cost [18].

V. BENEFITS OF SIX SIGMA IMPLEMENTATION IN SMEs

Many organizations have taken benefits by implementing Six Sigma in small medium enterprises such as reduction in process variability, reduce cost of operation, increase in profitability, minimize cost of poor quality, improved productivity, reduce cycle time, reduce customer complaints and sales improvement etc. [6, 14] and literature also includes status of Six Sigma in many organizations and their weaknesses and strengths of SMEs. Mostly Six Sigma programs have implemented to distinguish the organization from others by accounting net benefits from Six Sigma projects [19].

Six Sigma implemented carefully in SMEs, to assure that benefits generated from project of Six Sigma are sustained for long time [20]. Most of the benefits achieved by Six Sigma implementation related to prevention and reduction of the defects which affects both processes and products quality [21]. It was found that huge amount of money can be saved and profit may be increased by controlling rejection rate of chain bush in its manufacturing organization [22]. Benefits of Six Sigma implementation have been reported by large, medium and smaller organizations. Literature also has evident that small medium enterprises have given less importance to quality culture [23].

VI. CONCLUSIONS

From review of literatures, author documented various issues of Six Sigma implementation within the small medium sized enterprises. The project selection is the most important issue but satisfaction of customer and financial benefits generated from project can have key focus as main targets of project selection criteria for Six Sigma implementation. Two key constraint in implementation of Six Sigma in SMEs which are human and financial resources. Many literatures show that the top management commitment is a key factor which plays very important role in critical to success in implementation of Six Sigma methodology.

Author also documented strengths and weaknesses of SMEs along with benefits achieved from Six Sigma programme and barriers of Six Sigma implementation in SMEs. In literatures, it can be seen that the lack of resources is critical barrier to Six Sigma implementation in SMEs and lack of knowledge is the most important

barrier for implementation of Six Sigma programme but the leadership issue is also crucial for the failure or success of implementation of Six Sigma. Improvement in all processes/services by reducing defects can enhance savings or increase profit of an organization has shown in literature.

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