Developing readiness index for Critical Success Factors for lean Six Sigma in service organization

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Abstract

This study intend to develop a readiness index that rates organizational readiness to realize the success factors of implementing Lean Six Sigma model. The study focus mainly on five factors including employee training, managerial involvement and commitment, clear linkage of Six Sigma to customer-facing goals, linkage of Six Sigma to business strategies, and cultural change. We found that implementing lean Six Sigma lead organizations to a better performance due to the concept of eliminating waste and improvement of procedures.

Introduction

Six sigma provides a framework to improve business processes by using many statistical analysis tools which will raise the performance and eliminate waste for more profitable organization. Jack Welch at General Electric 1995 implemented Six Sigma as a business strategy and after the success story of GE many companies started to implement this approach in order to achieve better financial goals. Moreover, to achieve Six Sigma approach organizational processes must keep their defects to a maximum of 3.4 per

million opportunities. Six Sigma is important as it will help organization in many Ways such as mapping processes, elimination of variation and waste, reduce defect, and continuous improvement. The project is a study of a specific aspect of business process improvement methodology. We intend to develop a readiness index that rates organizational readiness to realize the success factors of implementing Lean Six Sigma model. We chose to focus on five factors among more than 30 articles, the factors are employee training, managerial involvement and commitment, clear linkage of Six Sigma to customer-facing goals, linkage of Six Sigma to business strategies, and cultural change. The report contains different parts starting with methodology which shows how the project was improved and how the articles were selected. After that the literature review has been written to focus more about each factor and how it affects the organizations progress and performance. Finally, a survey has been conducted from the literature review in order to focus more on the results of the employees' opinion.

We found that most of them ensures that implementing lean Six Sigma will lead organizations to a better performance because of the concept of eliminating waste and improvement of procedures.

Methodology

In this research, researches and studies have been studied in different sectors to identify the most critical success factors recognized by the researchers in the world. The aim was to build a model for implementing lean Six Sigma in service industry in UAE based on the top five critical factors. To that, thirty articles have been read and a selection of twenty different factors in multiple publications from 2002 to date have been done. To be more specific, the most repetitive factors have been selected as shown in below table which

were management involvement and commitment, training, Culture change, linking Six Sigma to customer and linking Six Sigma to strategy, and the articles that give us a deeper understanding for each factor in developing and developed countries with variety of sectors have been picked.

Number	Critical Success Factor	Frequency
1	Management involvement and commitment.	17
2	Understanding tools and methods for Six Sigma.	3
3	Linking Six Sigma to business strategy.	14
4	Linking Six Sigma to customer.	10
5	Project management skills.	11
6	Project selection and tracking.	6
7	Cultural change.	16
8	Organizational infrastructure.	9
9	Linking Six Sigma to suppliers.	6
10	Training.	18
11	Linking Six Sigma to human resources.	6
12	Communication	8
13	education	7

14	teamwork team design	7
15	IT	4
16	Six Sigma consultants	2
17	Manufacturing strategy	2
18	Process category	3
19	Leadership	6

Frequencies of critical success factors

- 1 Management involvement and commitment.
- 2 Understanding tools and methods for six sigma.
- 3 Linking six sigma to business strategy.
- 4 Linking six sigma to customer.
- 5 Project management skills.
- 6 Project selection and tracking.
- 7 Cultural change.
- 8 Organizational infrastructure.
- 9 Linking six sigma to suppliers.
- 10 Training.
- 11 Linking six sigma to human resources.
- 12 Communication
- 13 education
- 14 teamwork team design
- 15 IT Technical know-how
- 16 Six Segma consultants
- 17 Manufacturing strategy
- 18 Process category
- 19 Leadership

Accordingly, a literature review has been prepared to sum up all the findings of covered articles and researches, and a survey based on our understanding of these studies to see the readiness of the service company employees in UAE to apply lean Six Sigma has been constructed. The sample size of the questionnaire is the employees of a service organization in UAE as they are more involved in the processes and interactions with customers. The questions provided in our survey have been presented with walk-in people to measure the clarity and understandability of the questions to a standard employee of an organization.

The questionnaire was made of 22 questions and was divided into two parts. The first part was to understand the background and demographic details of the participants. The second part was to measure the 5 most critical factors selected in our researches study which are engagement category, strategy category, culture change category, training category and customer category. The respondents were asked to determine the best order for these factors then to determine the agreement level for these factors as core factors in their organization based on Likert scale in five order scale.

Literature Review

In this section, the critical success factors have been selected in order to improve the quality of an organization which will lead to achieving the targets required to be a successful, profitable and well-organized company.

1. Training:

According to Lande, Shrivastava & et al. (2016) and Laureani & Antony (2018) education and training are critical in introducing Six Sigma in small and medium enterprises. Galloway (2008) states that “quality begins and ends with training.” emphasizing the significance of training and continuous improvement. Manville, Greatbanks & et al. (2012) states that 43% of the participants in the survey think that training and education are important to achieve lean six sigma in organization and ultimately achieve excellence.

Silva, Mergulhão & et al. (2019) states that training is essential to reduce Six Sigma time implementations in the organization and to reduce resistance from employees.

Galloway (2008) and Ismyrlis & Moschidis (2013) mentioned that the structured system of Six Sigma that is presented by the belt system requires all employees to have specific training. Not only the training employees receive should be specific, but continuous training is a requirement as well. In addition, Explaining the belt system properly to everyone in the organization is essential to make sure that everyone is speaking the same language.

Mishra (2018), Silva, Mergulhão & et al. (2019) and Antony & Banuelas (2011) agree that the basic training of Six Sigma should cover the following aspects: mapping, introduction to design of experiment, hypothesis testing, metrics and process modeling.

Problem-solving with statistics or non-statistics methods is required for Six Sigma project and must be communicated to everyone in the organization in order to assure the suitable use and understanding of the program. Finally, Appropriate training should be carried out for each belt level. As a result of the ongoing training, employees will innovate new ways to further improves processes and procedures.

Kumar (2007) presented an interesting case study about implementing Six Sigma in one of the companies in the electronics sector in the UK. They started the implementation in 2003 by training five champions, 148 yellow belts, two green belts and one black belt. In two years, the company managed to save over 250,00 pound per year. The management understood the importance of training their employees, therefore, they followed the concept of" train the trainer" by allowing the black belt to train the Green Belt and Yellow Belt levels. Therefore, Employees must be empowered by proper training to allow them to use techniques and tools in their jobs and apply knowledge in the right way. However, Antony & Banuelas (2011) states that the training for the belt system is different from organization to another and it has to be identified by the program leaders. For instance, to be accredited the black belt in Motorola, candidates usually require a one-year training to showcase their knowledge in Six Sigma and how they practice it. However, in GE, candidates only need up to twenty weeks of training to be accredited the black-belt.

Finally, Mishra (2018) and Leong & The (2012) agree that managers need to commit and involve themselves in the implementation activities of Six Sigma for it to be successful in the organization. Top management should allow employees the free time they need to attend training workshops and seminars because developing their skills and knowledge

are important contributors to their day-to-day operations and problem-solving. As long as employees are given enough time to understand and execute the basic resources, they will achieve economic, environmental and social performances.

2. Management involvement and commitment:

Top management involvement means commitment and continuous support from the top management toward employees where the employees should be directed by all levels of managers and directors of companies implementing six sigma and lean six sigma. It also stresses the involvement and participation of employees in the process of decisions making because the six sigma and LSS programs are dependent on the cross functional teams to implement it and insure its success. So If that factor didn't pass in the right track the whole process will fail.(Antony & Banuelas, 2011)

Antony and Banuelas (2011) agreed that the top management and involvement is the major important factor in implementing six sigma in UK. They did a research on 300 SME companies in UK in the service industry, the quality managers of the sample companies gave more weight and importance to top management and involvement for six sigma programs success. This has been agreed by many other authors and researchers who researched different sectors in different parts in the world.

However, A. Shahin (2010) disagreed in his study on the Iranian manufacturing sector and stressed that the top management and involvement comes in the third rank where the understanding methodology and techniques of six sigma and linking six sigma to the customer come in the first rank.

On the other hand, Zahid Shah and Asfa Din (2016) did their study on Pakistani companies at different sectors and at different scales and found that the large companies consider top management and involvement as the most critical success factor for six sigma. However, they found the small companies as well as service companies are not considering it as the most critical factor.

In a survey by Silva, Mergulhão, Favoretto and Mendes (2018) on 45 Brazilian manufacturing and services companies, they summarised five different categories as critical success factors which are data availability, prior infrastructure and training, goals and gains, implementation of the solution to resistance of change. They reinforced the importance of the top management involvement; however, it goes hand by hand with real data and statistical analysis to these data which shall enable managers to base their decisions on factual information not personal judgments or opinions.

However, Alidrisi (2014) argued in his case study which was directed towards car companies employees in Saudi Arabia that all six sigma factors are all linkage variables and all are important in implementation of six sigma, however he identified education and training and understanding tools and techniques as more dominant than other critical success factors since they were drifting more towards independent variables.

Accordingly, most researchers drift towards agreeing to the importance of total employees' involvement (top-down management) as it links them directly to the organization's vision and mission which should be in line with company direction and ultimate goal.

3. Linking Six Sigma to customer

Alhuraish, Robledo, and Kobi (2014) explored the implementation of Six Sigma by small and medium-sized enterprises in France as drivers of business success. According to the article, six sigma is strongly linked with customers because it plays a critical role in improving the quality of the products and services offered by the business. Alhuraish, Robledo, and Kobi (2014) argue that six sigma provides a platform for companies to unite different quality tools, including DMAIC and statistical process controls to improve the quality of the products and services offered to the customers. Moreover, the tool enables a business to identify and eliminate non-value adding activities in its operations. The link between six sigma and customers in this case is that customers are in continuous track of the highest quality products and services offered by different business organizations. Six Sigma through the improvement of the quality of products and services increases the levels of customer satisfaction. Customer satisfaction is strongly driven by six sigma because of the improved product and service quality results in the realization of high usefulness by the customers. The tools can also contribute to increase customer loyalty as a result of the high levels of satisfaction achieved. So overall, we can see that implementing six sigma tools will drive to customer satisfaction which will lead to have loyal customers.

The link between six sigma and customers according to Gošnik and Vujica-Herzog (2010), is in the tool's focus on the identification and elimination of defects in all business processes which are influenced to customers. For companies to gain and maintain sustainability and competitiveness in such environments they continuously leverage the

tools of six sigma in the formulation of their strategies to offer the desired product and service qualities.

Chelangat (2016) explored the success factors of six sigma in the Kenyan banking sector. It highlights the management and leadership of commercial banks in Kenya are continuously focused on achieving the highest levels of customer satisfaction. The article links the tool to customers by repeating that business organizations can influence the concept to set their focus on daily activities to achieve increased levels of customer satisfaction. Overall, the tool facilitates the improvement of business process efficiency in a bid to improve the quality of services provided and increase the benefits received by the customers which will lead at the end to improve customer satisfaction.

Antony and Cudney (2016) explored the role of six sigma in higher education institutions in the UK to ascertain its relevance. In the analysis, the authors linked the tool to the customers by arguing that it contributes significantly to the improvement of efficiency and effectiveness in the provision of services in institutions of higher education. The application of the tool results in improved customer satisfaction because it sensitizes the institutions to remain focused on their customers and the provision of efficient services.

4. Cultural change

In many articles [1-15], Six Sigma is a cultural breakthrough management idea because it affects the organization to change in its culture and in the performances of employees. Moreover, it shows that creating the change is by transferring behaviors and values of the employees beside the results of sharing experiences and needed knowledge to develop their skills and abilities. Nevertheless, the culture will change by having practical and systematic DMAIC to be ready to solve the problems within the system by making SMART organizational goals

S= Simple ^[L]_[SEP] M= Measurable A= Achievable R= Realistic ^[L]_[SEP] T= Time bound.

According to [8] creating changes in the culture of company by changing the top managements, having advanced training and involving the reward and recognition culture between employees.

Employees have the difficulty to change and saw it as a difficult and very hard to turn to new practices. As a result, this will create a hard resistance by which they will believe in two statements “we have tried it before” or “we are in the system for last so many years” [9].

From different articles such as [1-15] it has been summarized that there are four different factors will cause the resistance for people to accept to change their cultures. Firstly, the technical struggles which will need more training and education to overcome this factor. Secondly, the political causes which is seeking to find solutions to be implemented as real, imagined or loss. Overcoming that by create the sense of urgent and let the employees feels the needs to change and how that will be beneficial to them. Individual factors are considered to be the third factor which are shown within their own

problems that won't let them be able to change. Listening and showing empathy to their problems will reduce the effects of this factor. Lastly, organizational factor which is depending on the shared beliefs and strategical goals within the company and that can be spread by having better communication from top management to the worked employees to know where the organization going towards. Better example to perfectly deal with employee's resistance in organizational culture is within GE Welsh who creates a systematic way such as investing on training, showing the important of rewards and recognition systems, changing the top management, being proactive and better communicating with employees. [1] [SEP]

On other hand, based on Jiju Antony & Elizabeth A. Cudney (2016), the cultural change is considered to be under leadership not an individual factor. Zahid Abbass and Asfa Muhammad (2016) shows that implementing lean six sigma will create a positive culture between employees to deliver the requirements for a project in proper attitudes.

5. Linking Six Sigma to business Strategy:

Previous studies [18-25] mentioned that it is critical to link six sigma project to business strategy. Most businesses have a goal of achieving profitability, and therefore, Six Sigma projects are selected based on the financial achievements. Also, the articles highlighted the importance of linking Six Sigma to business strategy and urging that each decision and action should be taken based on the organization's strategy.

Studies on [16-26] stated that organizations must choose the right business strategies to avoid problems while implementing Six Sigma. Moreover, Six Sigma should be integrated in the organization business strategy to ultimately achieve business goals. Six Sigma requires commitment to business strategy rather than implementing few tools and

techniques for quality improvement purposes. Finally, Six Sigma projects and activities must be clear in how it is linked to business strategies and how it can achieve the organization's goals.

Ibrahim et al. (2014) studied the key success factors that are involved with the implementation of both the Lean and Six Sigma methodologies. The researchers specifically investigated how these methodologies provide employment and added value among small and medium enterprises in France. The study addressed such factors as managerial involvement, leadership, and supply chain integration and sought thereby to discover the commonalities and differences between Lean and Six Sigma as far as their ability to improve business efficiency is concerned. The team determined that both methodologies were able to contribute significantly to the improvement of organizational performance. They seem especially effective in waste reduction and elimination of intra-organizational variation, thereby improving product quality and customer satisfaction.

Gosnik and Vujica-Herzog (2010) studied one hundred manufacturing companies throughout Slovenia to investigate their respective implementations of Six Sigma and their individual experiences. The team noted that the biggest challenge facing these companies is maintaining product quality and customer satisfaction. Many firms are unaware of the benefits that can derive from applying a formalized business process improvement methodology. The team also found that many firms experimenting with Six Sigma found that they lacked the resources faithfully and reliably to implement the program. Their position may admittedly be biased by their failure fully to understand the complex relationship among customer satisfaction, process management, and cost control.

CSF Readiness Index in Service Industry

Thank you for giving us your time to participate in filling this survey and hope you will give honest and open answers. Your answers will be dealt in total confidentiality.

1. Demography:

1. Please select your gender:

- ☐ Male
- ☐ Female

2. Please select your age:

- ☐ Less than 18
- ☐ 18-24
- ☐ 25-34
- ☐ 35-44
- ☐ 45-54
- ☐ 55 and over

3. Please select your educational level:

- ☐ High School Degree
- ☐ Bachelor
- ☐ Master
- ☐ PhD

4. Please tell us your nationality:

5. Employment level:

6. Which industry sector you are working in:

- ☐ Manufacturing
- ☐ Service
- ☐ Others

7. Based on your experience, the best order for the critical success factors for successful implementation of Lean Six Sigma program

- ☐ Top management and involvement, Culture change, Strategy, Training, Linking six sigma to customer
- ☐ Culture change, Strategy, Training, Linking six sigma to customer, Top management and involvement
- ☐ Strategy, Training, Linking six sigma to customer, Top management and involvement, Culture change

2. Training category

1. In your organization, you have a clear, well-structured training program for your progress.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

2. The top management in your organization believes that continuous education and training is key to achieve excellence.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

3. To apply lean six sigma in your organization, all employees must be trained on areas such as mapping, design experiment etc., so that everyone speaks the same language.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

4. Your organization encourages continuous training by giving employees the free time they need to attend workshops and seminars.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

5. Your organization believes that ongoing and continuous training will allow employees to innovate new ways to further improve processes and procedures.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

3. Management involvement and commitment category:

1. In your organization, you are well aware of organization's vision, missions and goals.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

2. In your organization, the sufficient meetings that held with your top management per month are 3-5 meetings

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

3. The empowerment and delegations given to the employee to make decisions.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

4. The top managements in your organization works as a role model for their followers, they encourage employees to achieve more tasks by being motivated.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

4. Linking Six Sigma to customer category:

1. In your organization, customers' feedbacks play a critical role in improving quality?

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

2. Your organization believes that customer satisfaction is strongly driven by lean six sigma which will lead to customer loyalty.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

3. Your organization provides continuous training for employees to better serve different customer needs.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

4. As customer service employee, top management supports and participations help the employee in improving service and procedures.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

5. Cultural Change category:

1. In your opinion, the required time needed to implement any change in your organization to see results is more than 6 months:

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

2. In your organization, applying lean six sigma is considered a breakthrough to change the culture.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

3. Applying systematic DMAIC in your organization will reduce the employees' resistance to change.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

4. In your opinion, cultural change is considered to be under leadership not as an individual factor.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

6. Linking Six Sigma to strategy category:

1. In your organization, Six Sigma project selection is directly related to the organization business strategy.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

2. In your organization, Six Sigma is not considered just a quick fix tool, rather it is integrated in your organization's business strategy

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

3. In your organization, the developments which results from lean six sigma is always parallel to organization's business strategy

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

4. In your opinion, the company must have rules and procedures to make sure that employees are aware of organization strategy.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

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