

Key Success Factors of Implementing Lean Manufacturing and Six Sigma

Ibrahim Alhuraish

LARIS/ISTIA/University of Angers (France)
email: ibrahim.alhuraish@univ-angers.fr

Christian Robledo

LARIS/ISTIA/University of Angers (France)
email: christian.robledo@univ-angers.fr

Abdessamad Kobi

LARIS/ISTIA/University of Angers (France)
email: abdessamad.kobi@univ-angers.fr

Abstract

Small and Medium Enterprises (SME) in France contribute more than large organizations, economically, in terms of employment provision, value added, and numbers of SMEs. Therefore, it is imperative for SMEs to be conversant with the key success factors of implementing either Six Sigma or Lean. This paper investigates and identifies the key success factors of Lean and Six Sigma implementation within SMEs. Factors such as top management involvement, leadership, and linking the method to supplier, among others are crucial factors for a successful implementation of Lean and Six Sigma. The study seeks to discover whether there are significant differences and similarities between the common success factors of Lean and Six Sigma and to notice whether there is a difference in priority, pertaining common success factors between Lean and Six Sigma. Consequently recognize between implementing either Lean or Six Sigma methodologies can fit within enterprise. The implementations depend on the capability of the enterprise to apply the success factors. We found out that Lean and Six Sigma contribute significantly to organizational performance as both methods help in reducing wastes and variations, hence improving quality and customer satisfaction.

Keywords

Lean; Six Sigma; Key success factors; Small and Medium Enterprises (SMEs)

1. Introduction

The methodology of Six Sigma offers a framework for uniting quality tools such as statistical process controls, and DMAIC (Define, Measure, Analyze, Improve, Control) technique with high-level management support (Breyfogle, 2003). It aims at identifying and eliminating sources of variability. Lean manufacturing on the other hand, is the identification and elimination of wastes that arise from non-value-added activities and improvement of quality (Wilson, 2010). Demand for products and services increases when they are of high quality. This has motivated many firms to implement Lean or Six Sigma or both because these methodologies are very successful in improving performance reducing costs, improving productivity and reducing cycle time of an organization (Kwaka and Anbari, 2006; Snee, 2010; Wilson, 2010). Lean manufacturing promotes efficiency; given that it originated from the automobile industry to improve process flow by eliminating waste while Six Sigma, which originated from the electronics industry, promotes effectiveness by improving quality and accuracy via reduction of variations. Lean and Six Sigma methodologies have become famous in the world because since many industries have achieved significant benefits by implementing Lean and Six Sigma. As a result, SMEs are attracted to implement Lean or Six Sigma or Lean Six Sigma methodologies. Small and Medium Enterprises play a noteworthy role in the European economy. They hold 99.8% of the total number of enterprises, 66.5% of employment and contribute 57.6% of the total value added to the EU (Gagliardi et al., 2013). According to the European Commission, a SME is an organization that has two hundred and fifty employees or less, with a turnover of fifty million or less and a balance sheet total of not more than forty three million (Gagliardi et al., 2013). SMEs in France are similar to other small and medium enterprises in Europe; the only difference is that French micro companies exhibit high productivity. SMEs in France contribute more than large organizations, economically, in terms of employment provision and value added. In addition, the number of SMEs in France is greater than large organizations. Therefore, it is imperative for SMEs in France to be conversant with the key success factors of implementing either Six Sigma or Lean manufacturing so that appropriate plans can be made for the implementation of Lean or Six Sigma or both methods, in consideration of these key success factors. *There are two objectives in our research. First objective is to investigate and identifies the key success factors for the implementation of Six Sigma and Lean manufacturing.*

According to (Breyfogle, 2003; George, 2002; Sorqvist,2009) emphasis implementation of Lean manufacturing and Six Sigma simultaneous to get rapid and dramatic improvements are achieved when a firm applies both Lean manufacturing and Six Sigma at the same time. When Lean and Six Sigma are integrated, the result is a new way of working which is a more effective than any of the two methodologies implemented singly and once Lean and Six Sigma are not implement in the same time or put either methodology on top of the other cause lack of improvement in terms process speed, value add, reduce cycle time, inventory etc. But the implementation of both methods may not be able to accomplish simultaneously by SMEs. In the other hand there is proof that SMEs have implemented one of these method before other one successfully (Kumar and Antony, 2009). Many authors indicate to implement Lean and Six Sigma simultaneously as both methodologies complement each other, but they have not taken in their consideration the capability of an organization to implement both methods in the same time. There are few SMEs that have implemented Lean with Six Sigma in the same time; integration of Lean with Six Sigma is widespread (Antony, 2008). SMEs have less resource in terms of expert, time, Finance, etc. because of that; maybe most SMEs have not implemented Lean manufacturing and Six Sigma simultaneously. Consequently we are trying to help SME determining between implementing either Lean or Six Sigma methods can be better fit within enterprise, once they are not be able to implemented both methods in the

same time. The implementations of the method (Lean or Six Sigma) depend on the capability of the enterprise to apply the success factors. *Second objective is to identify and pick appropriate method depend on the capability of the company to apply the success factors of Lean or Six Sigma or both methodologies*

The aim of this study is to identify the key success factors of implementing Lean and Six Sigma within SMEs in the electronics industry, through survey. The study seeks to discover whether there are significant differences and similarities between the common success factors of Lean and Six Sigma and to notice whether there is a difference in priority, pertaining common success factors between Lean and Six Sigma. Consequently recognize between implementing either Lean or Six Sigma methodologies can fit within enterprise. The implementations depend on the capability of the enterprise to apply the success factors. The study also seeks to find out which of the methodologies, Lean, Six Sigma or Lean Six Sigma (a combination of Lean and Six Sigma) has implemented by electronics industry SMEs. The study seeks to establish which of the two methodologies that SMEs in the electronics industry have implemented and whether such organizations implement both Lean and Six Sigma simultaneously, with the reasons for doing so. The study also tries to find out the benefits that are associated with the implementation of the preferred methodology by SMEs in the electronics industry. In addition, the tools and practices that are relevant to the implementation of Lean or Six Sigma within SMEs are investigated. Finally, the success levels of implementation of Lean, Six Sigma or both are investigated.

2. Literature Review

William Smith, an engineering scientist at Motorola developed the concept of Six Sigma during the 1980s, who was the first engineer to develop the concept. Together with other pioneering scientists and engineers, Smith sought to develop the Six Sigma concept so as to reduce variation, maximize productivity and improve quality (Taghizadegan, 2006). Six Sigma aids in the identification few but vital factors which can reduce wastes and defects, and at the same time increase speculated results, profits customer satisfaction and shareholder value. It also seeks to reduce production or service variations. Organizations apply Six Sigma to design new processes and solve problems (Breyfogle, 2003). Lean manufacturing originated from the Toyota Motor Company. The aim of adopting Lean manufacturing in Toyota Company was to reduce wastes in the process of manufacturing and, raw materials, and waiting times before the product was delivered to the customer. This was to make the Toyota Motor Company in the automobile industry more competitive by increasing efficiency, effectiveness and quality (Duque and Cadavid, 2007). Through Lean manufacturing, attempts to exclude the seven categories of wastes are made, in a bid to minimize costs. This involves all organizational aspects including over-production, motion, transportation, waiting, inventory surplus, and defects and over-processing. All-round value takes preference in Lean manufacturing. The main objective is to reduce costs, improve quality, and achieve appropriate delivery time by total elimination of waste (Wilson, 2010). Summary of each methodologies, Lean manufacturing and Six Sigma are provided in the table below (Antony et al., 2003).

Table 1: Differences between Lean and Six Sigma

Issue	Six Sigma	Lean
Focus on customer value stream	No	Yes
Focus on creating a visual workplace	No	Yes
Creation of a standard work sheet	No	Yes
Attack on WIP-Inventory	No	Yes
Focus in good housing keeping	No	Yes
Process control and monitoring	Yes	No
Focus on reduction of variation and achieving uniform process output	Yes	No
Detailed focus on the application of statistical tools and techniques	Yes	No
Employment of a structured, rigorous and well planned problem-solving methodology	Yes	No
Attack on 7 wastes	No	Yes

Implementation of Lean manufacturing without adopting Six Sigma limits the expected improvement. Lean cannot allow organizations to choose the right project and this may lead to sub-optimization of the system. In addition, such companies do not seek to adopt the use of Six Sigma Tools such as Design of the Experiments (DOE) (Breyfogle, 2003). In addition, Lean manufacturing does not put a process under statistical control (George, 2002). On the other hand, Six Sigma does not make a process rapid. Therefore, firms that have implemented Six Sigma alone do not make improvements in their lead time, but they make only diffident improvements in Work In Progress (George, 2002). Lean manufacturing needs to be integrated with Six Sigma, and at the same time, Six Sigma needs to be integrated with Lean manufacturing as explained by George, 2002 in Table 2, so that it can be possible to identify non-value added waste, improve processing speed and cycle time, as well as, leading to rapid action. This means that Six Sigma work greatly when there is waste elimination. Combining Lean and Six Sigma leads to elimination of waste as the perfection mentality of Six Sigma is put into practice.

Table 2: Importance of both methods to Each Other

Lean Manufacturing is Important to Six Sigma because;	Six Sigma is Important to Lean Manufacturing because;
<ul style="list-style-type: none"> • Through Lean manufacturing, wastes that are on no value addition are identified. • Lean has tools that help to increase processing speed to improve cycle time such as 7 Muda, TPM, 5S etc. • Lean embraces Kaizen, which is a method for rapid action. • Lean enables Six Sigma to work efficiently by eliminating waste. 	<ul style="list-style-type: none"> • Discrepancies can be minimized through the tools of Six Sigma. • Six Sigma has tools that identify critical aspects to quality such as capturing data through VOC and DMAIC. • Six Sigma expresses, in details the culture and infrastructure system that is needed to achieve a sustainable result.

Source (George, 2003)

Therefore, it is imperative that Six Sigma is integrated with Lean because Six Sigma enhances the reduction of variation, increases a process’s capability of identifying critical

factors of quality so that data can be captured through VOC (Voice Of the Customer). Six Sigma also deals with culture and infrastructure that is required by a system to achieve and sustain a better result. When Lean is integrated with Six Sigma, reduction of waste, cycle time and non-value added work is effectively dealt with it because this avails the best possible tools. However, Six Sigma and Lean manufacturing seem to be complement and both are important in improving shareholder value. Application of Six Sigma is more common in cases that require reduction of variation, while application of Lean is more common in cases that require reduction of waste. The two methodologies enable an organization achieve maximum improvement by addressing the root causes of poor process performance (Snee, 2010). In integrating Lean with Six Sigma, some firms are unclear on implementation because they put either methodology on top of the other. This is because the structures and packages of Lean and Six Sigma are too different to make this approach practicable. Methodologies and techniques should be integrated with each other while there organizational stakeholders should demonstrate great competence in the two concepts (Sorqvist). Lean-Six-Sigma is the combination of Lean manufacturing and Six Sigma, and it seeks to increase shareholder value by ensuring high quality, speed and customer satisfaction is beneficial for SMEs. Such organizations adopt both Six-Sigma and Lean manufacturing simultaneously. All organizations seek to adopt new standards for products to meet client needs and specifications, using both Lean and Six Sigma (Snee, 2010; Pamfiliea et al, 2012).

3. Success Factors for Lean & Six Sigma

The success factors have identified by previous literature review. We select most critical factor that can affect implementing Lean and Six Sigma. In this particular paper, there are no studies have done before, comparable between the success factors of implementing Lean and Six Sigma. We compare between them since there are some success factors are common between these methods. So we are trying to find out whether there is a difference or similarities between Lean and Six sigma in terms of success factors. The list below of Success Factors for Lean and Six Sigma

1. Top management involvement and commitment
2. Linking method to suppliers
3. Cultural change
4. Organizational infrastructure
5. Leadership
6. Linking method to business strategy
7. Project prioritization and selection, reviews and tracking
8. Linking method to customers
9. Linking method to human resources
10. Understanding tools and techniques within method
11. Project Management skills
12. Education and training
13. Reward system
14. Kaizen Team
15. Communication
16. Consultant participation
17. Skill and expertise
18. Project prioritization and selection, reviews and tracking
19. Monitoring and evaluation of performance

Top management involvement and commitment, and it is a factor of high priority for Six Sigma (Ho et al., 2008). Therefore, the management team of an organization should be involved and supported in learning and understanding principles of Six Sigma. On the other is important to involve top management in implementing Lean manufacturing as well (Rose et al., 2009). Management commitment enables employees to understand the new project of Lean implementation (Scherrer-Rathje et al., 2009). Therefore, there has to be total employee involvement, through a clear vision and mission, which should be highlighted by top management. Companies should extend Six Sigma to include suppliers, for instance, by involving suppliers who offer direct provision of a company's raw materials in the company's Six Sigma. Traditionally, companies engage different suppliers so as to reduce costs, but Six Sigma requires companies to have few suppliers with Six Sigma performance level so as to reduce variability (Coronado and Antony, 2002). In Lean manufacturing is susceptible both to variability of internal sources and external resources (Conner, 2009; Wong et al., 2009). Suppliers are vital stakeholders of Lean manufacturing. Therefore, it is imperative for companies to encourage suppliers to develop Lean. Pull system works well once the company manufacture the right quantity of products and delivers them to clients in time, so it is essential to link Lean to supplier. There has to be a common objective between manufacturers and suppliers, for companies to adopt successful Lean manufacturing, which will lead to minimized wastes and costs. Organization culture also contributes to successful implementation of Six Sigma (Näslund, 2008; Coronado and Antony, 2002; Kwaka and Anbari, 2006). Therefore, employees and management should have the right attitude and awareness to solve problem and emphasize on the reduction of variations, as well to success implementation of Lean (Wilson, 2010; Dora et al., 2013). It is very important to take organizational infrastructure into consideration as a success factor for Six Sigma. Organizational infrastructure involves training of employees so as to work effectively, especially, statistical training (Kwaka and Anbari, 2006). Companies that apply Six Sigma should train their staff on the four classifications; champion, master black belt, black belt and green belt because the belt system require an organization to achieve success (Taghizadegan, 2006). In the other hand, lean method exclude belt systems. Leadership is the one who play the most dominant success factor of Lean manufacturing (Achanga et al., 2006). Effective leadership development programs produce good leaders, who play a role of educating other staff members the requirements and basic concepts of Lean manufacturing. Lean method has featured of Kaizen team which doesn't include within Six Sigma method. Kaizen team that should seek to offer improvement of Lean projects rapidly within an organization. Kaizen methodology is important because it offers a company an opportunity to improve the quality of its products and services to satisfy their clients, employees and suppliers (Radharamanan, 1996). Linking Six Sigma to business strategy is very important (Zailani and Sasthriyar, 2011; Kwaka and Anbari, 2006). Since the business strategy incorporates stakeholders such as customers, employees and others, there should be a clear explanation on how Six Sigma activities are linked to other processes and activities of the organization. Linking Six Sigma to business strategy is third in importance as a success factor for Six Sigma (Brun, 2011). It is important to link Lean manufacturing to business strategy as well (Scherrer-Rathje et al., 2009). Linking method to customers, based on customer requirements, Six Sigma has more advantage than Lean as it can obtain data through Voice of customer. In Lean manufacturing, value is determined by the customer. Company should be able to specify customer wants and timelines and all the processes and activities that are required to bring the product to the customer (Wilson, 2010). Linking both methods are very important to human resources because human resources determine the results of implementation of Lean or Six Sigma through their actions and behavior (Zailani and Sasthriyar, 2011; Shah and Ward, 2003; Brun, 2011). Understanding tools and techniques within Six Sigma. It is important to train both

managers and employees while implementing Six Sigma because it enables people to have a clear sense in understanding the fundamentals, techniques and tools of Six Sigma (Kwaka and Anbari, 2006). Training is crucial in implementing Six Sigma, and there are those who can be categorized as champions, master black belts, black belts, and green belts (George, 2002). In the other hand, understanding tools and techniques within Lean Small and Medium Enterprises should make it a priority to ensure that the tools and techniques of Lean manufacturing are well understood so as to achieve a flourishing adoption of Lean. Leadership is the most critical success factor for successful implementation of Lean in SMEs (Rose et al., 2009). Organizational leaders have to offer training pertaining to the doctrines of Lean manufacturing to other employees. We make a modification to this factor for Lean and Six Sigma to be “understand the tools and techniques within method to white-collar worker and blue collar worker”.

Allow consultants to participate and involve in implementation Lean or Six Sigma help to success in implementing both methods. This is because consultants can be invited to support implementation of an organization’s (Axelson, 2007; Brun, 2011; Scherrer-Rathje et al., 2009). Rewarding employees motivates them and contributes to successful implementation of Six Sigma. (Ho el al, 2008). Among the factors that may contribute significantly to successful implementation of Lean manufacturing is motivation (Scherrer-Rathje et al., 2009; Duque and Cadavid, 2007). Communication is essential in educating employees to accept change, in preparation for implementation of Six Sigma (Ho el al, 2008; Coronado and Antony, 2002). Intensive communication is very important as well in implementing Lean successfully (Duque and Cadavid, 2007; Pingyu and Yu, 2010). Advantages of Lean manufacturing should be identified and a pleasant future state map should be developed so as to enhance evaluation or monitoring of the project (AR and al-Ashraf, 2012). It is important that the implementation of Six Sigma should be reviewed periodically. Six Sigma can allow organizations to choose the right project, and evaluate the project progress and understanding of Six Sigma tools and techniques (Kwaka and Anbari, 2006).

Human skills and expertise such as problem solving, communication and teamwork are very important for the success of Lean manufacturing (Achanga et al., 2006; Bhasin and Burcher, 2005; Dora et al., 2013). As desires to compare between Lean and Six Sigma in terms of success factors. We add “human skills and expertise” for Six Sigma. Project management skill has highlighted more within Six Sigma than Lean methodologies in terms of success factors (Kwaka and Anbari, 2006; Brun, 2011; Coronado and Antony, 2002). We add “project management skill” as success factors for Lean implementation to find out whether there are significant differences between these methods.

4. Hypothesis Statement

Implementation Lean, Six Sigma or both methods have recently developed in France by many enterprises, such as Alstom, 3M, Essilor, Technip and Safran, Oréal and STMicroelectronics. Despite there is proof that adopting Lean or Six Sigma or both methods lead to positive impact Such as improve productivity, reduce cost, reduce variation, and improve quality (Gagliardi et al., 2006; Wong et al., 2009; Kwaka and Anbari, 2006; Wilson, 2010). There are various requirements to success of implementing Lean and Six Sigma. Such as tools and technique support implementing the method, factor contributes to success, and extends the method to an enterprise. Therefore we make investigation on below question.

1. What are the key success factors of implementing Six Sigma?
2. What are the key success factors of implementing Lean manufacturing?

3. What are the differences between implementing Lean manufacturing and Six Sigma in terms of success factors?
4. What are the success factors of implementing Lean manufacturing and/or Six Sigma that support to reduce cost, reduce variation, improve quality, reduce turnover rate, and improve profit etc.?
5. Which tools and practices that are relevant to the implementation of either Lean or Six Sigma support to reduce cost, reduce variation, improve quality, reduce turnover rate, and improve profit etc.?
6. What are the differences between implementing Lean manufacturing and Six Sigma in terms of benefit?
7. Do Six Sigma initiatives share a similar success rate with Lean Manufacturing or contrast?
8. What are the reasons of not implementing Lean and Six Sigma simultaneously?
9. What are the reasons of implementing Lean and Six Sigma simultaneously?
10. Do age matter regarding extend Lean or Six Sigma method to the organization?
11. Do age matter regarding success factors?
12. Do age matter regarding tools and technique?

- HA1. Success factors have a statistically significant influence to success Six Sigma implementation within SMEs.
- HA2. Success factors have a statistically significant influence to success Lean manufacturing implementation within SMEs.
- HA3. There is an important different among rank of success factors in Six Sigma initiatives.
- HA4. There is an important different among rank of success factors in Lean manufacturing initiatives.
- HA5. There are statistically significant difference between Lean manufacturing and Six Sigma methodologies in terms of benefits.
- HA6. There are statistically significant difference between Lean manufacturing and Six Sigma methodologies in terms level of success.
- HA7. There are statistically significant difference between Lean manufacturing and Six Sigma regarding success factors.
- HA8. There are statistically significant impact on extend Lean manufacturing method to level of success.
- HA9. There are statistically significant impact on extend Six Sigma method to level of success
- HA10. There are statistically significant influence on age of implementing Lean or Six Sigma regarding tools and technique
- HB11. There are no statistically significant influences on age of implementing Six Sigma concerning level of success
- HB12. There are no statistically significant influences on age of implementing Lean concerning level of success
- HB11. There are no statistically significant differences on age of implementing Six Sigma concerning success factors
- HB12. There are no statistically significant differences on age of implementing Lean concerning success factors

5. Methodology

The research aim to find out the success factors of implementing Lean manufacturing and Six Sigma by SMEs in the French electronics industry. This study uses survey as a data

collection method. SMEs in the electronic industry have been taken into consideration while collecting information for this study. The samples of companies will obtain from regions Pays de la Loire and Bretagne and all companies that are part of the group West Electronic Network (Wen). We have already communicated with some companies to make a validation on the survey. Question validation is addressed to continuous improvement manager and production manager to ensure the questionnaires are understandable. By using survey, it means that data will be collected from informants who represent a significant portion of a certain population, whereby survey forms will be distributed to expert of quality for the respondents to fill their feedback. Survey on the factors that lead to successful implementation of either Six Sigma or Lean in SMEs from the electronic industry is carried out to gather information for this study. The survey comprises several sections. First one is Personal information (Job title and industry type). Second one is background information (Age of the enterprises, capacity of employed, Belt system, and method has applied within enterprise). Third one is to know the situation of the method (Extent the method, tools and technique, level of success) fourth one is to know the actual benefits of the initiative (Improve quality, Reduce cost, reduce turnover rate, Improve profit). Last one to identify the importance of key success factors for Lean & Six Sigma.

In the survey, the age of the organization, number of, employees, ISO certification, the training category of the organization and the method that the organization has implemented are investigated. Also the numbers of years for which Lean, Six Sigma or both have been implemented, whether Lean and Six Sigma are implemented simultaneously and the reasons for implementing both methodologies are investigated. The survey also seeks to find out how both Lean and Six Sigma are implemented, as well as, the relevant practices for the firms. In this survey, the benefits of methodology that the organization has implemented, the success level of implementation and success factors for the implementation of both Lean and Six Sigma are investigated. Since some success factors are common in Lean and Six Sigma, the study seeks to find out whether there are significant differences between the importance of common success factors for Lean and Six Sigma. The study also seeks to find out whether there is a difference in priority, pertaining common success factors for Six Sigma and Lean. The results of the survey that is underway will be used to provide details on the success factors of Six Sigma and Lean implementation within SMEs in the electronic industry in France.

6. Conclusion

Many publications have been made by former researchers pertaining to successful implementation of manufacturing in large organizations. However, there is no much documented evidence about successful implementation of Lean manufacturing or Six Sigma in smaller firms. This study investigates the key success factors of implementing Lean manufacturing and Six Sigma by SMEs in the French electronics industry. The results of the survey that is underway will be used to provide details on the success factors of Six Sigma and Lean implementation within SMEs in the electronic industry in France.

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Survey questionnaire

Please provide a response to each of the following questions. Thank you.

❖ **Current job title in the company (Please tick where appropriate)**

1. Project leader
2. Quality manager
3. Operation Manager
4. Senior management
5. External Consultant
6. CEO enterprise
7. Other (Please Specify...)

❖ **Age of the enterprise? (Please tick where appropriate)**

1. Less than 5 years
2. Between 5 and 10 years
3. Between 10 and 15 years
4. 15 years and more

❖ **Number of employees in your organization? (Please tick where appropriate)**

1. From 0 to 9 employees (micro)
2. From 10 to 49 (small)
3. From 50 to 249 (medium)
4. From 250 and more (large)

❖ **Does your organization have any accreditation standardization? (Such as ISO, EN900,...) (Please tick where appropriate)**

1. Yes
2. No
- If yes, kindly specify below...

❖ **Which belt(s) system(s) of Six Sigma is (are) in your organization? (Please tick where appropriate)**

1. None
2. Yellow belt
3. Green belt
4. Black belt
5. Master Black belt
6. Champion

❖ **Which method has your organization implemented? (Please tick where appropriate)**

1. Lean Manufacturing
2. Six Sigma
3. Lean and Six Sigma
4. None

❖ **For how many years has your organization implemented the method named above? (Please tick where appropriate)**

1. Less than 3 years
2. Between 3 and 6 years
3. Between 6 and 9 years
4. 9 years and more

❖ **Has your organization implemented the methodologies of Lean and Six Sigma simultaneously? (Please tick where appropriate)**

1. Yes
2. No

❖ **In your opinion, what are the reasons of not implementing Lean and Six Sigma simultaneously? (Please tick where appropriate)**

1. Finance

2. Company culture
3. Lack of awareness
4. Lack of top management support.
5. Other reasons (please specify...)

❖ **In your opinion, select the reasons of implementing Lean and Six Sigma simultaneously?**

1. Rapid Improvement
2. Improve sale
3. Customer satisfaction
4. Lack of improvement, if we implement Lean and Six Sigma separated
5. Other reasons please specify

❖ **How does your organization implement Lean method? (Please tick where appropriate)**

Method	Not implemented in any department	Implemented in few departments	Implemented in some departments	Implemented in most of the departments	Implemented in the whole organization including suppliers
Lean					

❖ **How does your organization implement the method of Six Sigma? (Please tick where appropriate)**

Method	Not implemented in any department	Implemented in few departments	Implemented in some departments	Implemented in most of the departments	Implemented in the whole organization including suppliers
Six Sigma					

❖ **What practices are relevant to your organization? (Choose from 1 –5, where 1 denotes no implementation and five denotes complete implementation)**

Tools	1.No implementation	2.Little implementation	3.Some implementation	4.Wide implementation	5.Complete implementation
5S					
Kaizen					
Standardized Work					
TPM					
Takt time					
Once piece flow					
SMED					
Cellular layouts					
Poka-yoke					
Visual Control					
Gemba					
Brainstorming					
VSM					
PDCA					
Kanban					
Check sheet					
Parto chart					
SIPOC					
Design of Experiment					
Control chart					
Cause and effect diagram					
Flow chart					
Voice of customer					
Failure Mode and Effect Analysis (FMEA)					
Control chart					
DPMO					
Regression analysis					
DMAIC method					

- ❖ Please rate the level of success of the method implemented in your organization, according to your opinion? (Please tick where appropriate)

Method	Not Implemented in the organization	Not successful	Slightly successful	Successful	Very Successful	Totally Successful
Lean						
Six Sigma						

- ❖ What are the benefits of the methodology that your organization has implemented? (Please tick where appropriate)

Benefit	Strongly disagree	Disagree	Neither Agree nor Disagree (Neutral)	Agree	Strongly agree
Improve quality					
Increases profit					
Reduces variation					
Improves productivity					
Reduces Lead-time					
Reduces cost					
Involves employees					
Increases suggestions from the employees					
Customer satisfaction					
Decreases Inventory					
Reduces turnover rate					
Creates safety environment					

Success factors: Lean Method

- ❖ Indicate the degree of importance for each factors that vital to success of implementing Lean (Choose from 1 to 5 by ticking where appropriate for each factor regarding its, where 1 denotes unimportant and five denotes critical factor)

Factor	1.Unimportant	2.Slightly important	3.Important	4.Very important	5.Critical
Top Management commitment and support					
Involvement of employees					
Linking Lean method to suppliers					
Monitoring and evaluation of performance					
Skills and expertise					
Leadership					
Cultural change					
Communication					
Education and training					
Kaizen Team					
Linking Lean Method to the business strategy					
Consultant participation					
Reward system					
Understanding the tools and techniques within Lean to the employees that perform job in shop floor					
Understanding the tools and techniques within Lean to the employees that perform job in an office					
Linking Lean to human resources					
Linking Lean to customers					
Project Management skills					

- ❖ Kindly inform us of any other success factor (s) which you think is (are) very important to the success of the implementation of Lean?

Success factors: Six-Sigma method

- ❖ Indicate the degree of importance for each factors that vital to success of implementing Six Sigma (Choose from 1 to 5 by ticking where appropriate for each factor regarding its, where 1 denotes unimportant and five denotes critical factor)

Factor	1.Unimportant	2.Slightly important	3.Important	4.Very important	5.Critical
Top management involvement and commitment					
Involvement of employees					
Linking Six Sigma method to suppliers					
Project prioritization and selection, reviews and tracking					
Cultural change					
Communication					
Education and training					
Belt system					
Linking Six Sigma method to business strategy					
Consultant participation					
Project Management skills					
Reward System					
Understanding tools and techniques within Six Sigma to the employees that perform job in an office					
Understanding tools and techniques within Six Sigma to the employees that perform job in shop floor					
Linking Six Sigma to human resources					
Linking Six Sigma to customers					
skill and expertise					

- ❖ Kindly inform us of any other success factor (s), which do you think, is (are) very important to the success of the implementation of Six Sigma?

