The advantages and disadvantages of lean six sigma

1. Introduction

While businesses seek for ways to survive and also to remain competitive in a changing global environment, they either choose adopting business excellence models or continuous improvement philosophies to guide them in the journey of organisational excellence. Lean Six Sigma is a new breadth in the area of continuous improvement, which constitutes strengths and key focuses of Lean and Six Sigma approaches.

The rest of the paper is organized as follows: section 2 provides an insight on the concepts Lean, Six Sigma and Lean Six Sigma. Then relevant examples of Lean Six Sigma in manufacturing and service sector will be presented in section 3. The advantages and disadvantages of Lean Six Sigma will be discussed in section 4. Lastly, an overall recap on the subject is done.

2. Literature review

The objective of this section is to provide an insight of the Lean Six Sigma by briefly outlining the concepts behind Lean and Six Sigma, the two ingredients of this blend, along with their strengths and criticisms.

2. 1 Lean Approach

Lean manufacturing, developed by Toyota Motor Corporation in 1950s, has been adopted and adapted by many companies (Finch, 2006). It then extended into a concept of ‘ Lean thinking’ that was introduced by Womack and Jones. The current state of Lean is called ‘ Lean enterprise’ that reaches beyond the shop floor and encompasses various departments within the organisation as a whole (Papadopoulou and Ozbayrak, 2005).

Dale (2007) defines Lean as " a way of thinking, consisting of a set of methods and operating principles to identify and eliminate waste in business processes" (Dale, 2007, p. 565). While for Ferguson (2007) Lean is a change that takes an organisation from where it currently stands and move to a desired state. Briefly, the objective of Lean is to eliminate all types of unnecessary waste by managing resources depending on customers' needs and at the lowest possible costs (Andersson et al. 2006). In other words, " doing more with less" (Thomas, 2009).

Principles

There are 5 principles of Lean; providing right product or service for the right price and time to customer, identification of value stream, smooth flow of processes, only customer's demand trigger the action and lastly continuously improve to value stream in pursuit of perfection (Dale, 2007).

The first step when implementing Lean is to identify value-added and non-value added processes (Pepper and Spedding, 2009) by Value stream mapping(VMS) which is a qualitative analysis tool. Other tools and techniques from the Lean Toolkit such as Single Minute Exchange of Die, 5S, TPM etc. are used in order to achieve above-mentioned principles. Whereas, it should be noted that using these tools and techniques only, does not guarantee a ' Lean organisation' (Bendell, 2006).

Criticism

In the literature, there are many criticism topics on Lean where the most popular ones are about its universality and social aspects.

It has long been argued that Lean is not flexible (Andersson et al., 2006) and not applicable to all environments but only to high volume-low variety (HVLV) operations. Authors like Arnheiter and Maleyeff (2005) define this view as one of the key misconceptions whereas Pepper and Spedding (2010) refer it as a limited success of Lean in their work.

There is a common misconception caused by the misunderstanding of the concept that Lean means laying-off people (Arnheiter and Maleyeff, 2005). However, Flinchbaugh (2001), Arnheiter and Maleyeff (2005) stress that Lean does not mean " less people" but using people in a smarter way.

David Meier (2001) who is a Senior Lean Manufacturing Consultant, argues that Lean creates a stressful, uncomfortable environment due to sense of urgency while ensuring an immediate response to customers. On the other hand, Papadopoulou and Ozbayrak (2005), and Williams et al. (1992) take the opposite view.

2. 2 Six Sigma Approach

Six Sigma, which is developed by Motorola and popularised after the adoption of General Electric (Finch, 2006) aims at value creation and improving the process through variation reduction (Dale et al, 2007). Six Sigma inherits principles from TQM (Arnheiter and Maleyeff, 2005) while setting focus on customer satisfaction. In statistical terms, the goal is to achieve a defect rate of 3. 4 per million (Pepper and Spedding, 2010).

This structured, top-down approach has a positive impact on business in monetary terms since it reduces risk and costs (Slack et al., 2006) especially

related with scrap and rework. Due to realised benefits, many organisations have adopted Six Sigma today.

Principles

DMAIC(Design, Measure, Analysis, Improve and Control) is the most commonly used 5-stage methodology which is employed to achieve minimum defects and to reduce the variation throughout the processes in an organisation (Bhuiyan and Baghel, 2005).

The approach is on project basis and these projects are carried out by trained supervisors called Black belts and Green belts (Bendell, 2006).

Criticism

“ Six Sigma has long been seen as a statistics-heavy, technical approach to process control” (Pepper, Spedding, 2009, p. 145). Bendell(2006) supports this view and criticises Six Sigma due to its tendency towards being a complex approach.

The training of Black Belts and Green Belts is required in order to be able to use statistical tools and handle the projects effectively. Senapati (2004) mentions that these trainings and solutions to problems can be costly for many businesses.

Bendell (2006) states that there is no formal link to policy deployment in Six Sigma. Since Six Sigma projects are chosen depending on their cost-effectiveness, it is possible for this “ cost-down” approach dominates the primary customer driven focus. and may shift it to cost-down possible to be dominated by immediate cost down driver (Bendell, 2006).

2. 3 Similarities and Differences between Lean and Six Sigma: The point of intersection -overlapping areas(küme ÅŸekli)

The intersection point: Similarities-The area of convergence

Both approaches have related operating philosophies, performance objectives, work focus, team approach and improvement focus (Watson, 2003).

Lean Six Sigma

Since Lean Sigma or Lean Six Sigma (LSS) is a relatively new management trend, there is not much literature available comparing to the information and facts found about Lean and Six Sigma alone.

Recently, many companies have started to combine continuous improvement programs together by utilising the best of each initiative to get an extensive and more effective program than individual programs (Bhuiyan and Baghel, 2005). Thus, Lean Six Sigma is evolved as a hybrid methodology that encompasses benefits from both Lean and Six Sigma (Bhuiyan and Baghel, 2005). Watson (2003) defines the merge between Lean and Six Sigma as a ‘ marriage of necessity’. The objective of this integrated approach is boosting quality and reducing costs through elimination of waste and variation reduction (Kamensky, 2008).

The origins of Lean and Six Sigma come from different roots however they both have an aim of improving the processes of a business. It has been shown that the benefits achieved with LSS cannot be achieved when applying Lean or Six Sigma solely (Bhuiyan and Baghel, 2005). This data-

driven approach enables sustainable competitive advantage if properly applied (Burgess, 2009).

In the report of John Maleyeff (2007) to IBM Business of Government, LSS is defined as:

Lean Six Sigma encompasses many common features of Lean and Six Sigma such as an emphasis on customer satisfaction, a culture of continuous improvement, the search for root causes, and comprehensive employee involvement. In each case, a high degree of training and education takes place, from upper management to shop floor.

It is now being realised by many businesses that Lean is more powerful and meaningful when combined with Six Sigma and vice versa (Watson, 2003). Many businesses in both manufacturing and service sector including GlaxoSmithKline, Xerox and Dell turned to Lean Six Sigma and achieved significant benefits (Neuhaus and Guarraia, 2007).

There has to be a careful blend of Lean and Six Sigma that brings two extremes into equilibrium. One end is becoming too Lean thus being very responsive to the market whereas the other end is too much focus on reducing variation beyond the expectations of customers resulting in unnecessary resources being wasted to achieve zero variation (Pepper and Spedding 2010). The optimum point is where market share is maintained by creating sufficient value in the eyes of a customer and the process variation is kept inside acceptable levels to achieve lower costs without over-engineering (Pepper and Spedding 2010).

Principles

George (2002) states the principles of LSS as " the activities that cause the customer's critical-to-quality issues and create the longest time delays in any process offer the greatest opportunity for improvement in cost, quality, capital, and lead time".

Focus is on customer needs as in Six Sigma and also on speed as in Lean, in order to be responsive to market by shortening lead times.

It should be noted that there is no standard framework of LSS that businesses can take it and apply step by step for a specific problem. In other words, there is no " one fit for all" since it depends on the situation and also the environment within a company. Nevertheless, there have been some attempts regarding different ways of implementing LSS in the literature and industry. Some authors argue that it would be more effective when Lean is used as a first step smoothen the process by eliminating waste and then run the DMAIC cycle. Another view is to implement Lean tools within DMAIC cycle as it can be seen in the work of Kumar et al (2006). Thomas et al. (2009) also proposed a similar framework where basic Lean principles are integrated in each phase of DMAIC method.

Criticism

Since it is a new breadth in the area of management, LSS has become the target of criticism in the literature. Bendell (2006) suggests a single approach that effectively combines the two philosophies rather than an alleged combination (Pepper and Spedding, 2010).

Another criticism is about the compatibility of these two approaches. Mika (2006) argues that Six Sigma cannot be embraced by the workers in the shop floor since it requires an effective use of statistical tools and techniques unlike Lean. In contrast, George (2003) outlines several points that Lean compliments Six Sigma and vice versa.

Furthermore, since LSS is an integration of two different approaches there is a possibility that one dominates other throughout implementation.

Some authors and practitioners see this new continuous improvement initiative as the latest management fad. However, Westwood and Silvester (2007) argue that these approaches such as Six Sigma, Lean or Lean Six Sigma are not fads but they are vital for improving and sustaining competitive advantage.

As opposed to views about the negative social aspects of LSS, Burgess (2009) strongly disagrees that it does not support creativity and turns people into robots mainly due to increased workload.

It has been argued that the continuous improvement initiatives including LSS are not working well in small-to-medium-sized enterprises (SME) due to lack of critical success factors such as commitment from top management, lack of understanding of tools and techniques and lack of financial capability (Thomas et al. 2009).

3. Findings

In this section, an attempt is made to present examples regarding the application of Lean Six Sigma in both manufacturing and service sectors.

Manufacturing firms were the early adopters of LSS. Then, it was embraced by the service sector in the 1990s (Kamensky, 2008). Halliburton, which is one of the world’s largest oilfield providers, began to implement Lean Six Sigma in 2004, in response to the growth in demand with the purpose of being able to respond customer needs by increasing efficiency and improving customer service (Atkinson, 2009). The amount that they used to produce in the manufacturing plants is tripled as a result of reduced cycle times and high utilisation of their equipments. Halliburton also encouraged its supply base to adopt the same strategy so that a synchronisation can be achieved in terms of being more responsive to the market (Atkinson, 2009).

The main reason to implement LSS approach in Caterpillar Inc. was to gain competitive advantage by breakthrough improvements. As a result of innovative products, their revenues had grown by 80 percent (Byrne et al. 2007).

Another notable example would be Xerox Corp., which was having problems with its long filing time for patents so first of all the root causes of delays were identified. To eliminate these non-value added steps, Xerox Lean Six Sigma team carried out DMAIC, and came up with a solution which reduced the cycle time of 64 days and saved $400, 000 in overall time (Xerox Corp. Brochure, 2009).

National Grid, who is a client of GE Fleet Services in the UK listened to the voice of its customers and applied Lean Six Sigma to reduce the time spent running (issuing and managing) order prompts (Fraser and Fraser, 2008). This project is an example of a well-applied Lean Six Sigma method in a

service sector in terms of achieving expected results in a timely fashion (Fraser and Fraser, 2008).

In the work of Kumar et al. (2006), the implementation of LSS in a die casting manufacturer is resulted in a significant decrease in the number of defects occurred in the final product and an overall savings of around $140 000 per year.

Apart from the success stories, National Health Service Modernisation Agency (MA) in UK, is a well-known failure case of LSS. In 2004, Six Sigma together with Lean implemented in NHS to improve processes and quality (Proudlove and Moxham et al., 2008). Whereas, due to lack of well-designed processes, lack of support and unclear link between business strategy, it resulted in failure (Montero, 2010).

4. Discussion

In light of the findings and review of literature, the advantages and disadvantages of LSS will be discussed in this section.

It is believed that this integrated approach will bring better results when the structured and systematic approach of Six Sigma came together with the agility of Lean with a focus of customer in the centre (Antony et al, 2003). Despite some views arguing its effectiveness, in theory, by integrating the best of Lean and Six Sigma, the outcome would be satisfactory or even delightful both from the organisation’s and the customer’s point of view that creates a “ win-win” situation.

According to Arnheiter and Maleyeff (2005), if Lean firms adopt Six Sigma principles, costs incurred by defective products such as rework or scrap costs and the related overhead costs can be reduced. Likewise, when Six Sigma companies adopt Lean principles, faster lead times and deliveries can be achieved.

Antony et al. (2003) outlines four major benefits of implementing LSS as; " becoming faster and more responsive to customers, striving for Six Sigma capability level, operating at lowest costs of poor quality, achieving greater flexibility throughout the business" (Antony et al., 2003, p. 41).

Companies that have successfully implemented Lean Six Sigma have gained considerable benefits in terms of increased shareholder value and market share. Based on the examples of several companies given in the Findings section, these benefits are provided in dollars.

On the other hand, a recent Bain&Co. survey of 184 companies, shows that 80 percent is dissatisfied with the results they got from their LSS efforts because they have not achieved their goals in both monetary terms and level of improvement (Neuhaus and Guarraia, 2007).

Because it brought many advantages to leading firms, it does not imply that every attempt will be success or that every firm is ready for this initiative. Basu (2001) outlines the difficulty of sustaining a process improvement program even it may be successful in the beginning. Thus, this situation causes employee layoffs and a decrease in employee morale (Basu, 2001).

Despite being a powerful engine for businesses, the necessity of high skills to be able to use relevant tools and techniques is seen as one of the weaknesses of LSS (Montero, 2010). This factor is seen as a critical prerequisite for the successful implementation of LSS. Though, the training and necessary investment can be costly to some companies. Therefore, this situation may limit its applicability. Unless a necessary change within the business is done including cultural aspects, mindset of employees together with the full commitment of top management, the result will be a failure.

5. Conclusion

Many businesses in various sectors have recently started to adopt LSS either as a result of an external pressure or due to inadequate results achieved with their current methodology applied (internal need).

Benchmarking plays a significant role in creating a trendy environment in the market where companies follow the ‘ giants’ and trying to adopt the best practice in order not to be ‘ obsolete’.

Although, this integration is seen as a fad by some authors and practitioners

The concept was emerged as a response to market requirement.

This merge between initiatives

Regardless of the continuous improvement strategy that is chosen to follow, there is a common ground that no positive results can be gained without an adequate support, and attention across the business.

There are still some uncovered areas of LSS for further research or no one knows what is next.