Lean Six Sigma and Operational Auditing as A New Paradigm for Improvement

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Abstract

Many companies are trying to implement Lean manufacturing in the business process, and at the same trying to reduce defects and variation using Six Sigma principles. In this study, researcher would like to discuss how Lean, Six Sigma and Operational Auditing can be integrated to help better assess and measure the efficiency and effectiveness of various organizational controls. Regardless of whether the organization is large or small, as an internal auditor, they are always trying to increase the effectiveness of various operational internal controls. One of the major problems in adopting Lean Six Sigma is that it could take as long as three to four months for the company to see the desired effects. Therefore, in order to keep an account of the changes of the implementation process, Operational Auditing is essential. This paper is to explore and measure the nature and extent of changes in organizational performance improvement that can be attributed to the impact of the implementation of Lean Six Sigma and Operational Auditing. As this study is currently at preliminary stage, the findings are yet to be determined.

Keywords*: Lean, Six Sigma, Operational Auditing.*

INTRODUCTION

Over the past few years, organizations are deciding to integrate different methodologies and improvement tools, with the purpose of reaching better results. For example, the combination of Lean and Six Sigma is quite popular, especially, after publication of the work by Rubrich et al. (2001) and George (2002).

Many companies are trying to implement Lean manufacturing in the business process, and at the same trying to reduce defects and variation using Six Sigma principles. Regardless of whether the organization is large or small, as an internal auditor, they are always trying to increase the effectiveness of various operational internal controls (Aghili, 2009). In this study, researcher would like to discuss how Lean, Six Sigma and Operational Auditing can be integrated to help better assess and measure the efficiency and effectiveness of various organizational controls.

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order to keep an account of the changes of the implementation process, Operational Auditing is essential.

Research concerning Operational Auditing for private business has been conducted for the past four decades and has answered many questions such as “What is Operational Auditing?”; “How does it influence organizational performance?”; “What are its advantages and limitations?”; and so on. However, the studies about Operational Auditing are still limited, especially the combination Operational Auditing with the management concept such as Lean and Six Sigma have not been much discussed by other researchers.

Objectives of the Research

The study will among other things achieve the following objectives:

1. Refine the concept of Lean, Six Sigma and Operational Auditing.
2. To investigate Internal Auditors assistance in transforming and creating a new culture to improve businesses through Lean Six Sigma and Operational Auditing.
3. To investigate the incremental difference in performance improvement between companies adopting either Lean or Six Sigma by themselves and those adopt a combined Lean Six Sigma with operational audit approach.
4. To explore and measure the nature and extent of changes in organizational performance improvement that can be attributed to the impact of the implementation of Lean Six Sigma and Operational Auditing.
5. To obtain Lean, Six Sigma and Operational Auditing model.

LITERATURE REVIEW

In this section, the concepts used in the study will be briefly defined. The concepts discussed including the definition on Lean, Six Sigma and Operational Auditing.

Lean

The Lean part comes from the lean manufacturing methodology that is centered on a simple working principle, create more value with less work (value as being perceived by the customer) by eliminating all non-value added process steps; harmonizing appropriately skilled people with a robust process and adequate equipment; and striving for continuous improvement as a mind-set to achieve a cultural shift (Lehmann, 2012). Lean manufacturing is the American name for the

Toyota Production System (TPS). It is one of the most advanced manufacturing concepts available in the market today. Many progressive companies like General Electric, Honeywell and Motorola have implemented Lean Manufacturing in various areas of their businesses and enjoyed the benefits.

According to Lehmann (2012), Lean was developed in 1948-1975 by Taiichi Ohno at Toyota with the help of others and named the Toyota Production System. Taiichi Ohno was heavily influenced by earlier work by Edward Deming and Henry Ford. Well known Lean Initiatives in the Medical Community are the "Danaher Business System" and the "Henry Ford Health System" in Michigan.

According to Becker (n.d), the use of the term "Lean", in a business or manufacturing environment, describes a philosophy that incorporates a collection of tools and techniques into the business processes to optimize time, human resources, assets, and productivity, while improving the quality level of products and services to their customers.

National Institute of Standard and Technology (2000) defines lean:

". . . as a systematic approach to identifying and eliminating waste (non value added activities) through continuous improvement by flowing the product only when the customer needs it (called "pull") in pursuit of perfection".

Lean emphasizes the learning by doing approach, where the members of a process improvement team are those most closely associated with adding value to the product. In other words, Lean is about to give our customers whatever he wants – faster, cheaper, and better at the lowest cost possible and get paid in shortest time.

Six Sigma

Many authors have described the story of Six Sigma and its development at Motorola as well as its anticipated savings in various types of industries. Whereby others have identified Six Sigma as the latest fad, encompassing nothing new but merely being a re-package of quality management practices. However, Lifvergren et al. (2009) believe that the Six Sigma projects have contributed to process maturity by creating an awareness of process immaturity and catalyzing process design and improvement work. In that respect, the program has created better conditions for the next generation to improvement projects and simultaneously stimulating other continuous improvement activities.

According to Pyzdek (2003), the evolution began in the late 1970s, when a Japanese firm took over a Motorola factory that manufactured television sets in the United States and the Japanese promptly set about making drastic changes to the way the factory operated. Under Japanese management, the factory was soon producing TV sets with 1/20th the number of defects they had produced under Motorola

management. Finally, Motorola recognized its quality was awful. Since then, Motorola management decided to take quality seriously. When Bob Galvin became Motorola's CEO in 1981, he challenged his company to achieve a tenfold improvement in performance over a five-year period (Process Quality Associates Inc., 2006).

Originally, Six Sigma started out strictly as a process variation that would produce no more than 3.4 defects per million opportunities. However today, Six Sigma is basically the art of producing a product that satisfies the customer in the most cost economical way. The process of Six Sigma was first developed by Bill Smith of Motorola in 1986. It was originally designed as a way to measure defects and to improve overall quality. After Motorola won the Malcolm Baldrige National Quality Award in 1988, the Six Sigma process became more visibly recognized as an improvement tool, and the methodology was used by many global corporations, such as General Electric, Allied Signal, and Citibank. The name refers to six standard deviations from the mean: a quality goal of reducing defects by 99.9997%, or striving for no more than 3.4 defects per million opportunities (DPMO). Six Sigma methodology has evolved in many ways over the past three decades. For instance, although Six Sigma was initially used in various manufacturing processes by quality engineers, its use has spread to the service and financial sectors, among others, and is no longer the exclusive domain of the engineering department (Aghili, 2009).

Six Sigma, on the other hand, is defined:

". . . as a business process that allows companies to drastically improve their bottom line by designing and monitoring everyday business activities in ways that minimise waste and resources while increasing customer satisfaction by some of its proponents", see Magnusson et al. (2004).

Six Sigma helped Motorola realize powerful bottom-line results in their organization. In fact, they documented more than USD16 Billion in savings as a result of Six Sigma efforts. In 1989, Motorola Chairman, Bob Galvin asked Mikel Harry to head the Six Sigma Research Institute, an organization that received funding from a number of Fortune 500 companies (Olson, n.d). From that moment, Six Sigma skills were not solely owned by quality engineers, but began to transfer from the quality department to the entire organization.

According to Byrne (1998), Six Sigma delivered USD 320 million in productivity gains and profits in 1997. In the annual report of 1999 GE was able to report savings of USD 2 billion for that year alone. Since then, hundreds of companies around the world have adopted Six Sigma as a way of doing business. By the late 1990s, about two-thirds of the Fortune 500 companies began using Six Sigma and numerous consulting firms have jumped on the bandwagon, including ASQ and numerous articles and

books have appeared on the subject. Many product and service advertisements are now mentioning Six Sigma.

According to O'Rourke (2005), the philosophy of Six Sigma is the use of data and statistical analysis tools for systematic processes improvement. Process data are gathered and analyzed to determine average process performance and the output quality variation. The Six Sigma methodology is a five-phase, disciplined approach to continuous improvement. These phases are referred to as DMAIC. Whereby, DMAIC follows these five steps:

1. **Define** goals to improve the overall process between your company strategy and your customer's demands.
2. **Measure** your current processes and collect relevant data. This data is then used as a baseline for future comparisons.
3. **Analyse** the data to inspect cause and effect relationships within the process. It is important to understand this relationship so that you can keep your companies strategy in line with your customer's demands.
4. **Improve** the process based on the data. It is important to constantly improve and alter the process to fit the current situations by using different techniques. One technique that is often used is Design of Experiments which can help to test a hypothesis.
5. **Control** is important because you must control and correct any variances to avoid defects and prevent the loss of quality. A common thing to do is to set up pilot runs to study process capability and production transition.

The Main focus of Six Sigma is to improve the quality of process outputs and to reduce errors or defects and variation within the process.

Any organization that implements Six Sigma will create an internal hierarchy of Six Sigma experts called "Yellow Belts", "Green Belts", "Black Belts" or "Master Belts". Whereas, it is similar to Martial arts, the Belt level and colour implicates the number of successfully completed projects.

Lean Six Sigma

Lean Six Sigma is an approach combining and capitalizing the strengths of the Six Sigma and Lean Management improvement programs. It has been claimed that companies that practice either lean management or Six Sigma exclusively would reach a point of diminishing returns. After the initial problem solving and process re-engineering efforts, systems show significant improvement, but further improvements are not easily realized (Arnheiter, 2005).

The Lean Six Sigma concepts were first published in the book titled "Lean Six Sigma: Combining Six Sigma with Lean Speed" authored by Michael George in the year 2002 (*Lean Six Sigma*, 2012). Lean Six Sigma, also called Lean Sigma, is a fusion of lean engineering with Six Sigma quality. Lean Six Sigma has adopted the terminology and belt rankings of Six Sigma. The same statistical principals apply to Lean Six Sigma and Six Sigma. The primary differences arise in prioritizing which project initiatives are to be adopted, data collection and data analysis.

Operational Auditing

The purpose of an operational audit is to improve the efficiency of day-to-day operations. In other words, managers review the routine processes and procedures of those employees, such as production workers, who do the primary work of the company. Managers use the operational audit to evaluate and analyze the current effectiveness of a company's operations while identifying areas of potential improvement. In other words, Operational Auditing is to assist employees of the company in effectively performing their responsibilities.

According to The Institute of Internal Auditors (IIA) publication cited in Leung et al. (2007), Operational Auditing is defined as:

"…a systematic process of evaluating an organization's effectiveness, efficiency, and economy of operations under management's control, and reporting to appropriate persons the results of the evaluation along with recommendations for improvements".

On the basis of the above definition, Salazar (2012) defined that Operational Auditing is a technique used by an organization to evaluate its effectiveness, efficiency, and nature of its operations and report to appropriate persons the results of the evaluation along with recommendations for improvement. The objectives are to assure management that its goals are being carried out and whether or not they are capable of being improved.

The Operational Auditing concept is not new; it has been around at least 1875. In that year, the Krupp company in Germany apparently carried on some form of operational audit (Piperis, 1993). However, the era of Sarbanes-Oxley seriously diminished the activity of Operational Auditing in many audit shops, whereby today its concept is somewhat misunderstood, the diversity of its scope curtailed, and a new generation of internal auditors are unsure of its application (***Operational Auditing: Influencing Positive Change*, 2011).**

According to Salazar (2012), Operational Auditing uses common sense along with logical audit techniques to apply findings to organizational objectives, operations, controls, communications, and information systems. The auditor performing the

evaluation is concerned with the whom, what, when, where, why, and how of running an efficient and effective operation. This means that the auditor must have knowledge of the company's operations

Instead of requiring individual employees and teams led by Green Belts or Black Belts to conduct Six Sigma projects, Operational Audits can be conducted by internal auditors who are members of an internal department of the company.

Comparison of Lean, Six Sigma and Operational Auditing

Referring to table 1, a further understanding of how Lean, Six Sigma and Operational Auditing complement each other's approach to continuous improvement can be seen in a more detailed (Comparison emphasis added from Nave 2002, and O'Rourke 2005).

Table 1: Comparison of Lean, Six Sigma and Operational Auditing

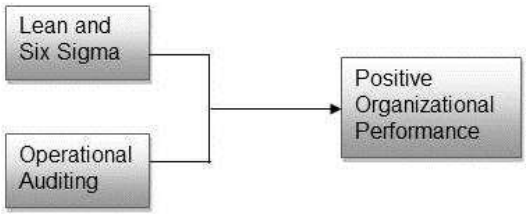
Program	Lean	Six Sigma	Operational Auditing
Theory	Remove waste	Reduce variation	Adding value
Application guidelines	1. Identify value 2. Identify value stream 3. Flow 4. Pull 5. Perfection	1. Define 2. Measure 3. Analyze 4. Improve 5. Control	1. Plan 2. Perform 3. Analyze 4. Recommend 5. Follow-up
Focus	Flow focused	Problem focused	Cross functional business processes
Assumptions	Waste removal will improve business performance. Many small improvements are better than systems analysis.	A problem exits. Figures and numbers are valued. System output improves if variation in all processes is reduced	Assessment of organization risk, capability and performance.
Primary effects	Reduced flow time	Uniform process output	Meeting organizational goals.
Secondary effects	Less variation. Uniform output. Less inventory. New accounting system. Flow – performance measure for managers. Improved quality.	Less waste. Fast throughput. Less inventory. Fluctuation – performance measures for managers. Improved quality.	Identify poor work practices in order to improve them. Assist in the evaluation of quality control procedures adopted. Evaluate implementation processes. Improving the efficiency and effectiveness of operations and increasing customer satisfaction.
Criticisms	Statistical or system analysis not valued.	System interaction not considered. Processes improved independently.	Operational auditors more expert in the field of audit than in the field of business.

METHODOLOGY

The purpose of this research is to identify the impact of integrating Lean, Six Sigma and Operational Auditing improvement methodologies within organizations. By understanding the impact of Lean, Six Sigma and Operational Auditing on organizational performance, an improvement model could be developed to assist organizations in achieving their desired performance goals.

Figure 1 represents the conceptual framework for the identified research topic as it relates to the integration of Lean, Six Sigma and Operational Auditing improvement methodologies expected to yield positive organizational performance.

Figure 1



This research employed a multiple case study design to gather data on lean Six Sigma implementation process. The cases will be solicited following a predetermined protocol that improved the reliability of the research by standardizing the data collection technique.

The companies selected for this study will be limited to those that have or were in the process of implementing an integrated Lean Six Sigma methodology. A cross-case synthesis technique will be used to analyze the collected data. This technique used word tables to analyze specific arrears of interest that related to the investigate questions.

CONCLUSION

Lean Six Sigma and Operational Auditing are a huge step for a company. Making sure that it is performed effectively will ensure that the company is able to accomplish its goals and objectives in the future.

In alignment with these research objectives an extensive review of the literature has been conducted which proposes to:

1. Provide enough background information for readers to gain an overview of the field specifically Six Sigma, Lean, combined Lean Six Sigma, Operational Auditing and their outcomes.

2. Provide a summary of the currently existing body of knowledge relevant to the chosen research topic area, particularly that which is supporting research arguments, questions, and discussion.
3. Provide a detailed discussion of what researchers in the field already know about the topic and what is currently unknown, as well as prominent questions.
4. The findings from this research can contribute to foundational literature involving lean, Six Sigma and Operational Auditing improvement initiatives.

Nevertheless, as this study is currently at preliminary stage, the findings are yet to be determined.

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