

## **The Extent of Implementation of Lean Six Sigma within Commercial Banks in Kenya**

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**Abstract:** *The objectives of this study were to find out the extent to which Lean Six Sigma is implemented within commercial banks in Kenya. The respondents were made up of managers from these commercial banks in the Kenyan banking industry. The study adopted exploratory research. Primary data was collected using questionnaires and analyzed using descriptive statistics and factor analysis. The study found that the following application of tools and techniques of Lean and Six Sigma were used to a large extent; Voice of the Customers (VOC), Cause and effect analysis, Total Quality Management (TQM), Cross-functional work teams, Continuous Improvement (Kaizen), –Define- Measure- Analyze-Improve and Control (DMAIC) ,Total Preventive Maintenance and Plan, Do, Check, Act (PDCA). The study also found that two main ways through which the banks knew about Lean Six Sigma were through professional publications and through top management.*

**Key Words:** *Lean Six Sigma*

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### **I. Introduction**

Over the past decades, business organizations have embraced a wide variety of management programmes that they hope will enhance competitiveness. Currently, two of the most popular programmes are Six Sigma and Lean management. According to Wang & Chen (2010), Six Sigma approach is primarily a methodology for improving the capability of business processes by using statistical methods to identify and decrease or eliminate process variation. Its goal is reduction of defects and improvements in profits, employee morale and product quality. Six Sigma is a philosophy that employs a well-structured continuous improvement methodology to reduce process variability and drive out waste within the business processes using statistical tools and techniques, (Banuelas & Antony, 2002).

Lean production or manufacturing is a paradigm shift requiring that the organization be structured around the customer pull-value. Since the early 1980s, manufacturers have moved away from the conventional Fordist push system of mass assembly line production toward a system of Lean production. Lean manufacturing is a more capable system of production than Fordism because it stresses quality and a quick reaction to market circumstances, using technologically advanced tools and an adaptable organization of the production process.

According to Furterer & Elshennawy (2005), Lean Management originated at Toyota Motor Corporation in Japan and is an approach that eliminates waste by reducing costs in the overall production process, in operations within that process, and in the utilization of production labor. Inventory waste is also eliminated by producing to customer order rather than to forecasted requirements. The term 'Lean' was applied by Womack and Jones in 1990 and further developed in their highly regarded book 'Lean thinking'.

In more recent times, some businesses have combined the ideas of Six Sigma and Lean management, to produce a method called Lean Six Sigma, to emphasize the quality and service improvement process offered by Six Sigma and the productivity and cost reduction tools offered by Lean management. Lean Six Sigma (LSS) is a methodology that combines Six Sigma and Lean management tools to enhance competitiveness, efficiency and agility of an organization. (De Koning et al., 2010). Thus according to Wang & Chen (2010), LSS improvement is brought out of manufacturing and into services as much of the world economy is now based on services rather than manufacturing.

Both Lean production and Six Sigma are broadly classified under the umbrella of Process improvement programmes, which also include other approaches such as business process re-engineering, theory of constraints and total productive maintenance (Shah et al. 2008). The concepts behind Lean and Six Sigma are based on foundational ideas that date back to Taylor (1911), and incorporate the seminal works of Ohno (1978), Shingo (1981), and Deming (1986).

Business organizations in the banking industry have been facing an increasingly competitive and global environment, which calls for enhanced firm capability in identifying new opportunities and sustaining superior performance. Strategies used by companies to avoid competitive disadvantages include the elimination of operational inefficiencies (which are large in the financial sector, on the order of 20 percent or more of total banking industry costs) and improvement of revenue by increasing the number of customers and their satisfaction, through innovation and improvement (De Koning et al., 2008).

According to Delgado et al. (2010), Lean Six Sigma is a method that can help financial institutions to improve operational efficiency and effectiveness by combining the strengths of Lean thinking and Six Sigma. They further note that since Lean does not possess the tools to reduce variation and provide statistical control and Six Sigma does not attempt to develop a link between quality and speed, the application of the combined tool LSS offers useful solutions that can lead to greater efficiency and better quality in the financial services industry. Employing therefore a standard operational framework for implementing both Lean and Six Sigma approaches is seen as a necessary step for companies to achieve simultaneous benefits from the both strategies.

## **II. Literature Review**

### **Introduction**

Lean Thinking and Six Sigma are typically considered as separate approaches to process innovation with complementary strengths. When combined as Lean Six Sigma, this approach provides a unified framework for systematically developing innovations. Lean Six Sigma can also bring about significant results and breakthrough improvements in financial services, for instance, case studies conducted by de Koning et al, (2008) on Dutch multinational insurance companies demonstrate the importance of incremental innovations and show that there is room for improvement in the financial services industry. In this chapter, an outline of the key principles and brief history of Lean production, Six Sigma and the Lean Six Sigma (LSS) approach are described.

### **Lean Production**

The Lean production concept was born on the Japanese manufacturing shop floor and was promoted through the success of the Toyota Motor Corporation, (Kollberg & Dahlgaard, 2007). Although the idea of Lean production was born already in the 1950s the dissemination of the new idea did not reach readers outside Japan until 1990 (Kollberg & Dahlgaard 2007). In the western manufacturing community the thinking was introduced through the book of Womack et al., “The Machine that Changed the World” (Womack et al., 1990). The authors coined the concept of Lean production as a system with a major purpose to use fewer resources compared to traditional mass production systems. The book, which was written as a result of the gaps in performance between Toyota and western carmakers using mass production systems, explores the infrastructure and practices that support Lean production in order to facilitate a translation to non-Japanese and non-automotive industries.

In 1996 the concept of Lean production was further elaborated in Womack and Jones’ book “Lean Thinking” (Womack & Jones, 2003). The concept was extended from the shop-floor techniques to include the entire organization and not only manufacturing functions. According to Shah, et al., (2008) Lean production can be described at different levels of abstraction: it can be defined as a philosophy, as a set of principles and as bundle of practices. For instance, Womack et al., (1990) define Lean production as a business and production philosophy that shortens the time between order placement and product delivery by eliminating waste from a product’s value-stream. The principle view of Lean production rests on a set of tenets such as those outlined by Shah, et al., (2008). However, the dominant view in describing and measuring Lean production rests on a set of practices and tools used in eliminating waste.

While researchers disagree with the exact practices and their number, there is general consensus that there are four main aspects of Lean production and frequently group related practices together into bundles. These are practices associated with quality management, pull production, preventive maintenance, and human resource management (Shah, et al., 2008). Grath, (2007) make a distinction between “Lean thinking”, “Lean enterprise” and Lean manufacturing. Lean thinking is a generic name for operation strategy. Lean manufacturing is the application of the strategy in manufacturing capacity. Lean enterprise is the total function of Lean concepts and philosophies throughout all aspects of the business. In essence “Lean” is elimination of waste and the addition of value to the process of delivering a product or a service to a customer. The “Lean” concept has often successfully allowed companies to deliver bottom-line savings in production through improved process efficiency, (Thomas et al., 2009).

### **Main Principles of Lean Production**

Lean is aimed at reducing waste and adding value to production systems so that systems performance is significantly improved and a company “does more with less”. The basic Lean philosophy as observed by Grath, (2007) relies on a five phase approach; Identify value (from the point of the customer), Measure the value stream, Pull on customer demand, Create flow and Achieve perfection. The first thing that a company must do is to establish accurately what their customers recognize as value. The first principle of Lean production is Value. Value is created by the producer from the customers’ stand point and it describes what the customers’ value from the customers’ perspective and not from the perspective of individual firms, functions and departments.

The second Lean principle is Value Stream Mapping (VSM). Value stream refers to those specifics of the firms that add value to the product or service under consideration. Value stream mapping is an enterprise improvement tool to assist in visualizing the entire production process, representing both material and information flow. The goal is to identify all types of waste in the value stream and to take steps to eliminate them. Taking the value stream viewpoint means working on the big picture and not individual processes, and improving the whole flow and not just optimizing the pieces. It creates a common language for production process, thus facilitating more thoughtful decisions to improve the value stream (Singh et al., 2010).

The suggestion of making the actions in the value stream flow is another main principle of the Lean process. Interruptions to this flow or restrictions in its channel can cause waste in the value stream. Waste in the Lean context refers to non-value added activities. There are seven wastes defined by Toyota production system. These are described by Womack and Jones, (1996) as; Overproduction, Waiting for the next production step, unnecessary transport of materials, over processing of parts (due to poor tool or product design, service design, inventory (more than the absolute minimum), unnecessary movement by employees and Production of defects.

Customer pull is a principle that advocates that no process step should produce anything unless the downstream customer (internal and external) has a requirement for it. Only make what is pulled by the customer. The final Lean production principle is continuous improvement meaning that perfection is the only goal throughout the production lifecycle. Continuous improvement involves operators helping to solve problems in order to improve the manufacturing of the production lifecycle (Grath, 2007).

### **Application of Lean Thinking In the Service Industry**

Lean enhances a more effective response to the needs of customers by providing faster and more valuable services. In a very competitive environment, Lean is usually the solution to track costs while optimizing some of the repetitive and wasteful steps, so as to obtain flexible and adaptive processes. When implementing Lean it is essential to involve the staff mainly because they are the ones with the best understanding of the processes of the organization, and because their involvement will help sustain the changes made (Denyse & Benny, 2009).

### **Six Sigma Tools and Techniques**

They can be described as practical methods and skills employed by Six Sigma project teams to tackle quality related problems for fostering performance improvement (Aboelmaged 2010). While Six Sigma tool has a specific role and is often narrow in focus, Six Sigma technique has a wider application and requires specific skills, creativity and training (Antony, 2004). Examples of Six Sigma tools include Pareto analysis, root cause analysis, process mapping or process flow chart, Gantt chart, affinity diagrams, run charts, histograms, quality function deployment (QFD), brainstorming, etc. Examples of Six Sigma techniques include statistical process control (SPC), process capability analysis, suppliers-input-process-output-customer (SIPOC), benchmarking, etc. Moreover, a Six Sigma technique can utilize various tools. For example, statistical process control (SPC) is a technique that utilizes various tools such as control charts, histograms, root cause analysis, etc.

### **Six Sigma Methodologies (DMAIC and DFSS)**

There are two major improvement methodologies in Six Sigma. The first methodology, DMAIC, is used to improve already existing processes and can be divided into five phases; define measure, analyze, improve and control. In contrast, the second methodology, design for Six Sigma (DFSS) is used for new processes or when the existing processes are unable to achieve business objectives such as customer satisfaction. DFSS methodology can also be divided into five phases (DMADV); define measure, analyze, design and verify (Banuelas & Antony, 2002).

### **Six Sigma Belt System**

A part of Six Sigma structure is the role of Six Sigma leaders who initiate, support and review improvement projects. Most Six Sigma organizations adopt the hierarchical level of black belt and green belt systems. A black belt is a full-time team leader dedicated to the Six Sigma initiative. Black belts are equipped with expertise in using the Six Sigma methodology and statistical analysis techniques for process improvement. Individuals at the highest level of expertise in Six Sigma methodologies are called master black belts. They teach, coach and mentor the lower-level black belts and green belts. Green belts are project leaders and/or process experts who integrate Six Sigma into their daily job duties. The key attributes of Six Sigma black belts in manufacturing companies include effective communicators, change agents, customer advocates, team builders, results-driven mindset personnel and positive thinkers (Aboelmaged, 2010).

### **Six Sigma and Quality Approaches**

Six Sigma literature has linked Six Sigma to quality approaches through two pivotal perspectives. The first perspective links Six Sigma to TQM, while the second treats Six Sigma as a continuous improvement approach. Even though most Six Sigma tools and techniques are already being applied in the TQM field and both approaches preach that continuous improvement of quality is essential to business success, there is a vital distinction between them. While authors regard TQM as a soft management system consisting of values, methodologies and tools that aims to improve customer satisfaction, they consider Six Sigma as a more structured methodology that foster product and process improvement so that the defects are never produced in the first place. Contrary to TQM, Six Sigma allows organizations to measure process capability and improvement efforts internally and externally. Aboelmaged (2010), identifies four core advantages of Six Sigma over TQM. These advantages involve the focus on financial and business results, use of a structured method for process improvement or new product introduction, use of specific metrics such as DPMO (defect per million opportunities), critical-to-quality (CTQ), and use of a significant number of full-time improvement specialists. According to Antony & Banuelas (2002), Ford found that Six Sigma is more profit orientated, while TQM focuses on fixing the quality problem regardless of the cost.

### **III. Statement of the Problem**

In modern economies, service sectors play very important role, absorbing huge part of national employee force and providing great part of GDP (Urban, 2009). He further observes that the size of service sector (as a percentage of total number of employees, of total added value, etc) in a particular national economy is treated as the measure of the country's development. In any service organization quality plays important role, quality causes many management problems, and it is the kind of a management challenge all over the world. A survey done by Wang & Chen (2010), on the application of LSS approach in USA shows that most research conducted usually focus on the process improvement of manufacturing spots and seldom discusses business performance from the viewpoint of the service industry, especially in banking services, which is the most critical topic in service operations. The research further explains that Service operations now comprise more than 80% of the GDP in the United States and are rapidly growing around the world and the cost to maintain and service an application is typically more than the initial purchase price and banking services are the most critical concern in the service industry. It is therefore necessary to find a method to improve the performance of service operations. LSS for service is a business improvement methodology that maximizes shareholder value by achieving the fastest rate of improvement in customer satisfaction, cost, quality, process speed and invested capital.

Furterer & Elshennawy, (2005), presented a case study of applying Lean and Six Sigma tools and principles to improving the quality and timeliness in a city's finance department. After implementing a LSS programme, the time to process payroll, purchasing and accounts payable were reduced by 60%, 40% and 87%, respectively. Delgado, et al, (2010) presented the implementation of Lean Six Sigma in financial services organizations. The results show that the LSS approach can reduce the costs, cycle time, customer returns and inventory, and increase in production capacity. Githiri, (2004) in his study on 'application of Lean production techniques, a survey of large construction firms in Kenya' found out that indeed some construction firms in Kenya have adopted Lean in their operations ,but others were not aware of the techniques and tools of Lean thinking.

A research done by de koning, et al,(2008) on the application of the Lean Six Sigma methodology in two Dutch insurance companies provide illustrations of the significant benefits that can be accomplished by the combined Lean Six Sigma approach. The key lessons learned from these cases are first of all, neither Lean nor Six Sigma alone is best suited, but that the combination can provide practical and useful solutions for financial services. Secondly, it shows that Lean Six Sigma can bring about significant results and improvements. It helps organizations to survive, directly by creating improvements in the processes (cost reductions), but also indirectly by developing the organizational ability for innovation.

From the literature review on studies on LSS implementation and its benefits in banking industry and other industries there is need to carry out a study on implementation of LSS in banking industry in Kenya in order to fill the existing knowledge gap and better understand the operations strategies employed by financial institutions in Kenya together with the critical success factors in their implementation. This study therefore examines the status of Lean Six Sigma implementation in commercial banks in Kenya .The details, such as, the extent of familiarity of LSS by the commercial banks, their implementation process and the tools and techniques that have been employed by commercial banks in Kenya.

### **Objective of the Study**

The study explored the following specific objectives.

- i) To find out the extent to which commercial banks in Kenya implemented Lean Six Sigma

## Research Question

The following research hypothesis guided the study;

- i) To what extent have commercial banks in Kenya implemented Lean Six Sigma?

## IV. Methodology

This was exploratory research. Exploratory research is chosen because research in LSS and its implementation in service organization are still at a very early stage. According to Delgado et al, (2010), this methodology offers advantages not found in more quantitative research tools because qualitative data allow researcher to explore more fully complex relationships difficult to capture in a quantitative study. The target population of this study were banking institutions in Kenya. The Kenyan commercial banking system is dominated largely by commercial banks and a small number of non-bank financial institutions which concentrate mainly on mortgage finance, insurance and other related financial services. The Kenyan commercial banking sector has only 43 financial institutions (Source: Central Bank of Kenya Website). Due to the size of the banking industry, the whole population on banking institutions is included in this study, thus it is a census study. It was also noted that in comparison to similar studies conducted elsewhere, the size of the population in this study was small.

A questionnaire was used to collect information for this study. The correspondence containing the questionnaire and a cover letter was addressed to top-level corporate managers heading the operations function in the institution, usually referred to as the Head of operations, or the General Manager - operations at most banks. The head of the operations function were identified as the most suitable person to comment on the LSS implementation process in the bank.

The survey questionnaire had five parts to collect the following details, Company background and preliminary data, LSS implementation details, Knowledge and usage of quality and process improvement tools, and techniques as used within Lean Six Sigma initiatives, CSFs of Lean and Six Sigma deployment and Key benefits from LSS implementation. The data was collected and analyzed using descriptive statistics (pie charts, tables, mean and standard deviation) and factor analysis. Factor analysis attempts to identify underlying variables, or factors that explain the pattern of correlations within a set of observed variables. The goal of factor analysis is to try to identify factors which underlie the variables to discover simple patterns in the pattern of relationship among variables (Richard, 1973). The data was analyzed according to themes and presented in pie charts and frequency distribution tables.

## V. Findings And Discussions

### Usage of Quality and Process Improvement Methods, Tools and Techniques within Lean Six Sigma

The respondents were asked to rate the application of tools and techniques of Lean and Six Sigma in their banks. A four point Likert scale ranging from 'never used' (1) to 'used continuously' (4) was used. The scores of 'never used' and 'used once' have been taken to present a variable which had an impact to a small extent (S.E) (equivalent to mean score of 0 to 2.2 on the continuous Likert scale ;(  $0 \leq S.E < 2.2$ ). The scores of 'to used sometimes' have been taken to represent a variable that had an impact to a moderate extent (M.E.) (equivalent to a mean score of 2.3 to 2.9 on the continuous Likert scale:  $2.3 \leq M.E. < 2.9$ ). The score of 'used continuously' has been taken to represent a variable which had an impact to a large extent (L.E.) (equivalent to a mean score of 3.0 to 4.0 on a continuous Likert scale;  $3.0 \leq L.E. < 4.0$ ). The findings are as shown in table 1.

**Table 1:** Application of tools and techniques of lean six sigma

	Mean	Std. Dev
PDCA(Plan ,check,do,act)	3.4211	.62106
Continuous improvement (Kaizen)	3.4189	.62154
VOC(voice of the customers)	3.3947	.63798
TQM(total quality management )	3.3821	.64886
DMAIC (define, measure, analyze, improve and control)	3.3421	.67941
Cause and effect analysis	3.3158	.68378
Cross -functional work teams	3.2368	.68511
Total preventive maintenance	3.0000	.69749
Team problem solving tools	2.9221	.69912
VOE(voice of employee)	2.8947	.70036
FMEA (failure mode and effect analysis)	2.8947	.70036
Continuous flow production	2.8947	.70036
Benchmarking	2.8684	.70408
Input -output analysis	2.8684	.70408
Statistical process control (SPC)	2.8684	.70408
process flow chart/ mapping	2.7895	.71358
VSM (value stream mapping)	2.7632	.74252
Process capability analysis	2.7105	.75182

bottleneck constraint removal	2.6842	.82318
Histogram	2.6579	.84530
Quick Change Overs	2.6316	.85172
SIPOC (Suppliers, Inputs, Process, Outputs, Customers )	2.6053	.86549
Brainstorming	2.5263	.87870
Gantt chart	2.5263	.87870
DoE(design of experiment )	2.5000	.90269
Just in time (JIT)	2.2895	.96968
Quality function deployment (QFD)	2.2895	.96968
Pareto analysis	2.2632	.97897
Quality -costing analysis	2.1632	.98083
Error proofing methods	2.1053	.99004
Fishbone diagram	1.8684	.99107

The study found that the following application of tools and techniques of Lean and Six Sigma were used to a large extent; VOC-voice of the customers (mean of 3.3947), Cause and effect analysis (mean of 3.3158), TQM (total quality management) (mean of 3.3821), Cross -functional work teams (mean of 3.2368),Continuous improvement (Kaizen) (mean of 3.4189),DMAIC(mean of 3.3421 ),Total preventive maintenance(3.000) and PDCA-Plan, check, do, act (mean of 3.4211). It was also noted that some of the application of tools and techniques of Lean and Six Sigma are only used to a small extent for instance; Fishbone diagram (mean of 1.8684), and Error proofing methods (mean of 2.1053).

From these findings it can be concluded that majority of banks in Kenya have implemented Lean Six Sigma tools and techniques. The most common tools applied across the banks are; Plan- Do- Check- and Act (PDCA), Continuous Improvement (Kaizen), Voice of the Customers (VOC), Total Quality Management (TQM), Define Measure Analyze Improve and Control (DMAIC), Cause and Effect Analysis, Cross-functional work Teams, and Total Preventive Maintenance. It was also noted that most responding companies have implemented Lean Six Sigma tools and techniques relating to operational efficiency and customer satisfaction, for instance Continuous improvement (Kaizen), Plan, Check, Do, Act (PDCA), the Voice of Customer and TQM have the highest application rates .

#### How the Banks Came To Be Aware Of Lean Six Sigma

The respondents were asked to state how their bank’s came to be aware of Lean Six Sigma. The findings are given in Table 2.

**Table 2:** how your company came to be aware of lean six sigma

	Frequency	Percent	Cumulative Percent
Professional publications	24	63.2	63.2
Top management	12	31.6	94.7
From customers	1	2.6	97.4
Have not heard of Lean Six Sigma in any context	1	2.6	100.0
Total	38	100.0	

As shown in table 4.2, majority of the responding bank’s (63.2%) knew about Lean Six Sigma through professional publications, 31.6% knew about it through top management and 2.6% knew about it from customers while 2.6% had not heard of Lean Six Sigma in any context.

### VI. Conclusion

The study identified eight application of tools and techniques of Lean and Six Sigma to a greater extent; Voice of the Customers, Cause and Effect analysis, Total Quality Management, Continuous Improvement (Kaizen), Define Measure Analyze Improve and Control (DMAIC), Total preventive maintenance, Cross-Functional work teams, and Plan, Check, Do, Act.

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