LEAN PROCUREMENT METHODOLOGIES USED BY LARGE SCALE MANUFACTURING FIRMS IN NAIROBI, KENYA

BY

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D61/61687/2010

A Research Project Submitted in Partial Fulfillment of the Requirement for the Award of Master of Business Administration (MBA), School of Business, University of Nairobi

November, 2012

DECLARATION

This research project is my original work and has not been previously published or presented for the award of the degree in any other university.

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ACKNOWLEDGEMENT

First I give thanks to the Almighty God for the gift of life and for giving me the skills, tenacity, resilience and the will to be able to complete this project.

My sincere gratitude goes to my project supervisors, Mr. Ernest Akelo and Mr. Peterson Obara Magutu for their guidance, support and patience throughout my research work and for their astute comments, criticism and insights, which kept me focused on the project. They were always available and ready to assist.

I also register my sincere appreciation to my siblings particularly my sister Esther Kabuga for her selfless support, my friends and my MBA colleagues especially the Liberian friends. I particularly salute J. Gonda Tozay for supporting and encouraging me to finish this project.

To my Employer and colleagues at my workplace place; 'Thank you for giving me the chance to pursue my studies and accommodating my tight schedule'.

DEDICATION

To my parents Mr & Mrs Kabuga for their inspiration and support throughout the entire MBA Programme. Their steadfast prayers and encouragement toward completion of my studies have indeed been answered.

ABSTRACT

The lean procurement process has been revolutionized, leading to a number of success stories from various companies. These companies join a growing number of businesses in a myriad of industries that have revamped their operations to be leaner and more efficient, all to a variety of benefits and to overcome the critical barriers in the lean procurement practices. To do this, firms apply different methodologies to manage their lean procurement. Most firms have not been able to formulate the right methodologies required to achieve this objective in their lean procurement process. However, the objectives of this study are to determine the lean procurement methodologies being implemented by large scale manufacturing firms; to determine the benefits of implementing lean procurement methodologies among large scale manufacturing firms; and to establish the critical barriers to the implementation of lean procurement methodologies by large scale manufacturing firms in Nairobi, Kenya.

Descriptive survey design was used to carry out the study. The population of the study constituted all the large scale manufacturing firms within Nairobi. The sample of this study consisted of 60 large scale manufacturing firms. Self administered drop and pick questionnaires were distributed to the head of purchasing/procurement/supply chain management currently employed by the large scale manufacturing firms in Nairobi. The data collected was analyzed with the use of means, standard deviation, and factor analysis with the aid of statistical packages for social sciences (SPSS). The methodologies adopted by large scale manufacturing firms influenced lean procurement and positively aided manufacturing firms to possess competitive advantage. Of primary consideration, the methodologies adopted by large scale firms included lean thinking, e-procurement, good supplier relationship management and the control movement of materials using the Kanban system and the benefits of implementing lean procurement methodologies also include eliminating waste in all procurement cycles, reduce lead time, reduce inventory, reduce cost, improved customer satisfaction and improved demand management. The critical barriers that the research established in the implementation of lean procurement methodologies to be affecting large scale manufacturing firms included lack of system thinking, resistance to change, poor planning, lack of adequate resource, lack of skills and expertise and the lack of clarity supply chain waste.

This study will be of great importance to the policy makers in the manufacturing industry as they will use the methodologies, benefits and established critical barriers in the implementation of lean procurement methodologies used by large scale manufacturing firms in Nairobi, Kenya in gaining competitive advantage by adding value and avoiding waste.

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CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Change is the word that best characterizes the nature of our modern societies and determines the challenges that managers face. Management of change therefore needs to be an everyday plan for a leader. The success of a manager depends on their ability to react, operate and adapt to change. With today's rapid technological progress, global communications, intensified competition and increasingly change in consumer tastes and preferences, old methods of firms operations can no longer produce desirable results nor can they respond to the fast changing situations. Powerful methods and tools are required for successful structuring of change processes (Kotler, 2007; Mertins and Jochem 2001; Spur *et al.,* 1996).

Staying competitive requires looking for new ways of reducing cost and increasing the quality of the company's products. Liker, (1998) argues that competitive advantage and leadership in the global marketplace can only be gained by applying lean principles to the supply chain .It is likely that most manufacturing firms in Kenya have difficulties to compete with lower prices given the high cost of production and therefore need to be more efficient, productive and simultaneously increase their capabilities regarding quality, delivery and service. Lean procurement methods can presumably enable this.

Lean is considered to be one potential approach for improving organization's performance. This complex highly integrated system is the reason for Japan's manufacturing effectiveness (Womack *et a*l., 1990; Liker, 1998). Lean procurement integrated as a complete system in the organization can ensure company's competitiveness and help the firm unlock the power of lean manufacturing principles. It is the future of supply chain management in a demand driven world. One of the essential aspects to lean concept is to attain highest possible satisfaction among internal and external customers of the procurement and logistics departments. The benchmark here is cost, quality which has become important for the manufacturers in regard to customer's satisfaction (Barla, 2003).

1.1.1 Lean Procurement Methodologies

According to Lean Enterprise Institute (2009) the term lean was coined by Krafcik in the late 80's, even though the philosophy came to the Western world's attention in the early 80's as a result of competition from Japan automobile industry which offered low prices and quality products. To precisely define lean is hard and it is likely that every company exercising lean will follow their own unique course (Lewis, 2000). It is the process of removing all of the wasted time and resources in the production process. Lean can be considered a philosophy, a work culture, a technique, a management concept, a value, a methodology or an ethos (Mark, Wilson and Ram, 2009). Today, lean is evolving into a management approach that improves all the processes at each level of an organization (Womack *et al.*, 1990; Liker, 1998).

According to Bhasin and Butcher (2006) some of the common lean procurement methodologies are; Kaizen, Kanban systems and Supplier development. A long term philosophy, processes, people and right culture are essential to convert an organization into a lean enterprise (Liker, 2004; Henderson *et al.*, 1999). Long term relationships with suppliers are important elements of lean supply (Handfield, 1993). According to Liker (1996); Lathin, (2001); Ferch, *et al.*, (1998) today's demand driven supply chains require lean procurement methods whose goals are: to eliminate waste in all procurement cycles, prevent shortages, reduce inventory investment, reduce procurement lead time and cost, increase inventory turnover and ensure customers' satisfaction. These methods ensure greater efficiency and standardization of procedures. Thus, applying lean methods to procurement function and purchasing activities can dramatically increase a company's performance and profits.

However, companies may fail to effectively implement lean procurement methods due to lack of system thinking (Sohal and Eggleston *et al.*, 1994). Employees may not be willing to adapt to new methods and may exhibit resistance to change. The organization may as well lack the internal capabilities to facilitate education and training, lack of clear responsibility in the supply chain, lack of management and suppliers' engagement, insufficient, planning monitoring and control may also inhibit the effective implementation of lean procurement. Lack clarity over the supply chain and the struggle to localize and differentiate value from waste may hinder effective implementation of lean procurement methods. It may also be costly to implement lean

procurement methodologies in an organization as it requires extra resources (Polito and Watson; Bhasin and Burcher, 2006).

1.1.2 Manufacturing Firms in Kenya

Although Kenya is the most industrially developed country in East Africa, manufacturing accounts for only 16% of gross domestic product (GDP). This level of manufacturing represents only a slight increase since independence. Despite the importance and the size of this sector in Kenya, it is still very small when compared to that of the industrialized nations (UNIDO, 1987). Manufacturing activities are concentrated around the three largest urban centres; Nairobi, Mombasa, and Kisumu. The firms are dominated by food processing industries. Others are beverage, metal engineering and textile firms which account for 63% of manufacturing value added (GOK, 2007). Kenya aims to become the provider of choice for basic manufactured goods in Eastern and Central Africa. This can be done through improved production efficiency at firm level.

The manufacturing industry is an important sector in Kenya as it makes a substantial contribution to the country's economic development. The industry is one of the key economic pillar in the vision 2030 geared to make the nation a middle level income country by the year 2030. According to KAM, there are over 700 established multi-sector manufacturing firms in Kenya where 455 are located in Nairobi. The firms differ in terms of products that they are engaged in and in size as determined by the number of employees. The manufacturing industry has the potential to generate foreign exchange earnings through exports to diversify the country's economy and create employment.

Globalization and intense competition of supply chains has forced manufacturing firms to look for better manufacturing methods to remain competitive. However the industry production has also slowed down owing to the rise in inflation, high cost of energy and the dumping of cheap imports. Rather than competing with lower prices, implementation of lean procurement methodologies would help the firms to achieve a competitive edge.

1.2 Statement of the Problem

Traditionally, procurement core responsibilities have produced purchased materials and services on time at the lowest cost and highest quality to meet their customer demands. However the role has expanded to play a critical role in improving the flow of information and materials throughout the entire supply chain and has become necessity in the supply chain excellence (Virolainen, 1998; Hines, 1996). According to Van Weele (2002) the largest part of cost of goods is in purchased raw materials, components and services. Efficient procurement can therefore lead to substantial competitive advantage (Langley; Coyle and Gibson; Novack and Bardi, 2008).

According to Karlsson and Ahlstrom (1997); Kaynak (2005), lean manufacturing is a necessary antecedent to lean procurement. In today's competitive environment, the role of purchasing departments have changed significantly. In order to keep the promises to customers, an effective material procurement method becomes necessary besides the improved manufacturing methods and technology. A purchasing department can take on both the active and effective role of applying the lean procurement principles as much as possible to improve efficiency, competitiveness and ensure organization's profitability (Larson, 2008).

Extensive research has been conducted in the field of lean procurement and much of it point to the fact that lean can lead to efficient procurement (Womack, Jones, Roos, 1990; Liker, 2004; Hines & Taylor 2000; Lee, 2003). Lubben (1988) also expresses the objectives of lean supply chains as improving efficiency, quality and delivery performance of suppliers. Mark, Wilson and Ram (2009) investigated the implementation of lean procurement among small and medium sized enterprises. They concluded that for successful implementation of lean, it required participation and full support of all the supply chain members and also depended on factors like stable demand, long term partnership and fast and frequent exchange of information. However not all these conditions can be met by small and medium sized enterprises.

Much of the discussions about lean in academic literature are still centered around applying the model on manufacturing, and most of the studies have been conducted in the context of developed world. The implementation success of lean principles is also ambiguous and Bhasin & Burcher (2006) note that less than 10 per cent of organizations that have implemented lean in the UK are considered successful. Polito and Watson (2006) argue that lean procurement only suits a specific set of economic and cultural conditions and exclude small to medium sized enterprises.

This study will therefore seek to determine lean procurement methodologies used by large scale manufacturing firms in Nairobi, Kenya by answering the following questions: (i) what are the lean procurement methodologies implemented by the large scale manufacturing firms in Nairobi, Kenya; and (ii) what are the benefits of implementing these lean procurement methodologies and lastly (iii) what are the critical barriers to the implementation of lean procurement methodologies among large scale manufacturing firms in Nairobi, Kenya.

1.3 Objectives of the Study

The main objective for this study is to determine lean procurement methodologies used by large scale manufacturing firms in Nairobi, Kenya

Specific objectives are:

i. To determine the lean procurement methodologies being implemented by large scale manufacturing firms in Nairobi, Kenya.

ii. To determine the benefits of implementing lean procurement methodologies among large scale manufacturing firms.

iii. To establish the critical barriers to the implementation of lean procurement methodologies.

1.4 Value of the study

The research will provide enduring and essential guidance to the top management and purchasing managers and leaders in large scale industry seeking to transform traditional enterprises into exemplars of lean success by developing a theoretical framework that provides a more detailed perspective of the lean procurement approaches to the firms that consider implementing lean as a possible direction towards achieving sustainable performance and increase profitability for their companies and help them understand how implementing lean can add value to the organization process and contribute in achieving operational excellence. Managers will also get useful insights on challenges that companies would experience when they need to change their business model and enhance their preparations to address these challenges for effective lean implementation.

The study will provide a framework for researchers who wish to further research on lean procurement methodologies that could bring value among large scale manufacturing firms in Kenya; their contribution to the economy at large and also analyse the critical barriers that hinder the effective implementation of lean procurement methodologies among large scale manufacturing firms. Academics will be able to borrow from findings of this research project to support their literature citations as well as develop theme for further research.

The research findings can be useful to the government and other stakeholders such as suppliers by providing insight on the lean procurement methodologies applicable in Kenyan large firms and thereby provide machineries to motive the firms in their implementation as well as help in addressing the challenges to ensure effective lean implementation. Consumers of the manufactured products will also have the benefit of buying products at competitive prices from firms that practice and embrace lean.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter explores the three dominant themes of the research questions by reviewing what others have done on lean procurement. The chapter starts by explaining the concept of lean procurement, its emergence and changing role where procurement is today becoming a management function from the traditional business support function. Different lean procurement methodologies are reviewed; benefits of implementing the lean procurement methodologies and critical barriers to the implementation of lean methodologies are also explained.

2.2 The Concept of Lean Procurement

The term "lean" refers to a systematic approach of identifying and eliminating waste (non-value added activities) through continuous improvement by moving the product at the pull of the customers in pursuit of perfection. Womack and Jones (2009) in their book argue that the adoption of lean approach will change almost everything in every industry choices for suppliers, consumers, and the nature of work.

The lean approach consists of various practices which aim to improve efficiency, quality and responsiveness to customers. Womack and Jones (2009) point out that all activity processes associated with leanness attempt to achieve three objectives: flow, pull and striving for excellence. Flow means that inventory moves through a supply chain continuously with minimal queuing; Pull means that customer orders trigger operations and pull materials through the supply chain rather than having schedules for upstream activities driving the rate of procurement; Striving for excellence means that supply chains must have efficient operations that remove all waste. As a contrast to the traditional mass production system, lean requires half the human effort, manufacturing space and capital investment, where strong partnership with suppliers are essential (Womack *et al.*, 2007; Lean Enterprise Institute ,2008; Liker,2004).

Procurement has a rich historical background as a business support function in industry (Fearon, 1989). However, this has changed to a management function since 1970's when the oil crisis and

the pressures of the competition necessitated careful management of purchasing inputs to protect the cost structure in public and private enterprises. Waters and Fuller (1995) state that the difference between lean and traditional way of procurement is that the traditional approach uses multiple sources and short term contracts, instead of single sourcing and long term contracts which lean is associated to. Ansarri and Modarress (1988) emphasize that lean procurement involves smaller batches, less quality inspection and administrative work, which is in line with lean's philosophy of doing more with less.

The core concept of lean thinking is the Japanese term muda, described by Womack *et al.,* (1990). In their book *machines that changed the World*, Muda means waste or any human activity that absorbs resources but creates no value. Example of Muda are spoiled production, unnecessary processing steps, the purposeless movement or movements of employees and goods, time wasted in waiting for materials, uneconomic or unnecessary inventories and goods and services that fail to meet customers' requirements. Lean procurement is an asset to the organization that strives to eliminate all waste by directly linking upstream and downstream flow of products, services, finances and information by efficiently and effectively pulling only what is needed to meet the needs of the individual customers (Abbott *et al.*, 2006).

2.3 Lean procurement methodologies

Building an organization with leaner procurement methods is a continuous improvement which requires strong integration and synchronization across the supply chain blocks (Supplier, manufacturers, Logistics, customers) with the consumer demand and each organization must be equipped with right capabilities (people, methods, systems). Lean procurement methodologies are often expressed as ideals to meet demand instantaneously with perfect quality and no waste. Some lean procurement methodologies are;

2.3.1 Employee's Involvement and Respect for People

Employees' involvement and empowerment is an imperative requirement and vital for success (Hines *et al.*, 2008; Lee, 2007). While implementing lean, it should be reinforced to the policy makers that lean is not just a set of tools and techniques but at its heart are the people (Ohno, 1988; Saurin *et al.*, 2011; Black, 2007). Ichimura and Arunachalam (2006) state that if

employees are to make any contribution which set them apart from competition, work needs to be stimulating and satisfying while providing an opportunity to develop their skills to perform well.

Lean philosophy is often put forward as a total system. Its aim is to provide guidelines which embrace everyone and every process in the organization. There exist a need to recognise that ultimately the best people to deliver any cultural change are the employees and that lean cannot work with isolated tools and therefore securing the full benefits of lean requires the need to concentrate on the whole value chain and that the employees should be respected (Liker, 2004; Comm and Mathaisel ,2000; Weiss, 2001; Spear, 2004; Black, 2007).

2.3.2 Continuous Improvement (CIP)/Kaizen

It is the continual pursuit of improvement in quality, cost delivery and design. It ensures organization achieve competitive advantage. Kaizen could be seen as a culture of sustained improvement aiming at eliminating waste in the entire organization and involves everyone in a common aim to improve work without huge capital investments (Bhuiyan and Baghel, 2005). Efforts focused on the reduction of waste are pursued through continuous improvement or kaizen events, as well as small incremental improvements.

The purpose of CIP is the identification, reduction, and elimination of suboptimal processes; ; its emphasis on incremental, continual steps rather than giant leaps; and the core principle of CIP is the, self-reflection of processes or feedback. All employees should continually be seeking ways to improve their own performance. This helps encourage workers to take ownership for their work, and can help reinforce team working, thereby improving workers motivation. It is the people whose knowledge, intelligence and desire to improve that steers organizations to new levels of continuous improvement. (Hines *et al.,* 2008).

2.3.3 Six- Sigma

Six-sigma has become a synonym for improving quality, reducing waste and improving customer loyalty and achieving bottom line results. It institutionalizes a rigorous, disciplined fact based way to deliver through process improvement and process design project. Six -sigma is the practice of building quality into the process rather than relying on inspection. It also refers to the

theory of employees assuming responsibility for the quality of their own work eliminating any form of waste through ensuring zero defects.

Six Sigma's goal is to define processes and manage those processes to obtain the lowest possible level of error. Not limited to manufacturing, Six Sigma can be applied to virtually any process. Because of its emphasis on quality, Six Sigma is often implemented together with lean in the manufacturing environment. In 2000 annual reports, GE describes the changes brought by six - sigma this way "Six Sigma has turned the company's focus from inside to outside, changed the way we think and train our future leaders and moved us towards becoming a truly focused organization. Its efforts focused on the reduction of waste are pursued through continuous improvement or kaizen events, as well as radical improvement activities.

2.3.4 Adopt Basic Working Practices

Shah *et al.*, (2008) and Liker (2004) state that unless the organization manages to inculcate appropriate behaviours into its culture, the transition to lean methods may be bound to fail. Organization should therefore stand a little chance of implementing lean unless they have paid at least equal attention to creating the right culture, conditions and circumstances which can become the foundation of implementing change. Management should express commitment in the implementation process and communicate the vision of the improvement program and involve the employees all the way.

Supply chain partners including the upstream suppliers and downstream customers work together as a team to provide value to the end-user customer. Collaboration must begin through a management understanding and acceptance of the concept, followed by a clear conveyance of this approval and its need to the workforce, nurture a learning environment for which indices such as, training employees can provide an approximate barometer; Make a conscientious effort to maximise stability in a changing environment whereby an attempt is made to reduce waste and use of periodical meetings, discussions, and exchange of information between supply chain partners. Another vital ingredient towards a successful implementation relates to the compensation system. A balanced compensation plan which focuses on measures of continuous improvement, operational efficiency, teamwork and short-term results will promote the culture where lean initiatives can survive, thrive and produce results (Fullerton & Wempe, 2009 ; Sim &

Rodgers, 2009). When an organisation proves to be serious regarding its lean journey, it is necessary to institutionalise the improvements and sustainability (Johnston, 2009).

2.3.5 Just in Time (JIT)

In lean procurement, JIT provides a cost effective delivery of only the necessary quantity of parts at the right quality, at the right time and place. This is accomplished through the application of elements which require total employee involvement and teamwork. This approach is also interchangeably called lean. It is both a philosophy and a method of procurement planning and control. The concept improves procurement performance. It means procuring goods and services exactly when they are needed and not before they are needed so that they wait as inventory, nor after they are needed so that it is the customers who have to wait. JIT aims to meet demand instantaneously, with perfect quality and no waste.

Just in Time can also be defined as the rapid and coordinated movement of parts throughout the supply chain network to meet customer demand and give high quality, fast throughput and exceptional productivity. Rather than buying large quantities of materials at well-spaced intervals, JIT needs small, frequent orders to meet immediate requirements. These small order sizes- typically enough for one day's need or even a few hours- are the main difference with normal purchasing. JIT includes the features like; a commitment to zero defects by the buyer and seller, frequent shipment of small quantities of materials with short lead time and strict delivery performance standards, close and collaborative buyer-seller relationship, stable products and procurement schedules sent to suppliers, Electronic data interchange and free flows of information with suppliers and extensive sharing of information between supply chain members.

2.3.6 Kanban systems

Kanban is a Japanese term which means "sign'' or "Instruction card. It is used to control operations by using containers, cards or visual cues to control the production and movement of materials through a supply chain .The cards or containers make up the Kanban pull system. Kanban as a control system according to Liker (2004); Ar-nold & Chapman (2004) is pulling only what is needed .The authority to produce or supply additional parts therefore comes from downstream operations.

They have the following characteristics; They are used to control the movement of materials by pulling materials through a supply chain, They use simple signalling mechanisms such as a card, empty container or even an empty space to show when specific items should be procured and moved; They can be used to synchronize activities within a single facility, or between different supply chain partners; They are not planning tools, but control the flow of materials. Upstream operations are ultimately controlled by the demands of the final customers who initiate the whole movement of materials.

2.3.7 Supplier Relationship

The key to lean procurement is visibility. Suppliers must be able to "see" into their customers' operations and customers must be able to "see" into their suppliers' operations. In Porters model of competitive advantage, Porter has identified buyers and suppliers as two of the five forces. Porter (1986) says that suppliers are an essential part of the company, impacting the ability of the firm in achieving competitive advantage. The relationship between buyer and supplier is based on a long-term orientation incorporating trust and commitment (Morgan and Hunt, 1994), with the buyer helping financially and technologically to address some of the supplier's operational problems if required. Liker and Choi (2006) states that lean companies have more focus on increasing their supplier's capability in order to reduce cost and improve quality.

With increasing turbulence in the Market place, it is clear that market have to move away from transaction oriented marketing strategies and move toward relationship oriented marketing strategies. Lean suppliers are able to respond to change since their prices are generally lower due to the efficiencies of lean processes, and they deliver on time and their culture is one of continuous improvement. To develop lean suppliers, organizations should include suppliers in their value stream. They should encourage suppliers to make the lean transformation and involve them in lean activities. This will help them fix problems and share savings. In turn, they can help their suppliers and set continually declining price targets and increasing quality goals hence increasing firm's profitability. Firms should focus on picking a number of suppliers who provide reasonable prices and quality materials, then forging a long-term relationship with them. In this way, businesses secure their line of goods and can forgo the extra costs and delays of finding new suppliers all the time. Confidence in the supplier or vendor's delivery commitment allows reduction of buffer inventories.

2.3.8 Lean thinking

Lean thinking is operationalized as an integrated management approach that has an impact over the whole organization including its stakeholder's suppliers and other business partners and customers. A report by research teams from the universities of Bath and Warwick on the people implementations of lean organization identified three phases of lean development and their associated production and human resources approaches; leanness as a transaction where efforts made by the organization to become lean through delayering, downsizing and outsourcing; leanness as an outcome by assumed structural flexibility through business process re-engineering and lastly leanness as a process through Total Quality management and JIT processes.

The commitment to Lean thinking must start at the top management level and should be cascaded down to various levels across the organization to improve flow and efficiency of processes. Womack and Jones in their seminal work *lean thinking* provided the following guidelines for implementing a lean supply chain; Value must be defined jointly; All firms along the value stream must make an adequate return on their investments related to the value stream; The firms must work together to identify and eliminate *muda* (waste) to the point where the overall target cost and return on investments targets of each firm are met; When cost targets are met, the firms along the stream will immediately conduct new analysis to identify remaining *muda* and set new targets.

2.3.9 E-Procurement

E- Procurement can be an important part of a company's overall strategy for reducing costs. This replaces the traditional methods which includes placing orders via telephone, fax, or mail. Electronic procurement method generally referred to as e-procurement or use of Information and Communication Technology potentially enable the procurement process to unfold in a faster, more efficient manner, and with fewer errors. The methods include electronic data interchange (EDI), online marketplaces or e-marketplaces, and various blends of the two. Besides varying from industry to industry, different companies use different blends of traditional and electronic procurement methods and individual e-procurement systems themselves may incorporate traditional capabilities like telephone or fax.

E-procurement provides a higher supply chain transparency which enables companies to centralize strategic procurement and decentralize operational procurement processes (Kaufmann, 1999; Lamming, 1995). EDI deals more with the way information is communicated during procurement than it does with the act of linking buyers and suppliers. By definition, EDI is the electronic exchange of business information such as purchase orders, invoices, bills of lading, inventory data, and various types of confirmations between organizations or trading partners in standardized formats. EDI also is used within individual organizations to transfer data between different divisions or departments, such as finance, purchasing, and shipping.

2.4 Benefits of Implementing Lean procurement methodologies

2.4.1 Introduction

Lean procurement is becoming a strategy method for gaining competitive advantage and even for survival, not just for manufacturers, but also for retailers and wholesalers since adding value and removing waste is no longer an option for companies. Non- lean practicing companies face competition from foreign made goods which can have significant impacts on their business and industry as well as the economy. The benefits of lean procurement are;

2.4.2 Elimination of Waste in all Procurement Cycles

The heart of lean can be seen as eliminating waste (Licker, 2004).Arguably the most significant part of the lean philosophy is its focus on elimination of all forms of waste. Waste can be defined as any activity which does not add value. Supply chain partners have work together and individually to eliminate wasteful processes and excess inventory across the chain. Two simple devices are commonly used in lean improvements. One is concerned with identifying waste as the first step towards eliminating it. There are seven forms of waste which need to be eliminated as suggested by Philips and Nystuen (2002); Meier, 2001; Siekman, Taylor & Brunt, 2000 *et al*,. These wastes are overproduction, transportation waste, inappropriate processing, and waste of waiting time, inventory waste, unnecessary motions and product defects. The other is the 5s which is a simple set of principles for reducing waste. Waste in procurement processes can be identified, classified and minimized in the same way as waste in manufacturing as well as create tremendous savings potential.

Without lean procurement, buyers spend the majority of their time on non-strategic processes like tracking down their order status, purchase order entry and maintaining "private" spread sheets for analysis. As a result they miss the opportunities for mutually beneficial supplier negotiation and process efficiencies. Lean procurement methods eliminates discrete purchase orders, adopt a more efficient pay on consumption business process that achieve substantially lower level of inventory improving the process of procuring materials. In the lean paradigm, inventory is considered waste since manufacturing can take place efficiently with little or no raw material, work in process (WIP), or finished goods inventory.

2.4.3 Reduce Lead time

This is the time taken by the customers to place an order for the goods and paying for them. Since firms faces growing challenges around market volatility, long lead time and forecasting errors, lean improves the flow of information and material throughout the supply chain thereby reducing time taken for the product to flow .Lean procurement deliveries are flexible and lean in order to meet changing demand in a demand driven supply chain. In addition to sheer cost of disrupting production, long lead times can damage the existing customer relationship and significantly weaken the firm's credibility.

Reduced lead time is the key structural element of lean processes and can result to improved efficiency of supply chain processes. This in turn lowers the inventory cost making it more consistent and increases manufacturing flexibility. Lean methods also ensures quick push and pull in the firm's product supply chain enabling quick response to demand rather than anticipated forecast.

2.4.4 Reduce Inventory

Inventory kept in waiting or as a safety stock does not add value and should be eliminated (Karlsson and Ahlstrom, 1996). Firms are under increasing pressure to reduce inventory levels in the demand driven enterprises. Many companies today produce directly into trailers and maintain no idle or waiting inventory. In this order to make scenario, all raw materials are sourced and utilized and no space is designated to store raw materials. Typically, waste across the supply chain will be made manifest in excess inventory. Reducing inventory can be aided by introducing postponement and customization strategies, which push the final assembly of a

completed product to the last practical point in the chain. Applying one-piece flow and pull systems and JIT techniques can reduce raw materials and WIP dramatically.

A Kanban or visual signal for more goods to be pulled and moved forward to the next process can also accomplish this procedure. The ultimate goal is to eliminate raw materials and any WIP. Although the leanest organizations have arranged just in time deliveries to support manufacturing, this approach requires the absolute highest degree of competency and coordination within the supply chain. JIT driven processes in the inventory management techniques enables firm to maintain no waiting inventory resulting in smooth inventory orders (Worthington, 1998).

2.4.5 Reducing Cost

Inventories should ebb and flow with the changes in customer demand. This leads to reduction in inventory carrying cost and administrative costs. Traditional mass production tries to minimize unit costs by increasing total production over the life cycle of the product thus procuring more than enough raw materials for more production. High development and carrying costs are the result of this model. Lean helps to minimize new product development time and expense. This delivers the product to market faster, making it easier to incorporate current requirements into the product. Lean also promotes the use of less capital-intensive machines, tools, and fixtures, which results in more flexibility and less initial cost to recover. As a result, product life cycles may be shorter. This contributes to smoother and more predictable earnings by reducing the variability of cost of goods.

2.4.6 Improved Customer Satisfaction

Lean procurement methodologies helps develop flexible and responsive supply chain where when customers demand unexpectedly goes up, the supply chain meets the increase and when forecast go down, the firm is left with no level of inventory. Lean procurement systems also allow a supply chain to not only to be more efficient, but also faster and responsive. As the culture of lean takes over the entire supply chain, all links increase their velocity. A culture of rapid response and faster decisions becomes the expectation and the norm. This does not mean that decisions are made without careful thought. It simply means that a "bias for action" becomes the new corporate culture. Slow response or no response becomes the exception, rather than the rule.

2.4.7 Improved Demand Management

The traditional procurement methods consist of the buyers managing MRP forecast and communicating the requirements to supplier via phone, fax and e-mail. These traditional methods are slow and cumbersome and cannot support today demand driven enterprises. A lean supply chain works to have products pulled through the channel using customer demand from point of sale systems in real time. This minimizes the need to forecast demand, given the actual and real demand for the product. One of the key principles of lean is moving to a pull system. That is, products or services are pulled when requested by the final customer. Clearly, the end-user requirement for the finished product will generally be meaningless to a third tier supplier, as they likely only provide a fraction of the materials for finished product and most probably do not understand how they contribute to the end-product structure. Implementation requires that all suppliers and processors everywhere in the supply chain process receive demand signals that come from the customer and turn those signals into components of the final saleable product for which they are responsible.

2.4.8 Process Standardization

Another attribute of a Lean supply chain is process standardization. Process standardization enables continuous flow to occur in the company, a major tenet of lean manufacturing. Flow is the uninterrupted movement of a product or service through the system to the customer. Major inhibitors of flow are work in queue, batch processing, and transportation. These roadblocks slow the time from product or service initiation to delivery. The "flow" or "value-stream" perspective represents a shift from vertical to horizontal thinking.

Horizontal thinking which means looking across the traditional vertical structures of functions and departments to connect activities in the stream of the value flowing from suppliers, through the organization, and on to customers (Hallam, 2001). In other words, continuous flow means focusing on system efficiency rather than just on the point efficiency of individual elements in an organization. Flow is enabled when materials and processes are standardized across the supply chain to reduce complexity. These efficiencies can only be gained through collaboration across the supply chain and by developing standardized processes for use in providing products and services that add value and eliminate wasted or duplicated steps. A thorough understanding of the processes involved through the supply chain will help partners to work towards standardizing

important processes and shifting work to the most efficient point in the chain. One of the important processes that transcend firms is planning and production.

Industry standards should be utilized wherever possible, and supply chain members should participate in industry standards bodies. Standardization of products is a benefit to customers who are using the products, and enhances serviceability. However it also decreases the proprietary nature of the product, making other competitive factors such as an efficient supply chain more important.

2.4.9 Makes the Supply Chain a Competitive Weapon

Liker (2004); Taylor and Brunt *et al.*(2001) suggest with empirical evidence that lean aids competitiveness. Sheridan (2000) insists that benchmarking studies of Japanese companies demonstrated that true conversions to lean produced four fold productivity gains. Sohal and Eggleston (1994) suggest that two-thirds of the companies said that a strategic advantage had been generated through lean methods, with the greatest improvements stemming from market competitive positioning, customer relationships and quality constraints. A strong supply chain enables the member companies to align themselves with each other and to coordinate their continuous improvement efforts. This synthesis enables even small firms to participate in the results of lean efforts. Thought, commitment, planning, collaboration, and a path forward are required.

2.5 Critical barriers to the Implementation of Lean procurement Methodologies

Some of the critical barriers to implementing lean procurement methodologies among large scale manufacturing firms are; lack of system thinking, resistant to change, poor planning, lack of adequate resources, lack of skills and expertise, and lack of clarity of supply chain waste.

According to Bashin and Burcher (2006), many companies fail in implementing lean procurement because they fail to see lean as more of a process. Lack of system thinking hinders successful implementation (Mason,2007; Liker,2004 & Lee,2003) .They state that lean is more than just a set of tools as it is about how you approach you job, customers, suppliers and

processes. According to Liker (2004) lean is a system of 4P model, i.e. Philosophy, Process, People & partner and problem solving.

Resistance to change is also a problem in the implementation of lean, as in most change processes. Sohal and Egglestone (1994) indicate that resistance is represented in all functions of a company, including senior managers, middle managers and shop floor personnel. Axelsson *et al.*, (2005) state that resistance from individuals is a familiar problem for purchasing managers which inhibits lean implementation. He states that the primary reasons for resistance is often lack of clarity and uncertainty for change, pressure, interference with interest, and challenges to learn something new. According to Bhasin and Burcher (2006), it is important for the implementation of lean to have a clear vision of what the organization will look like after the transformation and the goals are also communicated to the staffs.

(Bicheno and Holweg (2009); Atkinson, (2010); Saurin *et al.*, (2011) state that implementation of lean procurement in the firms fail due the existing culture and lack of support of change by the management The literature dictates that nine of the top ten barriers to change are quoted as being people-related, including poor communications and employee opposition (Ransom, 2008; Lee, 2007; Vinodh and Balaji, 2011 ; Shook, 2010), Cocolicchio (2008); Hines *et al.*,(2008) and Dalal ,2010).

Another major difficulty when applying lean is lack of planning and project sequencing (Bhasin & Burcher, 2006; Ahlstrom, 1997). Knowledge of the tools and method is often not the problem, according to Bhasin and Burcher (2006), but rather difficulties of coordinating the work and making people believe in them. In his article, Philip Atkinson states that most organization fail to create a culture that will sustain lean and any other programme of organization improvement He states that failing to plan for change equates to planning to fail. Firms should pay equal attention to creating the right culture, conditions and circumstances which can become the foundation of implementing change.

Implementing lean methodologies also requires extra resources which most of the firms are not willing to spend. Financial resources are needed for employee training programs, external

consultants, ICT Integration and coordination etc. Sometimes even production of firms may be interrupted as a result of the employees training in the new techniques. The managers would rather refuse unnecessary loss of resources especially if they do not anticipate immediate returns (Pius Achanga *et al.,* 2008).

Implementing lean methodologies require use of intellectual capital and ability to innovate and differentiate. Most companies experience difficulties after employing people with low skills levels, who do not foster the ideology of skill enhancement. Companies often lack clarity of differentiating value from waste in the supply chain. Balancing procurement related activities that are "necessary waste" with those that create value presents an on-going struggle for companies of all sizes. For instance, it might be difficult for firms to tell whether employees' movement within the firm adds value or not.

2.6 Summary of the Literature

From the literature, it is clear that lean procurement is conceptualized differently amongst organization. Organizations that implement lean therefore do so in their own unique way depending on the firm different variables and problems. Quality, delivery and costs are central during the entire process of lean implementing lean, which also entails selection and establishing long term and healthy relationship with suppliers. Lean procurement requires high level of cooperation from all the supply chain partners.

Implementing lean across the enterprise gives many positive results in the firm as it develop the employees to be problem solvers and increase their level of work satisfaction which result to change in the management culture form a command and control to flexible and team building culture. Introducing lean methods in the firm is not always a smooth journey and may at times fail to be successful due to lack managerial commitment and attention. Implementing lean procurement methods seem to bear a direct relationship to improvements in performance which this research seeks to establish.

CHAPTER THREE: REASERCH METHODOLOGY

3.1 Introduction

This chapter discusses the methodologies employed to answer the research question of the study. It highlights a full description of the research design, the research variables and provides a broad view of the description and the selection of the population and the sample. Data collection techniques, research instruments, and data analysis procedure have also been explained.

3.2 Research Design

The study employed a descriptive research design of a survey type. This is a measurement process used to collect information during a highly structured interview, sometimes with a human interviewer (Cooper Schindler 2008). This method is ideal where the researcher can engage in a survey by going to the population of interest in order for the respondent to explain certain features about the problem under study. The survey method was therefore useful in providing descriptive information on lean procurement methodologies employed by Kenyan large scale manufacturing firms in Nairobi, their benefits and critical barrier of implementing these methods. Similarly it is a common method of studying individuals under natural conditions (Saunders & Thornhill, 2003).

3.3 Population of the study

The population of the study consisted of all large scale manufacturing firms in Nairobi, Kenya. According to Kenya Association of Manufacturers (KAM) directory, June, 2011, there are 455 large scale manufacturing firms in Nairobi. This area was chosen because it is where most of the large scale manufacturing firms in various sectors are concentrated thereby giving a big population where a proportionate sample was to be derived.

3.4 Sampling

According to Mugenda and Mugenda (2003), a representative sample should be at least 10% of the population. Sixty (60) respondents were therefore ideal which constituted 13.2% of the population which is in the threshold of Mugenda and Mugenda (2003) recommendation. The study used a simple random sampling approach to determine the sample.

3.5 Data Collection

Primary data was used in the study. It was collected by means of a structured questionnaire comprising 3 parts. Part A will capture lean procurement methods where the respondents were asked to what extent the various methods were employed in their firms. Part B evaluated the benefits of the lean procurement methods and part C the critical barriers of implementing these methods. The evaluation was done on a 5 point likert scale, where 5= Very Great Extent, 1= Very Small Extent.

The respondents were the heads of purchasing/ Procurement/ supply Chain department management of officers in charge of materials management of their firms and in their absence their deputies. It was believed that being heads of supply chain department, they were familiar with the procurement methods employed by the firm. Further at the high level in the organization hierarchy, it is expected that they have the capacity to evaluate their firm's performance. The questionnaire was administered using a drop and pick later method.

3.6 Data Analysis

The data collected was analyzed using descriptive statistics which involved measures of central tendency and dispersion. To ensure efficient and effective data analysis, factor analysis which used SPSS method was used to regroup and reduce the data to a small number of underlying common factors or domains that summarized the data to help in the interpretation through recoding of variables.

The first objective was to determine the lean procurement methodologies being implemented by large scale manufacturing firms in Nairobi, Kenya. To achieve this, mean scores was used.

To address the second objective, i.e. to determine the benefits of implementing lean procurement methodologies among large scale manufacturing firms, descriptive (mean and standard deviation) and factor analysis was used to determine whether the variables could be categorized into the 9 discussed benefits.

For the last objective, of establishing critical barriers to the implementation of lean procurement methodologies, descriptive statistics was used. Factor analysis was also used to determine whether the variables can be categorized into the 6 critical barriers discussed in the literature review.

CHAPTER FOUR: DATA ANALYSIS, FINDINGS AND DISCUSSION

4.1 Introduction

This chapter presents the data analysis and findings of the study in detail. The data collected was analyzed using both qualitative and quantitative analysis and were presented in tables and graphs. The section addresses the findings, analysis and results from the responses on questionnaires collected from the respondents. The researcher distributed 60 questionnaires to head of purchasing/procurement/supply chain management in large manufacturing firms in Nairobi who were selected by means of simple random sampling to avoid a biased selection. The questionnaire was categorized into three sections, comprising 69 variables (explanatory variables). The data collected was analyzed with the use of both descriptive statistics, which include the use of mean scores and standard deviation and factor analysis with the aid of the statistical packages for social sciences (SPSS) to derive results of the study. The analysis findings and results of the study are stated below.

4.2 Response Rate

The researcher distributed 60 questionnaires to the head of purchasing/ procurement/ supply chain management department in large manufacturing firms in Nairobi. 44 of the questionnaires were returned thus giving a response rate of 73.33% in the study. The 16 responses which constitute 26.67% were non-responsive with some respondents communicating that they will complete the questionnaires during the following week, but despite the many follow-up by the researcher the effort was fruitless. The 73.33% response rate is an indication of a well dispersed representation to the large scale manufacturing firms in Nairobi, Kenya, and was considered successful for this study to proceed.

4.3 Lean Procurement Methodologies

There are a number of procurement practices that firms can adopt. One of them is the implementation of lean procurement methodologies. The respondents were asked to indicate the extent to which their firms have practiced and adopted such lean methodologies among large

scale manufacturing firms in Nairobi, Kenya on a five point likert scale (1= No extent at all, 2= small extent, 3= Moderate Extent, 4= Great Extent and 5= Very great Extent). To answer the research question, 9 explanatory variables were identified as possible variables in the determination of lean procurement methodologies. The descriptive statistics in Table 4.1 shows the mean scores and the standard deviation of the variables used in the determination of the lean procurement methodologies. The mean scores were structured in an order of highest to lowest scores. Means with the highest score indicated the variables which are best used in the determination of lean procurement methodologies.

Table 4.1: Lean Procurement Methodologies

Methodologies	Means	Standard Deviation
Practice of lean thinking	4.05	0.914
Use of e-procurement	3.84	0.939
Good supplier relationship management	3.59	1.263
Use of Kanban system to control movement of materials	3.55	0.73
Firm continually improves performance	3.36	0.718
Employees free to bring lean procurement cultural change	3.25	0.781
No inspection of procured products	2.91	1.217
Compensation for employees practicing lean	2.91	1.007
Firm practices JIT	2.84	0.888

From the result indicated in Table 4.1 above, to a great extent (mean $\geq 3.5, \approx 4$ with significant standard deviation) shows that the firms use lean thinking, e-procurement, good supplier relationship management and the control movement of materials using the Kanban system. This is true since for the firms to be lean in their procurement, they should first have lean thinking. Lean thinking in supply chain management is the use of lean principles to align activities across corporate functions within the firm and to manage business relationships with customers and suppliers to eliminate wastes. Use IT such as E-Procurement to operate the transactional aspect of requisitioning, authorizing, ordering, receiving and payment processes for the required services or product. Good supplier relationship provides customer with the required quantity based on the customer order and avoid the supply of sub-standard and defective goods to customer. Kanban is a Japanese term which is a system used to control operations by using containers, cards or visual cues to control the production and movement of materials through a supply chain. . These results are in line with the findings of Womack and Jones (2009);

Kaufmann (1999) and Lamming (1995); Porter (1986); and Liker (2004) which indicated that the adoption of lean procurement methodologies will change almost everything in every industry nature of work, choices for suppliers, consumers, and in the expression of ideals to meet demand instantaneously with perfect quality and no waste. Variables with mean score less than 3.5 is an indication that these are least lean procurement methodologies that large scale manufacturing firms in Nairobi implement.

4.4 Benefits of Implementing Lean Procurement Methodologies

Section B of the questionnaire was used to identify and rank the benefits of implementing lean procurement methodologies considered by large scale manufacturing firms in Nairobi, Kenya. To answer the second research question, 39 factors (explanatory variables) were identified as possible benefits that result from the implementation of lean procurement methodologies. Each of the respondents reviewed each factor captured on the questionnaire and responded on a likert scale from five (very great extent) to one (no extent at all). Descriptive statistics and factor analysis was used with the aid of statistical packages for social science (SPSS) to deriving the analysis of this section. Factor analysis is used to find the latent variables among observed variables. With factor analysis one produces a small number of factors from a large number of variables which explain the observed variance in large number of variables. The reduced factor is used for further analysis.

From the result indicated in Table 4.2 below, a great extent(mean ≥ 3.5, ≈ 4 with significant standard deviation), there are 22 benefits to the implementation of lean procurement methodologies ranging from flexible and responsive supply chain, smooth information flow, efficient and faster supply chain, customers loyal to firm products, prompt payment for procured items, coordination of continuous improvement, limited waiting hours for procured materials, on time response to demand, demand driven supply chain, strong supply chain, increase in productivity, customers happy with firm's products, procurement of only required materials, lean produces strategic advantage to the firm, procurement of defect free materials, customer signals important in product development, firm meets all firm's demands, prompt demand signal reception by suppliers, employee understanding of processes, pulling of products in real time orders, continuous product flow in the supply chain and horizontal thinking by firm. The benefits

of the use lean procurement methodologies from the analysis were categorized into six components: elimination of waste in all procurement cycles, reduce lead time, reduce inventory, reduce cost, improved customer satisfaction, and improved demand management. The main purpose of lean is to eliminate the waste in every step of work processes in the enterprises, to maximize customer value while minimizing waste. This can shortly be described as creating more value for customers with fewer resources .The term "lean" refers to a systematic approach of identifying and eliminating all waste (non-value added activities) through continuous improvement by flowing the product at the pull of the customer in pursuit of perfection. Reduced lead time emphasis is on the responsiveness to customers demand. Reduced lead time for the inputs going into the product manufactured compresses the performance cycle resulting in superior customer service and simultaneously reduced overall inventory levels. Consumer demands for a high degree of manufacturing responsiveness and reduced lead-times,. Reduced inventory as a benefit of lean procurement methodology implies that many companies today produce directly into trailers and maintain no other finished goods inventory. All quality inspections and checks are performed within the process, rather than after production are complete. Lean practices also helps to minimize new product development time and expense thereby reducing cost. Consumer preferences and variety suffer in this scenario. Costs still need to be minimized, but not at the expense of what more sophisticated consumers now demand.

Improved customer satisfaction as one of the benefits of lean procurement methodologies entails that lean promotes minimizing new product development time and expense. This delivers the product to market faster, making it easier to incorporate current requirements into the product to meet customer satisfaction and improved demand management works to have products pulled through the channel using customer demand from point of sale systems in real time. This minimizes the need to forecast demand, given the actual and real demand for the product

These results are in line with the findings of Liker (2004), Lean Enterprise Institute (2009, Philips and Nystuen (2002), Meier (2001) Karlsson and Ahlstrom (1996) and Worthington (1998) which indicate that the lean approach to managing operations is founded on doing the simple things well, on gradually doing them better and (above all) on squeezing out waste every step of the way. Lean procurement methodology is becoming a strategy method for gaining competitive advantage and even for survival since adding value and removing waste is no longer an option for companies.

Table 4.2: Benefits of Lean Procurement Methodologies

Variables	Means	Standard Deviation
Flexible and responsive supply chain	4.2	0.553
Smooth information flow	4.09	0.473
Efficient and faster supply chain	3.98	0.59
Customers loyal to firm products	3.95	0.48
Prompt payment for procured items	3.93	0.545
Coordination of continuous improvement	3.91	0.64
Limited waiting hours for procured materials	3.91	0.64
On time response to demand	3.89	0.493
Demand driven supply chain	3.89	0.895
Strong supply chain	3.89	0.655
Increase in productivity	3.86	0.51
Customers happy with firm products	3.86	0.594
Procurement of only required materials	3.86	0.852
Lean produces strategic advantage to the firm	3.86	0.824
Procurement of defect free materials	3.82	0.815
Customer signals important in product development	3.8	0.701
Firm meets all customer demands	3.77	0.605
Prompt demand signal reception by suppliers	3.7	1.025
Employee understanding of processes	3.7	1.002
Pulling of products in real time orders	3.61	0.618
Continuous product flow in the supply chain	3.59	0.497
Horizontal thinking by firm	3.57	0.501
Focus on system efficiency	3.39	0.493
Flexible and fast delivery of procured items	3.36	0.718
Use of 5s to reduce waste	3.27	0.694
Uninterrupted product movement to customers	3.23	0.424
Reduction of inventory carrying and admin. costs	3.2	1.047
Use of less capital intensive machinery	2.89	0.868
Less procurement logistics	2.82	1.263
Maintaining of order to make	2.73	0.758
Direct procurement into production department	2.66	0.888
Practice of postponement and customization	2.61	0.784
Direct transportation to designated places	2.59	0.972
Use of visual signal for material movement	2.59	0.726
No storage space for raw materials	2.57	0.759
No safety stock maintained	2.36	1.014
No keeping of inventory	2.32	1.006
No mass production	1.86	0.462
Less time spent on new product development	1.8	0.553

The correlation matrix in Appendix 3, gives the correlation coefficients between the each single variable and every other variable in the investigation. The data contained in the correlation matrix are then rearranged in a manner that better explains the structure of the underlying system which produced the data. The correlation between all possible pair of variables in the analysis is then obtained. The diagonal elements which are all 1.000 are omitted. The next step from the factor analysis output is the Kaiser-Meyer-Olkin (KMO) and Barlett's test which measures the sampling adequacy which should be greater than 0.5 for a satisfactory factor analysis to proceed. Looking at Table 4.3, the KMO measure is 0.712. From the table, we can see that the Barlett's test of sphericity is significant.

Table 4.3: Kaiser- Meyer- Olkin and Barlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.712
Bartlett's Test of Sphericity	Approx. Chi-Square	1241.01
	Df	120
	Sig.	0

The extraction of principal component analysis takes place by calculating eigenvalues of the matrix. Principal component analysis is used as a method of extraction as it seeks a linear combination of variables such that maximum variance is extracted from variables. It then removes the variance and seeks a second linear combination which explains the maximum proportion of the remaining variance.

Appendix 4 presents the eigenvalues and percentages variance associated with each factor. In order to determine the number of factors to be used, the variances and co-variances of the variable are computed. The eigenvalues and eigenvectors are evaluated for a covariance matrix and the data is transformed into factors. The factor loadings are important for the interpretation of the factors, especially the high ones. From the result illustrated in Appendix 4, R- mode factor analysis was used to cluster the variables as shown on the component matrix in Appendix 5. Component loadings from the principal component analysis were used to percentage of variance in the variable explained in the factor. The component matrix in Appendix 6 summarizes these loadings for the 39 variables and the 9 components (factors). Varimax rotation was used to make it easy to identify each of the 39 variables with single factor. Appendix 7 illustrates the rotated component matrix for the data.

Figure 4.1: Scree Plot 1

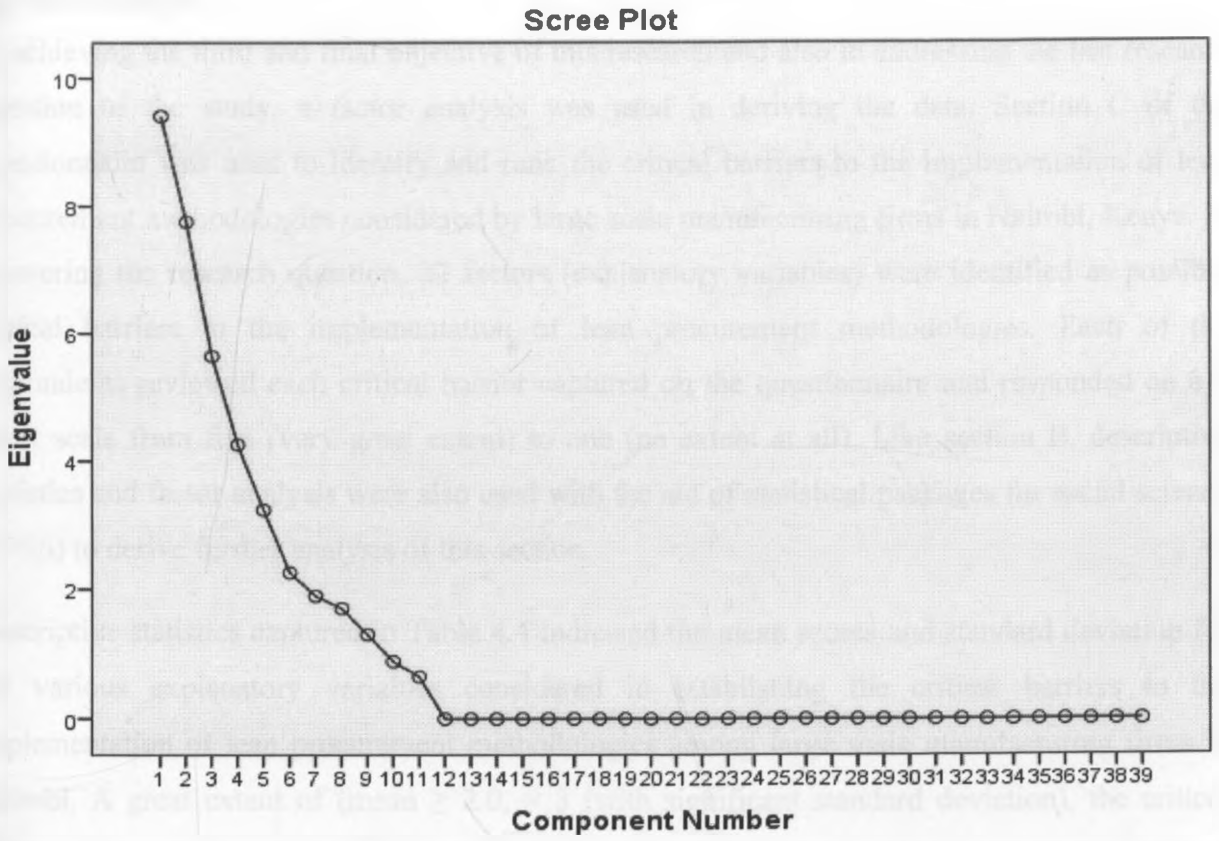


Figure 4.1 illustrates the scree plot which indicates that the scree begins to tee-off after factor 9 showing that 9 factors were considered in the analysis in determining the benefits of lean procurement methodologies within large scale manufacturing firms. However, only six of the factors were considered significant to explain the characteristics of the benefits of lean procurement methodologies. The factors were grouped into 6 categories constituting the benefits of lean procurement methodologies.

The benefits include elimination of waste in all procurement cycles, reduced lead time, reduced inventory, reduced cost, improved customer satisfaction and improved demand management. These benefits have the highest loading in their specific categories. These are therefore the factors that are considered significant as the benefits of lean procurement methodologies among large scale firms within Nairobi. Benefits (7, 8 & 9) in the rotated component matrix analysis revealed that these are not significant in determining the benefits of lean procurement methodologies.

4.5 Critical Barriers to the Implementation of Lean Procurement Methodologies

In achieving the third and final objective of this research and also in addressing the last research question of the study, a factor analysis was used in deriving the data. Section C of the questionnaire was used to identify and rank the critical barriers to the implementation of lean procurement methodologies considered by large scale manufacturing firms in Nairobi, Kenya. In answering the research question, 22 factors (explanatory variables) were identified as possible critical barriers to the implementation of lean procurement methodologies. Each of the respondents reviewed each critical barrier captured on the questionnaire and responded on a 5 likert scale from five (very great extent) to one (no extent at all). Like section B, descriptive statistics and factor analysis were also used with the aid of statistical packages for social science (SPSS) to derive further analysis of this section.

Descriptive statistics captured in Table 4.4 indicated the mean scores and standard deviation for the various explanatory variables considered in establishing the critical barriers to the implementation of lean procurement methodologies among large scale manufacturing firms in Nairobi. A great extent of (mean $\geq$ 2.0, $\approx$ 3 (with significant standard deviation), the critical barriers to the implementation of lean procurement methodologies is where employees view lean as set of tools, inability to coordinate and sequence lean implementation, inability to clarify between value and waste in supply chain and employees slow on implementing lean . This is in line with the findings of Bashin and Burcher (2006); Mason (2007); Liker (2004) and Lee (2003).

Table 4.4: Critical Barriers to Lean Procurement Methodologies

Variable	Means	Standard Deviation
Employees view lean as set of tools	3.39	1.083
Inability to coordinate and sequence lean implementation	2.16	0.713
Inability to clarify between value and waste in supply chain	2.07	0.661
Employees slow on lean	2	0.715
Management inability to instill new skills to employees	1.98	0.34
Lack of time to implement lean	1.95	0.48
Firm cannot afford to implement ICT	1.95	0.48
Lack of clear outcome vision	1.93	0.545
Ideology of skill enhancement not fostered	1.93	0.255
Employees do not embrace fad of lean procurement	1.91	0.64
Lack of funds for consultants	1.91	0.52
Lack of articulate method of lean implementation	1.86	0.734
Poor communication channels	1.86	0.347
Employees lack knowledge of lean tools	1.86	0.347
Lack of anticipated returns of lean implementation	1.86	0.347
Lack of intellectual capital	1.84	0.479
Rigidity to change traditional procurement methods	1.82	0.582
No culture of change management in the firm	1.82	0.54
Employees not seeing lean as a process	1.8	0.765
Inability to discern whether employee movement creates value or not	1.77	0.677
Employees not eager to learn new things	1.73	0.451
Employees do not see importance of lean	1.7	0.632

The starting point of a factor analysis is the correlation matrix, in which the intercorrelations between the studied variables are presented. The dimensionality of this matrix can be reduced by looking for variables that are correlated highly with a group of other variables, but very badly with variables outside of that group. The correlation matrix in Appendix 6, gives the correlation coefficients between each single variable and every other variable in the investigation. The correlations between all possible pairs of variables are obtained. The diagonal elements which are all 1.000 are omitted in the analysis.

In table 4.5 the KMO measure is 0.806. From the table, it is observed that the sampling is adequate and the Barlett's test of spherity is significant.

Table 4.5: KMO and Barlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.806
Bartlett's Test of Sphericity	Approx. Chi-Square	189.741
	Df	15
	Sig.	0

Principal component analysis is used as a method of extraction as it seeks a linear combination of variables such that maximum variance is extracted from variables. It then removes the variance and seeks a second linear combination which explains the maximum proportion of the remaining variance.

From the result illustrated in Table 4.6 overleaf, R-mode factor analysis was used to cluster the variables as shown on the component matrix Table 4.7. The component loadings from the principal component analysis were used to explain the percentage of variance in the variable explained in the factor. The component matrix table 4.7 summarizes these loading for the 22 variables and the 6 components (factors). Varimax rotation was used to make it easy to identify each of the 22 variables with a single factor. Table 4.8 illustrates the rotated component matrix for the data.

Table 4.6: Critical Barriers to Lean Procurement Methodologies Total Variance Explained

Component	Initial Eigenvalues			Extraction Sum of Squared Loadings		
		% of Variance	Cumulative %	Total	% of Variance	Cumulative %
Lack of articulate method of lean implementation	9.955	45.25	45.25	9.955	45.25	45.25
Employees not seeing lean as a process	3.456	15.711	60.96	3.456	15.711	60.96
Employees view lean as set of tools	2.397	10.896	71.857	2.397	10.896	71.857
Rigidity to change traditional procurement methods	2.053	9.332	81.188	2.053	9.332	81.188
Employees do not see importance of lean	1.675	7.614	88.803	1.675	7.614	88.803
Employees not eager to learn new things	1.031	4.687	93.49	1.031	4.687	93.49
No culture of change management in the firm	0.587	2.669	96.159			
Employees do not embrace fad of lean procurement	0.434	1.973	98.132			
Inability to coordinate and sequence lean implementation	0.347	1.579	99.711			
Lack of clear outcome vision	0.064	0.289	100			
Poor communication channels	1.05E-15	4.79E-15	100			
Employees lack knowledge of lean tools	9.44E-16	4.29E-15	100			
Lack of funds for consultants	7.79E-16	3.54E-15	100			
Lack of time to implement lean	5.85E-16	2.66E-15	100			
Firm cannot afford to implement ICT	1.47E-16	6.70E-16	100			

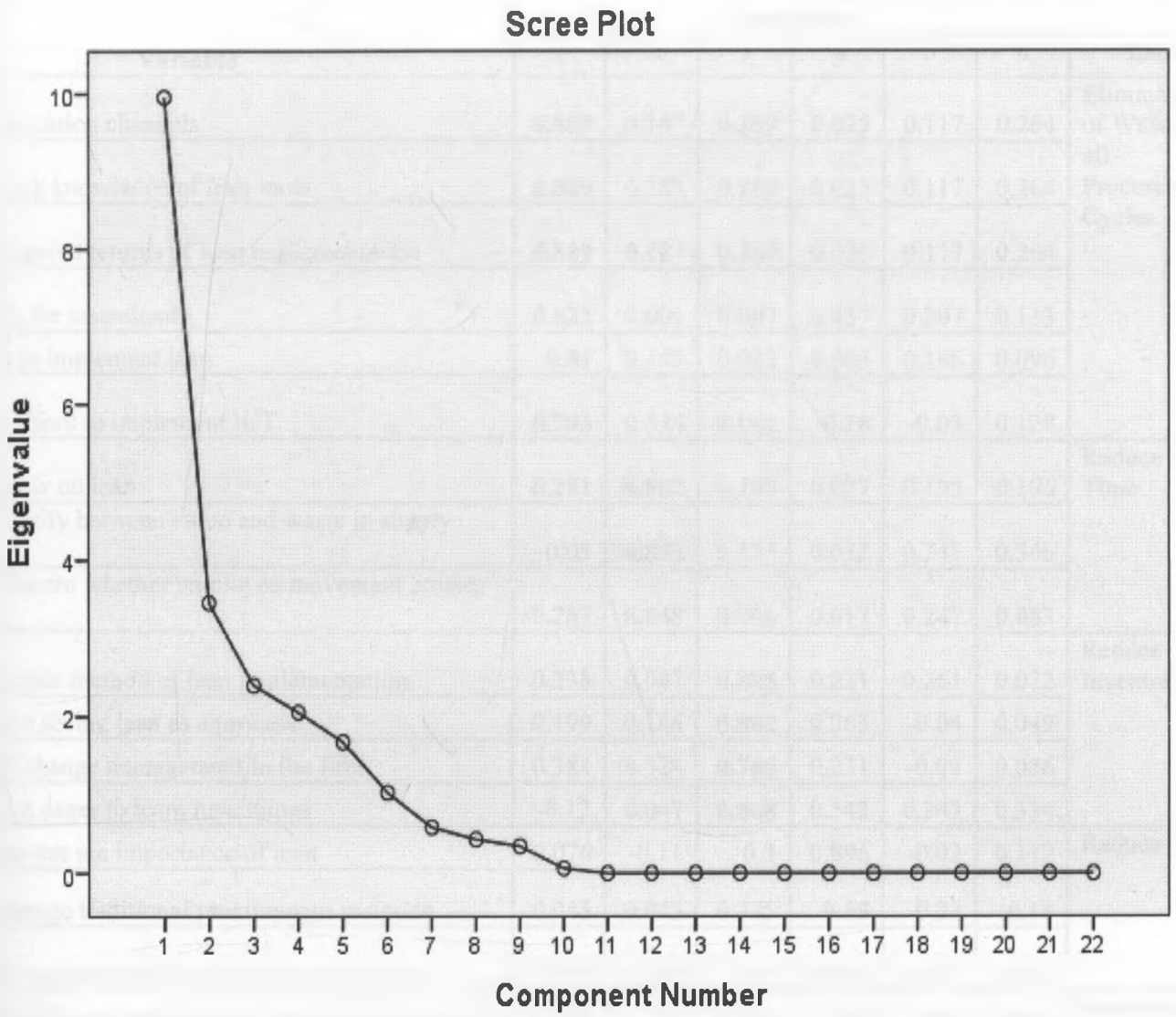
Extraction Method: Principal Component Analysis

Table 4.7: Critical Barriers to Lean Procurement Methodologies Component Matrix

Variable	Component					
	1	2	3	4	5	6
Lack of articulate method of lean implementation	0.238	0.047	0.885	0.231	0.261	-0.072
Employees not seeing lean as a process	0.199	0.146	0.862	0.263	-0.042	0.049
Employees view lean as set of tools	-0.097	-0.18	-0.116	-0.235	-0.899	0.159
Rigidity to change traditional procurement methods	0.045	0.043	0.375	0.85	0.28	0.18
Employees do not see importance of lean	0.076	-0.11	0.3	0.896	-0.018	0.112
Employees not eager to learn new things	-0.12	0.047	0.668	0.543	0.243	0.334
No culture of change management in the firm	0.384	0.524	0.705	0.231	-0.049	0.036
Employees do not embrace fad of lean procurement	0.449	0.448	0.465	0.585	0.042	-0.041
Inability to coordinate and sequence lean implementation	0.249	0.147	0.103	0.192	0.923	0.024
Lack of clear outcome vision	0.115	0.291	0.019	-0.147	0.923	0.302
Poor communication channels	0.889	0.187	0.269	-0.025	0.117	0.264
Employees lack knowledge of lean tools	0.889	0.187	0.269	-0.025	0.117	0.264
Lack of funds for consultants	0.822	0.001	0.007	0.457	0.207	-0.113
Lack of time to implement lean	0.81	0.143	0.022	0.503	0.196	0.096
Firm cannot afford to implement ICT	0.783	0.534	-0.061	-0.18	-0.028	0.128
Lack of anticipated returns of lean implementation	0.889	0.187	0.269	-0.025	0.117	0.264
Lack of intellectual capital	0.113	0.291	-0.193	0.142	-0.24	0.809
Management inability to instill new skills to employees	0.261	0.241	0.157	0.102	0.145	0.839
Ideology of skill enhancement not fostered	0.5	0.054	0.182	0.123	0.249	0.708
Employees slow on lean	0.281	0.862	0.193	-0.027	0.195	0.196
Inability to clarify between value and waste in supply chain	0.03	0.855	0.137	0.032	0.245	0.346
Inability to discern whether employee movement creates value or not	0.267	0.848	0.066	0.017	0.247	0.083

Extraction Method: Principal Component Analysis.
a. 6 components extracted.

Figure 4.2: Scree Plot 2



In order to determine the number of factors to retain, the factors with eigenvalues greater or equal to one were retained. This was further illustrated by using the scree plot figure 4.2 which indicates that the scree started to tee-off after factor 6 showing that only 6 factors explain the critical barriers influencing the lean procurement methodologies among large scale manufacturing firms in Nairobi. Therefore these factors were considered as significant in analysis in determining the critical barriers which influence large scale manufacturing firms in Nairobi, Kenya.

ble 4.8: Critical Barriers of Lean Procurement ethodologies Rotated Component Matrix

Variable	Component						
	1	2	3	4	5	6	Label
or communication channels	**0.889**	0.187	0.269	-0.025	0.117	0.264	Elimination of Waste in all Procurement Cycles
nployees lack knowledge of lean tools	**0.889**	0.187	0.269	-0.025	0.117	0.264	
ck of anticipated returns of lean implementation	**0.889**	0.187	0.269	-0.025	0.117	0.264	
ck of funds for consultants	**0.822**	0.001	0.007	0.457	0.207	-0.113	
ck of time to implement lean	**0.81**	0.143	0.022	0.503	0.196	0.096	
rm cannot afford to implement ICT	**0.783**	0.534	-0.061	-0.18	-0.03	0.128	
nployees slow on lean	0.281	**0.862**	0.193	-0.027	0.195	0.196	Reduce Lead Time
ability to clarify between value and waste in supply ain	0.03	**0.855**	0.137	0.032	0.245	0.346	
nbility to discern whether employee movement creates lue or not	0.267	**0.848**	0.066	0.017	0.247	0.083	
ck of articulate method of lean implementation	0.238	0.047	**0.885**	0.231	0.261	-0.072	Reduce Inventory
nployees not seeing lean as a process	0.199	0.146	**0.862**	0.263	-0.04	0.049	
o culture of change management in the firm	0.384	0.524	**0.705**	0.231	-0.05	0.036	
nployees not eager to learn new things	-0.12	0.047	**0.668**	0.543	0.243	0.334	
nployees do not see importance of lean	0.076	-0.11	0.3	**0.896**	-0.02	0.112	Reduce Cost
igidity to change traditional procurement methods	0.045	0.043	0.375	**0.85**	0.28	0.18	
nployees do not embrace fad of lean procurement	0.449	0.448	0.465	**0.585**	0.042	-0.041	
ability to coordinate and sequence lean implementation	0.249	0.147	0.103	0.192	**0.92**	0.024	Improved Customer Satisfaction
ack of clear outcome vision	0.115	0.291	0.019	-0.147	**0.92**	0.302	
nployees view lean as set of tools	-0.097	-0.18	-0.116	-0.235	**-0.9**	0.159	
nagement inability to instill new skills to employees	0.261	0.241	0.157	0.102	0.145	**0.839**	Improved Demand Management
ack of intellectual capital	0.113	0.291	-0.193	0.142	-0.24	**0.809**	
eology of skill enhancement not fostered	0.5	0.054	0.182	0.123	0.249	**0.708**	

xtraction Method: Principal Component Analysis

otation Method: Varimax with Kaiser Normalization

otation converged 11 iterations.

From the rotated component matrix above, it is clear that factor loading of the various factors were categorized into 6 components. The components include lack of system thinking, resistance to change, poor planning, lack of adequate resources, lack of skills and expertise and lack of clarity in supply chain waste. These components have factors with the highest loading in their specific categories. These are therefore the factors that are considered significant in determining the critical barriers within lean procurement methodologies within large scale manufacturing firm in Nairobi, Kenya.

Lack of system thinking is an impediment for sustainability. This addresses problem with only the short term in mind, offering no systematic fix, only to be confronted with the same problem during the next quarter. Resistance to change is a natural reaction when employees or organizations are asked, well, to change. Change is uncomfortable and requires new ways of thinking and doing. Organizations and employees resistance to change served as the critical barrier to the used of lean procurement methodologies by large scale manufacturing firms. Poor planning results in setting up in appropriate objectives or plan. Poor planning within the lean procurement can result into waste. These wastes may include overpopulation, delays between processing steps, inventory waste, unnecessary processing, unnecessary movements, production of defective parts and unnecessary transport of products, parts and supplies.

The result of the analysis of the third research question has identified some of the key critical barriers in the implementation of lean procurement methodologies by large scale manufacturing firms in Nairobi. By looking at the 6 labels derived from the factor analysis, it is important to show the role of these critical factors in the implementation of lean procurement methodologies.

Lack of system thinking is an impediment for sustainability. This addresses problem with only the short term in mind, offering no systematic fix, only to be confronted with the same problem during the next quarter. Resistance to change is a natural reaction when employees or organizations are asked, well, to change. Change is uncomfortable and requires new ways of thinking and doing. Organizations and employees resistance to change served as the critical barrier to the used of lean procurement methodologies by large scale manufacturing firms. Poor planning results in setting up in appropriate objectives or plan. Poor planning within the lean procurement can result into waste. These wastes may include overpopulation, delays between

processing steps, inventory waste, unnecessary processing, unnecessary movements, production of defective parts and unnecessary transport of products, parts and supplies.

The lack of adequate resources within the lean procurement cycle results in low funding and operations. The lack of the right level of staffing eventually results in the low performance and the development of sub-standard goods. This also causes the lack of effectiveness in ensuring proper lean procurement. The lack of skills expertise is a key barrier to the lean procurement methodologies. For instance, if a manufacturer lacks the technical skills to develop equipment, he may develop over stretched specification which may not be necessary for the operation, thus resulting into waste and loss of resources. The lack of clarity of supply chain waste is a challenge to most large scale manufacturing firms in the implementation of lean procurement methodologies. Companies often lack clarity of differentiating value from waste in the supply chain. Balancing procurement related activities that are "necessary waste" with those that create value presents an on-going struggle for companies of all sizes. For instance, it might be difficult for firms to tell whether employees' movement within the firm adds value or not.

The analysis and interpretation of the findings of this research shows the methodologies, the benefits and the critical barriers of lean procurement methodologies used by large scale manufacturing. The lean procurement methodologies derived from the study are practice of lean thinking; use of E-procurement; good supplier relationship; use of kanban system to control procurement materials; firm continually improves performance and employees to bring lean procurement cultural change. The six important benefits the lean procurement methodologies are elimination of all waste from the procurement cycle, reduce lead time, reduce inventory, reduce cost, improved customer satisfaction and improved demand management, where as the critical barriers to lean procurement are lack of system thinking, resistance to change, poor planning, lack of adequate resource, lack of skills and expertise and lack of clarify supply chain waste. The research noted that most of the firms in the study apply lean procurement methodologies. These practices are universal and the findings from this research are in line with the findings of other studies (Licker 2004, Arnold & chapman 2004, Porter 1986, Kaufmann 1999, Philips and Nystuen 2002, Meier 2001, Siekman, Taylor & Brunt 2000, Karlsson & Ahlstrom 1999, shoal & Egglestone 1994 and Ahlstrom 1997)

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of the Findings

The main aim of this study was to establish the lean procurement methodologies used by large scale manufacturing firms in Nairobi, Kenya. The objectives of the study were: To determine the lean procurement methodologies being implemented by large scale manufacturing firms in Nairobi, Kenya; To determine the benefits of implementing lean procurement methodologies among large scale manufacturing firms and lastly to establish the critical barriers to the implementation of lean procurement methodologies. Thereafter, the researcher has established the most important lean procurement methodologies which large scale manufacturing firms are required to focus on. This study has referred to a range of literature and engaged in the primary research aimed at understanding the lean procurement methodologies used by large scale manufacturing firms in Nairobi.

5.1.1 Lean Procurement Methodologies

A number of variables were examined by the use of descriptive statistics to establish the lean procurement methodologies adopted by large manufacturing firms in Nairobi. The study established that the practice of lean thinking; use of E-procurement; good supplier relationship; use of kanban system to control procurement materials and firm's continual improved performance and employees motivation to bring lean procurement cultural change. The practice of lean thinking system in lean procurement is important and therefore large scale manufacturing usually analyze the lean principles to align activities across corporate functions within the firm and to manage business relationships with customers and suppliers to eliminate wastes.

5.1.2 Benefits to Lean Procurement Methodologies

The most relevant components of the study derived from the analysis and interpretation of the findings; using 6 labels identified the benefits of lean procurement methodologies used by large scale manufacturing firms in Nairobi. These components are very significant to the benefits of

lean procurement methodologies by large manufacturers in Nairobi. The benefits of the methodologies that will be applied in the lean procurement process matter so much to most of the firms. Lean procurement is a strategy method for gaining competitive advantage and even for survival, not just for manufacturers, but also for retailers and wholesalers since adding value and removing waste is no longer an option for companies. Elimination of all waste from the procurement cycle was found out in the study to be a key benefit in the lean procurement methodologies. The other important benefits which should be considered by large scale manufacturing firms in Nairobi are reduce lead time, reduce inventory, reduce cost, improved customer satisfaction and improved demand management.

5.1.3 Critical Barriers to Lean Procurement Methodologies

A number of 6 factors were identified as critical barriers that affect lean procurement methodologies by large scale manufacturing firms in Nairobi, Kenya. Lack of system thinking is a major challenge in the implementation of lean procurement where most firms view lean practice as a preserve of some departments in the organization instead of being embraced in the entire organization system. Resistance to change is also a challenge to most large manufacturing firms in Nairobi, whereby employees and some organization find it difficult to accept the changes in modern reality. The success of any organization depends on the plans initiated from the beginning of that organization. Poor planning greatly hamper every organization. In order for lean procurement methodologies to survive, a good planning strategy needs to be put into place. Other factors which also affect the use of lean procurement methodologies are the lack of adequate resources, lack of skills expertise and the lack of clarity of supply chain waste.

5.2 Conclusions

The study suggests that large scale manufacturing firms can determine their methodologies, benefits and critical barriers using the derived methodologies from the study and also including the 6 factors identified as the benefits of lean procurement methodologies and critical barriers which predict reasons for lean procurement methodologies used by large scale manufacturing firms in Nairobi. It can be concluded that there are several methodologies, benefits and critical barriers that explain the use of lean procurement methodologies by large manufacturing firms in Nairobi: However the descriptive statistics conducted derived the following variables as the best

lean procurement methodologies, these include the practice of lean thinking; use of E-procurement; good supplier relationship; use of kanban system to control procurement materials; firm continued improved performance and employee's motivation to bring lean procurement cultural change. Only the practice of lean thinking had a mean score of 4.05, while the rest obtaining a mean score more than 3.00. The factor analysis conducted in determining the benefits of lean procurement methodologies by large scale manufacturing firms came up with six significant factors each. These factors include: elimination of waste in all procurement cycles, reduce lead time, reduce inventory, reduce cost, improved customer satisfaction and improved demand management. These were the factors given a lot of significance from the factor analysis conducted. Three components (7, 8 & 9) within the component matrix were non-significant and could not be categorized as benefits to lean procurement methodologies.

The most critical barriers in the implementation of lean procurement methodologies include: lack of system thinking; resistance to change; poor planning; lack of adequate resources; lack of skills expertise and the lack of clarity of supply chain wastes. In order for better and successful lean procurement methodologies to be used, large scale manufacturing firms need to develop strategies in eliminating waste, meeting customer satisfaction, improving operational performance, and value added at the lowest cost in overcoming these challenges.

5.3 Recommendations

Based on the findings of the study, the researcher was able to come up with the following recommendations:

Large manufacturers in Nairobi should ensure that they engage services of qualified individuals who have the required expertise in the implementation of lean procurement methodologies that can assist in making informed lean procurement. This will assist them to avoid making decisions which pose challenges to its operation.

The government of Kenya should also ensure that all large organizations operations in the country adopt lean procurement in their supply chain management. Large scale manufacturing firms should consider and avoid those barriers which pose problems to the application of lean procurement methodologies in eliminating waste from all sector of the manufacturing industry.

5.4 Limitations of the Study

The study findings were concluded on the basis of the strategic responses to a changing environment of the large scale manufacturing firms in Nairobi only. The findings can therefore not be generalized to all organizations. Another challenge faced was the administration of the questionnaires. The fact that the intended mode of the data collection was to furnish the respondents with questionnaires and get them back immediately was not possible. Therefore, the questionnaires were dropped and picked after some days and this meant that the control to who filled the questionnaires could not be verified. Scarcity of funds was another limitation. The limitations therefore dictated the number of respondents and the duration of the study.

5.5 Suggestions for further research

This study was only able to address lean procurement methodologies used by large scale manufacturing firms in Nairobi. It will be necessary to carry out a study featuring other areas outside Nairobi in order to find out if there are any similarities and differences in the findings of this study.

It will also be important to do a comparative study with another country both in the sub-region, the developed and developing world to ascertain the similarities and differences in lean procurement methodologies. There is also a need to carry out a study on the lean procurement methodologies in other industries in Kenya.

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APPENDICES

Appendix I: Introduction Letter

Mary W. Kabuga
MBA Student
University of Nairobi
School of Business
P.O. box 30197
Nairobi
30th July, 2012

To Whom It May Concern:

Re: Permission To Carry Out a Research In Your Firm

I am a Post graduate student at the university on Nairobi and in partial fulfilment of a Masters in Business Administration Degree; i intend to carry out a research on large scale manufacturing firms in Nairobi. The topic of the research is 'Lean Procurement Methodologies used by large Scale manufacturing firms in Nairobi, Kenya'.

Your manufacturing firm has been chosen for the study and choice is based on the strategic importance in the achievement of the objective of the study. I therefore kindly request your approval of collecting data in the organization through the attached questionnaire which i request the heads of purchasing/ Procurement/ supply Chain department or in their absence their deputies to respond to.

The research information will be confidential and will only be used for academic purposes.

Thank you in anticipation

Mary W. Kabuga, D61/61687/2010

MBA Student,

University of Nairobi

Appendix II: Research Questionnaire

PART A: Lean Procurement Methodologies

To what extent has your firm implemented the following lean procurement methodologies in its work place, using a five point scale below? Please tick appropriately against each statement. The scale stand for the following: 1 = No Extent at All; 2= Small Extent; 3= Moderate Extent; 4= Great Extent; 5= Very Great Extent

Lean procurement methodologies	Extent				
	No Extent at all	Small Extent	Moderate Extent	Great Extent	Very Great Extent
	1	2	3	4	5
The employees are free to bring any lean procurement cultural change in the organization. (Employee's Involvement)	1	2	3	4	5
The firm continually improve their own performance with small incremental lean procurement improvements (Kaizen)	1	2	3	4	5
Firm does not rely on inspecting products procured (Six-Sigma)	1	2	3	4	5
Firm has set a compensating system on those employees who practice lean (Basic working Practices)	1	2	3	4	5
Firm buys products in smaller batches only when they are needed at the place where they are needed and exactly in the quantity required (Just in Time)	1	2	3	4	5
Firm uses containers, cards or visual cue to control the movement of materials throughout the supply chain (Kanban Systems)	1	2	3	4	5
Firm has few and long term relationship with the suppliers (Supplier Relationship)	1	2	3	4	5
Firm practices delayering, Downsizing and Outsourcing (Lean Thinking)	1	2	3	4	5
Firm uses Information and Communication technology (ICT) such as EDI, and E-markets in the procurement process (E-Procurement)	1	2	3	4	5

Others_____

PART B: Benefits of Implementing Lean Procurement Methodologies

To what extent has the firm benefitted from the implementation of lean procurement methodologies using a five point scale below. Please tick appropriately against each statement. The scale stand for the following: 1 =No Extent All; 2= Small Extent; 3= Moderate Extent; 4= Great Extent; 5= Very Great Extent

Benefits Of Implementing Lean Procurement Methodologies	Extent				
	No Extent at all	Small Extent	Moderate Extent	Great Extent	Very Great Extent
	1	2	3	4	5
1.Elimination of Waste in all Procurement Cycles					
Firm does not keep stock	1	2	3	4	5
Materials ordered are transported directly to the designated places	1	2	3	4	5
Firm uses 5s as a set of principle of reducing waste	1	2	3	4	5
Firm only procures what is required	1	2	3	4	5
All materials procured by the firm are defect free	1	2	3	4	5
2.Reduce Lead time					
Goods ordered are paid for promptly	1	2	3	4	5
Firm is able to respond to all the demand on time	1	2	3	4	5
There is smooth flow of information in the firm	1	2	3	4	5
Manufacturing department do no wait long hours for raw material to be procured	1	2	3	4	5
Firm procurement deliveries are flexible and fast	1	2	3	4	5
3.Reduce Inventory					
Firm procures directly into production department	1	2	3	4	5
Firm maintain no safety stock	1	2	3	4	5
Firm practices postponement and customization practices	1	2	3	4	5
Firm maintains order to make scenario	1	2	3	4	5
Firm has no space designated to store raw materials	1	2	3	4	5
Firm uses visual signal/ kanban for more goods to be pulled and moved forward	1	2	3	4	5
4.Reduce Cost					
Firm has reduced inventory carrying cost and administrative cost	1	2	3	4	5
Firm does not practice mass production	1	2	3	4	5
Firm spend less time in new product development	1	2	3	4	5
Firm uses less capital, intensive machines tools and fixture to procure	1	2	3	4	5
Less logistics are involved in procurement	1	2	3	4	5
5.Improved customer satisfaction					
Firm has flexible and responsive supply chain	1	2	3	4	5
Firm has efficient and faster supply chain	1	2	3	4	5

Firm meets all the customers demand	1	2	3	4	5
Customers are loyal to the firm's products	1	2	3	4	5
Customers are happy with the firm products	1	2	3	4	5
6. Improved Demand management					
Products are pulled when customer when customer order for them in real time	1	2	3	4	5
Suppliers and all processes in the supply chain receive demand signal that come from the customer	1	2	3	4	5
Firms turn customers signal into components of the final saleable products for which they are responsible	1	2	3	4	5
Suppliers and others in the supply chain receive demand signal promptly that come from the customers	1	2	3	4	5
7.Process Standardization					
Employees understand the processes of the firm in the delivery of product	1	2	3	4	5
Firms experience un interrupted movement of the product to the customers	1	2	3	4	5
Firms experience continuous flow of products in the supply chain	1	2	3	4	5
Firm has horizontal thinking	1	2	3	4	5
Firm focus on system efficiency	1	2	3	4	5
8. Makes the Supply Chain a competitive Weapon					
Firm experience increase productivity	1	2	3	4	5
Firm has a strong supply chain	1	2	3	4	5
Members of the supply chain align and coordinate their continuous improvement methods	1	2	3	4	5
Lean methods produces a strategic advantage to the firm	1	2	3	4	5

PART C: Critical Barriers to the Implementation of Lean Procurement Methodologies

What are the critical barriers does the firm face while implementing lean procurement methodologies using a five point scale as below. Please tick appropriately against each statement. The scale stand for the following: 1 = No Extent at All; 2= Small Extent; 3= Moderate Extent; 4= Great Extent; 5= Very Great Extent

Critical Barriers	Extent				
	No extent at all	Small Extent	Moderate Extent	Great Extent	Very Great Extent
	1	2	3	4	5
1.Lack of System Thinking					
Firm has no articulate method of lean procurement implementation	1	2	3	4	5
Employees in the firm do not see lean as a process	1	2	3	4	5
Employees understand and see lean as a set of tools to be used rather than a continuous process	1	2	3	4	5
2. Resistant to Change					
The management and other employees are rigid to any change					
Employees has no perceived importance about lean	1	2	3	4	5
Employees are usually not eager to learn something new in the firm	1	2	3	4	5
Firm does not have a culture of change management	1	2	3	4	5
Employees do not embrace the fad of lean procurement	1	2	3	4	5
3. Poor Planning					
Firm is unable to coordinate and sequence the lean implementation	1	2	3	4	5
Firm has no clear vision of the outcome of lean implementation	1	2	3	4	5
Firm has no clear communication channels	1	2	3	4	5
Employees do not have knowledge of the tools and methods of lean	1	2	3	4	5
4. Lack of adequate resources					
Firm does not have adequate funds to pay to introduce lean.	1	2	3	4	5
Firm has no time to implement lean	1	2	3	4	5
Firm cannot afford to implement ICT					
Firm does not anticipate immediate returns of lean implementation	1	2	3	4	5
5. Lack of Skills and Expertise					
Firm has no intellectual capital	1	2	3	4	5
Firm's management is not able to instil new skills to employees	1	2	3	4	5
Firm do not foster the ideology of skill enhancement	1	2	3	4	5
Employees in the firm are slow learn					
6. Lack of Clarity of Supply chain Waste					
Firm is not able to clarify between value and waste in the supply chain	1	2	3	4	5
Firm cannot tell whether employees movement create value or not, overproduction and un necessary processes					

Appendix III: Benefits of Lean Procurement Methodologies Correlation Matrix

TABLE 4.X Correlation Matrix

Variable	No Keeping of inventory	Direct transportation to designated places	Use of 5s to reduce waste	Procurement of only required materials	Procurement of defect free materials	Prompt payment for procured items	On time response to demand	Smooth information flow	Limited waiting hours for procured materials	Flexible and fast delivery of procured items	Direct procurement into production department	No safety stock maintained	Practice of postponement and customization	Maintaining of order to make	No storage space for raw materials	Use of visual signal for material movement	Reduction of inventory carrying and admn costs	No mass production	Less time spent on new product development	Use of lesss capital intesive machinery	Less procurement logistics	Flexible and responsive supply chain	Efficient and faster supply chain	Firm meets all customer demands	Customers loyal to firm products	Customers happy with firm products	Pulling of products in real time orders	Demand driven supply chain	Customer signals important in product development	Prompt demand signal reception by suppliers	Employee understanding of processes	Uninterrupted product movement to customers	Continuous product flow in the supply chain	Horizontal thinking by firm	Focus on system efficiency	Increase in productivity	Strong supply chain	Lean produces strategic advantage to the firm	Coordination of continuous improvement
No keeping of inventory	1	0.612	0.51	0.38	-0.1	0.3	0.5	0.23	0.37	0.67	0.2	0.14	0.454	0.36	0.03	0.37	-0.1	-0.31	-0.2	0.18	0.29	0	0.13	-0.1	0.03	0.07	0	-0	0.3	0.1	0.3	0	0.1	0.4	0.4	0.2	0.25	0.15
Direct transportation to designated places	0.61	1	0.31	0.27	0.3	0.1	0.44	0.09	0.46	0.62	0.62	0.44	0.734	0.54	0.1	0.55	0.39	-0.13	-0.2	0.41	0.2	0.2	0.43	-0	0.26	-0.3	0.4	0.1	-0.1	0.27	0.1	0.6	0.5	0.1	0.3	0.6	0.6	0.68	0.61
Use of 5s to reduce waste	0.51	0.307	1	0.69	-0.6	0.7	0.71	0.14	0.27	0.45	0	-0.05	0.241	0.54	-0	-0.19	0.11	-0.24	-0.3	-0.3	-0.5	0.3	0.36	0.21	0.46	0.43	0.3	0.4	0.3	0.41	0.6	0.2	-0	-0.3	-0.2	-0.2	-0	0.11	-0.2
Procurement of only required materials	0.38	0.268	0.69	1	-0.4	0.6	0.41	-0.4	-0.2	0.12	-0.1	-0.4	-0.12	0.48	-0.2	-0.02	0.01	-0.64	-0.4	0.2	-0.3	0.4	0.32	0.16	0.1	0.47	0.2	0.2	0.3	0.14	0.3	0.2	-0	-0.7	-0.4	0.1	0.2	0.27	0.15
Procurement of defect free materials	-0.1	0.256	-0.6	-0.4	1	-0.9	-0.4	0.04	-0.3	-0	0.59	0.45	0.288	0.22	-0.1	0.3	0.4	0.55	0.6	0.53	0.58	-0	-0.3	-0.4	-0.4	-0.8	0	-0	-0.4	-0.1	-0.2	0.1	0.2	0.4	0.5	0.2	0	0.34	0.15
Prompt payment for procured items	0.25	0.078	0.73	0.63	-0.9	1	0.66	0.03	0.38	0.12	-0.3	-0.21	-0.06	0.12	0.1	-0.07	-0.2	-0.88	-0.7	-0.5	-0.8	0.3	0.57	0.39	0.52	0.78	-0	0	0.1	0.01	0.2	-0.1	-0	-0.4	-0.4	-0	0.2	0.08	0.12
On time response to demand	0.5	0.435	0.71	0.41	-0.4	0.7	1	0.35	0.63	0.58	0.34	0.32	0.365	0.6	0.55	0.39	0.41	-0.27	-0.3	-0.3	-0.1	0.3	0.63	0.38	0.57	0.42	0.3	0.4	0.1	0.35	0.4	-0.1	0.3	-0	-0.1	-0.1	0.2	0.53	0.11
Smooth information flow	0.23	0.083	0.14	-0.4	0	0	0.35	1	0.57	0.11	0.46	0.75	0.473	0.27	0.31	0.11	-0	0.38	-0	-0.5	-0.1	0	0.09	0.4	0.43	0.05	0.1	0.2	-0.2	0.01	-0.1	-0.5	0.2	0.5	0.1	-0.2	-0.2	0.03	-0.2
Limited waiting hours for procured materials	0.37	0.462	0.27	-0.2	-0.3	0.4	0.63	0.57	1	0.53	0.35	0.45	0.438	0.14	0.59	0.47	0.06	-0.04	-0.5	-0.3	0.01	0.2	0.61	0.55	0.74	0.33	0.3	0.1	-0.1	0.14	-0	0.1	0.5	0.2	-0.1	0.3	0.4	0.24	0.28
Flexible and fast delivery of procured items	0.67	0.618	0.45	0.12	-0	0.1	0.58	0.11	0.53	1	0.24	0.1	0.503	0.36	0.25	0.38	0.36	0.08	-0.2	0.14	0.38	0.2	0.24	-0.1	0.25	0.01	0.2	0.2	-0.1	0.5	0.3	0.5	0.1	0.1	0.3	0.3	0.2	0.28	0.12
Direct procurement into production department	0.2	0.616	0	-0.1	0.6	-0.3	0.34	0.46	0.35	0.24	1	0.81	0.541	0.72	0.36	0.57	0.6	0.34	0.1	0.28	0.3	0.3	0.36	0.29	0.35	-0.4	0.6	0.5	-0.1	0.17	0.2	0.1	0.8	0.3	0.1	0.1	0.2	0.7	0.18
No safety stock maintained	0.14	0.438	-0	-0.4	0.4	-0.2	0.32	0.75	0.45	0.1	0.81	1	0.708	0.44	0.36	0.37	0.39	0.41	0.3	-0.2	0.05	-0	0.17	0.14	0.27	-0.4	0.3	0.3	-0.2	0.08	0	-0.2	0.8	0.6	0.4	-0	0.1	0.51	0.18
Practice of postponement and customization	0.45	0.734	0.24	-0.1	0.3	-0.1	0.37	0.47	0.44	0.5	0.54	0.71	1	0.41	0.18	0.17	0.41	0.24	0.1	-0	0.05	-0	0.08	-0.1	0.14	-0.5	0.4	0.2	-0.1	0.48	0.1	0.3	0.5	0.5	0.5	0.2	0.2	0.39	0.3
Maintaining of order to make	0.36	0.539	0.54	0.48	0.2	0.1	0.6	0.27	0.14	0.36	0.72	0.44	0.405	1	0.2	0.3	0.63	0.09	-0	0.2	0.02	0.6	0.4	0.32	0.35	-0	0.6	0.7	0.1	0.37	0.5	0.1	0.2	-0.2	-0.1	-0.2	0	0.65	-0
No storage space for raw materials	0.03	0.102	-0	-0.2	-0.1	0.1	0.55	0.31	0.59	0.25	0.36	0.36	0.182	0.2	1	0.47	0.47	0.03	-0.1	-0.1	0.35	0.1	0.39	0.49	0.33	0.18	0.5	0.6	0.4	0.4	0.2	-0.2	0.8	0.2	-0.2	-0.1	0.1	0.31	0.06
Use of visual signal for material movement	0.37	0.549	-0.2	-0	0.3	-0.1	0.39	0.11	0.47	0.38	0.57	0.37	0.165	0.3	0.47	1	0.24	-0.17	-0.1	0.4	0.6	0.1	0.41	0.21	0.15	0.03	0.1	-0	-0.2	-0.2	-0.2	0	0.5	0.1	0.1	0.6	0.8	0.76	0.62
Reduction of inventory carrying and admn costs	-0.09	0.381	0.11	0.01	0.4	-0.2	0.41	-0	0.06	0.36	0.6	0.39	0.41	0.63	0.47	0.24	1	0.3	0.2	0.21	0.26	0.4	0.31	0	0.16	-0.4	0.6	0.6	0.2	0.58	0.6	0.2	0.5	0.2	0.1	-0.2	-0	0.57	0.03
No mass production	-0.31	-0.13	-0.2	-0.6	0.6	-0.7	-0.3	0.38	-0	0.08	0.34	0.41	0.238	0.09	0.03	-0.17	0.3	1	0.6	0.02	0.2	-0	-0.4	-0.1	-0	-0.5	0.2	0.2	-0.1	0.18	0.1	0	0.1	0.3	0.2	-0.4	-0.3	-0.2	-0.4
Less time spent on new product development	-0.22	-0.2	-0.3	-0.4	0.6	-0.7	-0.3	-0	-0.5	-0.2	0.14	0.26	0.062	-0	-0.1	-0.1	0.23	0.62	1	0.24	0.31	-1	-0.7	-0.8	-0.6	-0.7	-0.1	0	0.1	0.01	0.1	-0.1	0.1	0.3	0.6	-0.3	-0.3	0.04	-0.3
Use of lesss capital intesive machinery	0.18	0.412	-0.3	0.2	0.5	-0.5	-0.3	-0.5	-0.3	0.14	0.28	-0.16	-0.03	0.2	-0.1	0.4	0.21	0.02	0.2	1	0.64	0	-0.1	-0.2	-0.4	-0.4	0.3	0.1	0.2	0.09	0	0.8	0.2	-0.3	0.1	0.5	0.4	0.34	0.32
Less procurement logistics	0.29	0.203	-0.5	-0.3	0.6	-0.6	-0.1	-0.1	0.01	0.38	0.3	0.05	0.045	0.02	0.35	0.6	0.26	0.2	0.3	0.64	1	-0	-0.2	-0.2	-0.4	-0.4	0	0.1	-0	0.19	-0.1	0.2	0.2	0.3	0.4	0.4	0.1	0.22	0.12
Flexible and responsive supply chain	0.01	0.202	0.34	0.41	-0.1	0.3	0.34	0.02	0.18	0.16	0.34	-0.05	-0.08	0.58	0.1	0.1	0.37	-0.16	-0.6	0	-0.1	1	0.73	0.63	0.65	0.3	0.4	0.4	-0.1	0.19	0.3	0.1	-0	-0.3	-0.6	-0.1	-0.1	0.22	-0.1
Efficient and faster supply chain	0.13	0.429	0.36	0.32	-0.3	0.6	0.63	0.09	0.61	0.24	0.38	0.17	0.081	0.4	0.39	0.41	0.31	-0.44	-0.7	-0.1	-0.2	0.7	1	0.64	0.82	0.39	0.4	0.3	-0.1	0.07	0.3	0.1	0.4	-0.1	-0.4	0.2	0.4	0.47	0.3
Firm meets all customer demands	-0.07	-0	0.21	0.16	-0.4	0.4	0.38	0.4	0.55	-0.1	0.29	0.14	-0.14	0.32	0.49	0.21	0	-0.11	-0.6	-0.2	-0.2	0.6	0.64	1	0.77	0.62	0.5	0.5	0.2	0	0	-0.2	0.1	-0.3	-0.6	-0.1	0.1	0.08	-0.1
Customers loyal to firm products	0.03	0.259	0.46	0.1	-0.4	0.5	0.57	0.43	0.74	0.25	0.35	0.27	0.138	0.35	0.33	0.15	0.16	-0.03	-0.6	-0.4	-0.4	0.6	0.82	0.77	1	0.47	0.4	0.3	-0.1	0.07	0.2	0.1	0.2	-0.1	-0.5	-0	0.2	0.16	-0
Customers happy with firm products	0.07	-0.26	0.43	0.47	-0.8	0.8	0.42	0.05	0.33	0.01	-0.4	-0.42	-0.47	-0	0.18	0.03	-0.4	-0.49	-0.7	-0.4	-0.4	0.3	0.39	0.62	0.47	1	-0.1	0	0.1	-0.2	-0.1	-0.3	-0	-0.6	-0.7	-0.1	0.1	-0.1	-0
Pulling of products in real time orders	0.02	0.389	0.31	0.21	0	-0	0.31	0.12	0.26	0.17	0.56	0.3	0.357	0.61	0.48	0.05	0.59	0.22	-0.1	0.26	0.03	0.4	0.36	0.51	0.41	-0.1	1	0.9	0.8	0.86	0.6	0.3	0.5	-0.2	-0.4	-0.2	0.1	0.28	-0.1
Demand driven supply chain	0.04	0.132	0.39	0.22	-0	0	0.45	0.19	0.14	0.17	0.48	0.25	0.201	0.67	0.58	-0	0.65	0.24	0	0.1	0.08	0.4	0.26	0.47	0.31	0.01	0.9	1	0.7	0.72	0.7	0.1	0.4	-0.1	-0.4	-0.5	-0.3	0.2	-0.4
Customer signals important in product development	-0.04	-0.09	0.26	0.3	-0.4	0.1	0.13	-0.2	-0.1	-0.1	-0.1	-0.16	-0.06	0.11	0.4	-0.21	0.19	-0.09	0.1	0.19	-0	-0	-0.1	0.16	-0.1	0.1	0.6	0.7	1	0.56	0.8	0.2	0.4	-0.3	-0.4	-0.3	-0.1	-0.1	-0.2
Prompt demand signal reception by suppliers	0.3	0.273	0.41	0.14	-0.1	0	0.35	0.01	0.14	0.5	0.17	0.06	0.462	0.37	0.4	-0.2	0.58	0.16	0	0.09	0.19	0.2	0.07	0	0.07	-0.2	0.7	0.7	0.6	1	0.7	0.4	0.3	0.2	0	-0.3	-0.3	-0	-0.3
Employee understanding of processes	0.1	0.136	0.59	0.33	-0.2	0.2	0.45	-0.1	-0	0.25	0.22	0.04	0.118	0.5	0.23	-0.2	0.61	0.06	0.1	0.04	-0.1	0.3	0.28	0	0.21	-0.1	0.6	0.7	0.8	0.88	1	0.3	0.3	0	-0.1	-0.5	-0.3	0.15	-0.4
Uninterrupted product movement to customers	0.26	0.569	0.18	0.15	0.1	-0.1	-0.1	-0.5	0.08	0.49	0.09	-0.2	0.27	0.05	-0.2	0.01	0.21	0.04	-0.1	0.58	0.21	0.1	0.11	-0.2	0.05	-0.3	0.3	0.1	0.2	0.43	0.3	1	0.2	0.1	0.1	0.5	0.3	0.02	0.18
Continuous product flow in the supply chain	0.03	0.512	-0.1	-0.2	0.2	-0.1	0.28	0.16	0.47	0.1	0.63	0.63	0.48	0.19	0.83	0.49	0.48	0.06	0.1	0.21	0.25	-0	0.36	0.15	0.21	-0.4	0.5	0.4	0.4	0.26	0.3	0.2	1	0.4	0.1	0.2	0.4	0.54	0.39
Horizontal thinking by firm	0.09	0.059	-0.3	-0.7	0.4	-0.4	-0	0.46	0.24	0.12	0.29	0.59	0.453	-0.2	0.23	0.08	0.17	0.34	0.3	-0.3	0.28	-0	-0.1	-0.3	-0.1	-0.6	0.2	0.1	-0.3	0.15	0	-0.1	0.4	1	0.7	-0.1	-0.3	-0	-0.1
Focus on system efficiency	0.4	0.289	-0.2	-0.4	0.5	-0.4	-0.1	0.15	-0.1	0.32	0.15	0.36	0.516	-0.1	-0.2	0.13	0.07	0.24	0.6	0.11	0.38	-1	-0.4	-0.6	-0.5	-0.7	-0.4	-0.4	-0.4	0.05	-0.1	-0.1	0.1	0.7	1	0.2	-0.1	0.13	0.11
Increase in productivity	0.4	0.635	-0.2	0.06	0.2	-0	-0.1	-0.2	0.32	0.33	0.1	-0.04	0.214	-0.2	-0.1	0.6	-0.2	-0.38	-0.3	0.49	0.36	-0	0.22	-0.1	-0	-0.1	-0.2	-0.5	-0.3	-0.3	-0.5	0.5	0.2	-0.1	0.2	1	0.8	0.34	0.82
Strong supply chain	0.16	0.62	-0	0.18	0	0.2	0.18	-0.2	0.42	0.24	0.21	0.1	0.184	0.03	0.09	0.63	-0	-0.28	-0.3	0.39	0.09	-0	0.35	0.11	0.21	0.14	0.1	-0.3	-0.1	-0.3	-0.3	0.3	0.4	-0.3	-0.1	0.8	1	0.57	0.88
Lean produces strategic advantage to the firm	0.25	0.684	0.11	0.27	0.3	0.1	0.53	0.03	0.24	0.28	0.7	0.51	0.385	0.65	0.31	0.76	0.57	-0.17	0	0.34	0.22	0.2	0.47	0.08	0.16	-0.1	0.3	0.2	-0.1	-0.3	-0.1	0.3	0.5	-0	0.1	0.3	0.8	1	0.64
Coordination of continuous improvement	0.15	0.611	-0.2	0.15	0.1	0.1	0.11	-0.2	0.26	0.12	0.19	0.16	0.299	-0	0.06	0.62	0.03	-0.44	-0.3	0.32	0.12	-0	0.3	-0.1	-0	-0	-0.1	-0.4	-0.2	-0.3	-0.4	0.2	0.4	-0.1	0.1	0.8	0.9	0.64	1

Appendix IV: Benefits of Lean Procurement Methodologies Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
No keeping of inventory	9.409	24.126	24.126	9.409	24.126	24.126
Direct transportation to designated places	7.753	19.879	44.005	7.753	19.879	44.005
Use of 5s to reduce waste	5.642	14.467	58.472	5.642	14.467	58.472
Procurement of only required materials	4.257	10.915	69.387	4.257	10.915	69.387
Procurement of defect free materials	3.24	8.307	77.693	3.24	8.307	77.693
Prompt payment for procured items	2.261	5.797	83.49	2.261	5.797	83.49
On time response to demand	1.899	4.869	88.359	1.899	4.869	88.359
Smooth information flow	1.707	4.376	92.735	1.707	4.376	92.735
Limited waiting hours for procured materials	1.301	3.335	96.071	1.301	3.335	96.071
Flexible and fast delivery of procured items	0.884	2.266	98.337			
Direct procurement into production department	0.649	1.663	100			
No safety stock maintained	1.49E-15	3.81E-15	100			
Practice of postponement and customization	1.28E-15	3.28E-15	100			
Maintaining of order to make	1.13E-15	2.90E-15	100			
No storage space for raw materials	9.55E-16	2.45E-15	100			
Use of visual signal for material movement	7.97E-16	2.04E-15	100			
Reduction of inventory carrying and administration costs	6.71E-16	1.72E-15	100			
No mass production	5.71E-16	1.47E-15	100			
Less time spent on new product development	5.06E-16	1.30E-15	100			
Use of less capital intensive machinery	3.25E-16	8.32E-16	100			
Less procurement logistics	2.61E-16	6.70E-16	100			
Flexible and responsive supply chain	1.72E-16	4.40E-16	100			
Efficient and faster supply chain	7.72E-17	1.98E-16	100			
Firm meets all customer demands	-6.08E-18	-1.56E-17	100			
Customers loyal to firm products	-8.09E-17	-2.08E-16	100			
Customers happy with firm products	-1.32E-16	-3.38E-16	100			
Pulling of products in real time orders	-2.27E-16	-5.83E-16	100			
Demand driven supply chain	-2.44E-16	-6.25E-16	100			
Customer signals important in product development	-3.72E-16	-9.53E-16	100			

Prompt demand signal reception by suppliers	-4.23E-16	-1.09E-15	100			
Employee understanding of processes	-5.42E-16	-1.39E-15	100			
Uninterrupted product movement to customers	-7.09E-16	-1.82E-15	100			
Continuous product flow in the supply chain	-7.54E-16	-1.93E-15	100			
Horizontal thinking by firm	-8.22E-16	-2.11E-15	100			
Focus on system efficiency	-1.06E-15	-2.71E-15	100			
Increase in productivity	-1.12E-15	-2.87E-15	100			
Strong supply chain	-1.27E-15	-3.25E-15	100			
Lean produces strategic advantage to the firm	-1.49E-15	-3.82E-15	100			
Coordination of continuous improvement	-1.88E-15	-4.81E-15	100			

Extraction Method: Principal Component Analysis.

Appendix V: Benefits of Lean Procurement Methodologies Component Matrix

Variables	Components								
	1	2	3	4	5	6	7	8	9
No keeping of inventory	0.437	0.115	-0.292	0.151	0.636	0.031	0.001	0.362	0.264
Direct transportation to designated places	0.711	0.413	-0.399	0.217	0.217	-0.104	-0.101	-0.187	0.101
Use of 5s to reduce waste	0.546	-0.485	0.181	0.211	0.553	-0.178	0.067	-0.053	0.126
Procurement of only required materials	0.353	-0.541	-0.159	0.602	0.138	-0.282	0.259	0.033	0.125
Procurement of defect free materials	-0.12	0.874	0.031	0.05	-0.252	-0.371	-0.096	0.069	-0.019
Prompt payment for procured items	0.403	-0.78	-0.192	-0.063	0.308	0.046	0.245	-0.135	-0.109
On time response to demand	0.823	-0.217	0.024	-0.138	0.306	0.027	0.294	0.188	-0.133
Smooth information flow	0.302	0.131	0.234	-0.801	0.2	-0.117	-0.02	0.089	0.354
Limited waiting hours for procured materials	0.685	-0.046	-0.234	-0.518	0.125	0.342	-0.228	0.009	0.068
Flexible and fast delivery of procured items	0.554	0.22	-0.142	0.155	0.513	0.121	-0.299	0.341	-0.077
Direct procurement into production department	0.661	0.575	0.111	-0.165	-0.245	-0.299	0.007	-0.001	0.094
No safety stock maintained	0.455	0.578	0.153	-0.557	0.021	-0.157	0.182	-0.2	0.142
Practice of postponement and customization	0.51	0.538	0.027	-0.143	0.456	-0.02	-0.04	-0.308	0.165
Maintaining of order to make	0.741	0.114	0.257	0.19	-0.005	-0.524	0.145	0.146	0.136
No storage space for raw materials	0.573	0.09	0.216	-0.274	-0.282	0.567	0.187	0.261	-0.117
Use of visual signal for material movement	0.504	0.39	-0.545	-0.101	-0.273	0.071	0.186	0.389	-0.031
Reduction of inventory carrying and admn costs	0.562	0.415	0.413	0.217	-0.155	-0.115	0.08	-0.016	-0.412
No mass production	-0.143	0.524	0.545	-0.229	-0.082	-0.117	-0.318	-0.002	0.215
Less time spent on new product development	-0.413	0.645	0.406	0.106	0.027	-0.041	0.368	0.008	0.092
Use of less capital intensive machinery	0.05	0.468	-0.242	0.724	-0.332	-0.002	-0.095	0.143	0.187
Less procurement logistics	0.028	0.644	-0.12	0.212	-0.172	0.298	-0.102	0.626	-0.044
Flexible and responsive supply chain	0.547	-0.361	0.092	0.082	-0.288	-0.456	-0.386	0.149	-0.247
Efficient and faster supply chain	0.767	-0.323	-0.226	-0.14	-0.199	-0.069	-0.119	-0.088	-0.374
Firm meets all customer demands	0.543	-0.491	0.079	-0.343	-0.481	0.018	-0.179	0.117	0.231
Customers loyal to firm products	0.681	-0.398	0.018	-0.403	-0.099	-0.092	-0.347	-0.154	-0.075

Customers happy with firm products	0.182	-0.871	-0.205	-0.152	-0.059	0.106	0.084	0.273	0.134
Pulling of products in real time orders	0.685	0.066	0.468	0.256	-0.308	0.108	-0.153	-0.2	0.246
Demand driven supply chain	0.614	-0.016	0.704	0.206	-0.208	0.081	0.043	0.106	0.132
Customer signals important in product development	0.199	-0.186	0.487	0.451	-0.143	0.536	0.285	-0.144	0.255
Prompt demand signal reception by suppliers	0.448	0.123	0.576	0.369	0.3	0.316	-0.197	0.035	-0.057
Employee understanding of processes	0.45	-0.067	0.631	0.415	0.176	0.033	0.104	-0.103	-0.282
Uninterrupted product movement to customers	0.228	0.239	-0.147	0.622	0.167	0.178	-0.546	-0.288	-0.034
Continuous product flow in the supply chain	0.553	0.484	0.005	-0.097	-0.255	0.43	0.196	-0.351	-0.061
Horizontal thinking by firm	-0.056	0.608	0.187	-0.517	0.315	0.217	-0.048	-0.04	-0.324
Focus on system efficiency	-0.217	0.736	-0.118	-0.058	0.598	-0.053	0.117	0.048	-0.11
Increase in productivity	0.157	0.265	-0.893	0.152	-0.008	0.145	-0.222	-0.041	0.062
Strong supply chain	0.364	0.12	-0.767	0.108	-0.209	0.131	0.068	-0.255	0.161
Lean produces strategic advantage to the firm	0.646	0.372	-0.318	0.087	-0.181	-0.271	0.45	0.005	-0.129
Coordination of continuous improvement	0.261	0.232	-0.82	0.055	-0.158	0.038	0.21	-0.25	-0.026

Extraction Method: Principal Component Analysis. a. 9 components extracted.

Appendix VI: Critical Barriers to Lean Procurement Methodology Correlation Matrix

TABLE 4. X Correlation Matrix

Variable	Lack of articulate method of lean implementation	Employees not seeing lean as a process	Employees view lean as set of tools	Rigidity to change traditional procurement methods	Employees do not see importance of lean	Employees not eager to learn new things	No culture of change management in the firm	Employees do not embrace fad of lean procurement	Inability to coordinate and sequence lean implementation	Lack of clear outcome vision	Poor communication channels	Employees lack knowledge of lean tools	Lack of funds for consultants	Lack of time to implement lean	Firm cannot afford to implement ICT	Lack of anticipated returns of lean implementation	Lack of intellectual capital	Management inability to instill new skills to employees	Ideology of skill enhancement not fostered	Employees slow on lean	Inability to clarify between value and waste in supply chain	Inability to discern whether employee movement creates value or not
Lack of articulate method of lean implementation	1	0.819	-0.46	0.59	0.51	0.73	0.76	0.67	0.44	0.2	0.47	0.47	0.33	0.11	0.5	-0.3	0.27	0.32	0.31	0.2	0.26	0.38
Employees not seeing lean as a process	0.82	1	-0.16	0.54	0.45	0.64	0.87	0.77	0.19	0.1	0.42	0.42	0.3	0.1	0.4	0.1	0.25	0.29	0.3	0.2	0.22	0.35
Employees view lean as set of tools	-0.46	-0.16	1	-0.48	-0.2	-0.4	-0.2	-0.35	-0.9	-0.7	-0.23	-0.2	-0.35	-0.1	-0.2	0.26	-0.2	-0.16	-0.36	-0.3	-0.42	-0.4
Rigidity to change traditional procurement methods	0.59	0.542	-0.48	1	0.86	0.87	0.49	0.7	0.46	0.2	0.22	0.22	0.48	-0.1	0.2	0.14	0.33	0.39	0.22	0.3	0.13	0.55
Employees do not see importance of lean	0.51	0.45	-0.2	0.86	1	0.69	0.38	0.62	0.21	-0.2	0.13	0.13	0.41	-0.1	0.1	0.07	0.29	0.31	-0.05	-0	0.06	0.49
Employees not eager to learn new things	0.73	0.644	-0.35	0.87	0.69	1	0.56	0.56	0.36	0.2	0.2	0.2	0.19	-0.2	0.2	0.12	0.41	0.44	0.29	0.4	0.1	0.26
No culture of change management in the firm	0.76	0.865	-0.2	0.49	0.38	0.56	1	0.89	0.26	0.2	0.61	0.61	0.44	0.51	0.6	0.16	0.36	0.41	0.66	0.6	0.58	0.51
Employees do not embrace fad of lean procurement	0.67	0.768	-0.35	0.7	0.62	0.56	0.89	1	0.39	0.2	0.57	0.57	0.67	0.44	0.6	0.18	0.31	0.39	0.56	0.5	0.54	0.74
Inability to coordinate and sequence lean implementation	0.44	0.189	-0.82	0.46	0.21	0.36	0.26	0.39	1	0.8	0.37	0.37	0.48	0.23	0.4	-0.1	0.3	0.45	0.37	0.4	0.46	0.5
Lack of clear outcome vision	0.15	0.133	-0.66	0.18	-0.2	0.21	0.19	0.18	0.81	1	0.32	0.32	0.22	0.25	0.3	0.22	0.37	0.47	0.48	0.5	0.46	0.25
Poor communication channels	0.47	0.418	-0.23	0.22	0.13	0.2	0.61	0.57	0.37	0.3	1	1	0.7	0.8	1	0.29	0.56	0.68	0.56	0.3	0.46	0.8
Employees lack knowledge of lean tools	0.47	0.418	-0.23	0.22	0.13	0.2	0.61	0.57	0.37	0.3	1	1	0.7	0.8	1	0.29	0.56	0.68	0.56	0.3	0.46	0.8
Lack of funds for consultants	0.33	0.303	-0.35	0.48	0.41	0.19	0.44	0.67	0.48	0.2	0.7	0.7	1	0.54	0.7	0.03	0.12	0.48	0.25	0.1	0.2	0.91
Lack of time to implement lean	0.38	0.354	-0.41	0.55	0.49	0.26	0.51	0.74	0.5	0.3	0.8	0.8	0.91	0.6	0.8	0.27	0.42	0.54	0.41	0.2	0.4	1
Firm cannot afford to implement ICT	0.11	0.101	-0.06	-0.11	-0.1	-0.2	0.51	0.44	0.23	0.3	0.8	0.8	0.54	1	0.8	0.27	0.42	0.54	0.68	0.5	0.68	0.6
Lack of anticipated returns of lean implementation	0.47	0.418	-0.23	0.22	0.13	0.2	0.61	0.57	0.37	0.3	1	1	0.7	0.8	1	0.29	0.56	0.68	0.56	0.3	0.46	0.8
Lack of intellectual capital	-0.26	0.099	0.26	0.14	0.07	0.12	0.16	0.18	-0.1	0.2	0.29	0.29	0.03	0.27	0.3	1	0.69	0.48	0.34	0.4	0.24	0.27
Management inability to instill new skills to employees	0.27	0.25	-0.17	0.33	0.29	0.41	0.36	0.31	0.3	0.4	0.56	0.56	0.12	0.42	0.6	0.69	1	0.79	0.48	0.5	0.48	0.42
Ideology of skill enhancement not fostered	0.32	0.285	-0.16	0.39	0.31	0.44	0.41	0.39	0.45	0.5	0.68	0.68	0.48	0.54	0.7	0.48	0.79	1	0.38	0.4	0.31	0.54
Employees slow on lean	0.31	0.298	-0.36	0.22	-0.1	0.29	0.66	0.56	0.37	0.5	0.56	0.56	0.25	0.68	0.6	0.34	0.48	0.38	1	0.9	0.82	0.41
Inability to clarify between value and waste in supply chain	0.21	0.212	-0.33	0.28	-0	0.38	0.56	0.45	0.37	0.5	0.35	0.35	0.09	0.52	0.3	0.4	0.52	0.44	0.93	1	0.76	0.23
Inability to discern whether employee movement creates value or not	0.26	0.222	-0.42	0.13	0.06	0.1	0.58	0.54	0.46	0.5	0.46	0.46	0.2	0.68	0.5	0.24	0.48	0.31	0.82	0.8	1	0.4

Appendix VII: Benefits of Lean Procurement Methodologies

Rotated Component Matrix

Variable	Components									
	1	2	3	4	5	6	7	8	9	Label
On time response to demand	**0.823**	-0.217	0.024	-0.138	0.306	0.027	0.294	0.188	-0.133	
Efficient and faster supply chain	**0.767**	-0.323	-0.226	-0.14	-0.199	-0.069	-0.119	-0.088	-0.374	
Maintaining of order to make	**0.741**	0.114	0.257	0.19	-0.005	-0.524	0.145	0.146	0.136	
Direct transportation to designated places	**0.711**	0.413	-0.399	0.217	0.217	-0.104	-0.101	-0.187	0.101	
Pulling of products in real time orders	**0.685**	0.066	0.468	0.256	-0.308	0.108	-0.153	-0.2	0.246	
Customers loyal to firm products	**0.681**	-0.398	0.018	-0.403	-0.099	-0.092	-0.347	-0.154	-0.075	
Limited waiting hours for procured materials	**0.685**	-0.046	-0.234	-0.518	0.125	0.342	-0.228	0.009	0.068	
Direct procurement into production department	**0.661**	0.575	0.111	-0.165	-0.245	-0.299	0.007	-0.001	0.094	
Lean produces strategic advantage to the firm	**0.646**	0.372	-0.318	0.087	-0.181	-0.271	0.45	0.005	-0.129	
No storage space for raw materials	**0.573**	0.09	0.216	-0.274	-0.282	0.567	0.187	0.261	-0.117	
Reduction of inventory carrying and admn costs	**0.562**	0.415	0.413	0.217	-0.155	-0.115	0.08	-0.016	-0.412	
Flexible and fast delivery of procured items	**0.554**	0.22	-0.142	0.155	0.513	0.121	-0.299	0.341	-0.077	
Continuous product flow in the supply chain	**0.553**	0.484	0.005	-0.097	-0.255	0.43	0.196	-0.351	-0.061	
Flexible and responsive supply chain	**0.547**	-0.361	0.092	0.082	-0.288	-0.456	-0.386	0.149	-0.247	
Use of 5s to reduce waste	**0.546**	-0.485	0.181	0.211	0.553	-0.178	0.067	-0.053	0.126	Elimination of Waste in all Procurement Cycles
Firm meets all customer demands	**0.543**	-0.491	0.079	-0.343	-0.481	0.018	-0.179	0.117	0.231	
Use of visual signal for material movement	**0.504**	0.39	-0.545	-0.101	-0.273	0.071	0.186	0.389	-0.031	
Procurement of defect free materials	-0.12	**0.874**	0.031	0.05	-0.252	-0.371	-0.096	0.069	-0.019	
Focus on system efficiency	-0.217	**0.736**	-0.118	-0.058	0.598	-0.053	0.117	0.048	-0.11	
Less time spent on new product development	-0.413	**0.645**	0.406	0.106	0.027	-0.041	0.368	0.008	0.092	Reduce Lead Time
Less procurement logistics	0.028	**0.644**	-0.12	0.212	-0.172	0.298	-0.102	0.626	-0.044	
Horizontal thinking by firm	-0.056	**0.608**	0.187	-0.517	0.315	0.217	-0.048	-0.04	-0.324	
No safety stock maintained	0.455	**0.578**	0.153	-0.557	0.021	-0.157	0.182	-0.2	0.142	

Practice of postponement and customization	0.51	**0.538**	0.027	-0.143	0.456	-0.02	-0.04	-0.308	0.165	
Customers happy with firm products	0.182	**-0.87**	-0.205	-0.152	-0.059	0.106	0.084	0.273	0.134	
Prompt payment for procured items	0.403	**-0.78**	-0.192	-0.063	0.308	0.046	0.245	-0.135	-0.109	
Demand driven supply chain	0.614	-0.016	**0.704**	0.206	-0.208	0.081	0.043	0.106	0.132	
Employee understanding of processes	0.45	-0.067	**0.631**	0.415	0.176	0.033	0.104	-0.103	-0.282	
Prompt demand signal reception by suppliers	0.448	0.123	**0.576**	0.369	0.3	0.316	-0.197	0.035	-0.057	Reduce Inventory
No mass production	-0.143	0.524	**0.545**	-0.229	-0.082	-0.117	-0.318	-0.002	0.215	
Increase in productivity	0.157	0.265	**-0.89**	0.152	-0.008	0.145	-0.222	-0.041	0.062	
Strong supply chain	0.364	0.12	**-0.77**	0.108	-0.209	0.131	0.068	-0.255	0.161	
Use of lesss capital intensive machinery	0.05	0.468	-0.242	**0.724**	-0.332	-0.002	-0.095	0.143	0.187	
Uninterrupted product movement to customers	0.228	0.239	-0.147	**0.622**	0.167	0.178	-0.546	-0.288	-0.034	
Procurement of only required materials	0.353	-0.541	-0.159	**0.602**	0.138	-0.282	0.259	0.033	0.125	
Smooth information flow	0.302	0.131	0.234	**-0.8**	0.2	-0.117	-0.02	0.089	0.354	Reduce Cost
No keeping of inventory	0.437	0.115	-0.292	0.151	**0.636**	0.031	0.001	0.362	0.264	Improved Customer Satisfaction
Customer signals important in product development	0.199	-0.186	0.487	0.451	-0.143	**0.536**	0.285	-0.144	0.255	Improved Demand Management

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 11 iterations.

Appendix VIII: Large Scale Manufacturing Firms in Nairobi, Kenya

Sector: Building, Construction and Mining (6)	
Central Glass Industries Ltd	Kenya Builders & Concrete Ltd
Karsan Murji & Company Limited	Manson Hart Kenya Ltd
Kenbro Industries Ltd	Mombasa Cement Ltd
Sector: Food, Beverages and Tobacco (100)	
Africa Spirits Ltd	Highlands Mineral Water Co. Ltd
Agriner Agricultural Development Limited	Homeoil
Belfast Millers Ltd	Insta Products (EPZ) Ltd
Bidco Oil Refineries Ltd	Jambo Biscuits (K) Ltd
Bio Foods Products Limited	Jetlak Foods Ltd
Breakfast Cereal Company(K) Ltd	Karirana Estate Ltd
British American Tobacco Kenya Ltd	Kenafric Industries Limited
Broadway Bakery Ltd	Kenblest Limited
C. Czarnikow Sugar (EA) Ltd	Kenya Breweries Ltd
Cadbury Kenya Ltd	Kenya Nut Company Ltd
Centrofood Industries Ltd	Kenya Sweets Ltd
Coca cola East Africa Ltd	Nestle Kenya Ltd
Confec Industries (E.A) Ltd	Nicola Farms Ltd
Corn Products Kenya Ltd	Palmhouse Dairies Ltd
Crown Foods Ltd	Patco Industries Limited
Cut Tobacco (K) Ltd	Pearl Industries Ltd
Deepa Industries Ltd	Pembe Flour Mills Ltd
Del Monte Kenya Ltd	Premier Flour Mills Ltd
East African Breweries Ltd	Premier Food Industries Limited
East African Sea Food Ltd	Proctor & Allan (E.A.) Ltd
Eastern Produce Kenya Ltd	Promasidor (Kenya) Ltd
Farmers Choice Ltd	Trufoods Ltd
Frigoken Ltd	UDV Kenya Ltd
Giloil Company Limited	Unga Group Ltd
Glacier Products Ltd	Usafi Services Ltd
Global Allied Industries Ltd	Uzuri foods Ltd
Global Beverages Ltd	ValuePak Foods Ltd
Global Fresh Ltd	W.E. Tilley (Muthaiga) Ltd
Gonas Best Ltd	Kevian Kenya Ltd
Hail & Cotton Distillers Ltd	Koba Waters Ltd
Al-Mahra Industries Ltd	Kwality Candies & Sweets Ltd
Alliance One Tobacco Kenya Ltd	Lari Dairies Alliance Ltd
Alpha Fine Foods Ltd	London Distillers (K) Ltd
Alpine Coolers Ltd	Mafuko Industries Ltd
Annum Trading Company Limited	Manji Food Industries Ltd

Aquamist Ltd	Melvin Marsh International
Brookside Dairy Ltd	Kenya Tea Development Agency
Candy Kenya Ltd	Mini Bakeries (Nbi) Ltd
Capwelll Industries Ltd	Miritini Kenya Ltd
Carlton Products (EA) Ltd	Mount Kenya Bottlers Ltd
Chirag Kenya Limited	Nairobi Bottlers Ltd
E & A Industries Ltd	Nairobi Flour Mills Ltd
Kakuzi Ltd	NAS Airport Services Ltd
Erdemann Co. (K) Ltd	Rafiki Millers Ltd
Excel Chemical Ltd	Razco Ltd
Kenya Wine Agency Limited	Re-Suns Spices Limited
Highlands Canner Ltd	Smash Industries Ltd
Super Bakery Ltd	Softa Bottling Co. Ltd
Sunny Processor Ltd	Spice World Ltd
Spin Knit Dairy Ltd	Wrigley Company (E.A.) Ltd
Sector: Chemical and Allied (62)	
Anffi Kenya Ltd	Crown Berger Kenya Ltd
Basco Product (K) Ltd	Crown Gases Ltd
Bayer East Africa Ltd	Decase Chemical (Ltd)
Continental Products Ltd	Deluxe Inks Ltd
Cooper K- Brands Ltd	Desbro Kenya Limited
Cooper Kenya Limited	E. Africa Heavy Chemicals (1999) Ltd
Beiersdorf East Africa td	Elex Products Ltd
Blue Ring Products Ltd	European Perfumes & Cosmetics Ltd
BOC Kenya Limited	Galaxy Paints & Coating Co. Ltd
Buyline Industries Limited	Grand Paints Ltd
Carbacid (CO2) Limited	Henkel Kenya Ltd
Chemicals & Solvents E.A. Ltd	Imaging Solutions (K) Ltd
Chemicals and Solvents E.A. Ltd	Interconsumer Products Ltd
Coates Brothers (E.A.) Limited	Odex Chemicals Ltd
Coil Products (K) Limited	Osho Chemicals Industries Ltd
Colgate Palmolive (E.A) Ltd	PolyChem East Africa Ltd
Johnson Diversity East Africa Limited	Procter & Gamble East Africa Ltd
Kel Chemicals Limited	PZ Cussons Ltd
Kemia International Ltd	Rayal Trading Co. Ltd
Ken Nat Ink & Chemical Ltd	Reckitt Benckiser (E.A) Ltd
Magadi Soda Company Ltd	Revolution Stores Co. Ltd
Maroo Polymers Ltd	Soilex Chemical Ltd
Match Masters Ltd	Strategic Industries Limited
United Chemical Industries Ltd	Supa Brite Ltd
Oasis Ltd	Unilever Kenya Ltd
Rumorth EA Ltd	Murphy Chemical E.A Ltd
Rumorth East Africa Ltd	Syngenta East Africa Ltd

Sadolin Paints (E.A.) Ltd	Synresins Ltd
Sara Lee Kenya Limited	Tri-Clover Industries (K) Ltd
Saroc Ltd	Twiga Chemical Industries Limited
Super Foam Ltd	Vitafoam Products Limited
Sector: Energy, Electrical and Electronics (42)	
A.I Records (Kenya) Ltd	East African Cables Ltd
Amedo Centre Kenya Ltd	Eveready East Africa Limited
Assa Abloy East Africa Ltd	Frigorex East Africa Ltd
Aucma Digital Technology Africa Ltd	Holman Brothers (E.A.) Ltd
Avery (East Africa) Ltd	IberaAfrica Power (EA) Ltd
Baumann Engineering Limited	International Energy Technik Ltd
Centurion Systems Limited	Kenwest Cables Ltd
Digitech East Africa Limited	Kenwestfal Works Ltd
Manufacturers & Suppliers (K) Ltd	Kenya Power & Lighting Co. Ltd
Marshall Fowler (Engineers) Ltd	Kenya Scale Co. Ltd/ Avery Kenya Ltd
Mecer East Africa Ltd	Kenya Shell Ltd
Metlex Industries Ltd	Libya Oil Kenya Limited
Metsec Ltd	Power Technics Ltd
Modulec Engineering Systems Ltd	Reliable Electricals Engineers Ltd
Mustek East Africa	Sanyo Armo (Kenya) Ltd
Nationwide Electrical Industries	Socabelec East Africa
Nationwide Electrical Industries Ltd	Sollatek Electronics (Kenya) Limited
Optimum Lubricants Ltd	Specialised Power Systems Ltd
PCTL Automation Ltd	Synergy-Pro
Pentagon Agencies	Tea Vac Machinery Limited
Power Engineering International Ltd	Virtual City Ltd
Sector: Plastics and Rubber (54)	
Betatrad (K) Ltd	ACME Containers Ltd
Blowplast Ltd	Afro Plastics (K) Ltd
Bobmil Industries Ltd	Alankar Industries Ltd
Complast Industries Limited	Dune Packaging Ltd
Kenpoly Manufacturers Ltd	Elgitread (Kenya) Ltd
Kentainers Ltd	Elgon Kenya Ltd
King Plastic Industries Ltd	Eslon Plastics of Kenya Ltd
Kingway Tyres & Automart Ltd	Five Star Industries Ltd
L.G. Harris & Co. Ltd	General Plastics Limited
Laneeb Plastics Industries Ltd	Haco Industries Kenya Ltd
Metro Plastics Kenya Limited	Hi-Plast Ltd
Ombi Rubber Rollers Ltd	Jamlam Industries Ltd
Packaging Industries Ltd	Kamba Manufacturing (1986) Ltd
Plastics & Rubber Industries Ltd	Keci Rubber Industries
Polyblend Limited	Nairobi Plastics Industries

Polyflex Industries Ltd	Nav Plastics Limited
Polythene Industries Ltd	Ombi Rubber
Premier Industries Ltd	Packaging Masters Limited
Prestige Packaging Ltd	Plastic Electricons
Prosel Ltd	Raffia Bags (K) Ltd
Qplast Industries	Rubber Products Ltd
Sumaria Industries Ltd	Safepak Limited
Super Manufacturers Ltd	Sameer Africa Ltd
Techpak Industries Ltd	Sanpac Africa Ltd
Treadsetters Tyres Ltd	Silpack Industries Limited
Uni-Plastcis Ltd	Solvochem East Africa Ltd
Wonderpac Industries Ltd	Springbox Kenya Ltd
Sector: Textile and Apparels (38)	
Africa Apparels EPZ Ltd	MRC Nairobi (EPZ) Ltd
Fulchand Manek & Bros Ltd	Ngecha Industries Ltd
Image Apparels Ltd	Premier Knitwear Ltd
Alltex EPZ Ltd	Protex Kenya (EPZ) Ltd
Alpha Knits Limited	Riziki Manufacturers Ltd
Apex Appaels (EPZ) Ltd	Rolex Garments EPZ Ltd
Baraka Apparels (EPZ) Ltd	Silver Star Manufacturers Ltd
Bhupco Textile Mills Limited	Spinners & Spinners Ltd
Blue Plus Limited	Storm Apparel Manufacturers Co. Ltd
Bogani Industries Ltd	Straightline Enterprises Ltd
Brother Shirts Factory Ltd	Sunflag Textile & Knitwear Mills Ltd
Embalishments Ltd	Tarpo Industries Limited
J.A.R Kenya (EPZ) Ltd	Teita Estate Ltd
Kenya Trading EPZ Ltd	Thika Cloth Mills Ltd
Kikoy Co. Ltd	United Aryan (EPZ) Ltd
Le-Stud Limited	Upan Wasana (EPZ) Ltd
Metro Impex Ltd	Vaja Manufacturers Limited
Midco Textiles (EA) Ltd	Yoohan Kenya EPZ Company Ltd
Mirage Fashionwear EPZ Ltd	YU-UN Kenya EPZ Company Ltd
Sector: Timber, Wood Products and Furniture (22)	
Economic Housing Group Ltd	Rosewood Office Systems Ltd
Eldema (Kenya) Limited	Shah Timber Mart Ltd
Fine Wood Works Ltd	Shamco Industries Ltd
Furniture International Limited	Slumberland Kenya Limited
Hwan Sung Industries (K) Ltd	Timsales Ltd
Kenya Wood Ltd	Wood Makers Kenya Ltd
Newline Ltd	Woodtex Kenya Ltd
PG Bison Ltd	United Bags Manufacturers Ltd
Transpaper Kenya Ltd	Statpack Industries Ltd
Twiga Stationers & Printers Ltd	Taws Limited

Uchumi Quick Suppliers Ltd	Tetra Pak Ltd
Sector: Pharmaceutical and Medical Equipment (20)	
Alpha Medical Manufacturers Ltd	Dawa Limited
Beta Healthcare International Limited	Elys Chemical Industries
Biodeal Laboratories Ltd	Gesto Pharmaceutical Ltd
Bulks Medical Ltd	Glaxo Smithkline Kenya Ltd
Cosmos Limited	KAM Industries Ltd
Laboratory & Allied Limited	KAM Pharmacy Limited
Manhar Brothers (K) Ltd	Pharmaceutical Manufacturing Co.
Madivet Products Ltd	Regals Pharmaceuticals
Novelty Manufacturing Ltd	Universal Corporation Limited
Oss. Chemie (K)	Pharm Access Africa Ltd
Sector: Metal and Allied (38)	
Allied Metal Services Ltd	Booth Extrusions Limited
Alloy Street Castings Ltd	City Engineering Works Ltd
Apex Street Ltd Rolling Mill Division	Crystal Industries Ltd
ASL Ltd	Davis & Shirtliff Ltd
ASP Company Ltd	Devki Steel Mills Ltd
East Africa Foundry Works (K) Ltd	East Africa Spectre Limited
Elite Tools Ltd	Kens Metal Industries Ltd
Friendship Container Manufacturers	Khetshi Dharamshi & Co. Ltd
General Aluminum Fabricators Ltd	Nampak Kenya Ltd
Gopitech (Kenya) Ltd	Napro Industries Limited
Heavy Engineering Ltd	Specialized Engineer Co. (EA) Ltd
Insteel Limited	Steel Structures Limited
Metal Crown Limited	Steelmakers Ltd
Morris & Co. Limited	Steelwool (Africa) Ltd
Nails & Steel Products Ltd	Tononoka Steel Ltd
Orbit Engineering Ltd	Welding Alloys Ltd
Rolmil Kenya Ltd	Wire Products Limited
Sandvik Kenya Ltd	Viking Industries Ltd
Sheffield Steel Systems Ltd	Warren Enterprises Ltd
Sector: Leather Products and Footwear (8)	
Alpharama Ltd	CP Shoes
Bata Shoe Co. (K) Ltd	Dogbones Ltd
New Market Leather Factory Ltd	East Africa Tanners (K) Ltd
C & P Shoe Industries Ltd	Leather Industries of Kenya Limited
Sector: Motor Vehicle Assembly and Accessories (17)	
Auto Ancillaries Ltd	Kenya Vehicle Manufacturers Limited
Varsani Brakelining Ltd	Labh Singh Harnam Singh Ltd
Bhachu Industries Ltd	Mann Manufacturing Co. Ltd
Chui Auto Spring Industries Ltd	Megh Cushion industries Ltd
Toyota East Africa Ltd	Mutsimoto Motor Company Ltd

Unifilters Kenya Ltd	Pipe Manufacturers Ltd
General Motor East Africa Limited	Sohansons Ltd
Impala Glass Industries Ltd	Theevan Enterprises Ltd
Kenya Grange Vehicle Industries Ltd	
Sector: Paper and Paperboard (48)	
Ajit Clothing Factory Ltd	Conventual Franciscan Friers-Kolbe Press
Associated Papers & Stationery Ltd	Creative Print House
Autolitho Ltd	D.L. Patel Press (Kenya) Limited
Bag and Envelope Converters Ltd	Dodhia Packaging Limited
Bags & Balers Manufacturers (K) Ltd	East Africa Packaging Industries Ltd
Brand Printers	Elite Offset Ltd
Business Forms & Systems Ltd	Ellams Products Ltd
Carton Manufacturers Ltd	English Press Limited
Cempack Ltd	General Printers Limited
Chandaria Industries Limited	Graphics & Allied Ltd
Colour Labels Ltd	Guaca Stationers Ltd
Colour Packaging Ltd	Icons Printers Ltd
Colour Print Ltd	Interlabels Africa Ltd
Kenya Stationers Ltd	Jomo Kenyatta Foundation
Kim-Fay East Africa Ltd	Kartasi Industries Ltd
Paper Converters (Kenya) Ltd	Kenafric Diaries Manufacturers Ltd
Paper House of Kenya Ltd	Kitabu Industries Ltd
Paperbags Limited	Kul Graphics Ltd
Primex Printers Ltd	Label Converters
Print Exchange Ltd	Modern Lithographic (K) Ltd
Printpak Multi Packaging Ltd	Pan African Paper Mills (EA) Limited
Printwell Industries Ltd	Ramco Printing Works Ltd
Prudential Printers Ltd	Regal Press Kenya Ltd
Punchlines Ltd	SIG Combibloc Obeikan Kenya

Source: Kenya Association of Manufacturers (KAM) Directory. June, 2011