

**JUST IN TIME ADOPTION AND PERFORMANCE OF MAJOR OIL
COMPANIES IN KENYA**

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DECLARATION

This project is my original work and has not been submitted for a degree award in any other university.

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This research project has been submitted for examination with my approval as the University supervisor.

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DEDICATION

This research is dedicated to my parents Richard and Esther, who made me be whom I am today and who never got tired of talking to me on the value of education, sacrificed our family comfort to invest in our education and endured a lot to make me whom I am today.

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ACRONYMS

- EBQ** Economic Batch quantity.
- EDI** Electronic Data Interchange.
- FMS** Flexible Manufacturing System.
- GT** Group Technology.
- JIT** Just-in-Time.
- JITP** Just-in-Time Purchasing.
- TPM** Total Productive Maintenance.
- TQM** Total Quality Management.
- WIP** Work-in-Progress.

ABSTRACT

The recent decades' global economic trends and the oil industry have turned out to be inseparable and they have a great impact on each other. The oil market is also exceedingly volatile because of various unpredictable factors. The purpose of this study was to assess Just in Time adoption and performance of major oil Companies in Kenya. The research design employed in this study was a descriptive survey research design with an illustration of a case study. The target populations for this study were the 15 major oil firms in Kenya, which are; Vivo Ltd (Shell), Total Kenya Ltd, Kenol/Kobil (Kenya Oil Ltd), Oil Libya Kenya Ltd, National Oil Corporation of Kenya (NOCK), GAPCO, Hashi, Gulf, Hass, Galana, Bakri, Engen, Oilcom, Rivapet and Fossil due to their market share and depot capacity. The respondents were selected from operations, customer service and procurement departments making a total sample of 45 respondents. Census sampling was used hence the entire target population of 15 major oil companies was studied. The study collected primary data which was analyzed by the use of descriptive statistics using SPSS (Statistical Package for Social Sciences) and presented through percentages, means and frequencies.

The study concluded that the aspects of JIT practiced in the organization were; Continuous improvement, Set-up time reduction, Smoothed line production, JIT purchasing, Work team quality control and Flexible workforce. The study further concluded that the greatest performance indicators the respondents' organization experienced as a result of implementation of Just in Time (JIT) techniques were; the organization currently has audited financial reports and it enjoys a good reputation with other partners. The study recommended that the companies should work to achieve the following specific requirements; Stabilize and level the master production system with uniform plant loading; Reduce or eliminate set-up times; Reduce lot sizes and lead times; Use total productive maintenance to reduce machine breakdowns; Train the work force to multi-skill; Develop few nearby suppliers, this may be difficult for the oil marketers during the first time but in the long run it can be achieved, and Use small-lot (single unit) conveyance using kanban card like system.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

In today's competitive global business environment, the goal of all manufacturing systems is long-term survival. A company's survival in an increasingly competitive market closely depends upon its ability to produce highest quality product at lowest possible cost and in a timely manner with shortest possible lead time. In addition, these goals should be achieved by paying utmost respect to the humanity of the employees who make the system work. Sometime, the difficulty of achieving the goals lies in the complexity of operations. It is not difficult to build the high quality product, but is extremely difficult to do so while maintaining excellent quality, and at some time respecting the humanity of people who do the actual work of building that product (Bowman, 1998).

A Just-in-Time (JIT) approach, which is suggested here, is capable of achieving all above stated goals. Just-in-Time (JIT) Based Quality Management is both philosophy and guiding set of principles that integrates the basic management techniques, existing improvement efforts, and technical tools. This approach stresses on long-term benefits resulting from waste elimination, and continuous improvements to systems, programs, products, and people (Cammamarano, 1996). It has significant impact on quality control, purchasing functions, and work culture with a philosophy that encompasses cost, meeting delivery schedules, employee's empowerment and skill development, supplier relations and development of new products.

Conceptually, this approach combines apparently conflicting objectives of low cost, high quality, manufacturing flexibility, and delivery dependability. Its effects are significant in improving the overall performance of the whole organization. However, there is no standard to implement JIT other than continuous progress towards the ultimate objective of delivery as wanted, with a smoothly synchronized continuous flow keyed to final demand, with perfect quality of incoming goods. Even with this problem, it provides a wide range of benefits (Bowman, 1998; Clode, 1993; White et al., 1999). The adoption of

JIT based approach may be helpful for oil companies, which are still struggling with problems of unreliable and long lead-time, inferior quality, low productivity, high rate of scrap and defects, shortage of raw-material, and under utilization of workers and equipments.

1.1.1 Just in Time Technique

JIT is a Japanese-developed manufacturing philosophy that represents “an aesthetic ideal, a natural state of simplicity” in production efficiency (Zipkin, 1991). Although precisely defining JIT continues to be perplexing (White and Ruch, 1990), JIT production is generally referred to as a manufacturing system for achieving excellence through continuous improvements in productivity and elimination of waste (Crawford and Cox, 1990; Suzaki, 1987). A more specific definition is provided by Calvasina et al. (1989): “JIT is a system of production control that seeks to minimize raw materials and Work in Progress (WIP) inventories; control (eliminate) defects; stabilize production; continuously simplify the production process; and create a flexible, multi-skilled workforce.”

According to Schonberger (1987), JIT is the “most important productivity enhancing management innovation since the turn of the century.” Gleckman et al. (1994) stated that “JIT has come of age,” and is recognized as a legitimate management philosophy. “The concept of JIT has completed its evolution from a manufacturing technique to a much broader philosophy of improvement” (Vokurka and Davis, 1996) that can help the US manufacturers regain and maintain a competitive advantage in the global market (Yasin et al., 1997). JIT looks beyond the short run to the long-term optimization of the entire production/distribution network (Jones, 1991). Successful JIT implementation should accomplish two major objectives: improve quality and control the timeliness of the production and delivery of products (Davy et al., 1992; Monden, 1981; Walleigh, 1986). By concentrating on quality, companies should experience less scrap and rework and more effective communication among departments and employees. In addition, long-term commitments with fewer suppliers should result in fewer inspections. The achievement of these results requires an even production flow of small lot size, schedule stability,

product quality, short setup times, preventive maintenance, and efficient process layout (Chapman and Carter, 1990; Foster and Horngren, 1987; Hall and Jackson, 1992).

1.1.2 Performance

Performance refers to how well an organization achieves its market-oriented goals as well as its financial goals. Different frameworks and reference models for measuring business performance have evolved from a variety of origins. Frameworks are approaches to measurement that businesses frequently adopted, often with significant diversity in their design and use. Reference models are more rigorous standards, typically around specific performance metrics and associated business processes, adopted by an industry or by a common functional unit. They include; Balanced Scorecard, Economic Value Added, Activity-based costing, Quality Management, Customer Value Analysis and Action-Profit Linkage Model.

A central tenant for all of these programs is business performance measurement. Quality programs, while grounded in product quality improvement and applied to many other business processes (Wruck & Jensen, 1998), are continuous improvement frameworks that might not be best suited to help manage discontinuities in business strategies (Kaplan & Lamotte, 2001). A number of prior studies have measured organizational performance using both financial and market criteria, including return on investment (ROI), market share, profit margin on sales, the growth of ROI, the growth of sales, the growth of market share, and overall competitive position.

Performance measurement and reporting is now widespread across the private sector as well as public sector of many industrialized and industrializing countries (Williams, 2003). The common tool that is used for this process, key performance indicators (KPIs), have been argued to provide intelligence in the form of useful information about a public and private agency's performance (Williams, 2003). Scholars like Modell (2004), Moynihan (2005), Vakkuri and Meklin (2006) have maintained that the implementation of performance measurement systems possess important symbolic value.

1.1.3 Just in Time and Performance

JIT is an integrated, problem-solving management approach aimed at improving quality and facilitating timeliness in supply, production and distribution (Davy et al.1992). Toyota believed that the only way for JIT to be successful is to have every individual within the organization involved and committed to it, if the resources and processes are fully utilized for maximum output and efficiency, and if the product and service offerings are delivered to satisfy market requirements without delay. Even three decades later in the twenty-first century, many firms are still struggling with the JIT management approach. JIT has gained considerable interest because it allows a firm to deliver high quality products/services with reduced waste and increased productivity (Davy et al. 1992).

The implementation of the JIT management approach requires a body of knowledge, encompassing a comprehensive set of management principles and toolkits. Generally, it is accepted that the implementation of JIT can lead to improved firm performance. For example, in a study on the financial impact of JIT adoption, Kinney and Wempe (2002) found that JIT adopters outperform non-adopters in asset turnover and profit margins. The reason behind this is that the ability of the adopters of JIT to turn their asset is increased with improved product quality, greater responsiveness to customer demand because of shorter lead times and greater product line variety. These performance dimensions are underpinned by the philosophical elements of the JIT management approach on waste reduction and system flexibility for the performance of business processes (Tierney, 2004).

Kinney and Wempe (2002) suggested further that firms practicing JIT are associated with increased profit margins as the waste reduction emphasis of JIT helps reveal activities that add no value. Generally, these activities and their related costs are either hidden by excessive buffer inventories, or are ignored because holding buffer inventories is a convenient solution to such problems as failure of production lines or other systems. With the implementation of JIT, excessive inventories are no longer allowed to mitigate these problems and the adopters of JIT are more inclined to develop cost-saving solutions,

thereby increasing profit margins. Another study also found a positive relationship between the level of JIT implementation in US manufacturing firms and their performance improvements (Fullerton and McWatters 2002).

1.1.4 Major Oil Companies in Kenya

Petroleum fuels constitute the main source of commercial energy in Kenya. Kenya is a net importer of petroleum products and has a refinery owned and managed by the Kenya Petroleum Refineries Ltd (KPRL). An 800 km cross country oil pipeline from Mombasa to Nairobi and Western Kenya with terminals in Nairobi, Nakuru, Eldoret and Kisumu, run by the Kenya Pipeline Company (KPC). The sector also boasts of over 30 oil importing and marketing companies, comprising of major and minor ones classified on basis of depot size and capacity and market share.

There are over 15 major Oil marketers in Kenya and their market share based on the volumes of fuel pushed within a given period. In the month of March, 2011, Total Kenya was the leader at 23.4% followed by Kenol Kobil at 22.8%, Shell at 17.9%, Libyaoil at 11.8%, Nock at 5.2%, Gapco at 4.4%, Hass at 1.8%, Gulf at 1.8%, Hashi at 1.8%, Galana at 1.4%, Bakri at 1.4%, Engen at 0.8%, Oilcom at 0.7%, Rivapet at 0.6% and Fossil at 0.5% of the total Kenyan market share. For one to remain on top in the list, then they must ensure they push large volumes of fuel which is dependent on the availability of the equipment at the retail outlets. The volume of fuel sold is used as the measure of gauging how particular Marketer is positioned in the market. Large volumes reveal higher margins since the prices are controlled and all Marketers almost sell at similar prices.

1.1.5 Just in Time and Performance in Oil Companies

There is no doubt of the significant effect of the oil industry in today's world economy and in our daily lives (Mast, 2005). Due to globalization, the role of world trade and transportation has increased. The oil is the number one energy source for many industries, especially for those which are based on motor driven machines for instance transportation companies, modern production and agriculture since oil meets their basic requirements such as portability, energy density, safety and ease of

handling whereas other sources do not (Mast, 2005). Accordingly, along with the increase of globalization, the world trend for oil consumption shows a constant increasing tendency (Tierney, 2004; Nation Master, 2009; CIA, 2010; Hilmola, 2011).

The US is reckoned to be the biggest consumer and China has become the second one (Hussain, Assavapokee & Khumawala, 2006; Nation Master, CIA, 2010). Moreover, Hölschler, Bachan and Stimpson (2008) state that China's robust economy and other fast developing countries' growth will continue the increasing trend in oil consumption in the near future. For the engine of these growth rates a stable energy supply is indispensable. But there are other facts too that strengthen the petroleum corporations' further significance. For instance Hilmola (2011) asserts that China is not just the second largest consumer of oil in the world but its oil reserves are decreasing thus China is forced to keep moving its economic growth.

The biggest producers and exporters in the industry are from the Middle East territory, especially Saudi Arabia and Russia (CIA, 2010). Due to the economic importance of the oil, oil companies are among the most profitable companies. Other alternative energy sources such as renewable wind, water and solar energy are still not equal competitors' of oil. Although oil reserves are limited, they will be available and exploitable for several decades; therefore, their importance can remain and will provide the base for the global economy in the near future (Hussain et al., 2006).

The high level of demand growth, the eased trade barriers and the technological growth in the oil industry has developed a strong competition among the oil corporations (Jenkins & Wright, 1998; Anderson, 2003; Himola, 2011). Therefore, oil companies, just like companies in every industry, endeavour to achieve competitive advantage over their competitors in order to be successful in the long-term. This competitive advantage derives from the capabilities of the businesses which make them able to provide a superior product or service among the competitors in a certain market (Johnson, Scholes & Whittington, 2009).

In the last few decades just in time techniques have been recognized as a vital capability of the businesses to achieve competitive advantages. Christopher (2011) argues that the company with better logistics and supply chain management can improve and sustain their competitive advantage over the rival companies. Competitive advantages of the companies are very closely related either to their cost or their value advantages, or in the most optimal case both exist at the same time. Therefore, just in time techniques have the ultimate goal to satisfy the customers preferably on the most cost effective level through the supplier-buyer integration and cooperation (Christopher, 2011).

1.2 Statement of the problem

The recent decades' global economic trends and the oil industry have turned out to be inseparable and they have a great impact on each other. The supply of oil and gas has become a necessity for the national economies and shows a growing demand tendency (Hilmola, 2011; Tierney, 2004; CIA, 2010). With globalization the trade barriers have also been eased for smoother trade and technology development has clearly intensified (Jenkins & Wright, 1998). Hall (2002) notes that faster delivery, reliability and lower cost have also appeared as a need from the customers' point of view. Supply chain management plays an indispensable role. In a competitive market the companies aim to be more effective, more efficient and more profitable than their competitors. Hussain et al. (2006) supports the importance of supply chain management within the industry as the oil companies of today believe that the competition occurs on their supply chain level rather than within individual companies.

The oil market is also exceedingly volatile because of various unpredictable factors. One of the main factors as, Anderson (2003) explains, is the frequent price fluctuation and the frequent political changes. Obviously these factors keep causing changes in the demand and supply which has an impact on the whole supply chain and its management. Ribas et al. (2011) add that volatility can be the result of unforeseen events as well, such as a natural disaster or broken down equipment. The result is tremendous uncertainty surrounding the industry which makes the supply chain manager's job and just in time techniques optimization more challenging. The high level of uncertainties actually is one

of the main reasons for the oil industry adopting a unique supply chain management approach (Ribas et al., 2011).

Studies have found that the implementation of JIT by the firms has been in a relatively slow and ad hoc manner, despite growing awareness of its purported benefits (Clode, 1993; Gilbert, 1990; Goyal and Deshmukh, 1992). One reason for a firm's reluctance to adopt JIT is its resistance to change (Golhar and Deshpande, 1993; King, 1988). The implementation lag has been attributed to a number of other factors, including a lack of understanding of JIT methods, an incompatible workforce and workplace environment, non-supportive suppliers (Majchrzak, 1988; Snell and Dean, 1992; Wafa and Yasin, 1998), and an inadequate performance measurement and incentive system (Fullerton and McWatters, 1999a). Evidence also exists that JIT may not be appropriate and has not been successful for all firms (Golhar and Deshpande, 1993; Inman and Brandon, 1992; Milligan, 1999). A categorization has been made (Jarrar, Maria and Dongilli, 2006), which places all these factors in the following categories; Top management commitment, Training and change management, Security Systems and IT infrastructure, and business process re-engineering.

Locally, Elyas and Richu (2012) did a study on the influence of Enterprise Resource Planning (ERP) on cycle time of supply of oil products in Oil Industry in Kenya. The study findings showed that Enterprise resource planning; Enterprise resource decision support and Information flow have a positive significant effect on supply chain performance. No study known to the researcher has been done to establish the extent to which the various factors affect the implementation of JIT system in major oil companies. Based on this review, this study sought to fill this research gap by answering the following research questions: what is the extent of Just in Time (JIT) techniques application in major oil companies in Kenya? what are the determinants of Just in Time (JIT) techniques application in major oil companies in Kenya? and what is the effect of Just in Time (JIT) techniques on performance of major oil companies in Kenya?

1.3 Objectives of the Study

- i. To establish the extent of Just in Time (JIT) adoption by major oil companies in Kenya.
- ii. To establish the determinants of Just in Time (JIT) adoption by major oil companies in Kenya.
- iii. To determine the effect of Just in Time (JIT) adoption on performance by major oil companies in Kenya.

1.4 Importance of the study

The findings of this study will be useful to the management of oil marketers in Kenya. It is expected to provide useful information that will help the management in application of Just in Time (JIT) techniques and strategies towards addressing the challenges that face its implementation.

This study will also be of assistance to the employees of these oil firms because it will be used as a reference during the implementation of other projects in the organization. Thus, helping the organization in increasingly competitive market based on the ability to produce highest quality product at lowest possible cost and in a timely manner with shortest possible lead time.

This study will also be useful to future researchers who might be interested to research further on application of Just in Time (JIT) techniques to all oil marketers in Kenya. Since oil industry involves a complex of processes, JIT application to many subsystems as engineering design, setup time and lot size reduction, will enhance performance.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter covers contributions from other scholars on JIT. The specific areas covered here are theoretical review, JIT techniques and JIT implementation factors as well as the conceptual framework.

2.2 Theoretical Review of JIT

According to Theory of JIT production, JIT Based Quality management is combination of inventory control, quality control and production management functions that makes sincere efforts for quality improvement by two ways. First, it concentrates on philosophical aspect of quality improvement by making the quality everyone's responsibility, and then focused on effective implementation of quality control techniques (Kumar et al, 2001).

It recognized that most valuable resources of an organization are its workers, and workers work best when they are motivated, valued, encouraged to contribute, and allowed to make their own decisions. Under this approach, Workers inspect the product quality after each successive operation. They are trained along with managers in preparation and interpretation of process control charts. Managers motivate the workers to think quality first and production rate second. The workers have authority to halt the production line or cell, if quality problems are uncovered. Thus, this concept not only gives the quality responsibility to workers but also match that responsibility with authority to share the quality control functions so that quality problems can be uncovered and solved quickly (Ebrahimpour and Schonberger, 1984).

Garg (1997) observes that, JIT production system demands to buy parts in small lots. Small lots require less space and time. Less space and time require less peoples and facilities to complete the same job. Besides, small lots easy to inspect, and defects can be immediately detected. Thus, the parts that are purchased steadily in small lot sizes with frequent deliveries contribute to higher quality and productivity through lower levels of inventory and scrap, lower inspection costs for incoming parts, and early detection of

defects. In short, JIT based approaches have potential to improve the product quality and productivity to significant level but organizations must adopt its principles in way that meet their own organizational structure, design and processes.

2.3 Just In Time Techniques

In order to implement JIT practically and eliminate the various types of waste, the practical aspects of JIT have been sub-divided into techniques. Even though JIT is not merely a set of techniques, certain techniques typify JIT production; these techniques are referred to as JIT techniques. It is important to note that many of these so-called JIT techniques are not unique to JIT. Such techniques are identified in production systems where JIT has never been implemented; one such example being process flow charts. Numerous JIT techniques have been studied and grouped. Those techniques that are presented by both Harrison (1992) and Bichero (1991) are considered in this study, and are summarized briefly as follows:

Total quality management is defined by Chase and Aquilano (1992) as managing the entire organization so that it excels in all dimensions of products and services that are important to the customer. Quality extends throughout the entire firm and is defined by the customer. The implementation of TQ is a long term process that generally results from proper implementation of other JIT techniques. Majima (1992) states that JIT puts people first. JIT maximizes the physical and mental capabilities of an individual. Management Commitment is essentially a long term technique aimed at preparing a manufacturing firm for the implementation of JIT; it includes managers and manufacturing staff.

Effective Project Management for JIT incorporates the principles of zero waste and zero defects with specific reference to the production system and each manufacturing process. According to Harrison (1992) design and development processes are far greater drivers of product costs and quality than manufacturing. Harrison refers to studies conducted on 2,000 components at Rolls-Royce (1986) where it was shown that 80% of total costs were determined by design. The aim of focusing is to initially produce only these items

while focusing on them. A Pareto analysis (Freund, Johnson & Johnson, 1990) is done on the product range to identify the items that are produced most frequently; the portion of the total income delivered by each product is examined. The total number of different products produced is reduced in order to eliminate waste in an effective manner.

When applied to production systems, JIT requires the parts to move through the system instantaneously. In working towards this goal the travel length of parts moving through the production system is minimized. Schniederjans (1993) states that cycle time requirements to meet customer demand are the driving force behind formation of production lines. In order to optimize the machine layout of the processes in the JIT production system, small machines are used. Large machines are replaced by a set of smaller more flexible machines. This basic principle of using smaller machines encourages the formation of flexible manufacturing cells and prevents the "big boat, big guns" approach that Toyota considers a major limitation in many western manufacturing firms (Majima, 1992).

TPM is referred to as Total Productive Maintenance by some (Harrison, 1992) and Total Preventive Maintenance by others. Unexpected machine downtime needs to be low for the proper implementation of various JIT techniques. By applying effective TPM on all equipment this is accomplished. Crawford et al (1988) state that TPM is an important technique that needs attention in the early stages of the JIT implementation process. Set-up time, the phrase is changing overtime. In order for small batch sizes to be economically feasible, it is essential that set-up times have an insignificant effect on the total time required to manufacture the product. Numerous studies have shown the radical set-up reductions obtained in manufacturing firms (Crawford et al, 1988; Harrison, 1992; Majima, 1992). The reduction of set-up is considered by some to be of first importance when implementing JIT.

The key to successful JIT implementation is to get people involved through training. This can be done by means of awareness revolution signboards, as Hirano (1988) suggests. He even states that no change will take place if such awareness campaigns are not in place. People involvement focuses on awareness: manufacturing staff need to be aware of order

quantities, outstanding orders and customer requirements and need to give inputs to the management of the production system in order to improve it continually. The manufacturing worker should develop into a problem identifier and -solver aiming at plant improvement. Two specific flow scheduling methods described in detail by Schniederjans (1993) are mixed model scheduling and *kanban* pull systems. The mixed model recommendation seeks a uniform daily production schedule where there is little or no variation in production quantities of each item type between days. A pull system operates only in environments where known customer orders drive the production effort. The production schedule is pulled by the demand.

Inventory reduction technique aims at reducing the value of non-value-adding capital. Inventory is WIP, and needs to be minimized. This is only possible when implemented in conjunction with other techniques such as people involvement, layout and flow, set-up reduction and standard containers. When the above are lacking large quantities of WIP are required at each process to make up for operator absence, machine breakdowns and scheduling and flow problems. Bowman (1991) states that inventory is the cholesterol of manufacturing. The mistake is often made to equate JIT and inventory reduction. Implementing JIT will reduce the inventory as shown for example at Cummins Engine by Venkatesan (1990). JIT is however much more than an inventory reduction system.

MRP is referred to as Manufacturing Resource Planning by some (Schniederjans, 1993) and Material Requirements Planning by others (Harisson, 1992); both refer to the same system. When an MRP-system is in use for flow scheduling the parts are essentially pushed through the production system. This can be combined with JIT in an effective manner as described by Bowman (1991); Harisson (1992) and Schniederjans, (1993). In theory, with a batch size of one and a balanced system, it is impossible to tell whether a part is pushed or pulled through the production system. Some examples of successful JIT/MRP combinations and resulting improvements are given by Bowman (1991). The use of standard containers is an effective way to aid the flow of parts through a production system (Hirano, 1988). The container size should match the batch size. The technique is based on the use of specific containers, containing a pre-determined number

of parts, throughout the production system. Ideally these containers should be small to aim at the ideal JIT batch size of one item.

Process charts have existed for many years and are included as a JIT technique; however, the use of these charts did not originate from JIT. Gilbreth's process chart proposed in 1921 had 40 symbols for activities. Modern process charts may be of several kinds, although all the standard types are constructed by using only five symbols. The ASME symbols derived from those originally used by Gilbreth are recommended in BS 3138, 1979, and discussed by Pilcher (1992). Process charts combine these symbols to represent the sequence of individual activities or events in the system under study. The total operation as well as the boundary conditions for the study should be clearly defined before a process chart can be constructed. Process charts are extremely useful when repetitive processes are studied. Production systems are good examples of systems where repetitive processes abound. Different types of process charts can be drawn at varying levels of detail, depending on the scope of the process.

In bottleneck-areas where specific problems exist in the production system the limiting processes, that lie on the critical path, can be analyzed and optimized. This will have an immediate effect on the productivity of the entire production system. Pilcher (1992) observes that a typical JIT system would require such a study to be conducted continually on each process in the production system, since JIT requires continual improvement. According to Harisson (1988) all processes in the production system can be made to be fool-proof. This takes time and is aided by input from the relevant machine operators. The idea is to improve the process to such an extent that the action cannot be performed incorrectly. With this in place in all processes the aim of total quality is within reach.

According to Harisson (1988) the equipment requirements of the typical JIT production system should be able to meet the entire peak demand. Thus, ideally, the equipment in a JIT layout is not operated at full capacity for a significant amount of the time. Integral to this method of operation, one operator can be shared between various machines in a cell, which is typically U-shaped, and production on each machine is thus scheduled below its

maximum capacity. This is one of the key techniques in the complete implementation of JIT in a manufacturing firm. The scheduling system should extend beyond the production line to the supplier and to the customer as discussed by Harrison (1988). The customer drives the production system by determining the inputs, since products are only produced as demand from the customer arises. Trust between buyer and supplier is essential in such an environment.

2.4 Just In Time and Performance

The JIT system is based on a philosophy of eliminating waste and utilizing the full capability of each worker to gain maximum benefit traditionally, purchasing departments have been given the task of negotiating for the lowest prices possible in an effort to reduce costs and increase company profits. These conventional relationships with suppliers were adversarial. Today's competitive marketplace calls for an updated strategy for the function. JIT (Just-in-Time) is one such approach to become a world-class competitor for world-class manufacturing. During the last two decades, the purchasing environment has become one of the most crucial elements in establishing the value added contents for the products and services and hence has become the vital organization in the dynamic international market (Kinney and Wempe, 2002).

Shortages of raw material, shorter lead time, high quality, increasing the variety of products with smaller runs, inflation, productivity and introduction of a JIT purchasing system etc. has prompted the realization of the importance of purchasing. The traditional approach to purchasing is at the root of many of the problems, business faces today. High inventory levels, soaring costs, adverse relationships with suppliers and quality issues which either stop production or results in poor products are just a few of the problems with the current way of purchasing. JIT purchasing functions often conflict with traditional practices of purchasing, which is characterized by competitive buyer-supplier relations with minimum communication and infrequent deliveries. The buyer carries large inventory to compensate for long lead-times and poor quality of incoming parts. In contrast a fundamental element of JIT purchasing is cooperative and long- term buyer-supplier relationship. In addition to price the supplier selection is based on quality,

technical expertise, and effective buyer-supplier communication, which result infrequent and reliable deliveries, high quality of incoming parts, small shipment size and parts delivered in exact quantity. As a result JIT purchasing helps to reduce inventory and increased productivity, benefiting both the buyer and supplier (Fullerton and McWatters 2002).

In this study, performance will be measured based on; Economic Value Added (EVA), Activity-based costing, Quality Management, Customer Value Analysis; and Action-Profit Linkage Model. Activity-based costing links expenses related to resources supplied to the company to the activities performed within the company. It is a way of measuring which of the firm's activities generate revenues in excess of costs and as a result, provide keen insight into what is really providing value for customers (Meyer, 2002). Action-Profit Linkage (APL) model helps firms identify measure and understand the causal links between company actions and profits. The APL model starts with the corporate strategy and moves to the four main components: company actions, delivered product/service, customer actions and economic impact. Customer value analysis is a sufficiently rich framework and customer relationship management (CRM) technologies that provide firms with better data integration and hence better measurement regarding customers. In addition, employee performance aspects will be addressed including knowledge about organization's vision and strategy, regularly training, as well as existence of team work.

2.5 Just in Time and Performance in Oil Companies

The oil industry faces many problems setting several constraints and challenges for the industry. Resulting from the above mentioned, demand growth, eased trade barriers and technological growth built a strong competition among the petroleum corporations (Jenkins & Wright, 1998; Anderson, 2003; Himola, 2011). Although the whole business world, especially the private sector is characterized by a high level of competition, it has a greater significance in the oil industry because of the enormous amount of money involved in (Anderson, 2003; Gainsborough, 2006). For illustration, out of around US\$ 1.5 trillion oil business globally, Exxon Mobile alone made US\$ 41 billion annual profit in 2011 (Gainsborough, 2006; Taxpayer,2011). The competition is complicated by

very volatile circumstances surrounding the whole oil industry. Unforeseen events, for instance political changes such as the recent international situation or governmental decisions have an impact on the price of the oil. Fluctuated oil prices affect the accurate demand forecasting which could lead to distortion in the supply (Anderson, 2003).

The oil supply chain is also known to be a very complex chain compared to other industries' (Jenkins & Wright, 1998; Hussain, Assavapokee & Khumawala, 2006). It is due to several reasons. The whole oil supply chain is divided into up-and downstream segments based on activities before and after the refining stage. However, the distance from the oil exploitation point to the final consumers could often be thousands and thousands of kilometers (km) which is the main reason for the oil supply chain having longer lead time than in other industries. In addition, crude oil has to go through a complex, capital intensive refinery process as well (Gainsborough, 2006; Ribas, Leiras & Hamacher, 2011). The long lead time also indicates the involvement of various means of transport such as ships, pipelines, rail and road as well as high transportation cost (Hussain et al., 2006; Ribas, Leiras & Hamacher, 2011). Hall (2002) and Gainsborough (2006) also emphasize that cost efficiency stands as a primary goal in order to maximize profit. It can be seen that oil just in time technique has an important role to play not only to gain competitive advantage but it helps to solve many constraints and challenges caused by the many variables in this business.

JIT emphasizes on quality, which is essential for a JIT system. The defects not only produce waste but they can also grind the production process to a halt. Since there is no inventory to cover up for mistakes, perfect quality is required by a JIT system. A JIT system is designed to expose errors and get them corrected rather than covering them up with inventory. JIT can be applied to many subsystems of a manufacturing environment such as engineering design, setup time and lot size reduction, purchasing, flexibility, suppliers' management, product development, inventory reduction at every stage, marketing, lead time reduction etc. among these purchasing has the cost saving. The purchasing goods represent 50-80% of the cost of goods sold for many companies, and in some industries such as textile industry, it accounts for more than 80% of the total cost.

Usually, the purchasing department is expected to procure the right quantity of material of right quality at the right time, from the right source, and at the right cost. JIT system has been implemented in many industries of several countries such as United States, United Kingdom, Italy, Germany, and Korea etc. JIT is an approach of excellence in the entire organization, emphasizing on quality, by eliminating wastages to improve productivity. JIT is an inventory monitoring technique at each stage of the system starting from raw material to finished product to achieve the target in time.

Kimani (2013) noted that there are challenges in Kenya petroleum industry and that Kenya's petroleum industry faces inventory challenges such as lack of strategic stocks, relatively high petroleum prices compared to other East African countries, frequent fuel shortages, sub-standard products and diversion of products destined for export back into the country.

2.6 Summary and Conceptual Framework

This section presents the summary of literature review and a conceptual framework, which depict the relation between the variables in the study.

2.6.1 Summary

One most outstanding feature of JIT is that it generates great number of suggestions by worker's involvement in continuous improvement. Management works hard to implement these suggestions. The number of suggestions is regarded as an important criterion in reviewing the performance of a worker. Thus, management recognizes worker's efforts for quality improvement. Quality circles are also act as group oriented suggestion system for making improvement. In short, JIT requires efficient suggestion system to involve employees in organization activities.

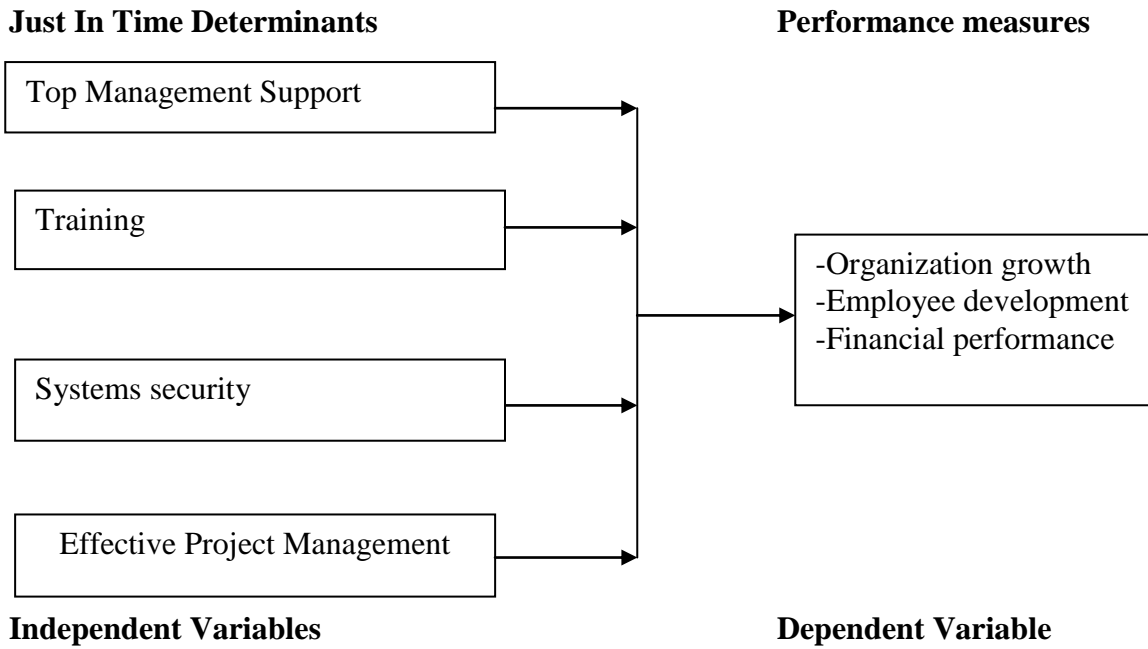
In bottleneck-areas where specific problems exist in the production system the limiting processes, that lie on the critical path, can be analyzed and optimized. This will have an immediate effect on the productivity of the entire production system. Pilcher (1992) observes that a typical JIT system would require such a study to be conducted continually on each process in the production system, since JIT requires continual improvement. The

latest advances regarding JIT, and methods for the implementation thereof are studied and then, in order to provide a sound basis for JIT implementation in major oil companies in Kenya.

2.6.2 Conceptual Framework

This section discusses the conceptual framework for the study. It shows the conceptualizations between the independent and dependent variables. The independent variables for purposes of this study are Top management support, Training and change management, Security Systems and IT infrastructure and Effective project management while the dependent variable is the application of JIT. This conceptualization is based on the arguments by Jarrar, Maria and Dongilli (2006).

Figure 2.1: Determinants of JIT Techniques Application and Performance



Source: (Author, 2014)

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

According to Guay and Kothari (2003), research methodology involves details in approaches and procedures used in carrying out studies. It includes the techniques, methods and procedures adopted in the research. This chapter discusses the research design, target population, sample and sampling procedures, data collection procedure and data analysis techniques

3.2 Research Design

The research design employed in this study was a descriptive survey research design with an illustration of a case study. A descriptive research design describes the state of affairs as it exists in the present (Guay and Kothari, 2003). It was deemed appropriate because the research involved seeking information from managers experienced in management and operation management practices and performance of the firm. A descriptive research design was appropriate as the study involved fact finding to describe the determinants of JIT techniques application and documenting the findings.

3.3 Target Population

The target populations for this study were the 15 major oil firms in Kenya, which are; Vivo Ltd (Shell), Total Kenya Ltd, Kenol/Kobil (Kenya Oil Ltd), Oil Libya Kenya Ltd, National Oil Corporation of Kenya (NOCK), GAPCO, Hashi, Gulf, Hass, Galana, Bakri, Engen, Oilcom, Rivapet and Fossil due to their market share and depot capacity. The study respondents were staff in operations, customer service and procurement department of these firms, because they are in charge of quality and operation issues hence have the required information.

3.4 Sampling

This study adopted census sampling. According to Bryman (2008), sampling is the process of selecting a number of individuals for a study in such a way that the individual represents a larger group from which they are selected. One approach is to use the entire population as the sample. Although cost considerations make this impossible for large

populations, a census is attractive for small populations (normally of less than 200). A census eliminates sampling error and provides data on all the individuals in the population.

The respondents were selected from operations, customer service and procurement departments making a total sample of 45 respondents. Census sampling was used hence the entire target population of 15 major oil companies was studied. The study collected primary data.

3.5 Data Collection

The main instrument for data collection was semi-structured questionnaires. The study collected primary data since there was no available secondary data specifically on Just in Time adoption and performance of major oil companies in Kenya. Primary research also enables a focus on specific subjects; it also enables the researcher to have a higher control over how the information is collected as well as deciding on the time frame and goal. Questionnaires gave the researcher comprehensive data on a wide range of factors. Data was collected from 45 respondents in all levels at the 15 major oil firms in Kenya. The questionnaire had two sections. Section A contained questions on demographic information of the respondents while section B focused on questions relating to Just in Time (JIT) Technique application and performance in major oil companies in Kenya.

The questionnaire were administered to the respondents using drop and pick later method since the managers are knowledgeable and busy hence would be able to fill the required answers at their own time without assistance. A period of two weeks was given for data collection period after which those who would not have completed were given one more week for completion. The filled questionnaires were then collected and sorted ready for analysis.

3.6 Data Analysis

Quantitative data collected using questionnaires was analyzed by the use of descriptive statistics using SPSS (Statistical Package for Social Sciences) and presented through percentages, means and frequencies. The information was also displayed by use of

frequency tables and charts. A frequency distribution indicated the result of the grouping of the responses with respect to a single quantitative characteristic.

The Likert scale data was analyzed using mean score and standard deviation. The Likert scale questions enabled the respondents to state their levels of agreement with statements referring to JIT application techniques. The standard deviation signified the variation or "dispersion" from the "average" (mean). Mean scores ranged from 1-5, where a mean of above 3 indicated significant adoption of JIT technique or high value of performance indicator. Standard deviation was used to indicate the variation or "dispersion" from the "average" (mean). A low standard deviation implied that the data points have a tendency to be near to the mean, while high standard deviation implied that the data is dispersed over a large range of values

Factor analysis is a statistical method used to describe variability among observed, correlated variables in terms of a potentially lower number of unobserved variables (factors). Factor analysis attempts to bring intercorrelated variables together under more general, underlying variables. Factor analysis was used to highlight the most significant determinants of Just in Time (JIT) techniques application in major oil companies in Kenya.

CHAPTER FOUR: DATA ANALYSIS AND FINDINGS

4.1 Introduction

This chapter discusses the analysis and findings of the study. The purpose of the study was to investigate the determinants of JIT techniques application and performance of major oil companies in Kenya (Vivo Ltd (Shell), Total Kenya Ltd, Kenol/Kobil (Kenya Oil Ltd), Oil Libya Kenya Ltd, National Oil Corporation of Kenya (NOCK), GAPCO, Hashi, Gulf, Hass, Galana, Bakri, Engen, Oilcom, Rivapet and Fossil). The researcher made use of frequency tables and figures to present data. Data was collated and reports were produced in form of tables and figures and qualitative analysis. A total number of 45 questionnaires were sent out, and of 35 of questionnaires of them collected. This gave a response rate of 78%.

4.2 General Information

The study initially sought to inquire information on various aspects of respondents' and company background that is; designation in the company, ownership status of the respondents company, number of branches of Respondents Company in Kenya and period of time respondents firm has been in operation in Kenya (In Years). This information aimed at testing the appropriateness of the respondent in answering the questions regarding determinants of JIT techniques application and performance of major oil companies in Kenya.

4.2.1 Respondents Designation in the Company

The respondents were requested to indicate their designation in the Company. The findings are as presented in Table 4.2.

Table 4.1: Respondents Designation in the Company

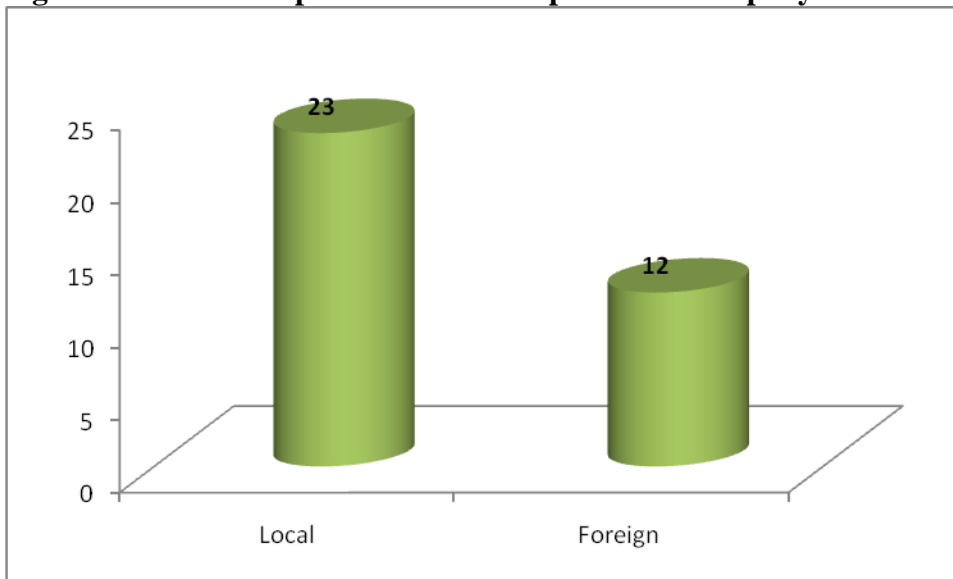
Designation	Frequency	Percentage (%)
Operations officer	16	46
Customer service officer	10	29
Procurement officer	9	25
Total	35	100

As per the findings, 16 of the respondents were operations officers, 10 were customer service officers and 9 were procurement officers. This is good representation of the target population.

4.2.2 Ownership Status of the Respondents Company

The study also requested the respondents to state the ownership status of their Company and the findings are as illustrated in Figure 4.2.

Figure 4.2: Ownership Status of the Respondents Company



From the findings, 23 of the respondents stated that the ownership status of their Company was local whereas 12 respondents stated that the ownership status of their Company was foreign. This depicts that the oil marketing companies under study were both foreign and locally owned as targeted.

4.2.3 Number of Branches of Respondents Company in Kenya

The study requested the respondents to indicate how many branches does their company has in Kenya. The findings are shown in Table 4.2.

Table 4.2: Number of Branches of Respondents Company in Kenya

Number of Branches	Frequency	Percentage (%)
0-20	4	11
21-40	9	26
41-60	10	29
61 -80	6	17
81 or more	6	17
Total	35	100

The findings show that 10 of the respondents company have 41-60 branches in Kenya, 9 have 21-40 branches in Kenya, 6 have 61-80 and 81 and above branches each in Kenya and 4 respondents have 0-20 branches in Kenya. This implies that they are large companies.

4.2.4 Period of Time Respondents Firm has been in Operation in Kenya

The study sought to determine the number of years respondents firm has been in operation in Kenya. The findings are shown in Table 4.3.

Table 4.3: Period of Time Respondents Firm has been in Operation in Kenya

Period (yrs)	Frequency	Percentage (%)
0-5	9	26
6-10	3	6
11-15	3	6
16-20	9	26
21 and above	11	36
Total	35	100

According to the findings in Table 4.3, 36% of the respondents firms have been in operation in Kenya for 21 years and above, 26% of the respondents firms have been in

operation in Kenya for 16-20 years, another 26% of the respondents firms have been in operation in Kenya for 0-5 years, 6% of the respondents firm have been in operation in Kenya for 6-10 years and 6% have been in operation in Kenya for 11-15 years. This shows that the respondents firms have been in operation in Kenya for over 5 years and have better knowledge about the performance of oil companies in Kenya.

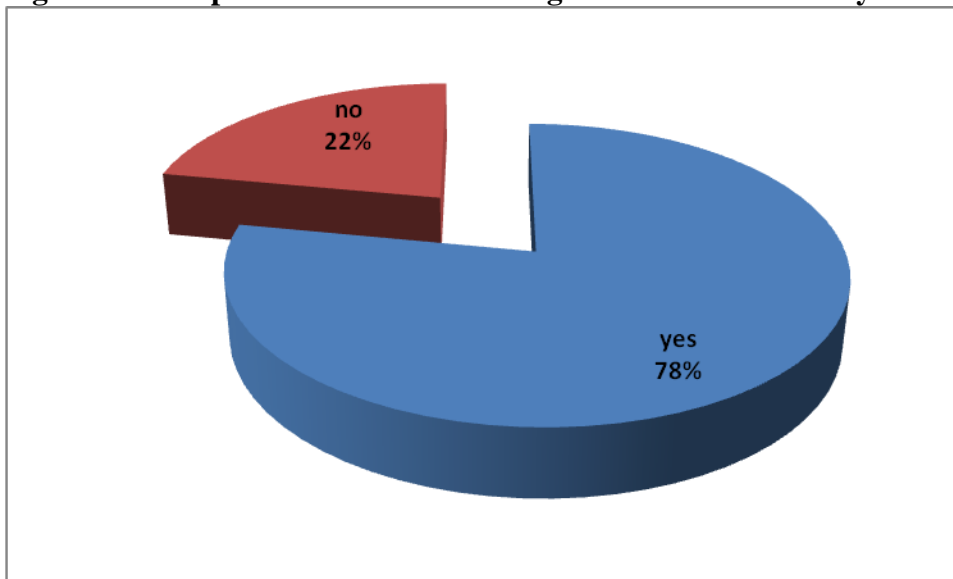
4.3 Extent of Just in Time (JIT) Techniques Application Adoption by Major Oil Companies in Kenya.

The first objective of the study was to establish the extent of Just in Time (JIT) adoption by major oil companies in Kenya. This section presents the findings in relation to this.

4.3.1 Respondents Prior Knowledge of JIT Production System

The respondents were asked if they have any prior knowledge of JIT production system. The findings are illustrated in Figure 4.3 below.

Figure 4.3: Respondents Prior Knowledge of JIT Production System



As per the findings above, 78% of the respondents have prior knowledge of JIT production system while 22% said they did not.

4.3.2 Implementation of JIT by Respondents Company

The respondents were asked if their Company is implementing JIT. A summary of the findings is presented in Table 4.4 below.

Table 4.4: Implementation of JIT by Respondents Company

Response	Frequency	Percentage (%)
Yes	23	66
No	12	34
Total	35	100

From the findings in Table 4.4, 66% of the respondents Company implement JIT whereas 34% of the respondents Company do not implement JIT.

The study probed further the respondents who disagreed that their Company is implementing JIT on why this is the case.

Table 4.5: Reasons against Implementation of JIT by Respondents Company

Reasons	Frequency
Incorporating JIT requires a heavy commitment of time	9
Incorporating JIT imposes a rigorous discipline upon the organization	7
JIT requires an overall cultural change of an organization	6
The trends of the industries discovered are currently influenced by the culture of traditional manufacturing system	6
A total employee involvement is required to ensure the quality of their product	5
Employees in the industries are not fully ready for this issue for fear of job security, job security prevailing	5
Total	38

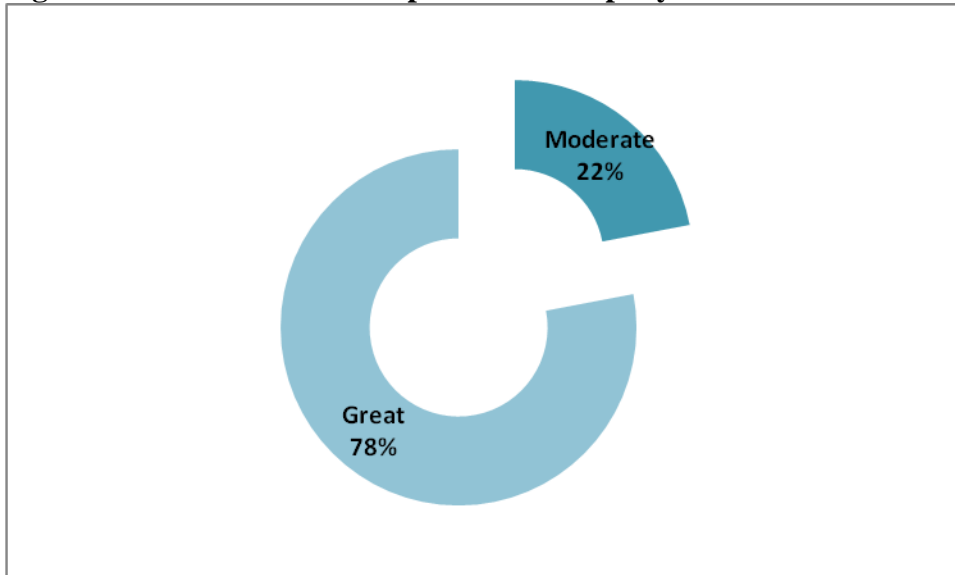
According to the findings in Table 4.5 above, the respondents mentioned that incorporating JIT requires a heavy commitment of time and imposes a rigorous discipline

upon the organization. JIT requires an overall cultural change of an organization, but the trends of the industries discovered, are currently influenced by the culture of traditional manufacturing system. They went on to say that a total employee involvement is required to ensure the quality of their product. It seems that employees in the industries are not fully ready for this issue. The main reasons cited by the respondent for the employee resistance in companies are: Fear of job security, Job security prevailing, Segmented problem solving practices (segmented concern), Working or acting to be loyal to their supervisors rather than the company, The employees are loyal to professionals, Narrow skill of most employees and Functional workers are somewhat specialized and rigid.

4.3.3 JIT Efforts in Respondents Company

The study requested the respondents to rate the JIT efforts in their company. A summary of the findings is illustrated in Figure 4.4 below.

Figure 4.4: JIT Efforts in Respondents Company



As per the findings, 78% of the respondents rated the JIT efforts in their company to be of great extent while 22% of the respondents rated the JIT efforts in their company to be of moderate extent.

4.3.4 Aspects of JIT Practiced in the Respondents Organization

The study sought to identify the aspects of JIT practiced in the respondents' organization. The responses were placed on a five Likert scale where 1 =very small extent, 2=small extent 3= moderate 4=great extent and 5=very great extent. A mean of above 3 is regarded to indicate a measure of satisfaction on the test variables. Standard deviation was used to indicate the variation or "dispersion" from the "average" (mean). A low standard deviation indicates that the data points tend to be close to the mean, whereas high standard deviation indicates that the data is spread out over a large range of values. The results are as in the Table 4.6.

Table 4.6: Aspects of JIT Practiced in the Respondents Organization

Aspects of JIT	Mean	Std Dev
U-shaped line production.	2.92	0.447
Parallel line production.	2.98	0.317
Statistical process control.	3.68	0.254
Group technology.	3.71	0.239
Preventive maintenance.	3.72	0.316
Work in progress reduction.	3.77	0.144
Kanban card information circulation system.	3.77	0.155
Production simplification.	3.85	0.252
Standard containers.	3.93	0.196
Flexible workforce.	3.98	0.213
Work team quality control.	4.00	0.178
JIT purchasing.	4.01	0.289
Smoothed line production.	4.07	0.336
Set-up time reduction.	4.09	0.416
Continuous improvement.	4.21	0.111

The findings in Table 4.6 portray that the respondents strongly agreed that the aspects of JIT practiced in the respondents' organization are: Continuous improvement

(mean=4.21); Set-up time reduction (mean=4.09); Smoothed line production (mean=4.07); JIT purchasing (mean=4.01) and work team quality control (mean=4.00):

They agreed that other aspects of JIT practiced in the respondents' organization are Flexible workforce (mean=3.98), Standard containers (mean=3.93), Production simplification (mean=3.85), Kanban card information circulation system and Work in progress reduction (mean=3.77 each), Preventive maintenance (mean=3.72), Group technology (mean=3.71) and Statistical process control (mean=3.68).

However they disagreed on some aspects of JIT begin practiced in their organization including Parallel line production (mean=2.98) and U-shaped line production (mean=2.92).

4.3.5 Factor analysis for Aspects of JIT

Factor analysis was used to extract the most important components that measured the Rotated component factor analysis for Aspects of JIT. The principal component analysis and varimax rotation methods were used to extract components with the Eigen values > 1 and items with correlation coefficients greater than or equal 0.60 as shown in the following rotated matrix tables.

Table 4.7: Rotated Component Matrix for Aspects of JIT

	Components		
	Quality Improvement	Multifunctional Worker	Inventory Management
Rotated component factor analysis for Aspects of JIT			
Continuous improvement	.419		
Production simplification	.381		
Work in progress reduction	.374		
Preventive maintenance	.369		
Set-up time reduction	.408		
Statistical process control	.359		
Work team quality control		.395	
Flexible workforce		.392	
Smoothed line production			.402
JIT purchasing			.399
Standard containers			.389
Kanban card information circulation system			.374
Group technology.			.366
Parallel line production			.261
U-shaped line production			.242
Eigen Values	1.635	1.199	.105
Variance %	7.108	10.902	15.911
Cumulative %	72.293	83.195	99.106

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A rotation converged in 8 iterations.

Factor analysis results yielded three components. These were interpreted as Quality Improvement (7.108), Multifunctional Worker (10.902), Inventory Management (15.911); all explaining 99.1% of the variance in Aspects of JIT.

Since the largest Eigen value of 1.635 corresponds to Quality Improvement, this is a component that claims most of the responses.

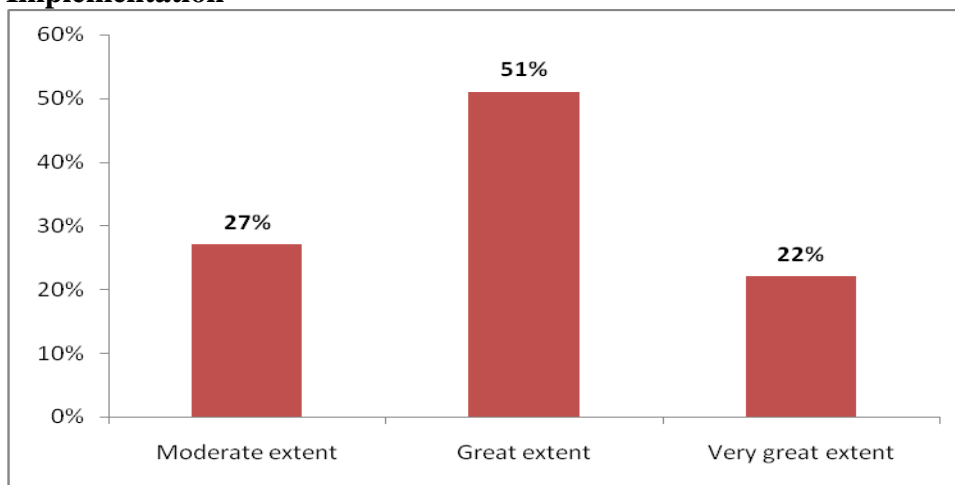
4.4 Determinants of Just in Time (JIT) Adoption by Major Oil Companies in Kenya.

The second objective of the study was to establish the determinants of Just in Time (JIT) adoption by major oil companies in Kenya. This section presents the findings in relation to this.

4.4.1 Extent to Which Top Management Provide Expertise in JIT Implementation

The respondents were asked to indicate the extent to which top management provide expertise in JIT implementation. The findings are as illustrated in Figure 4.5.

Figure 4.5: Extent to Which Top Management Provide Expertise in JIT Implementation



The findings in Figure 4.5 depict that majority (51%) of the respondents are of the opinion that top management provide expertise in JIT implementation to a great extent, 27% of the respondents are of the opinion that top management provide expertise in JIT implementation to a moderate extent and 22% of the respondents are of the opinion that top management provide expertise in JIT implementation to a very great extent. This implies that top management provides expertise in JIT implementation to a great extent.

4.4.2 Factors Influencing JIT in Respondents Organization

The study sought to identify the influence of various factors on JIT in the respondents' organization. The responses were placed on a five Likert scale where 1=very small extent, 2=small extent 3= moderate 4=great extent and 5=very great extent. A mean of

above 3 is regarded to indicate satisfaction on the test variables. Standard deviation was used to indicate the variation or "dispersion" from the "average" (mean). A low standard deviation indicates that the data points tend to be very close to the mean, whereas high standard deviation indicates that the data is spread out over a large range of values. The results are as in the Table 4.8.

Table 4.8: Factors Influencing JIT in Respondents Organization

Factors	Mean	Std Dev
The cost of the system security exceeds the monetary benefits accruing from the system.	2.12	0.211
The organization does not have competent personnel to effectively maintain the JIT system.	2.65	0.325
There is a project team in charge of JIT implementation.	3.45	0.244
There is a department concerned with ultimate control and operation of JIT	3.55	0.148
There are sufficient measures to retrieve lost data.	3.64	0.169
There are no loopholes in the JIT system security in this organization.	3.68	0.174
The team has been able to deliver as per the stipulated time schedule in JIT implementation.	3.69	0.156
There are no issues of confidentiality to unauthorized personnel.	3.71	0.365
A sufficient budget has been allocated for purposes of JIT training.	3.75	0.333
My competencies on the use of the JIT have contributed to increased efficiency in this organization.	3.76	0.188
JIT system is compatible with other Information technology systems	3.84	0.167
The adequacy of the security system of JIT in this organization is sufficient	3.88	0.111
JIT adoption involves integration of all functions of the organization	3.96	0.562
The Managing Director enhances the running of JIT	3.96	0.239
JIT adoption enhances costs reduction.	3.99	0.144
JIT adoption entails better management control	4.03	0.233
JIT adoption improves business processes	4.08	0.241
JIT adoption enhance customer service	4.12	0.279
Training in JIT has improved performance	4.18	0.156
Good performance can be attributed to adequate training on JIT.	4.32	0.199

From the findings in Table 4.8 depict that, the most influential factors on JIT in the respondents' organization are; Good performance can be attributed to adequate training on JIT (mean=4.32); Training in JIT has improved performance (mean=4.18); JIT adoption enhance customer service (mean=4.12); JIT adoption improves business processes (mean=4.08) and JIT adoption entails better management control (mean=4.03). They also agreed that JIT adoption enhance costs reduction (mean=3.99), The Managing Director enhances the running of JIT and JIT adoption involves integration of all functions of the organization (mean=3.96 each). The adequacy of the security system of JIT in this organization is sufficient (mean=3.88), JIT system is compatible with other Information technology systems (mean=3.84), my competencies on the use of the JIT have contributed to increased efficiency in this organization (mean=3.76).

In addition, a sufficient budget has been allocated for purposes of JIT training (mean=3.75), There are issues of confidentiality to unauthorized personnel (mean=3.71), The team has been able to deliver as per the stipulated time schedule in JIT implementation (mean=3.69), There are no loopholes in the JIT system security in this organization (mean=3.68), There are no sufficient measures to retrieve lost data (mean=3.64), There is a department concerned with ultimate control and operation of JIT (mean=3.55) and There is a project team in charge of JIT implementation (mean=3.45). However, they disagreed that the organization does not have competent personnel to effectively maintain the JIT system (mean=2.65) and the cost of the system security exceeds the monetary benefits accruing from the system (mean=2.12). This implies that Good performance can be attributed to adequate training on JIT.

4.4.3 Factor Analysis for Factors Influencing JIT

Factor analysis was used to extract the most important components that measured the rotated component factor analysis for factors influencing JIT. The principal component analysis and varimax rotation methods were used to extract components with the Eigen values > 1 and items with correlation coefficients greater than or equal 0.60 as shown in the following rotated matrix tables.

Table 4.9: Rotated Component Matrix for factors influencing JIT

	Components			
	Top Management Support	Training	Effective Project Management	Security Systems
Rotated component factor analysis for factors influencing JIT				
JIT adoption enhance customer service	.409			
JIT adoption entails better management control	.400			
The Managing Director enhances the running of JIT	.391			
There is a department concerned with ultimate control and operation of JIT	.351			
Good performance can be attributed to adequate training on JIT		.429		
Training in JIT has improved performance		.411		
My competencies on the use of the JIT have contributed to increased efficiency in this organization.		.370		
A sufficient budget has been allocated for purposes of JIT training.		.369		
The organization does not have competent personnel to effectively maintain the JIT system.		.256		
JIT adoption improves business processes			.405	
JIT adoption involves integration of all functions of the organization			.391	
JIT adoption enhance costs reduction			.395	
The team has been able to deliver as per the stipulated time schedule in JIT implementation			.361	
There is a project team in charge of JIT implementation			.341	
The adequacy of the security system of JIT in this organization is sufficient				.384
JIT system is compatible with other Information technology systems				.379
There are no issues of confidentiality to unauthorized personnel				.366
There are no loopholes in the JIT system security in this organization				.359
There are sufficient measures to retrieve lost data				.356
The cost of the system security exceeds the monetary benefits accruing from the system				.210
Eigen Values	.083	.074	.037	.012
Variance %	.360	.322	.161	.051
Cumulative %	99.466	99.788	99.949	100.000

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A rotation converged in 8 iterations.

Factor analysis results yielded four components. These were interpreted as Top Management Support (0.360), Training (0.322), Effective Project Management (0.161), Security Systems (0.051); all explaining 100.000% of the variance in factors influencing JIT.

Since the largest Eigen value of 0.360 corresponds to Top Management Support, this is a component that claims most of the responses.

4.5 Effect of Just in Time (JIT) Adoption on Performance of Major Oil Companies in Kenya.

The final objective of the study was to determine the effect of Just in Time (JIT) adoption on performance by major oil companies in Kenya.

4.5.1 Extent To Which Respondents Organization Experienced Performance Indicators

The study sought to identify the extent to which respondents' organization experienced the following performance indicators as a result of implementation of Just In Time (JIT) techniques where responses were placed on a five point Likert scale (1 =very small extent, 2=small extent 3= moderate 4=great extent and 5=very great extent). A mean of above 3 is regarded to indicate satisfaction on the test variables. Standard deviation was used to indicate the variation or "dispersion" from the "average" (mean). A low standard deviation indicates that the data points tend to be very close to the mean, whereas high standard deviation indicates that the data is spread measure range of values. The results are as in the Table 4.10.

Table 4.10: Extent To Which Respondents Organization Experienced The Following Performance Indicators

Performance indicators	Mean	Std Dev
Team work exists within the organization.	3.51	0.411
Employees have the skills and knowledge to do their job well.	3.74	0.148
Employees are regularly provided with training in their areas of work	3.86	0.114
Managers/supervisors give people the authority they need to do their work effectively	3.96	0.332
The organization is able to achieve objectives within their budgets	3.99	0.239
The organization's structure helps different departments/regions to work together effectively	3.99	0.358
The organization adapts well to changes in the internal environment	3.99	0.562
The organization has clearly documented procedures	4.03	0.169
The organization adapts well to changes in the external environment	4.04	0.279
Management provides good leadership for employees	4.05	0.119
The organization has seen an increase in profits	4.06	0.177
Employees are regularly provided with training in their areas of work	4.09	0.230
Employees are clear about organization's vision and strategy	4.11	0.163
Employees are clear about the values required for the organization to be successful	4.15	0.228
Customers are satisfied with our organizations performance	4.18	0.110
Over the past years, the organization has shown steady, reduction in cost.	4.19	0.247
The organization has implemented new innovations in the past 6 months	4.20	0.233
Organization promptly resolves customer complaints.	4.27	0.118
The organization enjoys a good reputation with stakeholders such as the Government and partners	4.29	0.328
The organization enjoys a good reputation with other partners	4.35	0.228
The organization currently has audited financial reports	4.41	0.112

From the findings in Table 4.10, the greatest performance indicators the respondents organization experienced as a result of implementation of Just In Time (JIT) techniques were: The organization currently has audited financial reports (mean=4.41); The organization enjoys a good reputation with other partners (mean=4.35); The organization enjoys a good reputation with stakeholders such as the Government and partners (mean=4.29); Organization promptly resolves customer complaints (mean=4.27), The organization has implemented new innovations in the past 6 months (mean=4.20), Over the past years, the organization has shown steady, reduction in cost (mean=4.19),

Customers are satisfied with our organizations performance (mean=4.18), Employees are clear about the values required for the organization to be successful (mean=4.15), Employees are clear about organization's vision and strategy (mean=4.11), Employees are regularly provided with training in their areas of work (mean=4.09), The organization has seen an increase in profits (mean=4.06), Management provides good leadership for employees (mean=4.05), The organization adapts well to changes in the external environment (mean=4.04) and The organization has clearly documented procedures (mean=4.03).

They also agreed that The organization adapts well to changes in the internal environment, The organization's structure helps different departments/regions to work together effectively and The organization is able to achieve objectives within their budgets (mean=3.99 each), Managers/supervisors give people the authority they need to do their work effectively (mean=3.96), Employees are regularly provided with training in their areas of work (mean=3.86), Employees have the skills and knowledge to do their job well (mean=3.74) and Team work exists within the organization (mean=3.51).

This implies that the greatest performance indicators the respondents' organization experienced as a result of implementation of Just In Time (JIT) techniques was the organization currently has audited financial reports.

4.5.2 Factor Analysis for Performance of JIT

Factor analysis was used to extract the most important components that measured the rotated component factor analysis for performance of JIT. The principal component analysis and varimax rotation methods were used to extract components with the Eigen values > 1 and items with correlation coefficients greater than or equal 0.60 as shown in the following rotated matrix tables.

Table 4.11: Rotated Component Matrix for Performance of JIT

Rotated component factor analysis for Performance	Components			
	Employee satisfaction	Customer satisfaction	Financial performance indicators	Operational performance Indicators
Employees are clear about the values required for the organization to be successful	.400			
Employees are clear about organization's vision and strategy	.399			
Employees are regularly provided with training in their areas of work	.397			
Management provides good leadership for employees	.389			
Managers/supervisors give people the authority they need to do their work effectively	.801			
Employees are regularly provided with training in their areas of work	.371			
Employees have the skills and knowledge to do their job well	.369			
Team work exists within the organization	.365			
The organization enjoys a good reputation with other partners		.430		
The organization enjoys a good reputation with stakeholders such as the Government and partners		.426		
Organization promptly resolves customer complaints		.419		
Customers are satisfied with our organizations performance		.402		
The organization currently has audited financial reports			.439	
Over the past years, the organization has shown steady, reduction in cost.			.409	
The organization has seen an increase in profits			.392	
The organization has implemented new innovations in the past 6 months				.416
The organization adapts well to changes in the external environment				.385
The organization has clearly documented procedures				.381

The organization adapts well to changes in the internal environment				.379
The organization's structure helps different departments/regions to work together effectively				.374
The organization is able to achieve objectives within their budgets				.374
Employees are clear about the values required for the organization to be successful				.401
Eigen Values	26.326	15.958	13.500	8.805
Variance %	36.564	22.163	18.750	12.229
Cumulative %	36.564	58.727	77.477	89.706

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A rotation converged in 8 iterations.

Factor analysis results yielded four components. These were interpreted as Employee satisfaction (21.938%), Customer satisfaction (13.396%), Financial performance indicators (13.028%), Operational performance Indicators (12.859%); all explaining 89.7% of the variance in Performance. Since the largest Eigen value of 36.564 corresponds to Employee satisfaction, this is a component that claims most of the responses.

4.6 Discussion of Findings

The study found out that Quality Improvement, Multifunctional Worker, Inventory Management explains 99.1% of the variance in Aspects of JIT. Since the largest Eigen value of 1.635 corresponds to Quality Improvement, this is a component that claims most of the responses. Similarly, Padukone and Rao (1993) have grouped the JIT techniques into two stages. The first stage of JIT implementation is composed of areas that are necessary for full JIT to work. They focus on four main elements of JIT that can be achieved in the short term. These are simplicity, flow, quality, and fast set-up and lay the foundation for moving on to the more difficult techniques like kanban and JIT purchasing, which are a part of stage two.

The study also found out that Top Management Support, Training, Effective Project Management, Security Systems explain 100.000% of the variance in factors influencing JIT. Since the largest Eigen value of 0.360 corresponds to Top Management Support, this is a component that claims most of the responses. Likewise, JIT experts such as Schonberger (1984) and Hall (1983) who maintain that it is essential to begin JIT implementation with a good deal of attention first being paid to the people aspects.

The study further found out that Employee satisfaction, Customer satisfaction, financial performance indicators, Operational performance Indicators explain 89.7% of the variance in Performance. Since the largest Eigen value of 36.564 corresponds to Employee satisfaction, this is a component that claims most of the responses. This is in agreement with Fiedler et al., (1993) who proposed the following two stages process: Prepare the plant and its people for flexibility, low costs, short lead-times and high quality by concentrating on design; maintenance; quality; layout; set-up time; and people. Strive to produce zero lead-time with no waste by focusing on: total people involvement; visibility; process data collection; enforced improvement; flow scheduling; inventory control; buffer and lot size reduction, and supplier and customer relationship.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the data findings on the determinants of JIT techniques application and performance of major oil companies in Kenya, the conclusions and recommendations are drawn there to. The chapter is therefore structured into summary of findings, conclusions, recommendations and area for further research.

5.2 Conclusion

The study concluded that the aspects of JIT practiced in the organization were; Continuous improvement, Set-up time reduction, Smoothed line production, JIT purchasing, Work team quality control, Flexible workforce, Standard containers, Production simplification, Kanban card information circulation system, Work in progress reduction, Preventive maintenance, Group technology and Statistical process control respectively.

The study also concluded that the most influential factors on JIT in the organization were good performance attributed to adequate training on JIT. The study further concluded that the greatest performance indicators experienced as a result of implementation of Just In Time (JIT) techniques were; the organization currently has audited financial reports and it enjoys a good reputation with other partners.

The study concluded that JIT Based Quality Management makes outstanding improvements in area of cost and quality through best use of human resources by focusing on simplicity, waste elimination and continuous improvement. It is a great opportunity for industries due to its relatively low investment needs and compatibility to small business environment. This approach utilizes the full capacity of workers and enables them to systematically analyze the hidden causes of quality problems by making small consistent changes in organizational arrangements.

It allows the workers to become participant in decision-making by putting the trust and responsibility in their hands. Several leading oil marketers in Kenya are implementing the JIT with belief that it would be helpful to face the global competition. Yet, its effectiveness would depend upon qualities, attitudes and values of the work force. In the end, it is hope that other industries would initiate the necessary changes in their existing production system for adopting the JIT Based Quality Management to gain maximum benefits.

5.3 Recommendations

In order to achieve the benefits of the pull (customer-demand) production, the oil marketer should utilize the Just-In-Time production system. The procedures necessary to implement the pull production system are simple yet powerful in maintaining efficiencies with minimum inventory. The basic idea is that the companies are only responding to the company's actual-customer demand for their products.

The implementation model of JIT developed for the companies are made with the consideration of where the companies are at the moment. Their readiness is rated at their infancy stage to implement JIT. Therefore, the line implementation model should be followed sequentially without shortcutting or jumping any of the steps.

In general, to implement JIT the companies should first made priorities like:-Respond to customer's requirement; Integrate and stream line all processes in their manufacturing system; Develop employee participation in meeting the commitments of the company; Implant a company-wide commitment to education; Eliminate redundant processes; Locate and eliminate all sources of inventory; Establish goals that require continuous improvement to the production process; Use a pull production system; Develop controllable production processes; Have a companywide defect protection program; Set goals on reducing set-up time, and Build products to specifications.

After achieving the above general goals, each of the companies should work to achieve the following specific requirements such as:-Stabilize and level the master production

system with uniform plant loading; Reduce or eliminate set-up times; Reduce lot sizes and lead times; Use total productive maintenance to reduce machine breakdowns; Train the work force to multi-skill; Develop few nearby suppliers, this may be difficult for the oil marketers during the first time but in the long run it can be achieved, and Use small-lot (single unit) conveyance using kanban card like system.

5.4 Limitations of the Study

The study area was limited to the 15 major oil companies in Kenya only and this could affect the generalizations of the findings.

The sample size is far below the number of cases reported in other research, which has led in this case to a more complex data analysis. It would be advisable to replicate the study in broader contexts to confirm the underlying factors identified in this case.

While the purpose of the study was to assess Just in Time adoption and performance of major oil Companies in Kenya, the study does not attempt to explain why such adoption might have occurred.

Finally, the study also suffers from a common limitation in quantitative research: the use of subjective measures for the variables considered. However, it is widely reported in the literature that this procedure increases the response rate as well as that there is a high correlation between subjective and objective data on performance (Venkatraman and Ramanujan, 1986). The use of self-reported data may induce social desirability bias, although the assurance of anonymity can reduce such bias when responses concern sensitive topics (Hair et al., 1999).

5.5 Suggestions for Further Studies

This study investigated on the determinants of JIT techniques application and performance of major oil companies in Kenya. The study suggests that further research to be done on challenges affecting implementation of JIT techniques application and performance of major oil companies in Kenya.

The study also recommends that further study be done on the impacts of effective implementation of JIT techniques application and performance of major oil companies in Kenya.

JIT techniques implementation has positive effects on overall firm performance. However such positive effects should be examined in detail to see if they are sustainable and continuous studies carried to verify if this then remains true in the long run. It would be good to know then the advantages and disadvantages of JIT techniques implementation.

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APPENDICES

APPENDIX I: LETTER TO THE RESPONDENTS



UNIVERSITY OF NAIROBI SCHOOL OF BUSINESS MBA PROGRAM

Telephone: 020-2059162
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P.O. Box 30197
Nairobi, Kenya

25 August 2014


TO WHOM IT MAY CONCERN

The bearer of this letter... Serem Nicholas Manese
Registration number... D.61/75655/2012

is a bona fide continuing student in the Master of Business Administration (MBA) degree program in this University.

He is required to submit as part of his coursework assessment a research project report on a management related problem. We would like the students to do their projects on real problems affecting firms in Kenya. We would, therefore, appreciate your assistance to enable him collect data in your organization.

Thank you.


PATRICK NYABUTO
MBA ADMINISTRATOR
SCHOOL OF BUSINESS



APPENDIX II: RESEARCH QUESTIONNAIRE

This questionnaire aims at collecting information and data for academic use by the researcher. Your kind participation will go a long way in providing useful information required to complete this research. The information provided will be treated in confidence. You need not indicate your name.

Please answer the questions precisely and objectively.

PART A: Background Information

Please tick (✓) or fill the gaps as appropriate

1. What is your designation in your Company?

.....

2. What is the ownership status of your Company?

Local.....

Foreign.....

Both.....

3. How many branches does your company have in Kenya?

0-20.....

21-40.....

41-60.....

61 -80.....

81 or more.....

4. How long has your firm been in operation in Kenya (In Years):

.....

PART B

Section 1: The extent of Just in Time (JIT) techniques application

5. Do you have any prior knowledge of JIT production system?

Yes [] No []

6. Is your Company implementing JIT?

Yes [] No []

If no, give reasons for your answer

.....
.....
.....

7. How do you rate the JIT efforts in your company?

Very small () Small () moderate ()

Great () Very great ()

8. In JIT environment the following aspects of JIT are practiced. Rate them according to the extent to which they are practiced in your company where; 1=very low extent, 2=low extent, 3=moderate, 4= high extent, 5= very high extent

Aspects of JIT	1	2	3	4	5
Flexible workforce.					
Work in progress reduction.					
Production simplification.					
Preventive maintenance.					
Statistical process control.					
Set-up time reduction.					
Continuous improvement.					
JIT purchasing.					
Work team quality control.					
Standard containers.					
Group technology.					
Smoothed line production.					
Parallel line production.					
U-shaped line production.					
Kanban card information circulation system.					

Section 2: The determinants of Just in Time (JIT) adoption in major oil companies in Kenya.

9. To what extent does top management provide expertise in JIT implementation
 Very small extent () Small extent () Moderate extent ()
 Great extent () Very great extent ()

10. Rank the influence of the following factors on JIT in your company according your level of agreement, where; 1 = strongly disagree 2 = disagree, 3 = Neutral, 4 = Agree, 5 = strongly agree

Factors	1	2	3	4	5
i. JIT adoption involves integration of all functions of the					

organization					
ii. JIT adoption entails better management control					
iii. JIT adoption enhance customer service					
iv. JIT adoption enhance costs reduction					
v. JIT adoption improves business processes					
vi. A sufficient budget has been allocated for purposes of JIT training.					
vii. My competencies on the use of the JIT have contributed to increased efficiency in this organization.					
viii. Training in JIT has improved performance					
ix. The organization does not have competent personnel to effectively maintain the JIT system.					
x. Good performance can be attributed to adequate training on JIT.					
xi. There is a department concerned with ultimate control and operation of JIT					
xii. There is a project team in charge of JIT implementation					
xiii. The team has been able to deliver as per the stipulated time schedule in JIT implementation					
xiv. The Managing Director enhances the running of JIT					
xv. JIT system is compatible with other Information technology systems					
xvi. The adequacy of the security system of JIT in this organization is sufficient					
xvii. There are no loopholes in the JIT system security in this organization					
xviii. There are issues of confidentiality to unauthorized personnel					
xix. There are no sufficient measures to retrieve lost data.					
xx. The cost of the system security exceeds the monetary benefits accruing from the system					

xxi. Others					
.....					
.....					

Section 3: The effect of Just in Time (JIT) adoption on performance of major oil companies in Kenya.

12 Indicate the extent to which your organization experienced the following performance indicators as a result of implementation of Just In Time (JIT) techniques (use scale where 1 = Very small extent 2 = Small extent, 3 = moderate extent, 4 = Great extent, 5 = Very great extent.

Performance indicators	1	2	3	4	5
i. Employees are clear about organization's vision and strategy					
ii. Employees are regularly provided with training in their areas of work					
iii. Employees are regularly provided with training in their areas of work					
iv. Employees have the skills and knowledge to do their job well					
v. Managers/supervisors give people the authority they need to do their work effectively					
vi. Team work exists within the organization					
vii. Management provides good leadership for employees					
viii. Customers are satisfied with our organizations performance					
ix. The organization enjoys a good reputation with stakeholders such as the Government and partners					
x. The organization enjoys a good reputation with other partners					
xi. Organization promptly resolves customer complaints.					
xii. Over the past years, the organization has shown steady, reduction in cost.					
xiii. The organization currently has audited financial reports					
xiv. The organization has seen an increase in profits					
xv. The organization is able to achieve objectives within their budgets					
xvi. The organization has clearly documented procedures					
xvii. Employees are clear about the values required for the organization to be successful					

xviii.	The organization has implemented new innovations in the past 6 months					
xix.	The organization's structure helps different departments/regions to work together effectively					
xx.	The organization adapts well to changes in the internal environment					
xxi.	The organization adapts well to changes in the external environment					
xxii.	Others					

Thankyou for your Cooperation!!

APPENDIX III: LIST OF OIL COMPANIES IN KENYA

1. BAKRI int
2. ENGEN int
3. FOSSIL local 2003
4. GALANA local
5. GAPCO int 1990 mid
6. GULF int
7. HASHI local 1991
8. HASS int 1997
9. KENOLKOBIL over 50 years
10. LIBYAOIL int 2006
11. NOCK local 1981
12. OILCOM int 1990
13. RIVAPET local 1996
14. SHELL int 1900
15. TOTAL int 1955

Source: PIEA, March 2011