DOWNSTREAM SUPPLY CHAIN PERFORMANCE MEASUREMENT BY THE OIL MARKETING COMPANIES IN KENYA

BY:

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DECLARATION

This research project is the result of my independent study and has not been submitted for a degree 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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ABSTRACT

With the rising number of Oil Marketing Companies (OMCs) and increased complexity of the Downstream Supply Chains, there's a greater interest in the potential of Downstream Supply Chains' Performance Measurement to function as a feedback mechanism for the continual improvement of a supply chain performance.

The objectives of this study were to examine the extent to which Oil Marketing Companies in Kenya measured their Downstream Supply Chain Performance; to identify the Key Performance Indicators used in these measurement and the challenges OMCs faced whilst undertaking the Downstream Supply Chain Performance measurements.

Data was collected through questionnaires from a population census of 53 Oil Marketing Companies and was analyzed quantitatively and qualitatively. The findings of the study indicated that many of the OMCs measured their Downstream Supply Chain Performance using KPIs such as unit cost of transportation, and of storage; quality of service, information and quality of products; time for loading, turnaround time, transportation, delivery and time to relay information; and customer feedback. Major challenges faced by the OMCs included infrastructural limitations, high demurrage costs and high operational costs.

The study concluded that the Downstream Supply Chain Performance Measurement is vital among the OMCs in Kenya with regard to enhancing the performance of their Downstream Supply Chains. The study recommended OMCs to put in place structured methods of the Downstream Supply Chain Performance Measurement to ensure optimized supply chains and to get more value from the supply chains. Flexibility of the

supply chain operations should be enhanced to ensure proper positive feedback from the SCP Metrics are easily adopted to improve on the performance of the supply chains. The study also recommended flawless cross-functional and inter-firm supply chain operations should be encouraged to enhance supply chain performance.

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LIST OF ACRONYMS AND ABBREVIATIONS

ARIMA – Auto-Regressive Integrated Moving Average

EABL – East Africa Breweries Ltd.

ERC – Energy Regulatory Commission

DSC – Downstream Supply Chain

KOSF – Kipevu Oil Storage Facility

KPC – Kenya Pipeline Company

KPRL – Kenya Petroleum Refineries Ltd.

KRA – Kenya Revenue Authority

KPI – Key Performance Indicator

LAPSET – Lamu Port-Southern Sudan-Ethiopia Transport Project

MoE – Ministry of Energy

OMCs – Oil Marketing Companies

OTS – Open Tendering System

PipeCor – Oil Industry Secretariat Pipeline Coordinator

POA – Performance of Activity

R & D – Research and Development

SC – Supply Chain

SCP – Supply Chain Performance

SCM – Supply Chain Management

SCOR – Supply Chain Operations Reference

TQM – Total Quality Management

UK – United Kingdom

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CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Products should be available to the intended customer at the right time, right place and the right quantities as per the demand. This is obtained by having proper functions; for example transport, warehousing, material handling and order processes. Su (1999) argues that for a physical distribution system to be successful the system needs to perform a series of important functions such as transport, warehousing, material handling and order processing. This therefore means that the various functions named need to be integrated for an effective system.

In the modern business environments characterized by ever-increasing competition and economy globalization, manufacturers have been exploring innovative technologies and strategies to achieve and sustain competitive advantage. As an effective business philosophy, supply chain management has gained tremendous amount of attention from both the academics and practitioners in the recent years (Chan & Qi, 2003b).

Supply chain management has been defined by Christopher (1998) as 'the management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at less cost to the supply chain as a whole'. To achieve this, the 'people dimension' is particularly important in combining technology and systems in manufacturing and throughout the supply chain but the coordinated contribution of various professional groups is involved. It has been argued that measuring supply chain performance can facilitate a greater understanding of the supply chain, and improve its overall performance (Myers et al. 2004; Chen & Paulraj, 2004).

1.1.1 Supply Chain Management

Supply chain management (SCM) is the management of a network of interconnected businesses involved in the ultimate provision of product and service packages required by end customers (Harland, 1996). Supply chain management spans all movement and storage of raw materials, work-in-process inventory, and finished goods from point of origin to point of consumption.

Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers and customers. Supply chain integrates supply and demand management within and across companies. Supply chain management is an integrating function with the primary responsibility of linking major business functions and business processes within and across companies into a cohesive and high performing business model. It includes all logistics, management activities as well as manufacturing operations and it drives coordination of processes and activities (Jonsson, 2008).

In the UK, a survey showed that 40% of the UK's gross domestic product was spent on distribution and logistics related activities (Gunasekaran et al. 2004). The authors noted that such findings and developments present significant visible impact of distribution, purchasing, and supply management on company assets.

Supply chains can generally be described with upstream, downstream and internal organisational activities. Upstream activities, flows and relationships include purchasing

and procurement functions. Internal organisational supply chain activities are related to traditional production. Downstream activities and flows may include outbound logistics, transportation, marketing, distribution, packaging and warehousing. Another definition for supply chain is the "design, planning, execution, control, and monitoring of supply chain activities with the objective of creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand and measuring performance globally" (Cox, 1999). A supply chain is also broadly defined as all of the linked individual organizations that by direct or indirect means, lead to delivery of a service or of a good to a customer (Chopra & Meindl, 2004).

A modern competition is a major upheaval affecting every aspect of how networked enterprises, supply chain networks, organize and operate. Gwako, (2008) noted that if an individual enterprise wants to thrive, it has to understand how supply chain networks work and how they can make them work better. A key feature of present day business is the idea that it's the supply chains that compete and not companies (Christopher & Towill, 2001), and the failure of supply chains is ultimately determined in the marketplace by the end customer.

In developing a supply chain strategy, the organisational structure of distribution channels can be viewed as a network of flows embracing the movement of products, services and information. This channel integration process offers potential for improving the performance of all organisations along the supply chain and enables them to compete effectively in the marketplace (Harrison & New, 2002). Supply chain therefore provides a unique opportunity for organisations to utilize assets more effectively.

The challenges and complexity of inventory management, transportation, facilities management, pricing and information availability are some of the factors that lead an organisation to embrace supply chain management. All inventories within a supply chain can dramatically alter a supply chain's efficiency and responsiveness. Unexpected changes in customer demands or uncertain supply can greatly affect a supply chain. Modes and routes for moving the inventory faster generally also affect the supply chain's efficiency and responsiveness. Decisions on location, capacity and flexibility of facilities have a significant effect on performance. Decisions on sourcing, whether in procurement, in-house sourcing or outsourcing also affects a supply chain. Pricing for economies of scale, as fixed price or menu pricing are also other decision drivers for supply chains.

1.1.2 Supply Chain Performance

Supply chain management has been a major component of competitive strategy to enhance organizational productivity and profitability. In recent years, organizational performance measurement and metrics have received much attention from researchers and practitioners. The role of these metrics in the success of an organization cannot be overstated because they affect strategic, tactical and operational planning and control. Performance measurement and metrics have an important role to play in setting objectives, evaluating performance, and determining future courses of actions (Gunasekaran, et al. 2004).

Companies must always be concerned with their competition. Today's marketplace is shifting from individual company performance to supply chain performance: the entire chain's ability to meet end-customer needs through product availability and responsive, on-time delivery. Supply chain performance crosses both functional lines and company

boundaries. Functional groups (engineering, R&D, manufacturing, sales and marketing) are all instrumental in designing, building, and selling products most efficiently for the supply chain. Traditional company boundaries are changing as companies discover new ways of working together to achieve the ultimate supply chain goal: the ability to fill customer orders faster and more efficiently than the competition. To achieve that goal, an organisation needs performance measures, or "metrics", for global supply chain performance improvements (Gunasekaran, et al. 2001).

The organisation's performance measures must show not only how well the firm is providing for its customers (service metrics) but also how it is handling its business (speed, asset, inventory, and financial metrics). Given the cross-functional nature of many supply chain improvements, a firm's metrics must prevent "organizational silo" behavior which can hinder supply chain performance. The basic objective of supply chain management is to "optimize performance of the chain to add as much value as possible for the least cost possible". In other words, it aims to link all the supply chain agents to jointly cooperate within the firm as a way to maximize productivity in the supply chain and deliver the most benefits to all related parties (Jie, Parton, & Cox, 2007).

Measurement is important, as it affects behavior that impacts supply chain performance. As such, performance measurement provides the means by which a company can assess whether its supply chain has improved or degraded. Supply chain performance metrics provide organizations with a standard framework to assess supply chain operations and performance including internal and external firm links (Burcher, Lee & Sohal, 2006).

1.1.3 The Oil Marketing Companies in Kenya

The Kenyan Economic Survey (2007) indicated that there has been an observable increase in demand for petroleum products within the Kenyan Economy and that of the neighbouring countries. This has been fueled by the growth of the industrial and agricultural sectors, road transport, rail transport, aviation, power generation and manufacturing. The demand for petroleum products in Kenya has therefore seen a constant increase. The 2011 Economic Survey shows that the Total demand of petroleum products grew by 4.3% from 3610.8 thousand tonnes in 2009 to 3760.7 thousand tonnes in 2010. The demand for power generation increased by 7.2% in 2010; the transport and communication sector experienced a growth of 5.9% in 2010, driven by the expansion of transport and storage sub-sectors.

The Oil Marketing Companies fall in the larger Petroleum industry in Kenya. They are involved in the import, export to the neighbouring countries and distribution of petroleum products to the end-consumers within Kenyan territory. Most of the neighbouring countries to Kenya like Uganda, Rwanda, Burundi, DRC, and The Republic of South Sudan continue to rely on Kenyan petroleum distribution networks and infrastructure. Most of the supply chain decisions to these countries are made by locally incorporated oil companies. There has also been an increased number of Oil Marketing Companies, implying increased competition both for the available distribution infrastructure and for the consumers. There are currently 53 registered OMCs which actively participate in the importation of petroleum products (KPRL Entitlement Statement for May, 2012).

Petroleum products come to Kenya through the port of Mombasa, imported in the form of refined products and as crude oil. The refined products are received by the OMC's, as

well as by Kenya Pipeline Co. or the Kenya Petroleum Refineries Ltd. on behalf of the OMC's. KPC stores and transports the finished products to upcountry destinations. The crude oil is received at the KPRL for processing to various petroleum products on the basis of a processing agreement, which sets out the precise terms on which KPRL takes custody of specific quantities and types of crude oil on behalf of the OMCs. The Mombasa local depots are served directly by KPRL. Bitumen and Fuel oil are however transported by road.

The supply chain of the petroleum products include three main activities namely the upstream activities which include oil and gas exploration and production of crude oil, the procurement of the crude by different users and the shipment to the different users. The internal organisational supply chain activities would consist of the processing of the crude oil to produce refined petroleum products. The downstream activities would include the transportation, marketing, packaging, warehousing and distribution of finished petroleum products. In the context of Kenyan petroleum industry, the downstream activities would start at the activities after the receipt of the petroleum products at the port of Mombasa. These activities include receipt of refined petroleum products at KPC, KPRL or at the OMC's depot, the receipt of crude oil by KPRL for refining, the transportation of the petroleum products received from KPRL and product stored at KPC by the pipeline or by oil tankers, and lastly, the distribution of the petroleum products to the end users.

The OMCs on receipt of the refined products at the port of Mombasa will liaise with KPC on the quantities required of given products at different parts of the country, and KPC will schedule to deliver the products to the OMC at the required destination, by the

required dates. The OMC will also coordinate with KPRL Refinery Scheduler on the entitled quantities of product that they would require from KPRL and schedule this to be delivered to the Mombasa local depots or transferred to the pipeline for onward transportation.

Requirement for all oil companies are consolidated to form a single product batch to be transported by KPC. OMCs have to share the available pipeline as well as storage tankage at KPC and KPRL. Sharing of the batch volume is based on each oil company's proportionate share of the stock at the KPC storage facility at the time of pumping. The Kenya Revenue Authority through its Customs Services Department stipulates the requirement for warehousing of petroleum products. The Department determines how much duty and when to pay the duties and levies as well as the import and export requirements. The individual OMCs have to pay up all the required tax duty before any oil is released from the storage depots.

Each OMC has to liaise with KPRL Planner, or the Pipecor (Pipeline Coordinator) who determines whether or not the marketer has material at KPRL or at KPC. KRA has then to clear the required amount for the marketer to have access to their product. The Pipecor and Refinery Scheduler then 'queue' the product for transportation by the pipeline, or for certain products to be transferred to the local depots for trucking before the transportation begins. Poor planning on the side of the OMCs will lead to them not having their products where they would require them, at the required time. KPC will move the batch to the next time slot that product will be transported in the pipeline.

The supply chain in the Petroleum industry is very dynamic, and thus it is very important to measure its performance to know what to control and keep the company on track of its business objectives. Measuring the performance of a supply chain will create a scope for improvement of its performance, which will go a long way in leading a company to gaining competitive advantage. This study intends to focus on the downstream supply chain in the petroleum industry in Kenya and examine the extent to which OMC's measure their performance.

1.2 Research Problem

Manufacturers and service providers now, more than ever, face an increasing pressure of customer satisfaction, quality improvement, and demand responsiveness. On the other hand they need to reduce production costs, shorten lead time and lower inventory levels to ensure profitability. In order to survive under these pressures, more and more enterprises are striving to develop long term strategic partnerships with a few component suppliers and collaborate with them in their operations (Lambert, et al. 1998).

'Anything measured improves'; 'What you measure is what you get'; 'anything measured gets done'; 'you cannot manage what you do not measure'. These are some of the clichés in the industry that support the interest in performance measurement (Lapide, 2000). Measurement of the supply chain performance maximizes the potential of a given supply chain, as the weak areas are identified and therefore the management objectives would be in such a way as to strengthen these areas. The supply chain would thus be driven towards higher effectiveness and efficiency. Oil Marketing Companies are keen on the assurance of proper control of production assets through application of asset-wide performance measurement systems. The business environment in which the Kenyan

Petroleum Industry operates in has statutory controls which constrain full market forces from taking place. The OMCs operate with constrained facilities and in long supply chains complicated by factors that they have no control over.

Cost of transportation remains high, and the clearance procedures remain long. Other challenges include; Petroleum products are produced and moved in bulk leading to high working capital requirements; volatility of crude oil prices in the international markets is rather high as compared to other products; safety issues are critical due to the high flammability property of petroleum, necessitating specialized handling all through from shipment, storage, refining, and transportation to retailing (Dempster, et al. 2000). The members of the downstream supply chain expect timely, reliable and quality delivery of the right amount of products at low cost (Cirtita& Glaser-Segura, 2012). Additionally, effective distribution of oil products will lead to increased profitability.

Ayugi (2007) examined the effectiveness and efficiency of the supply chain model in Wrigley's East Africa. He indicated that supply chain activities would increase the organisation's performance significantly. His focus was to understand the supply chain model and the challenges the model was facing. Amolo (2002) found that most oil companies were constrained in achievement of operations objectives; the major constraints identified being the shared infrastructure and Government legislation. Gataragwa (2007) examined the benefits enjoyed by East Africa Breweries Ltd., EABL, by integrating the upstream and downstream of their supply chain. He observed that the main risk faced by EABL was that the company relied heavily on few suppliers. Gwako (2008) examined the metrics and corresponding indicators that Kenya Airways applied in

supply chain performance measurement. He highlighted the competitive strengths that an airline should have to effectively and efficiently compete in the market.

Mukhwana (2010) researched on the impact of supply chain on performance at Safaricom. He observed that there's need to adopt a systematic approach to performance measurement in the supply chain. He also suggested that metrics could be used to ensure that the supply chain is performing as expected. He however did not specify any performance measurement approach. Cirtita & Glaser-Segura (2012) studied downstream supply chain performance metrics. They specifically focused on the use of the Supply Chain Council's Supply Chain Operations Reference, SCOR model. They indicated that the SCOR model covered all aspects of demand satisfaction. This study covered aspects of supply chain performance measurement but did not relate it to any particular industry or market.

The downstream supply chain in the petroleum industry faces many challenges, which could be managed better if the supply chain performance was measured with a view to optimizing its performance. This study seeks to answer the following questions; Do the OMC's measure their downstream supply chain performance? Do the OMCs have supply chain performance indicators? What challenges do the OMCs face in undertaking downstream supply chain performance measurements?

1.3 Objectives of the study

The objectives of this study were;

i. To determine the extent to which the Oil Marketing Companies in Kenya measure their Downstream Supply Chain Performance.

ii. To identify the key performance indicators used in Supply Chain Performance Measurement.

iii. To determine the challenges faced by Oil Marketing Companies in Kenya while undertaking Downstream Supply Chain Performance Measurement.

1.4 Value of the Study

The knowledge and information from this study will have a practical impact and will be used by the Kenyan Oil Marketing Companies in utilizing the concept and tools of downstream supply chain performance measurement to improve their operations. This study will also be important to potential investors in the industry. It will assist the supply chain managers in the Petroleum industry in Kenya to evaluate local conditions, key success factors and challenges unique to the Kenyan business environment that can contribute to the successful implementation of supply chain performance measurement.

The concepts from the study will form a basis for further research to the academicians. There has been little study on the concept of supply chain performance measurement and its importance in the industry. This study will also contribute to the knowledge in the area of downstream supply chain performance measurement in Kenya.

The study will also contribute towards sound and more informed decision making on downstream supply chain performance measurement by the policy makers in organisations and in public institutions. Decisions made from an informed point of view tend to be more effective. Effective and efficient supply chain operations would be the goal of policy makers and institutional leaders.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

In this chapter, literature on Supply Chain Management, its need and benefit is reviewed. The literature will also define Supply Chain Performance and the need to measure it. The chapter will end by exploring studies that have been done on Supply Chain Performance Measurement.

2.2 Supply Chain Management

Globalization and the advent of new technologies are great contributors to prompting business competition. Enterprises are looking to effectively and efficiently satisfy customers' needs to remain competitive (Chan & Qi, 2003a). The viability of a firm largely depends on how well the firm responds to customer requirements while becoming lean (Gunasekaran, et al. 2001). Effectiveness calls for enterprises to be equipped with customer-focused common goals among all the related suppliers and manufacturers. The business success would then rely on the capability of quick response to customer requirements. The supplier and the manufacturer need to coordinate in sharing the common goal and strategy of improving product quality and customer service level. Efficiency requires that enterprises meet customer requirement (Chan & Qi, 2003a).

A supply chain is the sequence of organisations – their facilities, functions, and activities – that are involved in producing and delivering a product or service. The sequence would begin with the basic suppliers of raw materials and would extend all the way to the final consumer (Stevenson, 2002). A supply chain is viewed as a number of organisations working cooperatively with some shared objectives (Holmberg, 2000). Lysons &

Farrington (2006) viewed Supply Chain Management, SCM, in three facets; as a management philosophy, where systems are viewed as a whole, with a strategic orientation towards the organizational goals; as a set of activities to implement management philosophy, where integrated behaviour, mutually shared information and risks as well as rewards have one goal and focus on serving the customers; as a set of management processes where customer service and customer relationship management as well as product development and commercialization are championed.

According to Giunipero & Brand (1996), Supply Chain Management represents a state-of-the-art management tool used to enhance overall customer satisfaction that is intended to improve competitiveness and profitability. In order to survive in the global competition and sustain long-term advantages, many firms have introduced SCM (Chan & Qi, 2003b). SCM thinking is a way of thinking that is devoted to discovering tools and techniques that provide for increased operational effectiveness and efficiency throughout the delivery channels that must be created internally and externally to support and supply existing corporate product and service offering to customers (Cox, 1999). Gunasekaran et al. (2004) indicated that SCM has been a major component of competitive strategy to enhance organizational productivity and profitability. Every business organisation is part of at least one supply chain, and many are part of multiple supply chains. The number and type of organisations in a supply chain are determined by whether the supply chain is manufacturing or service oriented.

Supply chains are sometimes referred to as value chains. This indicates that value is added to goods and services as they progress through a chain. Lysons & Farrington (2006) defined a supply chain as that network of organisations that are involved, through

upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services. SCM is a management philosophy that seeks synchronization and convergence of intra-firm and inter-firm operational and strategic capabilities into a unified, compelling marketplace force (Ross, 1998).

Holmberg (2000) indicated that the interest in managing supply chains is growing rapidly among companies around the world, the major forces being increasing competitive pressure and the belief that working cooperatively in a supply chain can create a competitive advantage. Firms adopt integrative management styles focused on coordinating activities along the supply chain in order to attain or sustain a competitive position. Organisations used to concentrate on immediate suppliers of their goods and materials. Most organisations hardly paid much attention to management of their supply chains. There are several factors, though, that would drive an organisation to consider managing its supply chain.

Every organisation in the marketplace is looking for ways of improving its operations. Techniques such as Total Quality Management (TQM), Lean production and agile production have resulted, and organisations that have adopted these techniques are seeing improved quality, and reduced excess costs. Organisations are also increasing their level of outsourcing, buying goods or services instead of producing or providing them themselves. Transportation costs are also increasing, and these need to be more carefully managed. Globalization and increasing use of information technology has made the world a ‘global village’, but this has resulted in longer, more complex, supply chains (Stevenson, 2002).

The markets have grown to be highly dynamic and highly competitive, coupled with demand for shorter lead times, lower costs, higher quality and diversified products by the customers (Ip, Chan & Lam, 2011). These are complicated by increased number of new products, shorter product development and life cycles, and increased demand for customization. There is also a growing need to adopt quick-response strategies and to reduce the lead time for products. With all these, organisations are striving to manage inventories, without causing shortages or having excess inventories that attract unnecessary handling costs (Stevenson, 2002).

Monczka et al. (1998) described SCM as a concept whose primary objective was to integrate and manage the sourcing, flow, and control of materials using a total systems perspective across multiple functions and multiple tiers of suppliers. Supply chain management deals with the total flow of materials from suppliers through end users. SCM is a set of beliefs that each firm in the supply chain directly and indirectly affects the performance of all the other supply chain members, as well as ultimate, overall supply chain performance.

SCM as an integrative philosophy directs supply chain members to focus on developing innovative solutions to create unique, individualized sources of customer value (Cooper, et al. 1998). The main objective of managing the supply chain is to synchronize the requirements of the customer with the flow of materials from suppliers in order to effect a balance between what are often seen as conflicting goals of high customer service, low inventory management, and low unit cost (Stevens, 1989). Embracing effective supply chain management practices brings a lot of benefits to an organisation. These include having lower inventories, lower costs, higher productivity, higher profits, shorter lead

times, improved ability to respond to fluctuations in demand, and general increased customer loyalty (Stevenson, 2002).

2.3 Supply Chain Performance

Today's businesses find that complex corporate supply chains on which they depend stretch across international borders and also embrace relationships with an increasing number of partners and suppliers (Mwanyota, 2004). The major challenges for companies today, arise from the fact that the longer the supply chain becomes the more complex they are to manage. Supply chains are clogged with unnecessary steps and redundant stockpiles all of which form a significant percentage of the operating costs. There are many opportunities to get cost out of the supply chain than you do out of manufacturing. There tends to be so much duplication and inefficiency. A thorough understanding of the concept often leads to its successful implementation. A successful implementation is closely dependent upon the ability to create, manage and reshape long-term relationships between individuals, organizations and networks within the supply chain. It requires new organisational arrangements and culture, which calls for considerable commitment, resources and time to develop (Saad & Patel, 2006).

Supply chains are fluid and are continuously adjusting to changes in supply and demand for the products they handle. To get the desired performance from supply chains requires a company to monitor and control its operations on a daily basis. A supply chain exists to support the market that it serves. To identify the performance that a supply chain should deliver, we need to evaluate the market being served (Hugos, 2011). In the current economy the battlefield is shifting from individual company performance to Supply Chain Performance. Schorr (1998) indicated that firms no longer compete against each

other individually, but do so together with their respective supply chains. For firms to compete and survive in this global competitive environment, they have to continuously improve their enterprise collaborative and cohesive relationships within the supply chain networks. Enterprises also need to manage all entities throughout the whole supply chain network to achieve a unified business objective (Ip, Chan & Lam, 2011).

Supply Chain Performance refers to the extended supply chain's activities in meeting end-customer requirements, including product availability, on-time delivery, and all the necessary inventory and capacity in the supply chain to deliver that performance in a responsive manner. Supply Chain Performance crosses company boundaries since it includes raw materials, components, work-in-progress as well as finished products, and distribution through various channels to the end customer. It also crosses traditional functional organization lines such as procurement, manufacturing, distribution, marketing and sales, and research and development (Hausman, 2002). A supply chain performance evaluation system represents a formal, systematic approach to monitor and evaluate the performance of the supply chain (Handfield, et al. 2009). It should however be noted that it is often difficult to develop measures that direct behaviour or activity exactly as intended. Some firms rely on measures that do not support long term performance. Over time, the workplace's view of performance measurement has become more humane and do not view employees as highly reliable, predictable machines, and exaggerated types of monitoring and control methods have fallen out of favor, and replaced by a focus on a measuring a business' performance rather than that of the individual (Lapide,2000).

Measurement is important, as it affects behavior that impacts supply chain performance. As such, performance measurement provides the means by which a company can assess

whether its Supply Chain has improved or degraded (Lapide, 2000). A performance measurement system plays an important role in managing a firm's business as it provides the information necessary for decision making and actions (Holmberg, 2000). Monitoring and improvement of a performance of a SC has become an increasingly complex task. A complex performance management system includes many management processes. These would include identifying measures, defining targets, planning, communication, monitoring, reporting and feedback. Performance measurement is critical for companies to improve supply chains' effectiveness and efficiency (Cai, Liu, Xiao & Liu, 2008). Traditionally, performance measurement is defined as the process of quantifying effectiveness and efficiency of action (Neely, et al.1995). Measuring performance means transferring the reality of performance into a sequence of limited symbols to be communicated (Chan & Qi, 2003a).

In recent years, organizational performance measurement and metrics have received much attention from researchers and practitioners. The role of these metrics in the success of an organization cannot be overstated because they affect strategic, tactical and operational planning and control (Gunasekaran, et al. 2004). From a management perspective, performance measurement and metrics have an important role to play in setting objectives, evaluating performance, and determining future courses of actions by providing the necessary information of management feedback. In the context of a dynamic SC, continuously improving performance has become a critical issue for most suppliers, manufacturers, and the related retailers to gain and sustain competitiveness. Monitoring and improvement of performance of a supply chain has become an increasingly complex task. A complex performance management system includes many

management processes, such as identifying measures, defining targets, planning, communication, monitoring, reporting and feedback. These processes are currently in many information systems and these solutions measure and monitor Key Performance Indicators which are crucial for optimizing supply chain performance (Cai, et al. 2008).

Most companies realize the importance of financial and non-financial performance measures. They have however failed to represent them in a balanced framework. Gunasekaran et al. (2004) observe that many companies have not succeeded in maximizing their supply chain's potential because they have often failed to develop the performance measures and metrics needed to fully integrate their supply chain to maximize effectiveness and efficiency. Lee & Billington (1992) observed that the discrete sites in a supply chain do not maximize efficiency if each pursues goals independently. They point to incomplete performance measures existing among industries for assessment of the entire supply chain. Gunasekaran et al. (2004) further reiterate that measurements should be understandable by all supply chain members and should offer minimum opportunity for manipulation.

With greater reliance on suppliers and increasing emergence of outsourcing and fierce competition, the main challenge for supply chain management is to sustain and continuously improve the coordination and integration of all interactions and interfaces in order to enhance the overall performance of the supply chain. It is therefore important to associate the supply chain concept based on continuous improvement with performance management (Saad & Patel, 2006). Lapide (2000) pointed out that supply chain performance measurements are important to firms as measurements are important to directly controlling behavior and indirectly to performance. A few key measurements will

go a long way toward keeping a company on track towards achieving its supply chain improvement objectives. He also noted that picking the wrong measures and leaving out important ones could lead to supply chain performance degradation. Driving a supply chain based only on after-the-fact measures, like losing an important customer or having poor financial performance is not very effective.

According to Handfield et al. (2009) there are a number of reasons for measuring and evaluating supply chain activity and performance. Measurement can lead to better decision making as the firm would understand the areas in which performance falls short. Performance measurement can result in better communication across the supply chain. Measurement provides the opportunity for performance feedback which then supports the prevention or correction of problems identified during the performance measurement process. Lastly, measurement also motivates and directs behaviour towards a desired end result.

2.4 Supply Chain Performance Measurement

There is no universal method of measuring supply chains performance. Many scholars have come up with innovative ways to measuring supply chain performance and others have studied existing methods of measurement. Many firms look to continuously improve their operations to enhance core competitiveness using supply chain measurement. However, many companies have not succeeded in maximizing their supply chain's potential because they have often failed to develop performance measures and metrics needed to fully integrate their supply chains to maximize effectiveness and efficiency (Gunasekaran, et al.2004).

Supply chain performance measures can be classified broadly into two categories: qualitative measures and quantitative measures. Quantitative metrics of supply chain performance can be classified into two broad categories: Non-financial and financial. Improving supply chain performance requires a multi-dimensional strategy that addresses how the organization will service diverse customer needs. While the performance measurements may be similar, the specific performance goals of each segment may be quite different. Use of metrics and communicating results allows members of a supply chain to compete at a higher level and attract customers more than other supply chains that coordinate inter-firm activity to a lesser extent would (Cirtita & Glaser-Segura, 2012).

2.4.1 Approaches to Supply Chain Performance Measurement

Traditionally, many companies have been tracking their performance based largely on financial accounting principles (Lapide 2000). These measures are important but are biased towards improving the financial status of a firm, but are largely insufficient to measure supply chain performance. These measures lack relationships to important strategic, non-financial performance, like customer service and loyalty, and product quality. They also may not be focused towards providing forward looking perspective and do not directly tie to operational effectiveness and efficiency. Because of these shortcomings, a variety of measurement approaches have been developed and explored by different scholars.

Chan & Qi (2003a, b) studied the feasibility of supply chain performance systems using a process-based approach. They indicated that performance measurement provided an approach to identify the success and potential of management strategies, and facilitating

understanding of progress and position. They proposed an innovative concept of Performance of Activity to identify and employ performance measures and metrics. This method reiterated the aspect of supply chains not being self-centered enterprises connected through the business relations. This measure takes a holistic system perspective beyond the organisational boundaries. Another model reiterates the integration of business processes. A supply chain is defined as the integration of key business processes from end user through original suppliers and other stakeholders. From this definition, the success of a supply chain requires a change from managing individual functions to integrating activities within key supply chain business processes.

Holmberg (2000) investigated a systems perspective on supply chain measures, and examined a system as inter-connected components separated from their environments by a system border. The rationale of using systems thinking is that it provides a method for describing, analyzing and planning complex systems of different kinds. This offers a way of understanding problems and communicating this understanding to others. Looking at what happens in an isolated unit, and optimizing the routines ensures that unit is as efficient as possible and would improve the productivity of that isolated unit. The hurdles that each unit would face would differ with the activity at that unit. With all units as efficient as possible, the whole supply chain's performance would improve.

Gunasekaran et al. (2001) studied performance measures and metrics in a supply chain environment and enumerates several measures and metrics that a firm could adopt. The first is the Metrics for performance evaluation of planned order procedures where an analysis of the way the order-related activities are carried out. This covers important issues like the order-entry method, order lead-time and path of order transverse. Next, the

supply chain partnership and related metrics is measured. Partnerships in a supply chain e.g. outsourcing are important. Many times these reduce product introduction times. Faster introduction of a product would considerably depend on the reliability and quick responsiveness of suppliers. This helps to evaluate the level of competitiveness.

Another metric proposed is the production level measures and metrics which focuses mainly on production processes; product cost, quality, speed of delivery and on the delivery reliability and flexibility. The fourth metric is the performance evaluation of delivery link. It deals directly with the customer delivery of goods and services. It is sometimes referred to as the driver of customer satisfaction. Delivery operations, however, are very dynamic, making the analysis and subsequent improvement plan of a distribution system difficult. Measuring customer service and satisfaction is the other metric. With increased globalization and global markets, effective performance measurement and supply chain metrics must be linked to customer satisfaction. This measurement is needed to integrate the customer specification in the control of the process. The Supply chain finance and logistics cost performance can also be assessed by determining the total logistics cost. Care must however be taken during decision making as the cost in one area could affect that of other areas (Gunasekaran, et al. 2001).

Ip et al. (2011) modeled supply chain performance and stability using systems dynamics and the Auto-Regressive Integrated Moving Average. This was an innovative metrics that they floated for further analysis and for projecting supply chain stability for long-term management decisions making. They proposed a three-step integrated model as follows; first create a KPI to quantify and document performance measurement. This could be in form of the balanced score card or an index measure. KPI is used widely in measuring

business performances of different industries. The next step would entail developing a systems dynamic model for simply monitoring, updating and evaluating supply chain performance in achieving the firm's objective. The dynamic context of supply chains need to be considered as it is crucial in improving a supply chain and in gaining competitive advantage. The third step is to build a uni-variate ARIMA model for examining SC stability.

Cai et al. (2008) proposed a systematic approach that would help analyze and select the right Key Performance Indicator groups and strategies for their accomplishment, based on the cost of iterative improvement of each KPI, for improved supply chain performance. Gatarwa (2007) examined the benefits that East Africa Breweries Limited enjoyed by integrating the upstream and downstream of their supply chain. The main risk faced by EABL was the over-reliance on very few suppliers. This posed as a risk to the performance of the supply chain. Mukhwana (2010) researched on the impact of supply chain on performance at Safaricom Kenya Limited. The research was to find the impact of Safaricom's SCM practices on the company's performance in the industry. The study focused on overall operational performance within the Safaricom business. He observed that there's need to adopt a systematic approach to performance measurement in the supply chain. He also suggested that metrics could be used to ensure that the supply chain is performing as expected. He however did not specify any performance measurement approach. Gwako (2008) examined metrics and corresponding indicators that Kenya Airways applied in their supply chain performance measurement. He brought forward the competitive strengths that an airline should have to effectively and efficiently compete in the world airline market. He identified the dimensions that Kenya Airways used in

measuring its supply chain performance which included reliability, on-time performance, delay minimization, schedule integrity, frequency of flights, passenger security, customer service, effectiveness of partnerships, competitive prices and distribution strengths. The main challenge faced at Kenya Airways being difficulty in linking measures to customer value.

Cirtita & Glaser-Segura (2012) studied downstream supply chain performance metrics, and specifically focused on the use of the Supply Chain council's Supply Chain Operations Reference, (SCOR) model. The downstream supply chain consists mainly of manufacturers, transportation, distribution, wholesale, retail and end user. Performance metrics offer a view of the Downstream Supply Chain cost structure and allow opportunities for improvement. They also keep track of service levels which allow for further development of supply efficiencies. The authors adopted the SCOR model which assesses the following performance attributes; Supply chain delivery performance, supply chain flexibility and responsiveness, supply chain logistics and cost and supply chain asset management. The scope of the SCOR model includes all elements of demand satisfaction starting with the initial demand signal, as an order, and ending with the signal of satisfying the demand, as final invoice and payments. In their paper, Cirtita & Glaser-Segura (2012) presented the SCOR model in five attributes; Supply chain delivery reliability, supply chain flexibility, supply chain responsiveness, supply chain costs and supply chain asset management efficiency. These attributes give a methodology on the measurement of Supply Chain Performance. The method does not relate to any specific industry, country or market. This research study on the Petroleum Oil Industry in Kenya

focuses on the Downstream Supply Chain Performance Measurement practice in the industry.

2.4.2 The Challenges of Supply Chain Performance Measurement

Cai et al. (2008) noted that improving the supply chain performance is a continuous process requiring both an analytical performance measurement system and a mechanism to initiate steps towards realization of goals that have been set. Supply chain performance is measured by a set of variables that capture the impact of actual working of the supply chains on costs and revenues of the system. Managers are tasked with having to improve on the variables set by continual improvement, monitoring and evaluation. Reliance on outsourcing and on suppliers brings a challenge in sustainability of efficient and flawless supply chain activities and interfaces. Managers are required to understand what constitutes effective relationships with partners in supply chains and how their effectiveness can be assessed (Saad & Patel, 2006). The success of the supply chain is reliant on less tangible factors. Many of the current metrics used in the measurement of performance are not sufficiently adequate.

Other challenges in supply chain performance measures and evaluation are the existence of too much data and existence of wrong data. There is sometimes too much data or the manager would be paying attention to the wrong data. This could be because metrics are selected using history, or a personal feeling of a manager that the measure is related to success. Sometimes measures followed by managers may be conflicting with measures used in other departments or functions. Sometimes managers have a challenge in setting measures and ignore the longer-range or strategic-focused metrics and instead focus on the short-range measures. Some supply chain performance measurement metrics lack

detail, or drive the wrong performance. They then tend to measure driving behaviour that is either not intended, or not needed. Many of the performance measures do not give the guarantee that the behaviour will lead to desired results (Handfield, et al. 2009).

2.5 Summary

The Literature review sought to introduce the reader to Supply Chains, which is a sequence of organisations involved in producing and delivering a product or service to customers. Supply Chain Management has the main objective of managing the supply chain and to synchronize the requirements of the customer with the flow of materials from suppliers in order to effect a balance between conflicting goals of high customer service, low inventory management, and low unit cost. The highly dynamic and competitive business environment has pushed firms to work together towards a common goal of supplying goods and services to customers. Measurement of the performance of a supply chain is equally important as this will ensure that a supply chain is optimized and is working as it should. Supply Chain Performance is a systematic approach to monitor and evaluate the performance of the supply chain. Measurement is important as it affects the behaviour that impacts on Supply Chain Performance. It provides information necessary for decision making.

Several approaches have been suggested for measuring Supply Chain Performance; A process-based approach, a systems perspective on supply chain measures, use of metrics and use of KPIs to benchmark on the performance of the supply chain. Supply chain performance measurement faces a major challenge of heavy reliance on outsourcing by firms making it difficult to sustain efficient and flawless supply chain activities. The studies took a broad view of Supply Chain Performance Measurement and did not focus

on the Downstream SCP Measurement. Most of the studies also did not focus on the Petroleum Oil Industry in Kenya, and did not also capture the challenges faced in the measurement of the SCP.

This study examines the Downstream Supply Chain Performance Measurement by the Oil Marketing Companies in Kenya. There are few studies done on the measurement of supply chain performance in Kenya, and especially by the Oil Marketing Companies. The study would examine extent to which the OMCs measure their Downstream SCP, and identify the KPIs used. Challenges faced by the OMCs while undertaking these measures will also be analyzed. The study will examine the manufacturers, transporters' efficiencies, distribution networks and efficiencies, wholesale and retail services, and end customer satisfaction of the services rendered.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter highlights the methodology that was adopted in order to meet the objective of the study, included in this chapter is the research design, the population of the study, data collection and data analysis procedures.

3.2 Research Design

The study employed a descriptive survey research design to determine the extent to which OMCs measure their downstream supply chain performance, and identified the KPIs used in the performance measurements. The survey method was selected as it was suited in exploratory research studies and allowed the collection of large amounts of data which could be analyzed quantitatively using descriptive and inferential statistics.

3.3 Population and Sampling

The population of the study was the Oil Marketing Companies (OMCs), in Kenya. The research was intended to capture data from a broad base consisting small, medium and large OMCs. The study was a census study of 53 OMCs licensed by the Energy Regulatory Commission (ERC) to import and process crude at the Kenya Petroleum Refineries Ltd. (KPRL) and that were operational and active in business as at May 2012. These organisations encountered long supply chains and had many logistical challenges in their supply chain operations.

3.4 Data Collection

Primary data was collected using a structured questionnaire through 'drop-and-pick-later' method. The questionnaires were sent to the supply chain managers or their equivalent of the various OMCs. The questionnaire has both closed and open-ended questions and has four sections. Section A of the questionnaire seeks data on the general information on the OMCs. Section B of the questionnaire examines the level of importance accorded to given supply chain measurement metrics. Section C of the questionnaire looks at the extent to which OMCs measure their downstream supply chain performance and the KPIs used. Section D determines the challenges faced by the OMCs in downstream supply chain performance measurement (see Appendix 1).

3.5 Data Analysis

The data collected was checked for completeness, consistency and accuracy. It was coded and tabulated for ease of interpretation. The data was analyzed using descriptive statistics of mean rating and standard deviation. Section A of the questionnaire was analyzed to give the general information of the different firms. Section B was analyzed to show importance accorded to measurement of the downstream supply chain. Section C was analyzed to show the extent to which the OMCs measured their downstream Supply Chain Performance. Part D was analyzed to establish the challenges faced in measuring performance of the Downstream Supply Chain.

CHAPTER FOUR: DATA ANALYSIS AND INTEPRETATION

4.1 Introduction

This chapter presents the analysis and interpretations of the data from the field. It presents analysis and findings of the study as set out in the research methodology to determine the extent to which OMCs measure their downstream supply chain performance, to identify the KPIs used in the performance measurements and to determine the challenges faced by Oil Marketing Companies in Kenya while undertaking downstream supply chain performance measurements.

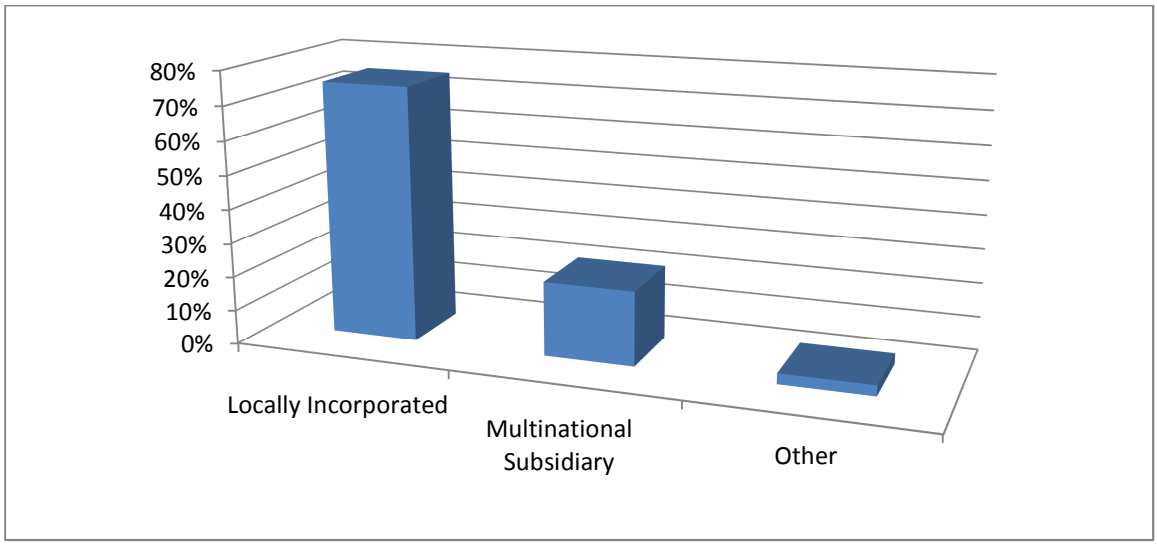
4.2 General Information

While the target population was 53 Oil Marketing Companies operating in Kenya, not all targeted firms responded. 32 firms responded which is equivalent to 60% response rate. The target was the senior supply chain and distribution managers of the research population, the Oil Marketing Companies in Kenya.

4.2.1 Information on the Organisation

Of the respondents, 75% of the firms were locally incorporated, 22% were Multinational Subsidiaries and there was one response from the Oil Industry Secretariat Pipeline Coordinator (Pipecor) as seen in Figure. 4.1. The organisations in the Oil Industry in Kenya are tending to shift their ownership to locally incorporated companies, which is a reverse of the earlier trends in the industry where most of the companies were multinationals.

Figure 4.1: Ownership of OMCs

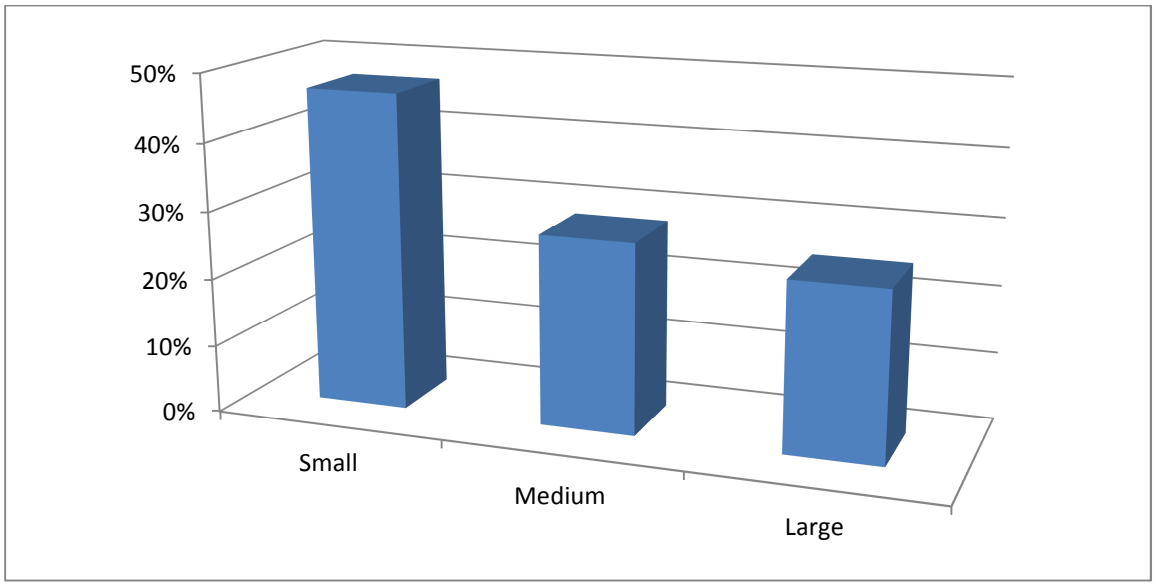


Source – Research Data

4.2.2 Size of OMCs

Figure 4.2 indicates that the OMCs that considered themselves as small were 47% while the ones classified as medium were 28% of the respondents. 25% were classified as large organizations. Many of the multinationals are withdrawing from the Kenyan market and there is a growing number of small independent oil companies mushrooming leading to stiff competition in the market.

Figure 4.2: Size of OMCs

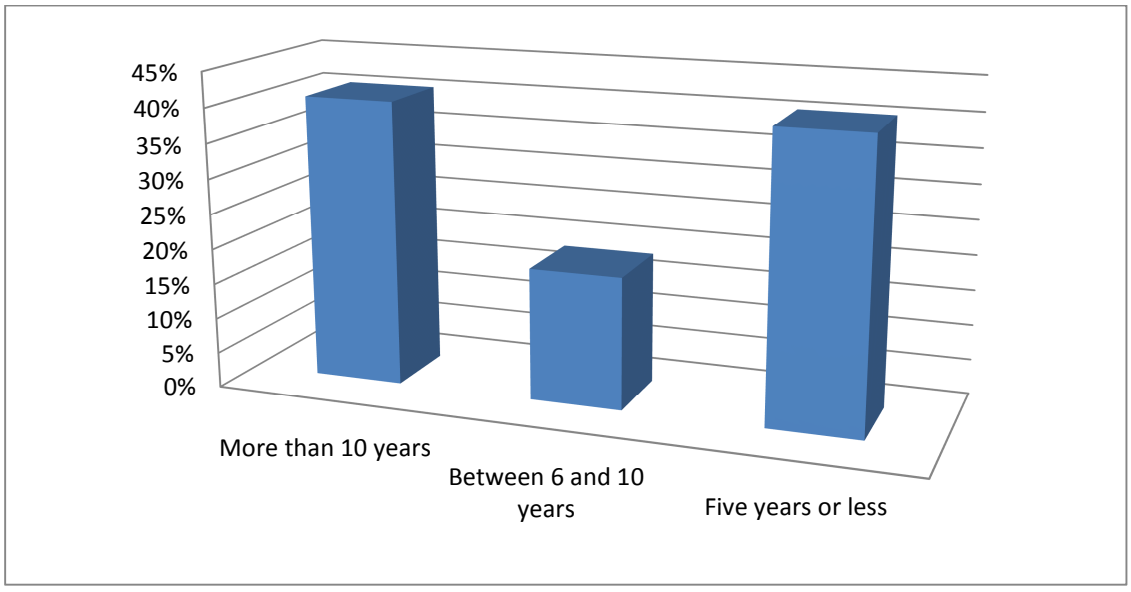


Source – Research Data

4.2.3 The Length of Time in Operation

The length of service a firm has been operating in the industry is an important factor as it reflects the wealth of experience such a firm has within that industry. The respondents were found to have different levels of experience within the industry, with majority of them having either less than 5 years' experience, or more than 10 years' experience as shown in the figure 4.3. Many of the young companies with less than 5 years' experience are the small independent Oil Marketing Companies. The companies that have been in the market for more than ten years are largely the Multinationals. The Kenyan oil industry market had very few players up to the time that the Kenya Government de-regularized the petroleum industry in 1994. More and more local oil marketers started operations. The crude prices have also been very volatile in the recent past. These factors have led to reduced profit margins among the OMCs in the Kenyan oil industry.

Figure 4.3: The Length of Time in Operation



Source – Research Data

Moreover, many of the big multinational OMCs have in the recent past shifted their focus from downstream petroleum oil operations to upstream, where they focus on oil and gas exploration activities, as these have much greater profit margins.

4.2.4 Oil Products Distributed by OMCs

Different OMCs distribute different oil products depending on the market target and business model of the specific OMC. From the respondents, the following was the percentiles of the different products that firms distributed. From the table 4.1, it can be observed that most OMCs distributed Diesel, Premium Motor Spirit (Petrol) and Kerosene.

The recent market trends indicate that the demand for diesel is growing fast and is surpassing that of petrol. This trend is also seen in many of the regions of the world

including the rest of Africa, Asia and Europe. Many of the OMCs would thus import more and market diesel, as the market is only growing. Many of the urban and peri-urban residents in Kenya use kerosene for cooking and lighting needs. The kerosene demand in Kenyan market is thus very high as well. Regular Petrol is only marketed in the rural parts of Kenya, and thus many of the OMCs that do not have country-wide coverage would shy away from marketing this product. The demand is also very low.

Bitumen and furnace oils have an extra cost of handling as they are heavy and thus have to remain heated during transportation and storage. The demand for furnace oils is high though, as there is an increase in number of both small jua kali factories as well as big industries. Aviation fuel is normally handled in bulk batches to supply mainly the airports. Many of the smaller OMCs therefore do not handle Jet A-1.

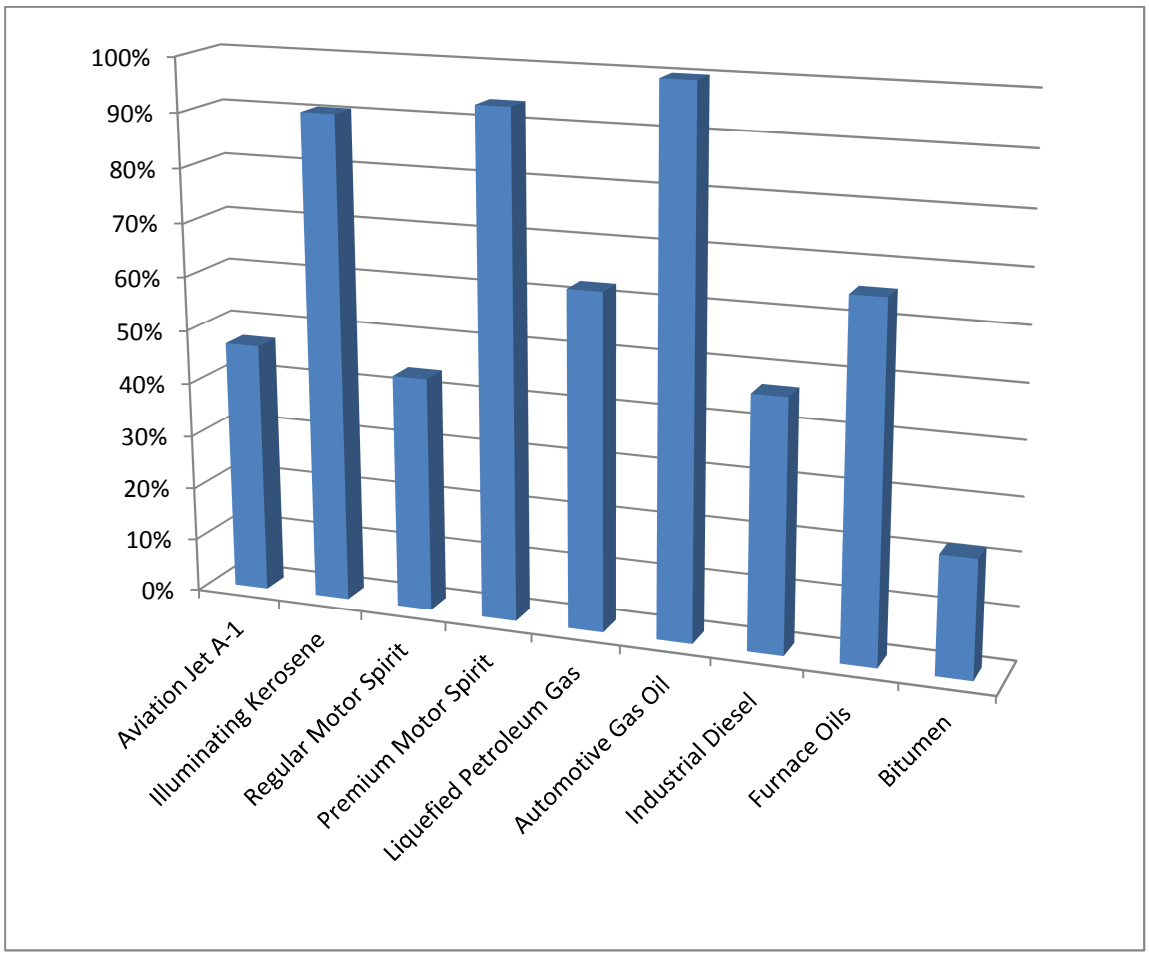
Table 4.1: Oil Products Distributed by OMCs

Product Distributed	**Number**	**Percentage**	**Ranking**
Automotive Gas Oil	32	100%	1
Premium Motor Spirit	30	94%	2
Illuminating Kerosene	29	91%	3
Furnace Oils	21	66%	4
Liquefied Petroleum Gas	20	63%	5
Aviation Jet A-1	15	47%	6

Industrial Diesel	15	47%	7
Regular Motor Spirit	14	44%	8
Bitumen	7	22%	9

Source – Research Data

Figure 4.4:Oil Products Distributed by the OMCs



Source – Research Data

4.2.5 Sources of the Petroleum Products by the OMCs

Kenya and the East African region as a whole is a net importer of petroleum products. The petroleum products would be imported as crude oil or as finished petroleum products. The Government under the Ministry of Energy conducts an Open Tender System where both Crude Oil and Finished Petroleum Products requirement for the country would be tendered and the winning oil marketing company would bring the oil on behalf of all the oil marketers, as per their market shares. Once the bare minimum of the market demand and requirement is met through this Open Tendering System (OTS), the OMC may choose to import more petroleum products as they would wish. Many OMCs also import for neighbouring countries. Other OMCs also buy petroleum products from other OMCs and only market it in Kenya and neighbouring countries.

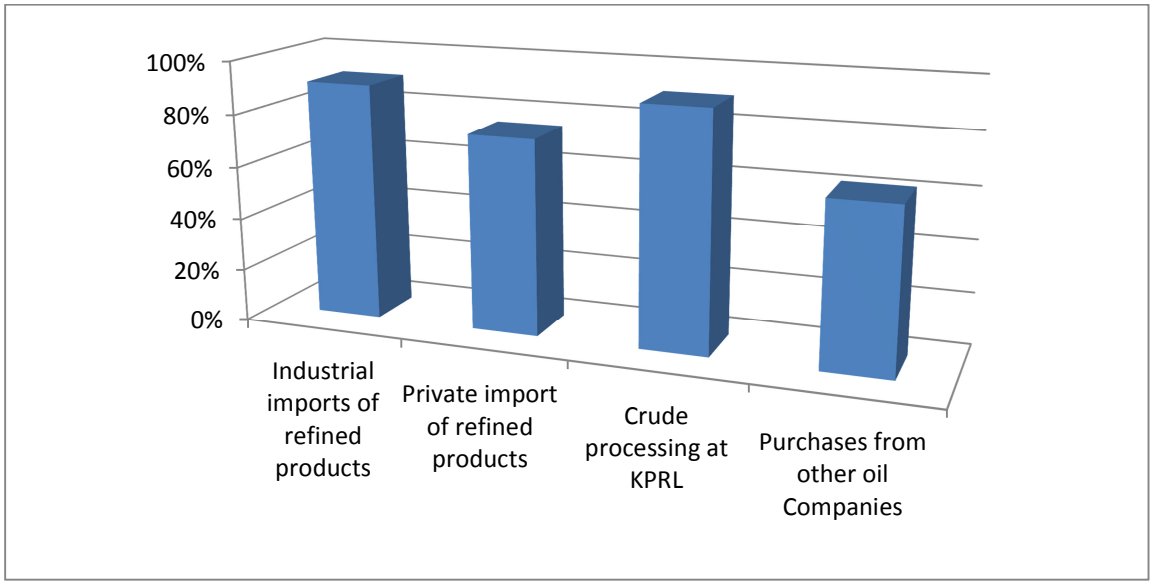
Table 4.2: Sources of Products Marketed by the OMCs

Source of Petroleum Product	**Number**	**Percentage of OMC using this source**
Industrial imports of refined products	29	91%
Private import of refined products	24	75%
Crude processing at KPRL	29	91%
Purchases from other oil Companies	20	63%

Source – Research Data

From Table 4.2, 91% of the respondents participate in the industry's open tendering system to import petroleum products. 91% of the respondents indicated that they process crude at Kenya Petroleum Refineries Ltd, KPRL. This indicates that a lot of their product is lifted from the refinery as well. 75% of the respondents import petroleum products outside the Ministry of Energy driven tendering, and 63% of the respondents also buy petroleum products from other OMCs.

Figure 4.5: Sources of Petroleum Products



Source – Research Data

4.2.6 Ownership of Petroleum Products Storage Facility

Storage facility is a key component in the oil industry supply chain activities. When a firm owned its storage facility, they would have greater flexibility in planning for oil product receipts and releases. Lack of storage facility would mean that a firm had to rent the facility of another OMC. This would ordinarily reduce the supply chain flexibility of

the firm renting the facility, as the owner of the facility would determine whether and when to receive or release another firm's products.

Of the respondents, 63% of the OMCs did not own their own storage facilities, but rented the facilities of other OMCs.

Table 4.3: Ownership of Petroleum Products Storage Facility

	Number	**Percentage**
Firms that own storage facilities	12	37%
Firms that did not own storage facilities	20	63%
Total	32	100%

Source – Research Data

Some of the products have specialized handling and storage facilities, for example LPG or bitumen. Very few OMCs have storage facilities for all the petroleum products that they would be handling, and would thus rent storage facilities for only specific products from other OMCs. Other OMCs do not have any storage facility in Kenya.

4.2.7 OMCs Importing for Other Countries

Kenya has neighbouring countries that are land locked and therefore rely on the Port of Mombasa for their petroleum products imports. These countries include Uganda, Burundi, Rwanda and The Republic of South Sudan. Many OMCs in Kenya also import products for these countries. Table 4.4 show the percentage of OMCs who import for other countries.

Table 4.4: OMCs Importing for Other Countries

	Number	Percentage
OMCs that import for other countries	22	69%
OMCs that do not import for other countries	10	31%
Total	32	100%

Source – Research Data

69% of the OMCs operating in Kenya also import for other countries. These firms would therefore have longer supply chains to ensure these products reach the consumers in these countries.

4.2.8 Pipeline Transport of Oil Products

The Kenyan legislation stipulates that the transportation of white oil products by road can only be done to certain stipulated distances, above which the oil products should be transported by the white oils pipeline owned by the Kenya Pipeline Co. The pipeline is a safer mode of transportation of the oil products. On importation of the finished products, or on refining of crude oil to finished oil products, the oil is transferred to the pipeline at Mombasa and transported inland. Any OMC handling large quantities of oil products and marketing it outside Mombasa would be required to use the pipeline. The OMCs have to schedule their product batches with Kenya Pipeline Company as per their product demand schedule at the point of destination. Because of this, the OMCs distribution supply chain flexibility is also reliant on the pipeline availability. The OMC requires to make advance product distribution planning.

Table 4.5: Pipeline Transport of Oil Products

	Number	Percentage
OMCs that use KPC pipeline	29	97%
OMCs that do not use KPC pipeline	1	3%
Total	30	100

Source – Research Data

From Table 4.5, 97% of the respondent OMCs use the pipeline to transport their oil products.

4.3 Importance of Downstream Supply Chain Performance Measurement

The importance of supply chain performance in a firm would be determined by the supply chain measurement metrics that a firm is using, and the emphasis on the implementation of the given metrics in their operations. Respondents were asked to rate the importance of a set of supply chain measurement metrics that their organisations use on a 5-point Likert scale. 1 indicated 'No Importance' and 5 indicated 'Extreme Importance'. The results are shown in table 4.6.

Quality of products was rated as the most important supply chain measurement metric with a rating of 4.81 followed by Total distribution cost and Customer service and satisfaction both of which had a mean rating of 4.75. Timeliness of deliveries and quality service were also highly ranked as important with a mean rating of 4.66. Information technology applications and networking with suppliers and other service providers and

Collaboration with other oil marketers were rated low at 3.77 and 3.39 respectively, implying importance of medium significance.

Table 4.6: Importance of Downstream Supply Chain Performance Measurement

Supply chain measurement metrics	Mean Rating of Importance	Standard Deviation	Ranking
Quality of products	4.81	0.74	1
Total distribution cost	4.75	0.57	2
Customer service and satisfaction	4.75	0.62	2
Timeliness of delivery	4.66	0.79	4
Ullage availability and product storage utilization	4.63	1.01	5
Quality of services	4.56	0.80	6
Tracking of order lead-time	4.44	1.01	7
Optimal transportation models	4.41	0.95	8
Accuracy of orders	4.35	0.95	9
Flexibility of orders	4.27	0.78	10
Responsiveness of orders and order fulfillment	4.26	0.82	11
Cost of information processing	4.13	0.75	12
Scale economies by importing bigger cargoes	3.88	1.34	13
Information technology applications and networking with suppliers and other service	3.77	1.20	14

providers			
Collaboration with other oil marketers	3.39	1.23	15

Source – Research Data

Other metrics that some respondents considered important were the Level of KRA performance, and Post-Sale follow-up. This is to follow up on customers to ensure quality products and services are delivered.

4.4 Downstream Supply Chain Performance Measurement, and the KPIs Used

Section C of the Questionnaire sought to examine the extent to which the Oil Marketing Companies measure their Downstream Supply Chain Performance and to identify the Key Performance Indicators (KPIs) that were used in making these measurements. Respondents were asked to rate the importance of a set of supply chain measurement metrics at their organisations on a 5-point Likert scale. 1 indicated 'No Importance' and 5 indicated 'Extreme Importance'. Most of the respondents answered on the extent of measurement but absconded on indicating the KPI used. The results are shown in Table 4.7.

Monitoring of supply chain operating costs and reliability of product supply and were considered as extremely important in the downstream supply chain performance measurement, with a rating of 4.77 and 4.72 respectively. Reliability of the product supply was measured by the number of delays in receiving products and compliance to set timelines. Cost of operating the supply chain was measured by the cost per cubic meter (m^3) of product supplied and by comparison of actual operating costs against the

budget allocation. Transportation costs and Inventory management costs were also considered extremely important in the supply chain performance measurement with a mean rating of 4.71 and 4.70 respectively.

Flexibility of orders and Efficiency of information dissemination had a medium rating of importance with a mean rating of 3.94 and 3.87 respectively. Number of orders changed was a KPI used to measure order flexibility. Reducing long bureaucracy was accomplished by ensuring that only one management approval was required to release product if funds were Not sighted. This also enhanced order flexibility. Delays in relaying of information and communication breakdown were the measures of information dissemination efficiency.

Table 4.7: Downstream Supply Chain Performance Measurement, and the KPIs Used

Metrics	**KPI**	**Mean**	**S.D.**	**Ranking**
Monitor the cost of operating your supply chain	- Cost per m3 (unit delivery) - Budget -Supply efficiency	4.77	0.5	1
Reliability of product supply	-Number of Delays -Set Timelines	4.72	0.77	1

	- Customer Feedback -Quality of the products			
Transportation costs	- Budget -Taken care of by the customer - Cost per distance(e.g. per Km) -Minimize transportation costs	4.71	0.59	3
Inventory management costs	- Cost per m3 (Unit) -Storage costs	4.70	0.6	4
Measure customer care satisfaction	- Independent Survey -Feedback from Customers - Customer Complaints	4.52	0.89	5
Reliability of transport means	-No. of missed transportation -Customer feedback	4.48	0.57	6

Timeliness of orders delivery	-Same day delivery unless there are factors beyond us - Delivery Time -Customer feedback	4.47	0.9	7
Order processing	- Time - Within 20 minutes of order confirmation. -Turnaround time\ -Loading time	4.25	0.95	8
Flexibility in service delivery	- Depends on payment for the products. -Getting more customers -Efficiency in loading	4.22	0.83	9
Flexibility of your orders	- One management approval if funds are NOT sighted - No. of orders to be	4.06	0.89	10

	changed -order processing methods			
Customer query time	- Time -as and when customers have issues	4.06	0.98	11
Flexibility of product demand	- Projection templates - Customer Feedback -Quality of the products	3.94	0.88	12
Efficiency of information dissemination	- Delays in information -Customer Feedback -Quality of information	3.87	0.99	13

Source – Research Data

Another metric that one respondent considered important was the Level of Product satisfaction by the customers. One respondent also had another KPI used to measure the Downstream Supply Chain Performance. This was the gate-to-gate time. It measures the turnaround time from product loading to product dispatch.

4.5 Challenges in Downstream Supply Chain Performance Measurement

Respondents were asked to rate the significance of various challenges faced by Oil Marketing Companies in Kenya while undertaking downstream supply chain performance measurements on a 5-point Likert scale. 1 indicated 'Not a challenge', 2 indicated 'Slight Challenge', and 5 indicated 'Major Challenges'. Table 4.8 below indicates the results.

Storage Limitations at Kipevu Oil Storage Facility was ranked as a major challenge by most of the Oil Marketing Companies with a rating of 4.55. High Operational costs, as well as high demurrage costs also ranked highly with mean rating of 4.48 and 4.43 respectively, indicating major challenges. Volatility of the crude prices in the International markets also posed as a big challenge with a rating of 4.41. Monitoring and evaluation of the supply chain parameters and Consistent product quality offered by KPC and KPRL were not considered as major challenges rated at 2.61 and 2.04 respectively.

Table 4.8: Challenges in Downstream Supply Chain Performance Measurement

Challenges	Mean Rating	Standard Deviation	Ranking
Storage capacity limitations at Kipevu Oil Terminal	4.55	0.85	1
High operational costs (Distribution, financing, administrative, etc.)	4.48	1.06	2

High Demurrage costs	4.43	1.14	3
Volatility of crude oil prices	4.41	1.02	4
The pipeline's throughput limitations	3.81	1.42	5
Inefficiency and narrow networks of railway services, leading to more costly road transportation of oil products	3.80	1.47	6
Safety concerns	3.63	1.38	7
Increasing Nos. of independent oil companies	3.61	1.38	8
KRA requirements for release of product from bonded warehouses	3.50	1.53	9
Legal requirement to process a percentage of your oil market share as crude oil at KPRL	3.42	1.48	10
Long lead time from crude oil order to delivery of products to the customer	3.33	1.60	11
Limited coverage of the pipeline in the country	3.31	1.44	12
Lack of Supply chain information	3.16	1.42	13
Storage capacity at the depot	3.14	1.57	14
Under-performance of the outsourced service delivery firms	3.13	1.38	15

Continual improvement in the supply chain practices	3.00	1.09	16
Use of ineffective supply chain KPIs	2.72	1.41	17
Difficulty in determination of supply chain KPIs in place	2.65	1.38	18
Monitoring and evaluation of the supply chain parameters	2.61	1.26	19
Consistent product quality offered by KPC and KPRL	2.04	1.35	20

Source – Research Data

Other challenges highlighted by the respondents included security concerns in the country. Petroleum products are highly flammable and terrorists have given threats to OMCs and other petroleum business outfits. Product theft was also cited as a challenge that many OMCs have had to deal with.

The level of safety awareness of the public is very low, and this has been seen in the rising number of incidents and accidents that have occurred around petroleum transport vehicles or product pipeline pilferage. Road transport safety is a challenge facing many players. Other transport networks are limited or largely non-existent. This poses higher risks on road transport as more road tankers are on our roads.

KRA Regulations stipulate that all petroleum products have to be paid for before being distributed. KRA thus has to ascertain the quantities being transacted before releasing any product from the depots. This and other KRA bureaucracy and their frequent system

downtime also pose as a challenge to many industry players. The Petroleum Industry is highly capital intensive. Access to credit lines and to cheap products was also pointed out as challenges faced by the industry players.

The Petroleum industry in Kenya is partly controlled by the Kenya Government bodies like the Ministry of Energy (MoE), Kenya Revenue Authority (KRA) and Energy Regulatory Commission (ERC). Many policy issues as well as other issues that relate to the industry are raised with these government bodies by the OMCs. Such issues take long to be addressed and the feedback normally takes too long.

In 2010, the ERC passed the Petroleum Pricing formula that caps the maximum wholesale and retail prices of oil products in Kenya. With the increased number of players in the industry, many respondents referred to shrinking profit margins as a challenge. The Global Environmental and Emissions regulations stipulate more stringent emission levels from petroleum products; all these are environmental concerns. This has meant that the processing of these petroleum products has to be more complex, and thereby more costly. This has also contributed to the shrinking profit margins as the price of the products would not necessarily increase proportionately.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the findings on the Downstream Supply Chain Performance Measurement. The conclusions and recommendations are drawn thereto. Limitations of the study and suggestions for further study are also outlined in the chapter.

5.2 Summary of Findings

The study had three objectives; to determine the extent to which OMCs measure their downstream supply chain performance, to identify the KPIs used in the performance measurements and to determine the challenges faced by Oil Marketing Companies in Kenya while undertaking Downstream Supply Chain Performance Measurement. The findings are summarized below;

The Petroleum Industry in Kenya is currently experiencing an increase in the number of locally incorporated OMCs. Many of the firms are young, having operated for less than 5 years, and are the Independent Oil Marketing Companies. Many of the OMCs that have operated for more than 10 years are still operating in the industry. Most of the OMCs use the KPC pipeline facility to transport their products and most OMCs import oil products for other neighbouring countries as well. The products that are marketed by most of the OMCs are Diesel, Kerosene and Petrol. These products are the fast moving products in the market, as they are used mostly in the transportation sector, and for domestic use. Most of the OMCs import petroleum oil products through the Open Tender System, for finished oil products and crude oil, driven by the Ministry of Energy.

The OMCs in Kenya realize the importance of measuring their downstream supply chain performance and product quality, customer satisfaction and quick delivery of products to consumers are considered highly by most OMCs to ensure efficient downstream supply chain operations. Reliability of product supply and monitoring of downstream supply chain operational costs was considered as extremely important in ensuring that the downstream supply chain is optimized. Optimization of the supply chain would lead to high levels of customer satisfaction and to higher profit margins. KPIs used to measure the downstream supply chain included the setting of timelines and budgets, and monitoring the cost per volume of product transacted against the budgeted costs. Projection templates were used to measure and control supply chain operations and the time to respond to customer queries was measured, with a view to reducing it.

The OMCs face various challenges while undertaking downstream supply chain performance measurement. The petroleum oil industry in Kenya is governed by many regulations and legislations. These include the KRA bureaucracies, the ERC regulations, and the Ministry of Energy regulations. Oil products are jointly tendered by the OMCs. The OMCs would therefore have little control on the cost of product. The retail and wholesale price of petroleum products is capped by the ERC, and oil product transportation is also regulated. This reduces the flexibility of the OMCs in deciding some supply chain parameters. Storage capacity at the Kipevu Oil Storage Facility is governed by an OMC's market share. This was considered as a great challenge by most OMCs as it limits the amount of product to trade and transport within the Kenyan market. The storage capacity of petroleum products in Kenya is limited, and this reduces the downstream supply chain flexibility of many OMCs as they have to share the existing

storage facilities. Other challenges included reduced profit margins and an increasing number of independent oil marketers.

5.3 Conclusion

From the findings of the study, the following conclusions are drawn. The petroleum industry in Kenya is very volatile and has many challenges ranging from petroleum regulations, the industry is highly capital intensive, increasing competition from new players in the market and decreasing profit margins. The OMCs therefore have to ensure that their downstream supply chains performance is at its best to ensure optimized supply chain operations. This could be achieved by measuring the downstream supply chain performance using KPIs such as cost per volume of product, cost of transportation per distance, time and cost of downstream supply chain information and communication, number of customer complaints, and gate-to-gate time. These would ensure optimized and reliable downstream supply chain activities.

The findings of this study indicate that firms would enjoy more efficient supply chain performance by optimizing weak areas of the supply chain. These results relate to the findings of Gwako (2008) who concluded that Kenya Airways measured its supply chain using given industry metrics and they used these to improve their performance. Major challenges included linking measures to customer care as well as mistrust between supply chain participants. Many firms find it difficult to attribute performance results to any particular entity.

This study focused on the Oil Marketing Companies in Kenya, which have peculiar challenges that they face that may not be encountered by other industries in Kenya. For

this reason, many of the findings from this study may not mirror those of many other studies as the industry downstream supply chain dynamics differ.

5.4 Recommendations

'Anything measured improves'; 'anything measured gets done'; 'you cannot manage what you do not measure' (Lapide, 2000). Measurement of an organization's performance encourages systematic approach to solving apparent issues within a system or an organisation. Based on the analysis of the study and from the findings and conclusion, it is important that Oil Marketing Companies in Kenya consider the following recommendations with regard to Downstream Supply Chain Performance Measurement. Organisations should put more emphasis on the measurement of their downstream supply chain performance through structured methods. This would ensure that the performance of their supply chain is optimized to give the most value back to the system. Oil marketing companies should make their organizational systems and supply chain processes flexible to ensure that positive changes that may arise from performance metrics can be adopted in the downstream supply chain operations. Cross-functional and inter-firm conflicts should be minimized as these would prevent optimum downstream supply chain operational performance.

The Petroleum industry has many factors that hamper the smooth operation of the downstream supply chain that the OMCs may have no control over. The OMCs should thus focus to measure and improve on downstream supply chain performance measurement operations that they have control over, such as cost and inventory management.

5.5 Limitations of the study

The study focused on the oil marketing companies in Kenya. The petroleum industry in Kenya has other stakeholders who play an important role in the downstream supply chain. These include the Kenya Petroleum Refineries Ltd. (KPRL), Kenya Pipeline Company (KPC), Kenya Revenue Authority (KRA), the Ministry of Energy (MoE), the Energy Regulatory Commission (ERC) and the Kenya Ports Authority (KPA). The inclusion of these stakeholders to the study data would give a more elaborate analysis of the whole industry.

It was difficult to reach many of respondents who were always busy at work. The response rate was thus slow. Many of respondents did not complete all the sections of the questionnaire and others did not fill-in the questionnaire.

5.6 Suggestions for Further Study

This study focused on measurement of the Downstream Supply Chain Performance in the Oil Marketing Companies in Kenya. The Petroleum Industry in Kenya has many stakeholders who influence the supply chain. These include the KPA, KRA, KPC, MoE, KPRL and ERC. Further studies could thus examine the upstream and downstream Supply Chain Performance Measurement in the Kenyan Petroleum Industry and how the Government bodies affect the Performance of the Supply Chain.

The study also recommends that further studies be carried out on the effect of the LAPSET (Lamu Port-Southern Sudan-Ethiopia Transport) Project on the Supply Chain of petroleum products. Further studies could examine the future of the petroleum business in

Kenya and in the region in the long term after the discovery of crude oil in Uganda and Kenya and the discovery of natural gas in Tanzania.

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APPENDICES

APPENDIX 1: QUESTIONNAIRE

Declaration

This research aims to examine the extent to which OMCs measure their downstream supply chain performance, and to identify the key KPIs used. It also aims to examine the challenges faced by the OMCs while undertaking downstream supply chain performance measurement.

The information received from this survey shall be kept confidential, and shall be used strictly for academic purposes only. Your participation in this survey shall be highly appreciated.

SECTION A

Name of organisation _____

Position held _____

Department / Function _____

Please tick (√) as may be applicable to your firm

Q1. a) Is your organisation locally incorporated or a multinational subsidiary

Locally Incorporated [ ] Multinational Subsidiary [ ] Other [ ] please specify

b) What size classification does your organisation fall into?

Small [ ] Medium [ ] Large [ ]

Q2. How long has your organization been in the petroleum import and distribution business?

i. More than 10 years [ ]

ii. Between 6 and 10 years [ ]

iii. Five years or less [ ]

Q3. What products among the ones listed does your organization distribute?

i. Aviation Jet A-1 [ ]

ii. Illuminating Kerosene [ ]

iii. Regular Motor Spirit [ ]

iv. Premium Motor Spirit [ ]

v. Liquefied Petroleum Gas [ ]

vi. Automotive Gas Oil [ ]

vii. Industrial Diesel [ ]

viii. Furnace Oils [ ]

ix. Bitumen [ ]

Q4. Does your organisation own storage facilities in Kenya?

Yes [ ] No [ ]

Q5. What are the sources of your products listed above?

i. Industrial imports of refined products [ ]

ii. Private import of refined products [ ]

iii. Crude processing at KPRL [ ]

iv. Purchases from other oil Companies [ ]

v. Other (specify) _____

Q6. Does your organisation import products for neighbouring companies?

Yes [ ] No [ ]

Q7. Is your company utilizing the Transport and Storage facilities at Kenya Pipeline Company?

Yes [ ] No [ ]

SECTION B

Q8. Please indicate by ticking (√) on the given table, the level of importance you accord the following supply chain measurement metrics in your organisation by ticking where applicable using the scale below;

Not Important (**1**) Slightly important (**2**) Important (**3**) Very important (**4**) Extremely Important (**5**)

	Supply chain measurement metrics	Rating of Importance				
		1	2	3	4	5
i	Tracking of order lead-time					
ii	Scale economies by importing bigger cargoes					
iii	Collaboration with other oil marketers					
iv	Flexibility of orders					
v	Accuracy of orders					
vi	Responsiveness of orders and order fulfillment					

vii	Information technology applications and networking with suppliers and other service providers					
viii	Ullage availability and product storage utilization					
ix	Optimal transportation models					
x	Quality of services					
xi	Quality of products					
xii	Timeliness of delivery					
xiii	Cost of information processing					
xiv	Total distribution cost					
xv	Customer service and satisfaction					

Other Metrics used? Please specify

_____

SECTION C

Q9. Indicate on the table below by ticking (√) the option that best suits your organization on the extent to which your organisation measures the following supply chain metrics and indicate the KPI used using the scale below.

Not Important (**1**) Slightly important (**2**) Important (**3**) Very important (**4**) Extremely Important (**5**)

	Metrics						**KPI Used**
		1	2	3	4	5	
i	Order processing						
ii	Flexibility of your orders						
iii	Timeliness of orders delivery						
iv	Monitor the cost of operating your supply chain						
v	Transportation costs						
vi	Measure customer care satisfaction						
vii	Customer query time						
viii	Flexibility in service delivery						

ix	Reliability of transport means						
x	Inventory management costs						
xi	Efficiency of information dissemination						
xii	Flexibility of product demand						
xiii	Reliability of product supply						

Other KPI used? Please specify

_____

_____

_____

SECTION D

Q10. Indicate on a scale of 1 – 5 indicating the extent to which you consider the following items as challenges faced in your organisation. Indicate by ticking (√) the appropriate box; 1 indicating No Issue, 2 indicating slight challenge, 5 indicating major challenges.

Item No.	Challenges	Rating of Challenge				
		1	2	3	4	5
1	Continual improvement in the supply chain practices					
2	Storage capacity limitations at Kipevu Oil Storage Facility					
3	Inefficiency and narrow networks of railway services, leading to more costly road transportation of oil products					
4	Limited coverage of the pipeline in the country					
5	Storage capacity at the depot					
6	Consistent product quality offered by KPC and KPRL					
7	Legal requirement to process a percentage of your oil market share as crude oil at KPRL					
8	The pipeline's throughput limitations					
9	Volatility of crude oil prices					
10	Long lead time from crude oil order to delivery of products to the customer					

11	High operational costs (Distribution, financing, administrative, etc.)					
12	KRA requirements for release of product from bonded warehouses					
13	Monitoring and evaluation of the supply chain parameters					
14	Safety concerns					
15	High Demurrage costs					
16	Increasing Nos. of independent oil companies					
17	Under-performance of the outsourced service delivery firms					
18	Lack of Supply chain information					
19	Use of ineffective supply chain KPIs					
20	Difficulty in determination of supply chain KPIs in place					

Any other challenges faced? Please specify

_____

_____

_____

Please give any other information not captured in this questionnaire or comments that you consider useful for this study.

_____

_____

_____

_____

_____

_____

Thank you for taking time to answer this Questionnaire.

APPENDIX 2: INTRODUCTION LETTER

UNIVERSITY OF NAIROBI
MOMBASA CAMPUS

Telephone: 020-2059161
Telegrams: "Varsity", Nairobi
Telex: 22095 Varsities

P.O. Box 99560, 80107
Mombasa, Kenya

DATE: 24TH JULY, 2012

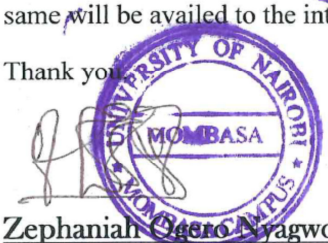
TO WHOM IT MAY CONCERN

The bearer of this letter, **Joy Livohi Shivo** of Registration number **D61/72021/2008** is a Master of Business Administration (MBA) student of the University of Nairobi, Mombasa Campus.

She is required to submit as part of her coursework assessment a research project report. We would like the student to do her project on ***Downstream Supply Chain Performance Measurement by Oil Marketing Companies in Kenya.*** We would, therefore, appreciate if you assist her by allowing her to collect data within your organization for the research.

The results of the report will be used solely for academic purposes and a copy of the same will be availed to the interviewed organization on request.

Thank you.



Zephaniah Ogero Nyagwoka
Administrative Assistant, School of Business-Mombasa Campus

APPENDIX 3: NAMES OF OMCs AS OF MAY 2012

1	ADDAX (K) LTD.
2	AINUSHAMSI ENERGY LTD.
3	ALBA PETROLEUM LTD.
4	AL-LEYL LTD.
5	ASTROL PETROLEUM LTD.
6	BAHRIYA (K) LTD
7	BAKRI INT'L ENERGY(K) LTD.
8	BANODA OIL LTD.
9	BNP (K) LTD
10	CAPE PETROLEUM LTD.
11	EA GASOIL LTD.
12	ENGEN LTD.
13	ESSAR PETROLEUM (EA) LTD
14	FAST ENERGY LTD.
15	FOSSIL FUELS LTD.
16	FUELEX
17	GALANA OIL (K) LTD.
18	GAPCO (K) LTD.
19	GLOBAL PETROLEUM PRODUCTS (K) LTD.
20	GULF ENERGY LTD.
21	HASHI ENERGY LTD.
22	HASS PETROLEUM (K) LTD.
23	INTOIL (K) LTD.
24	JADE PETROLEUM LTD.
25	JOVENNA
26	KAMKIS TRADING CO. LTD.
27	KENCOR
28	KENOL KOBIL LTD.
29	KEROKA PETROLEUM LTD.
30	RIVA OILS LTD.
31	MOGAS INT'L LTD.
32	MOCO (K) LTD
33	MULOIL (K) LTD
34	NOCK LTD.
35	OILCITY SERVICES LTD.
36	OILCOM (K) LTD.
37	LIBYA OIL (K) LTD.
38	OILMARK (K) LTD
39	OLYMPIC PETROLEUM LTD.
40	ONE PETROLEUM LTD.
41	ORIX OIL (K) LTD.
42	PETRO OIL (K) LTD.
43	RANWAY TRADERS LTD.
44	REGNOL OIL (K) LTD.
45	RIVA PETROLEUM DEALERS LTD.
46	ROYAL PETROLEUM LTD
47	KENYA SHELL LTD.
48	SOUTH WEST
49	TOPAZ PETROLEUM LTD.
50	TOSHA PETROLEUM (K) LTD.
51	TOTAL KENYA LTD.
52	TRITON
53	TROJAN INT'L LTD.