CHALLENGES AFFECTING PERFORMANCE OF SUPPLY CHAIN SYSTEMS IN THE PETROLEUM INDUSTRY IN KENYA

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Challenges Affecting Performance of Supply Chain Systems in the Petroleum Industry in Kenya

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DECLARATION

This thesis in my own original work and has not been submitted for the award of a degree in any other University.

Signature…… Date……..

Anthony Osoro

This thesis has been submitted for examination with our approval as the University Supervisors.

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Signature …… Date……

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DEDICATION

In memory of my late beloved Mother Aloisa Birundu Oiro who passed on 20th December, 2012 while I was doing my studies and my family members who encouraged and embraced my endeavors towards this noble achievement.

ACKNOWLEDGEMENT

With this dissertation, another important milestone has been successfully accomplished in my long journey of personal and professional development. Therefore, I would like to take this occasion to thank my supervisor Dr. Willy Muturi and Dr.Patrick k.Ngugi (Jomo Kenyatta University of Agriculture and Technology) for providing me with this great opportunity as well as the necessary discretion to develop my dissertation. I am equally indebted to my other lecturers Prof. Gakure, Dr. Mberia, Dr. Karanja, and Prof. Mukulu for the numerous inspiring discussions we had in Kenya throughout the course of this research project. Personally as well as professionally, I greatly cherish the time spent with both the doctors over the last couple of years.

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LIST OF ACRONYMS

DAC	Development Assistance Committee
DC	Distribution Centers
DV	Dependent Variables
EDI	Electronic Data Interchange
EIA	Energy Information Administration
ERC	Energy Regulatory Commission
ERP	Enterprise Resources Planning
GSCM	Global Supply Chain Model
IFRC	International Federations of Red Cross
IV	Independent Variables
IOC	International Oil Companies
GNI	Gross National Income
GNPC	Ghana National Petroleum Corporation
KPI	Key Performance Indicator
KPRL	Kenya Petroleum Refineries Limited
KRA	Kenya Revenue Authority
LPG	Liquefied Petroleum Gas
NPA	National Petroleum Authority
NOC	National Oil Companies
ODA	Official Development Assistance
OMCs	Oil Marketing Companies
OPEC	Organization Petroleum Exporting Countries
OOS	Out-of-Stock Events
OTS	Open Tender System
SCM	Supply Chain Council
SCPI	Supply Chain Performance Indicator
SCPM	Supply Chain Performance Measurement
SPSS	Statistical Package of Social Sciences
TAM	Technology Acceptance Model

TCF	Trillion Cubic Feet
UPPF	Unified Petroleum Pricing Fund
VIF	Variance Inflation Factor

OPERATIONAL, DEFINITION OF TERMS

Crude Oil: A naturally occurring, unrefined petroleum product composed of hydrocarbon deposits. Crude oil can be refined to produce usable products such as gasoline, diesel and various forms of petrochemicals (Pearce, dan & Robinson, 2012).

IT: is a term that encompasses all forms of technology used to create, store, exchange, and use information in its various forms (business data, voice conversations, still images, motion pictures, multimedia presentations, and other forms, including those not yet conceived (Sakhuja & Jain, 2012).

Skills: is defined as an ability and capacity acquired through deliberate, systematic, and sustained effort to smoothly and adaptively carryout complex activities or job functions involving ideas, and/or people (Maheshwarkar & Sohani, 2013).

Supply Chain: may be defined as an integrated process wherein a number of various business entities (i.e., suppliers, manufacturers, distributors, and retailers) work together in an effort to: (1) acquire raw materials, (2) convert these raw materials into specified final products, and (3) deliver these final products to retailers (Honcharenko, 2015).

Supply Chain Integration: can be divided into supply and demand integration. According to Liu, *et al.*, (2012), supply integration includes just-in-time (JIT) and delivery performance,

establishing long-term contracts with suppliers, and the elimination of paperwork. Demand integration includes increased access to demand information throughout the supply chain to permit planning, and improved logistics communication.

Supply Chain Management: can be defined as the configuration, coordination and continuous improvement of a sequentially organized set of operations. The goal of supply- chain management is to provide maximum customer service at the lowest cost possible. A customer is anyone who uses the output of a process (Lin &Sheu, 2012). According to (Luthra,*et al*...,2013) and Lin and Sheu (2012) also proposed that performance be defined as the efficiency and effectiveness of action, which leads to the following definitions:

i. Performance measurement is defined as the process of quantifying the efficiency and effectiveness of action; or
ii. A performance measure is defined as a metric used to quantify the efficiency and/or effectiveness of an action.

Supply Chain Systems: it helps consumer goods companies to build high-performance supply chains. It optimizes operations, assets and management in all areas, using advanced techniques and real world know-how. Our personnel all have broad supply chain knowledge as well as specialized expertise in transportation management, DC optimization,

inventory management, SCS structures assignments to be efficient, time- bounded and focused on Results (Kojima, 2013).

Tender: is defined as a kind of contract mostly followed by public companies especially when government want to construct bridge, road, railways, airways and these kind of activities then government call the top player in that field and ask them to give their quotation which means the minimum amount that is required to completed that project and the one who quotes the least price get that contract which is called tender (Taylor, 2014).

ABSTRACT

The purpose of this study was to establish the challenges affecting performance of supply chain systems in the petroleum industry in Kenya. The study examined several parameters that affect workers' Supply chain performance in the petroleum industry in Kenya resulting to often oil shortages. This has been occasioned by globalization which has intensified competition and increased the mobility of high skilled personnel yet oil companies depend on their staff for success and sustainability whether skilled or not. Specifically, the objectives of the study was to establish whether these factors; level of skills of staff, information and communication technology, cost of crude oil and tendering systems and the moderating factor have effect of performance on supply chain systems. The study was conducted using a survey design. The target population for this study was the 73 registered oil companies in Kenya, which was the unit of observation. For this study, the unit of analysis comprised all the senior procurement officers from the 73 registered oil companies in Kenya by June 2014. A census of all the 73 registered oil companies was conducted. This study anchored variables on different theories and models. This study was anchored on positivist Philosophy. The study used questionnaires to collect Data from the respondents. This involved both structured and semi-structured questions. Data was analyzed mainly using statistical package for social science (SPSS) version 22, where descriptive and inferential statistic such as mean and standard deviation were produced. This was more than the generally recommended sample size for statistical data analysis. The study used inferential statistics, correlation analysis, and multiple regressions for moderation analysis. Qualitative and Quantitative data was put into categories based on themes that was aligned to thesis objectives and was integrated in the study's discussion and findings. The study also revealed that level of skill for staff negatively affected the performance of supply chain. This study therefore brought to the fore, the role of skills and its effect on performance. The findings also indicated that crude oil price affect performance. In the presences of level of skills of staff, crude oil price, information communication and technology and tendering systems did not affect performance. These findings also indicated that in the presence of level of skill of staff, information communication and technology, crude oil price and tendering systems did not affect performance of the supply chain systems. Further, the study established that majority of the respondents felt that the cause of fuel shortages was unpredicted price increase in the petroleum industry. The findings showed that personal characteristics such as age and education level did not have a moderating effect on the relationship between independent variables and dependents variable. The study established that on average the staff possessed undergraduate degree unlike the previously where empirical findings had indicated there was paucity of undergraduate degrees in the employees in the petroleum industry in Kenya. Finally, this study concluded that there is need to emphasize the effect of performance on supply chain systems by doing proper forecasting from the up streams to the down streams towards achieving a competitive edge in the business markets such as the petroleum industry. The study recommended basically three functions that attribute to performance indicators; Information functions, support decision and Steering function and controlling function. The study also recommended an extension study to unregistered oil companies, since this study confined itself to the 73 registered oil companies only in Kenya. A comparative study should be carried out to compare whether the findings also apply for the unregistered oil companies in Kenya in order to validate whether the findings can be generalized to all unregistered oil companies operating in Kenya. The study ended up developing new policies in the area of performance on supply chain systems in the Kenya context.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

This study explored the effect at the wide range of the petroleum industry's products as well as the varied value of these products coupled with the global nature of the petroleum industry presents both challenges and opportunities within the petroleum supply chain systems. It is along this supply chain that poses challenges for creating value for the customer exist as well the opportunities for reaching this goal. This study explored the effect of performance on supply chain systems in the petroleum industry in Kenya. Empirical studies show that most successful oil companies do not only embrace customer satisfaction but they also do proper forecasting (Tseng & Chiu, 2013).The petroleum industry works as a global supply chain involving exploration, material handling, domestic and international transportation, use of technology, and so on. The industry offers a strong model for implementing supply chain management (SCM) techniques (Giovanni & Vinzi, 2012).

Supply chain management involves providing maximum satisfaction to end users (consumers), in other words, delivering the right product to the right person at the right time while still maximizing profits. Today, there are many opportunities for the coordination of activities across the supply chain even in the ever complex oil and gas sector. This is largely due to the development of information systems and communication technologies within the sector (Luthra, Garg, & Haleem, 2013).

1.1.1 Global Perspective of the Petroleum Industry

The petroleum industry includes the global processes of exploration, extraction, refining, transporting (often by oil tankers and pipelines), and marketing petroleum products. The largest volume products of the industry are fuel oil and gasoline (petrol). Petroleum (oil) is also the raw material for many chemical products, including pharmaceuticals, solvents, fertilizers, pesticides, and plastics. The industry is usually divided into three major components: upstream, midstream and downstream. Midstream operations are usually included in the downstream category (Matusov & Brobst, 2013).

The oil and gas industry is one of the largest and most complex industry in the world today that touches on peoples' everyday lives with services ranging from transportation, electricity, heating, lubricants and a host of chemical and petrochemical products (Geisler & Wickramasinghe, 2015).. Globally, a whopping 30 billion barrels of oil is consumed per year. The United States Energy Information Administration (EIA) in its 2011 International Energy Outlook projects that the world's energy consumption will increases by 53% by the 2035 (Franzosi-vara, 2013). In Europe and Asia, oil accounts for 32% of energy consumption, whilst in the Middle East, 53%. For South and Central America the figure is 44% whereas in North America it is 40%.

In the oil industry, the supply-chain network is composed of shipping via vessel, oil tankers, and pipelines that may run across multiple countries. This network is used to transport crude from wellhead to refinery for processing, to transport intermediates between multi-site refining facilities, and to transport finished products from product storage tanks to distribution centers and finally to the customers. Any disruptions arising in the global supply chain can have tremendous adverse effects in achieving operational efficiency, maintaining quality, profitability, and customer satisfaction. The adverse events may happen due to uncertainty in supply of crude, demand, transportation, market volatility, and political climate. Hence, Hannum (2016) identify that to effectively model a supply-chain design problem, the dynamics of the supply chain ought to be considered and data aggregation techniques for the extensive data set should be employed (U.S.EIA,2012).

1.1.2 Regional Perspective of Supply Chain Systems

The term Supply Chain Systems applies to the collaborative relationships of members of a different echelon of the supply chain and refers to common and agreed practices performed jointly by two or more organizations. Eberle (2014) highlighted the importance to distinguish between Supply chain systems and its antecedents. Before SCM can be developed, the supply chain members must first have specific behaviors, called supply chain orientation (SCO), like trust, commitment, common vision and goals or top management support. SCO and SCM concepts are two related but different concepts. SCO relates to the firm and precedes SCM that, in its turn, should be applied to a collection of firms, forming a chain (Dacker, 2013).

Africa's oil history stretches over a period of several decades, in some places it is even a century old. Presently, there are about 500 oil companies that participate in African hydrocarbon exploration. According to figures from the US EIA (Kimaiyo et al.,2015). Africa's proven oil reserves have grown by nearly 120% in the past 30 years or so, from 57 billion barrels in 1980 to 124 billion barrels in 2012. In addition, it is estimated that at least another 100 billion barrels are offshore Africa, only waiting to be discovered. In turn, Africa's proven reserves of natural gas have grown from 210 trillion cubic feet (tcf) in 1980 to 509 tcf in 2012, representing growth of over 140%. Furthermore, recent further discoveries of sizable natural gas reserves in Tanzania and Mozambique point to significant upward potential for these figures (Mohali & Panchkula, 2012).

The goal of supply chain systems is to provide maximum customer service at the lowest cost possible through the petroleum industry (Kim et al., 2015). A customer is anyone who uses the output of a process. Therefore, the customer's customer is important to any organization that is focused on customer service. In a supply-chain, a company will link to its suppliers upstream and to its distributors downstream in order to serve its customers. Usually, materials, information, capital, labor, technology, financial assets and other resources flow through the supply-chain. Since the goal of the firm is to maximize profits, the firm must maximize benefits and minimize costs along the supply chain (Luthra et al., 2013). The firm must weigh

the benefits versus the costs of each decision it makes along its supply-chain. Supply chain management is therefore an extension of the focus on customer service. Integrating supply management with other factors of operations allows all functions to be involved in the management decisions (Ndegwa, 2013).

1.1.3 Local Perspective of Performance of Supply Chain Systems

A company needs to have performance measurements to be able to evaluate the efficiency of the Supply chain systems. Taylor (2014), states that you can't manage if you can't measure. Barrow (2013) observed that companies have to achieve both cost leadership and service leadership to have an efficient Supply chain. If a company only measure internal performance measurements as for example order handling time and yield in production the measurements can't be used for evaluating the efficiency in a company. Shatina *et al*, (2014) also claimed that most of the supply related performance measurements have an internal focus and do not measure how the company drives profitability. If this still is valid there is an indication that there is a gap of measuring efficiency.

Africa's adherence to OPEC output quotas has varied over the years, with domestic supply problems and the international oil price at times more of a driving force to determine output levels, especially in Nigeria, than OPEC output restrictions (Miles & Saldaña, 2014). In terms of trade in oil, Africa has for years been seen by western and Asian markets as a means to diversify away from too deep a dependence on Middle Eastern oil. Robust demand from especially India and China over the past decade, fuelled by strong economic growth in these countries, has started to change not only Africa's export profile, but also the continent's economic landscape. According to Matusov and Brobst (2014) although Saudi Arabia is the principal supplier of oil to China, Angola occupies second place, with China receiving nearly 9% of its oil from Luanda, according to Trade Map figures. Performance measures are also used to design proposed systems, by determining the values of the

decision variables that yield the most desirable level(s) of performance. Available literature identifies a number of performance measures as important in the evaluation of supply chain effectiveness and efficiency (Schrettle et al., 2013).

The performance prism framework suggests that a Performance Measurement Systems (PMS) should be organized around five distinct but linked perspectives of performance (Tseng and Chiu, 2013). Stakeholder satisfaction (Who are the stakeholders and what do they want and need?); Strategies (What are the strategies we require to ensure the wants and needs of our stakeholders?); Processes (What are the processes we have to put in place in order to allow our strategies to be delivered?); Capabilities (The combination of people, practices, technology and infrastructure that together enable execution of the organization's business processes, both now and in the future, and what are the capabilities we require to operate our processes?) and Stakeholder contributions (What do we want and need from stakeholders to maintain and develop those capabilities?). The performance prism has a much more comprehensive view of different stakeholders (investors, customers, employees, regulators and suppliers) than other frameworks (Cheng, 2014).

1.1.4 Common Challenges of supply chain Systems

Over the years, the oil industry has continued to face growing challenges, from stricter government regulation, political risks, competition, emergent new comers and political hostilities, which has affected growth and output. (Kim et al., 2015). Due to the scramble for resources, many oil companies have been driven to explore and produce in some of the most hostile and harsh environments, which in turn tend to be extremely costly. Also, there have been concerns in the industry about the growing scarcity of natural resources, which underlies fears of not being able to meet production levels and goals (Hou et al., 2014). However, in reality, the resources are not the cause of supply restrictions with vast potential still available due to continuous discoveries of oil reservoirs around the world (Kinyua, 2014). The main challenge facing the oil industry is not the

availability of oil resources, but putting these reserves into production and delivering the final products to consumers at the minimum cost possible. Thus, a solid supply chain management program will enhance this goal (Schrettle, Hinz, Rathje, & Friedli, 2013).

Petroleum products are similarly purchased through the Open Tender System. Depending on supply and demand, the oil marketing companies may source the balance of their needs independently. The Open Tender System is intended to have the dual benefit of ensuring competitive prices (which are made public) and transporting the oil in a way that would minimize evasion of the import duty (Kinley & Ben-Hur, 2015). Each company is required to take the crude oil allocation and pay for the consignment within a specified time frame or risk penalties for late payment. In times of high oil prices, some marketers could not pay on time for imports, and their late payments delayed subsequent crude shipments, lowered refinery throughput, and caused fuel shortages. Kenya imports enough petroleum products to accommodate three separate tenders a month, opening up the possibility of options other than the current Open Tender System where the right to import is granted to only one company (Topal, 2014).

1.2 Statement of the Problem

The problem of managing the challenges affecting performance of supply chain system has been a pertinent issue in Kenyan oil industry. According to Anderson (2013), managing supply chain systems such as the oil industry is a challenge to the energy sector in Kenya. Similarly, Kimani (2013) noted that managing supply chain systems in the energy sector is wanting especially in regards to their performance, and the inability of these oil companies to give their customer a satisfactory service on a timely basis. Studies available show that managing supply chain systems that can creatively and innovatively exploit the benefit of industry improve their performance up to 80 percent depend on the extent of adherence to supply chain requirements needs to have clear performance strategy (Zhu et al.,2013).

These problems of habitual oil shortages resulted to this study to disclose the challenges affecting performance of supply chain systems in the petroleum industry in Kenya. Luthra *et al...* (2013) observed that the studies available have largely remained far below the expected standards which were intended to meet this expectation of the oil companies. It's noteworthy that procurement efficiency and effectiveness cannot be achieved unless they are pursuant in tandem with the goals of managing performance of supply chain systems. For instance supply chain goals revolve around embracing the five rights i.e. right quality, right quantity, right source, right time and right price respectively so as to maintain stock level inventory often, with longer term strategy goal revolving around the ultimate customer satisfaction, controlling of shortages, competency in skills and timely delivery of oil products to retailers (Shields, Patricia & Rangarjan, 2013).

Also Agami, Saleh and Rasmy (2012) observed that a previous empirical finding shows that managing performance of supply chain systems measures have lacked precision and consistency. Alquist, Kilian and Vigfusson (2013) established that many researchers have only focused on financial performance measures at the expenses of managing performance of supply chain systems and their proper forecasting of accuracy. It is inadequate to merely analyze a company's performance by financial capability, especially under today's changing volatile supply chain systems (Hannum, 2016).

Despite the foregoing, there is insufficient research in the area of managing the challenges affecting performance of supply chain systems in the Kenyan context. Reasons advanced for these shortages range from the delay of vessels supposed to discharge refined products and the inability of Oil Marketing Companies (OMCs) to obtain letters of credit from banks. Bartlomiejczuk (2015), asserted that the oil and gas industry is one of the largest and most complex industries in the world today that touches on peoples' everyday lives with services ranging from transportation, electricity, heating, lubricants and a host of chemical and petrochemical products. This is important.

Petroleum products are used across the entire economy in every country. Gasoline and diesel are the primary fuels used in road transport. Oil is used in power generation, accounting for 11 percent of total electricity generated in Africa in 2007 (Hannum, 2016). As such it is essential for the energy sector in Kenya to know why there are poor performances in petroleum industry leading to fuel shortages. This study therefore, sought to establish the challenges affecting performance of supply chain systems in the oil industry in Kenya. Therefore, to come up with the effects, the researcher sought to find out, the effect of level of skills of staff on performance of supply chain systems; how information communication and technology contributes to supply chain system performance; the role of crude oil price on performance of supply chain systems, whether tendering systems have an effect on performance and sought suggestions on performance that can help Kenyan oil companies to maintain their forecasting in an accurate manner and hence mitigate fuel shortages.

1.3 Objectives of the study

This study was guided by the following objectives.

1:3.1 General Objectives

The general objective of this study was to establish the challenges affecting performance of supply chain systems in the petroleum industry in Kenya.

1.3.2 Specific Objectives

1. To establish the extent to which level of skills of staff affects performance of supply chain systems in the petroleum companies in Kenya .
2. To determine the effects of information and communication technology on

performance of supply chain systems in the petroleum industry in Kenya

3. To establish the extent to which cost of crude oil affects performance of supply chain systems in the petroleum industry in Kenya.
4. To examine the effect of tendering systems on performance of supply chain systems in the petroleum industry in Kenya.
5. To determine the moderating effect of legal and regulatory environment in the oil companies on the, relationship between level of skills, information and communication technology, cost of crude oil and tendering systems in the oil industry in Kenya.

1.4 Study Hypotheses

The following hypotheses guided the study:

Hypotheses 1

1. Ho: Level of Skills does not significantly affect performance of supply chain systems in the petroleum industry in Kenya.
2. Ho: Information and communication technology does not significantly affect performance of supply chain systems in the petroleum industry in Kenya.
3. Ho: Cost of crude oil does not significantly affect performance of supply chain systems in the petroleum industry in Kenya.
4. Ho: Tendering Systems does not significantly affect performance of supply chain systems in the petroleum industry in Kenya.

5. Ho: Legal and regulatory environment do not have a moderating effect on the performance of supply chain systems in the petroleum industry in Kenya

1.5 Significance of the study

The study was important because it sought to establish the challenges affecting performance of supply chain systems in the petroleum industry in Kenya, with the understanding that performance is very critical in the functioning of these oil companies where ultimate customers relies on for the supply of all oil products so as to mitigate often shortages in the country. The rationale also proposed ways of managing the supply chain from the upstream to the downstream, so as to smoothen the flow of fuel within links in both locally and internally markets. The study findings were beneficial to various stakeholders as follows:

Consumers

The study provided empirical information to all oil company consumers in Kenya for the improvement of oil shortages in order to put in place clear forecasting strategy and to avert time wastage when there is no oil. It was envisaged that this research was provided with empirical information on the current critical competence factors which was useful to all petroleum companies in formulating competence strategy by supply chain systems and reviewing the existing problems. This was to build confidence to all customers. This leads to consumers benefiting.

Academicians

The research pointed out other research areas for possible consideration by other scholars that contributed to the existing body of knowledge on level of skills competence. One of this is a comparative study focusing the challenges affecting performance on supply chain systems to all oil companies to find out if these findings could be similar and to finally arrive at a prudent academic decision making. This leads to academician benefiting.

Policy Makers

The findings provided policy makers with viable opportunities to revise the existing policies related to the challenges affecting performance of supply chain systems such as strategizing in advance. This in turn benefited policy makers in Kenya with the provision of proactively making decisions towards the delivery of service at the right time, at the right price, of the right quality, the right quantity and from the right source. This was to mitigate oil shortages.

Community

As the community gears towards the realization of Kenya vision 2030, competence of supply chain will ensure that companies have adequate capability to execute their services with due diligence towards customer satisfaction. In the current competitive market and the revolution of technology, fuel shortage is a disaster for the manufacturing industry, which is leading in staff, lay off from the service and even closing businesses. Through proper forecasting of supply chain systems, performance of the community has eradicated Poverty.

1.6 Scope of the Study

The study was carried out on both local and international companies transacting in the oil industry in Kenya, the study was established on the following independent variables; the Level of Skills of staff, ICT, Cost of Crude Oil and Tendering Systems can inconvenience performance of supply chain systems in the petroleum industry in Kenya. Supply chain Performance, being a paramount issue, in order to mitigate petroleum shortages in future. These companies comprised all the 73 registered oil companies as per the Energy Regulatory commission of Kenya (ERC records). A census survey sampling was done to all stakeholders, suppliers, Kenya Petroleum Regulatory Commission and staff who are directly involved in the supply chain among others. All senior procurement officers were being targeted from the 73 oil companies in Kenya_in this scope, as it was stated by the purpose of which the researcher focused upon and evaluated in this study. A state of the art and forecast study, taking into account developments over the past three years and looking at the evolution foreseen within five years.

1.7 Limitation of the Study

This research study had a number of limitations. Since it was across sectional survey, hence the researcher could not monitor whether the turnover cognitions were actualized. The scope of the study for instance was limited by the sample size, industrial coverage, respondents and location. This study was focusing on all petroleum companies in Kenya. The model therefore, was tested in other oil companies to validate its accuracy. Since all oil companies in Kenya were involved in the study it was not easy for the researcher to collect data on his own and therefore he sought the assistance of three research assistants to enable him to collect data on time for the study. The other challenge which was experienced during the study was the distance from one oil company to the other, since the 73 oil companies were located in varied locations. Further human resource employees have a different level of understanding the aspects of performance on supply chain systems.

These challenges were addressed by ensuring that the questionnaires were well constructed by putting into consideration variation in the adoption of performance on supply chain systems. Where it was necessary the contents of the questionnaire were explained to the respondents during the data collection stage before they responded. Finally the study used a survey in distributing questionnaire to the respondents, which also had some challenges to gather accurate data on supply chain systems, Instead of using other methods of data collection such as experimentation and observation could have been preferred method. These challenges were sorted out by ensuring all the items were well captured in the questionnaires to achieve validity and reliability

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter deals with literature review and in particular theoretical framework, theories, models, the conceptual framework and their effect on performance of supply chain systems, critique of existing literature on performance of supply chain systems, research gaps and summary of the literature. The chapter is divided into three main parts. The first part covers the theoretical review on level of skill of staff, information and communication technology, cost of crude oil, tendering systems and legal and regulatory framework leading to the development of the conceptual framework guiding this study. The second part deals with the secondary research in accordance with the variables of this study. The third part deals with empirical studies carried out in the past and in accordance with the variables presented in the research model, the critique and the research gaps.

2.1.2 Theoretical Framework

Most research is founded on a question. The researcher or writer of the report not only questions, but ponders and develops thoughts or theories on what the possible answers could be. These thoughts and theories are then grouped together into themes that frame the subject. This is what is known as a theoretical framework. It's a process of identifying a core set of connectors within a topic and showing how they fit together or are related in some way to the subject (Zhu, Gang, Sarkis & Lai, 2013).

2.1.3 Skills Theory

Skill theory is considered relevant in understanding the effect of level of skill of staff on performance of supply chain systems in the petroleum industry in Kenya and hence provides the theoretical background for this study. This finding is in line with Katz (1955), who observed that these skills are quite different from traits or qualities of leaders. Skills are what leaders can accomplish, whereas traits are who leaders are such as their innate characteristics. Leadership skills are defined as the ability to use one's knowledge and competencies to accomplish a set of goals or objectives. These leadership skills can be acquired and leaders can be trained to develop them. Skills theorists sought to discover the skills and abilities that made leaders effective. Similar to trait theory, skills theories are leader-centric, focused on what characteristics about leaders make them effective. The two primary theories to develop from a skills approach were Katz's three-skill approach and Mumford's skills model of leadership (Yang, Lu, Haider & Marlow, 2013).

The three-skill approach argued that effective leadership required three skills: technical, human and conceptual skills. Technical skill refers to proficiency in a specific activity or type of work. Human skill refers to being able to work with people and conceptual skill refers to the ability to work with broad concepts and ideas. The three-skill approach asserted that, while all skills were important for leaders, their level of importance varies depending on the organizational level of leaders. As leaders move through the levels of the organization (from lower to upper), skill importance moves from technical to human to conceptual (Miles, Huberman, & Saldaña, 2014). More complex than the three-skill approach, the skills model of leadership outlined five components of effective leadership: competencies, individual attributes, leadership outcomes, career experiences and environmental influences (Maheshwarkar & Sohani, 2013). According to Chiesser (2015), systems theory have been debated and criticized. One argument has been that it escapes from reality and not is productive Skills; There is a belief that they are in two categories: incremental and entity, those who believe in incremental says that, the talents may emerge from

acquiring new skill, ability and knowledge respectively, but there are some entrepreneur who never went to school, but they have managed their businesses properly, this is according to entity theorist.

2.1.4 Socio-Technical Systems Theory of Acceptance

Socio-Technical Systems Theory of Acceptance is considered relevant in understanding the effect of information and communication technology on performance of supply chain systems in the petroleum industry in Kenya and hence provides the theoretical background for this study. Emery and Trist (1960) argued that social technical systems perspective has become influential in the analysis of the organizational impact of technology. Originating in work carried out by the Tavistock Institute in London (Yang et al., 2013) on the introduction of mining technology in Britain, socio-technical systems theory views any organization as an open system of interdependent sub-units, transforming inputs to desired outputs. As the theory has moved on from its original psychodynamic model of human behavior, the term "socio-technical" has become synonymous with almost any analysis of a configuration of technology and users, though its use in the present chapter is linked more closely to the researchers and theoreticians who have developed the concept (Tseng & Chiu,2013).

A fundamental tenet of socio-technical systems thinking is that a technology on its own (in the form of its technical capability) has little meaning for purposes of organizational analysis, being truly comprehensible only in terms of the context in which it is embedded and, by extension, the organizational goals or transformations that it serves or enables . Moving beyond a concern with one user and an interface, socio-technical systems theory argues that a network of social relationships surround all working practices (cooperation among workers over the course of a task, supervisory relationships, and general

social interaction) (Yang et al., 2013).The gainful employment of any technology hinges on the ability and willingness of users to employ it for worthwhile tasks (those deemed central to the organization's goals) (Kara, 2012). Accordingly, Weil (2014) argued that technology cannot be analyzed or understood in isolation of the goal-oriented organization it is intended to support. In order to jointly optimize both the social and technical attributes of any organization, allowance must be taken at the engineering level of the social dynamics of any organization or sub-unit within it (Hou et al., 2014).

2.1.5 Tendering Theory

Tendering theory is considered relevant in understanding the effect of Tendering Systems on performance of supply chain systems in the petroleum industry in Kenya and hence provides the theoretical background for this study. Friedman (1956, 1957) argued that it's simple and clear for any tender: to maximize the expected profit from a single tender where each competitor simultaneously submits one closed tender. The bidder should select the mark-up on cost that maximizes expected value of the profit which is the product of the mark-up and the probability of winning the contract (Tseng & Chiu, 2013). Tendering theory is not only about how tendering 'ought to' be performed, but also an explanation of achievable rationality. Rationality, whether aimed for or postulated as an axiom, is about outcomes, which if achieved, will have implications that, at least in principle, can be observed, tested and verified or falsified (Styles, Schoenberger & Galvez-Martos, 2013).

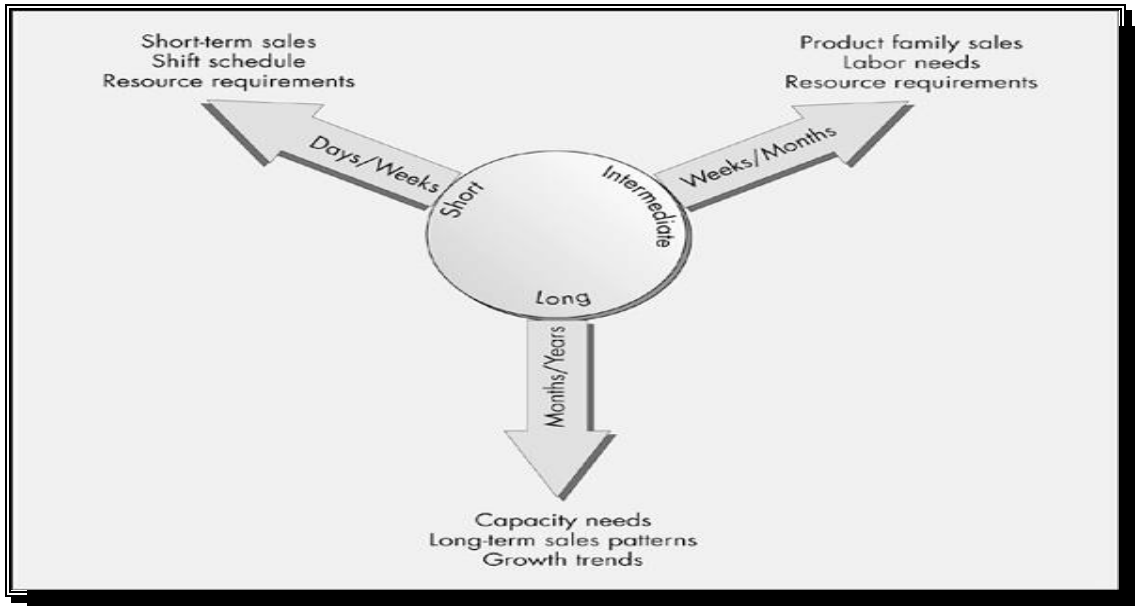

Figure 2.1 Proper forecasting model (Adopted from Trochim, 2006)

Importance of forecasting: Forecasting is an imperfect science, but it is also a necessity for most businesses. That's particularly true when it comes to supply chain management. Proper forecasting helps ensure you have enough supply on hand to satisfy demand. Business analysts use supply chain management systems and other tools to forecast demand weeks and months in advance (Hou et al.,2014).

According to Matusov and Brobst (2013), accurate demand forecasting is indispensable for the optimization when embracing demand forecasting within the supply chain systems. It has to cover the procurement, refining and distribution which form the

basis to optimize the downstream supply chain (Hoque 2016). Although marketing is the last stage in the oil downstream supply chain by selling the oil derivatives, it also has responsibility for provide forecasting information which triggers the whole supply chain process. Demand numbers usually come from historical data, forward trade data, macroeconomic indicators, Point of Sales (POS) system, marketing input and metrological input. Accuracy plays key role because a little error could cause very expensive damage on the total cost (Tseng & Chiu, 2013).Therefore, it's imperative to say that a priority argument that theories like tendering theory that stipulate rationality and can also be formulated in a normative way as decision rules cannot also be descriptive or positive is invalid. Such an argument must be empirically derived. The tendering theory stipulates a universal maximization objective (Delai & Takahashi, 2013).

2.1.5 Theory of Performance

Theory of Performance is considered relevant in understanding the effect of Tendering Systems on performance of supply chain systems in the petroleum industry in Kenya and hence provides the theoretical background for this study. Elger (1962) argued that the Theory of Performance (ToP) develops and relates six foundational concepts to form a framework that can be used to explain performance as well as performance improvements. To perform is to produce valued results. That not all performances are equal "Full performance" involves a level of competence that produces artistry, though measures of competency are to be discovered in each fieldwork situation and with awareness of local measures of artistry. This theory is anchored on performance of supply chain systems which is our dependent variable in this study. According to Schrettle et al. (2013), who observed that the same time performance theory calls for greater awareness of and attention to formal elements of textual representation (structural concerns), it also calls for greater focus on context. Performance theory situates stories to a particular event and credits a narrator who assumes responsibility for the performance. Each performance is keyed, and relies

on a performer's assumption of responsibility for the emergent event. Folklore is not to be conceived any longer as disembodied "text" but rather a rich convergence of performer, situation, setting, audience, and society (Hou et al., 2014).

Richard Bauman noted the typical view of oral literature until recently and the changes in orientation urged by performance theory: "oral literature has been conceived of as stuff collectively shaped, traditional stuff that could wander around the map, fill up collections and archives, reflect culture, and so on" (1986:2), giving it the bounded appearance that, as with culture, is problematic (Lin & Sheu, 2012). Performance theory is also based upon this recognition of the "interlacing" of "description with interpretation." The similarity of this metaphor to Bauman's "web of interrelationships" indicates the consensus among scholars of the need for a fluid approach that recognizes such interconnections (Addy, 2012). There is need to established how Performance theory can helps us to continuously discuss and appreciate what it means to be human and to give expression to our lives general plot outlines, and then by comparing it to timeliness service delivery in the petroleum industry, so as to avoid often oil shortages through proper forecasting and maintenance of stock levels (Agami et al., 2012).

2.2 Three Skills Model

Three skills model is considered relevant in understanding the effect of level of skill of staff on performance of supply chain systems in the petroleum industry in Kenya and hence provides the model background for this study. Three skills model of Grush (2005) argued that an approach shows that leaders have certain behaviors that allow them to act as a leader in specific situations that they come across. Up until this time, I have been giving a lot of attention to Taylor (2014) "Three Skills Model" where the basic skills you need to be a leader are "technical skills, human skills, and conceptual skills". Using these three skills, it is easy to fit an individual into these skills categories based on whether or not they have them. I was wondering if Maheshwarkar and Sohani (2013) "Skills Model" would work in the same way. In this research discussion it's well-

articulated on how “leadership skills in action”, is focused on the three excelled areas. Since the dynamics of performance measurement has been addressed, alongside of taking these three skills model, in has given me a good insight on how to determine “good leaders”. These leaders can be born with leadership traits or learn behaviors through experience (Saad, Mohamed, & Hasnan, 2014).

2.2.1 Technology Acceptance Model

Technology acceptance model is considered relevant in understanding the effect of Information and communication technology on performance of supply chain systems in the petroleum industry in Kenya and hence provides the model background for this study. Davis (1986) argued that the purpose of TAM is to assess the user acceptance of emerging information technology. TAM is more specific and applies only to the use of computers. TAM addresses the human-computer interface. Technology Acceptance Model (TAM) is one of the most successful measurements for computer usage effectively among practitioners and academics. Another important difference is that TAM proposes a direct path from perceived usefulness to intention, violating others which shows attitude completely mediating the relationship between beliefs and intention. According to Taylor (2014) who observed that in the work environment, intentions to use IT may be based on its anticipated impact on job performance, regardless of the individual's overall attitude toward that system. In other words, even though an employee may dislike a system, that employee may still use the system if it is perceived to increase job performance.

2.2.3 Trading Models

Trading models is considered relevant in understanding the effect of tendering systems on performance of supply chain systems in the petroleum industry in Kenya and hence provides the model background for this study. Goran and Martin (1999) argued that it demonstrates how tendering model determines market prices and how it is different from game and decision theories and that in the tendering process, with non-cooperative, simultaneous, single sealed bids with individual private valuations, extensive public information, a large number of bidders and a long sequence of tendering occasions, there develops a competitive equilibrium. A trading recommendation naturally includes a price change forecast, but it must also account for the specific constraints of the dealer of the respective trading model because a trading model is constrained by its past trading history and the positions to which it is committed (Nasarullah & Raja, 2014). A price forecasting model, on the other hand, is not limited to similar types of constraints. A trading model thus goes beyond predicting a price change such that it must decide if and at what time a certain action has to be taken. These models are based on the continuous collection and treatment of foreign exchange quotes by market makers around-the-clock at the tick-by-tick frequency level. There are important reasons for utilizing high frequency data in the real-time trading models (Anderson, 2013).

The first one is that the model indicators acquire robustness by utilizing the intraday volatility behavior in their build-up. The second reason is that any position taken by the model may need to be reversed quickly although these position reversals may not need to be observed often (Gorard, 2013). The stop-loss objectives need to be satisfied and the high frequency data provides an appropriate platform for this requirement. Third, the customer's trading positions and strategies within a trading model can only be replicated with a high statistical degree of accuracy by utilizing high frequency data in a real-time trading model. More importantly, the high frequency data in these models lets us learn the underlying heterogeneous market microstructure properties of the foreign exchange markets (Barrow, 2013).

According to Honcharenko (2015), the importance of the supply chain model and improving has long been recognized as one of competitiveness strategy in scientific research. This model is anchored on supply a chain system that is our dependent variable for this study. However, most of the performed work has focused on designing supply chain modeling and improving in developed countries with fewer concerns for their partners in developing countries. The manufacturing industry in developing countries has experienced fierce competition for their product and consequently, a loss of market share (Grimsley, 2016). The Supply-Chain Operations Reference (SCOR) provides a standard description of supply chain processes, performance metrics, best practice and enabling technologies. It offers a Comprehensive methodology to improve supply chain operations. It is designed by the Supply-Chain Council (SCC). It is widely acknowledged as the quasi–industry standard for supply chain management (Gorard, 2013).

SCR model provides a framework that links business processes, metrics, best practices, and technology into a unified structure. It is hierarchical in nature, interactive, and interlinked. The SCOR model supports supply chain improvement by aiding the capture of an "as -is" current state from which the desired "to be" future state can be derived (Agami et al., 2012). By speeding data collection, SCOR can make it much less time consuming for managers to find answers to basic questions about how a supply chain is performing, drill down to identify contributing factors, and quickly initiate corrective actions. SCOR facilitates supply chain integration by providing common process and metric definitions applicable across multiple organizations. For each process it includes parent and/or child processes, performance metrics, best practices, and the skills required for the employees performing the process (Luthra et al., 2013).

2.2.4 Models of Public Policy Making

Models of Public Policy Making is considered relevant in understanding the effect of regulation and regulatory environment on performance of supply chain systems in the petroleum industry in Kenya and hence provides the model background for this study. Lindblom (1959) argued that model address how public policy is made. Long term policy making requires the consideration of issues in the present that have consequences for inhabitants of future years, either because current issues and decisions will extend into upcoming decades or because new policy challenges can be reasonably anticipated. Policy making is only one part of the entire policy process. It describes the duties and arrangements of bureaus and departments. Also considers constitutional provisions, administrative and common law, and judicial decisions. According to Ghanbari (2014), who observed that it focuses on formal arrangements such as federalism executive reorganizations, presidential commission and others.

Traditionally political science has studied government institutions Congress, presidency, courts, political parties, etc. that authoritatively determine, implement, and enforce public policy. Strictly speaking, a policy is not a public policy until it is adopted, implemented and enforced by some governmental institution. Government lends legitimacy to policies, they are then legal; Government extends policies universally to cover all people in society; Government monopolizes the power to coerce obedience to policy, or to sanction violators. Traditional studies using the institutional approach focused on institutional structures, organization, duties and function, without investigating their impact on public policy (Addy, 2012).

2.3 Conceptual Framework

A conceptual framework is a set of broad ideas and principles taken from relevant fields of enquiry and used to structure a subsequent presentation (Gorard, 2013).This is a written or visual presentation that:" explains either graphically, or in narrative form, the main things to be studied the key factors, concepts or variables and the presumed relationship among

them". According to Honcharenko (2015), this provides the structure/content for the whole study based on literature and personal experience. Conceptual frameworks provide researchers with: The ability to move beyond descriptions of 'what' to explanations of 'why' and 'how'. A means of setting out an explanation set that might be used to define and make sense of the data that flow from the research question. A filtering tool for selecting appropriate research questions and for any related data collection methods.

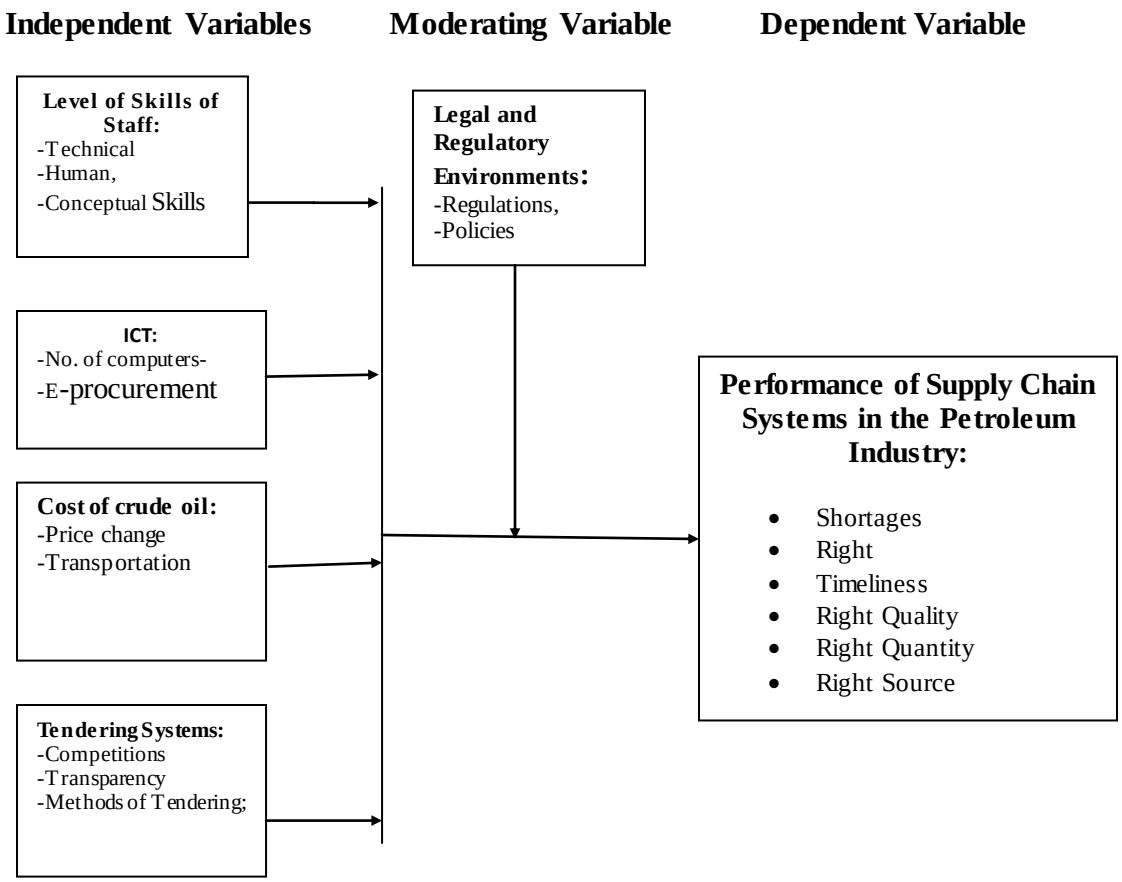

Figure 2.2 Conceptual Frameworks

2.3.1 Level of Skills of Staff

Regardless of the level of management, theorist and psychologist Daniel Katz identified three skills common to every manager. These are conceptual skills, human skills, and technical skills. Conceptual skills allow a manager to visualize the entire organization and work with ideas and the relationships between abstract concepts (Insala. 2015). Human skills, also called human relation skills, require communication and attention to relationships with others. Technical skills are needed to actually get the work done; they are the techniques, practices, tools, and processes needed by front-line employees in the manager's functional area (Wernet, 2014).

While all managers have these skills, the ratio of each skill to the others varies based on the industry and level of management. Each job requires the same amount of conceptual skills to ensure their team is meeting organizational objectives. They'll also use equivalent technical skills (generally accepted accounting principles) to ensure the quality of the work (Saad et al., 2013).

Top managers rely mostly on conceptual skills, but they use significant human skills as well. Remember, though, they need technical skills to set a strategy that makes sense for the organization (Boundless, 2016). Top managers have the most discretion, or choice, in how they exercise any of these skills. Human skills are needed by most middle managers, because middle managers need to communicate up, down, and across the organization in order to do their work well, but they also need conceptual skills to set the goals and achieve strategic objectives of supply chain systems (Gorard, 2013. They are

expected to have more technical skill and less conceptual skill than the managers above them because they are 'closer to the ground.' Direct supervisors do not spend as much time doing work that requires conceptual skills the day-to-day operations of the organization are more task-minded than strategically oriented. Instead, they are the 'closest to the ground,' so they need more technical skills as the most hands-on and visible managers. They do need some human relations skills (Borgdorff, & Schwab., 2014).

Conceptual skills: conceptual skill is the ability to visualize the organization' supply chain as a whole. It includes analytical, creative and initiative skills. It helps the manager to identify the causes of the problems and not the symptoms. It helps him to solve the problems for the benefit of the entire organization (Barrow, 2013). It helps the manager to fix goals for the whole organization supply chain and to plan for every situation. According to prof. Robert Katz, conceptual skills are mostly required by the top-level management because they spend more time in planning, organizing and problem solving. Human relations skills: human relations skills are also called interpersonal **s**kills. It is an ability to work with people. It helps the managers to understand, communicate and work with others. It also helps the managers to lead, motivate and develop team spirit (Imran, 2014).. Human relations skills are required by all managers at all levels of management. This is so, since all managers have to interact and work with people. Technical skills: a technical skill is the ability to perform the given job within the chain. Technical skills help the managers to use different machines and tools. It also helps them to use various procedures and techniques. The low-level managers require more technical skills. This is because they are in charge of the actual operations from upstream to downstream (Taylor, 2014).

2.3.2 Information and Communication Technology

Technological progress is a considerable driving force behind economic growth, citizen engagement and job creation. Information and communication technologies (ICTs), in particular, are reshaping many aspects of the world's economies, governments and societies (Imran, 2014). In developing countries, public officials, businesses and citizens are working together to harness the transformative power of ICTs to make services more efficient, catalyze economic development and strengthen social networks (Taylor, 2014). More than 75 percent of people around the world now have access to a cell phone, with the number of global mobile-cellular subscriptions quickly approaching 7 billion. In addition, new services and industries are rapidly emerging. In Kenya, for example, mobile money agents now outnumber all other financial intermediaries by a factor of 10 to one. More than half of those living on less than US$2 a day in that country have access to mobile technology (Maheshwarkar & Sohani, 2013).

At the same time, access to mobile and fixed broadband remains prohibitively expensive in some countries where lack of ICT infrastructure and regulatory bottlenecks still hamper broadband development (Boundless, 2016).. Residential fixed-broadband services cost about 30 percent of average monthly Gross National Income (GNI) per capita in developing countries compared to just 1.7 percent of average national income in wealthy countries (Billy Gray *et al.*, 2013).This average masks vast discrepancies between and within countries, affecting opportunities available to citizens. In Djibouti, for example, a mobile broadband package costs more than the income of the country's poorest 60 percent of the population. When done right, ICT infrastructure investment and policy reform can empower poverty reduction and shared prosperity. A 10 percent increase in high-speed internet connections leverages a 1.4 percent increase in economic growth (on average) in developing countries (Topal, 2014).

2.3.3 Cost of Crude Oil

With so many different grades of oil, there is actually no specific individual market price for most crude oils. Instead, prices are determined with reference to a few benchmark oil prices, notably Brent and West Texas Intermediate (WTI). Brent is produced in the North Sea and is used as a reference price for roughly two-thirds of the global physical trade in oil, although it only accounts for around 1 per cent of world crude oil production (Idris et al.,2015). WTI is produced in the United States and has traditionally dominated the futures market, accounting for around two-thirds of futures trading activity (Sidola et al., 2012). However, futures market trading in Brent has increased significantly in recent years to be now close to that for WTI, reinforcing Brent's role as the key global benchmark. As discussed below, Brent's dominance as a benchmark has benefited from the fact that it is a seaborne crude and, unlike WTI (which is a landlocked pipeline crude), can readily be shipped around the world (Luthra et al., 2013.

These benchmarks form the basis for the pricing of most contracts used to trade oil in the physical markets. For oil transactions undertaken in the spot market, or negotiated via term contracts between buyers and sellers, contracts specify the pricing mechanism that will be used to calculate the price of the shipment (Idris et al., 2015). So called 'formula' pricing is the most common mechanism, and it anchors the price of a contracted cargo to a benchmark price, with various price differentials then added or subtracted (Topal, 2014). These price differentials relate to factors such as the difference in quality between the contracted and benchmark crude oils, transportation costs and the difference in the refinery's return from refining the contracted and benchmark crudes into the various petroleum products. For example, a barrel Brent is generally worth more than a barrel of Dubai (a medium sour crude oil) because Brent will yield more high-value gasoline, diesel and jet fuel than Dubai without the need for intensive refining (Billy Gray et al., 2013).

The failure of oil industry economists to predict the price of oil was simply because most future predictions are based on examining what happened in the past. Everyone expected the Saudis to cut production and maintain prices as they did in the

past. When they didn't, the fallout resulted in massive layoffs in the oil industry. According to Chiesser (2015), the livelihoods of entire communities were decimated over 100,000 jobs lost worldwide by our estimates. The oil price fell from $115 per barrel in June 2014 to around $55 per barrel at the beginning of 2015. Some analysts predicted that the price would continue to fall, while others saw a rebound on the horizon and others felt prices would stay the same for years to come. One thing analysts unanimously agreed upon was that US fracking was immensely set back, if not finished

However, the actual magnitude of the Brent-Dubai spread will depend on the relative prices of these petroleum products at the time when the oil is sold to the refineries, along with the location and the spare capacity in those refineries that can easily convert lower-quality crude oil into higher-yielding petroleum products. According to Honcharenko (2015), reflecting changes in these fundamental determinants, the Brent-Dubai spread has fluctuated within a range of around US$0 15 per barrel. These benchmark prices used in formula pricing are usually based on either (i) 'spot' prices determined by other scholars or (ii) prices determined in futures markets. Oil companies often reference more than one benchmark price depending on the final destination; for example, Saudi Aramco typically employs the Brent benchmark to price oil exports to Europe, Dubai-Oman for exports to Asia and the Argus Sour Crude Index for exports to the United States (Saad, Mohamed , & Hasnan., 2014).

These particular crudes emerged as benchmarks due to several distinctive characteristics. Brent developed as a benchmark owing to favourable tax regulations for oil producers in the United Kingdom, in addition to the benefits of stable legal and political institutions. Ownership of Brent crude oil is well diversified, with more than 15 different companies producing it, which helps to reduce individual producers' pricing power. Brent can also be used by a variety of buyers, given that it is a light sweet crude oil that requires relatively little processing (Nasarullah & Raja, 2014). The physical infrastructure underlying Brent is also well developed. When the Brent benchmark was established in the mid-1980s, its production was

initially reasonably large and stable, which is an important characteristic of a benchmark as it guarantees timely and reliable delivery. Although the volume of Brent crude oil produced has declined over time, three other North Sea crudes have been added to the Brent benchmark basket over the past decade, such that it now comprises (Anderson, 2013).

The current pricing framework for crude oil is complicated, as is the nature of price discovery. Global crude oil trade is currently priced according to the prices of a handful of benchmark crudes, which make up less than 5 per cent of total crude oil produced. Yet these benchmark crude oils are facing problems of their own. The prolonged divergence of the WTI price from other major benchmark prices has impaired its benchmark status, leading some oil-consuming and oil-producing companies to shift to other benchmarks. On the other hand, production volumes for the Brent basket are declining, leading to concerns regarding its own robustness as a benchmark. Regulators and the industry are working together, under the auspices of the G-20, to ensure that prices for crude oil are determined in a transparent manner and continue to reflect physical fundamentals (Barrow, 2013).

2.3.4 Tendering Systems

Increasing the effectiveness, efficiency and transparency of procurement systems is an on-going concern of governments and of the international development community. All have recognized that increasing the effectiveness of the use of public funds, including funds provided through Official Development Assistance (ODA) requires the existence of an adequate national procurement system that meets international standards and that operates as intended (Topal, 2014). Under the auspices of the joint World Bank and Development Assistance Committee (DAC) Procurement Round Table initiative, developing countries and bilateral and multilateral donors worked together to develop a set of tools and standards that provide guidance for improvements in procurement systems and the results they produce (Addy, 2012).

The understanding among the participants in this process is that the assessment will provide a basis upon which a country can formulate a capacity development plan to improve its procurement system. Similarly, donors can use the common assessment to develop strategies for assisting the capacity develop plan and to mitigate risks in the individual operations that they decide to fund. The long term goal is that countries will improve their procurement systems to meet internationally recognized standards enabling greater effectiveness in the use of funds to meet country obligations (Creswell, 2014). It should be noted that the methodology presented in this paper has capacity development as a core objective and progress is dependent upon country ownership and commitment to managing the development program. The methodology includes a numeric scoring with defined criteria that will provide a qualitative scoring of the country's procurement system and contribute to the primary objective of supporting capacity development in the area of procurement by helping to more specifically and consistently identify the strengths and weaknesses of the systems assessed and increase the ability to track progress of reform initiatives (Cheng, 2014).

The legal framework should include: a clear definition of the permissible procurement methods; and the circumstances under which each method is appropriate. The legal framework should make open competitive tendering the default method of procurement. The law and regulations should define the situations in which other less competitive methods can be used and ensure that acceptable justification and approval levels are clearly specified. Fractioning of contracts to avoid open competition should be prohibited (Silva, 2013). The hierarchy of the legal instruments where acceptable procurement methods are established should be such that the discretion of individual agencies or procurement officials is reasonably controlled to minimize the use of methods that limit competition. This indicator assesses whether: a) the legal framework includes requirements to publish contract awards as a matter of public interest and to promote transparency; b) there is wide and easily accessible publication of business opportunities; and, c) there is adequate time provided between publication of opportunities

and submission date, consistent with the method and complexity of the procurement, to prepare and submit proposals (Topal, 2014).

Time between publication of the invitation for prequalification applications, or for an open tender and the submission of proposals relates to the complexity of the procurement and the level of competition expected. If foreign bidders are expected to compete, this is a factor to consider. The law and regulations should establish the criteria for setting the minimum time between advertisement and submission of proposals. This indicator assesses the participation and selection polices to ensure that they are non-discriminatory. As a general principle, firms, including qualified foreign firms, should not be excluded from participating in a tendering process for reasons other than lack of qualifications. Exclusions from tendering that are not based on the qualifications of the firm may arbitrarily limit competition and may result in inefficient procurement and higher prices (Cheng, 2014).

The indicator assesses the degree to which the legal framework specifies the content of tendering or solicitation documents to enable suppliers to understand clearly what is requested from them and how the tendering process is to be carried out. Tendering documents should contain sufficient information to enable the submission of responsive tenders/proposals and to establish the basis for a transparent evaluation and award process. International standard where possible / other officially recognized standards that are essentially equivalent to the ones specified in the tender document towards achieving transparency. It is important that the content requirements for tender and solicitation documents are relevant to making an award decision. Information not needed for the process should not be required as part of the submission. Excessive information and documentation requirements are considered to cost money and can reduce competition of potential bidders on the basis of unnecessary requirements (Wernet, 2014).

2.3.5 Performance of Supply Chain Systems

Performance management is the process through which supervisors and those they lead gain a shared understanding of work expectations and goals, exchange performance feedback, identify learning and development opportunities, and evaluate performance results. It is through this process that organizations are able to create and sustain a workplace environment that: Values continuous improvement, Adapts well to change Strives to attain ambitious goals, Encourages creativity, Promotes learning and professional development. Is engaging and rewarding for employees (Topal, 2014). This study is a contribution to the growing research stream trying to clarify the impact of supply chain management on performance. Specifically, we explored the impact of the supply chain management as a multidimensional construct (information sharing, long-term relationship, cooperation and process (integration) on different competitive priorities (cost, flexibility, quality and time). The research setting was the emerging Brazilian economy, a less researched environment (Hou et al., 2014).

The empirical results provided evidence of a positive impact of SCM on operational performance, supporting previous empirical research and contributing to generalization. Main contribution, however, resides on the integrative model that tested SCM a multidimensional construct and the use of the competitive priorities literature to conceptualize dimensions of operational performance. Previous studies have only partially studied this relationship, as they tested the impact of SCM as a undimensional construct on a multidimensional operational performance (Agami et al., 2012). These research findings suggested that SCM impacted positively the operational performance as a whole and all the competitive priorities, providing support for the cumulative capabilities perspective. Quality: These indicators are often the simplest to implement and measure. Typically, they tell you how well you are performing a specific activity a common logistics indicator in this classification is accuracy including order accuracy, inventory accuracy, picking accuracy, etc. Time: These indicators focus on the time it takes to complete specific activities (Luthra et al., 2013). They show where saving time during specific activities can improve the

overall supply chain performance. Financial: These indicators help managers identify the supply chain cost drivers and help move toward a more efficiently managed supply chain. Productivity: These indicators examine how well resources are used. For example, filling vehicles to their capacity, instead of sending out vehicles half-full, could reduce costs and improve efficiency (Silva, 2013).

2.4 Empirical Literature Review

The word empirical means information gained by experience, observation, or experiment. The central theme in scientific method is that all evidence must be empirical which means it is based on evidence. In scientific method the word "empirical" refers to the use of working hypothesis that can be tested using observation and experiment (Luthra et al., 2013). Shatina *et al.* (2014) had observed that most of the supply related performance measurements have an internal focus and do not measure how the company drives profitability. If this still is valid there is an indication that there is a gap of measuring efficiency. This research will evaluate the performance measurements in the Supply chain of oil companies used today and identify if performance efficiency can be measured. It is a way of gaining knowledge by means of direct and indirect observation or experience.

This is in line with the findings of Barrow (2013), who observed that the oil industry itself has an impact on the use of information and communication technologies (ICTs) in the global economy. According to Schwab & Borgdorff (2014) had observed that the years immediately following rising oil prices in 2004, which saw suspension of pricing policies linked to world price movements, some governments responded to high oil prices in 2011 and 2012 by freezing prices. This is in line with the findings of Lin & Sheu (2012) who observed that over the years, the oil and gas industry has continued to face growing challenges, from stricter government regulation, political risks, competition, emergent new comers and political

hostilities, which has affected price hike and shortages. Similarly, Mwaniki and Moronge (2013), also noted that incorporated one Kenyan petroleum industry, Supply Chain systems are experiencing Challenges and strategic planning on the performance of petroleum firms in Kenya.

2.4.1 Level of Skills of Staff

Together, the Dynamic Development Research Group (DDRG) has built an approach to understanding and analyzing variation and order in the organization of people's behavior, especially in cognition and emotion, which is called dynamic skills. Contrary to prevailing psychological approaches, which tend to limit people to one narrow model, dynamic skill portrays much of the rich complexity and diversity in human behavior. According to Creswell (2014), who observed that this theory provides a toolkit of concepts and methods for analyzing the changes in behavior that occur with development, learning, context, and emotion. Through its analysis of the natural variation in human behavior, skill theory provides powerful tools for relating cognitive and emotional development to brain development. According to Anderson (2013), dynamic skill provides tools for predicting and explaining many such changes and relating them to changes in the organization of cortical functioning in the brain.

The tools have proven useful for explaining changes arising from development, learning, emotion, and context. They facilitate specification of developmental levels, skill transformations, context, support, domain, emotional script, and person in social situations. A range of developmentally appropriate methods are used to assess both change and continuity. Skill provides a toolbox and blueprints with which to analyze development (or other types of change in organization) in any domain and thus to facilitate education, clinical intervention, and all sorts of practical activities focusing on change this is as per (Creswell, 2014).

Oil forms a major source of energy in Kenya and world at large for it contributes about 40% of world energy consumption. Kenya's petroleum market has 27 major players and hundreds of independents. The oil sector has become highly competitive and is being characterized by price wars and low sales margins. Industry data shows that petroleum dealers are currently enjoying retail margins of between Sh84.30 per litr to Sh 89.50 per litre for super petrol and Sh. 62.15 per and 71.10 litre for every litre of diesel or illuminating kerosene (Barrow, 2013). Kenyan Oil sector was liberalized in October 1994. It is regulated by Ministry of Energy through the Energy Act of 2006 and enforcement is done by Energy Regulatory Commission. Part IV of the Act (Petroleum and Natural Gas) deals with the issuance of business licenses for importation, storage, refining, exportation, sale and resale, transportation of petroleum and natural gas (Topal, 2014).

The main challenge of upstream operations that include exploration and production (E&P) of crude oil is to extend the life of this depleting resource ICTs are becoming more and more important for the upstream operations of the oil industry. Because of the up with this demand from the supply side, the sector is facing the challenge of increasing production and improving oil recovery rates. According to Cheng (2014), who observed that this situation has caused the oil sector to invest more and more in research and development, and as a result, improved drilling and extraction technologies have been introduced**.** These new technologies can be divided into two on better drilling and extraction instruments such as "horizontal drilling", a drilling process where the pipes it possible to cover a broader area than with vertical drilling. The second category of technologies is based on providing information during the processes. This is done by using monitoring devices in drilling and extraction processes in order to steer them in such a way that maximum productivity and oil recovery are achieved (Silva, 2013).

These new technologies are becoming indispensable as the share of easy oil from the Middle highly digitalized. use of more sophisticated technologies that make it possible to "visualize" the oil wells and recover more oil than the current techniques

permit. ICTs' role here is hard to overstate as they make it possible to collect consecutive transfer and manipulation of those data in sophisticated models that in their turn support decision making as far as the optimal oil recovery methods are of an ICT network at company level, as all of them are increasingly connected through the Internet and monitored in a quasi-real-time regime (Hariharan, 2015). All elements rigs, production platforms and compression facilities, are interlinked, each having its own IP address. The greatest computing needs for interpreting elements of oil-well-related data derive from so-called 3D/4D seismic search methods that by using down hole such dimension. At the same time, major IOCs continue to work on improvements in those methods, trying to acquire seismic data in substantially higher resolution (Wernet, 2014).

Conceptual skills are the ability to work with ideas and concepts. Whereas technical skills deal with things and human skills deal with people, conceptual skills involve the ability to work with ideas. A leader with conceptual skills is comfortable talking about the ideas that shape an organization and the intricacies involved (Hartzell, 2015). He or she is good at putting the company's goals into words and can understand and express the economic principles that affect the company. A leader with conceptual skills works easily with abstractions and hypothetical notions. Conceptual skills are central to creating a vision and strategic plan for an organization. For example, it would take conceptual skills for a CEO in a struggling manufacturing company to articulate a vision for a line of new products that would steer the company into profitability (Silva, 2013). Similarly, it would take conceptual skill for the director of a nonprofit health organization to create a strategic plan that could compete successfully with for-profit health organizations in a market with scarce resources. The point of these examples is that conceptual skill has to do with the mental work of shaping the meaning of organizational or policy issues-understanding what a company stands for and where it is or should be going (Hou et al., 2014).

Technical Skill: Technical skill is knowledge about working cooperatively as a group to achieve common and proficiency in a specific type of work or activity goals (Mohan, 2012). For Katz, it means being aware of one's own it

includes competencies in a specialized area, analytical perspective on issues and, at the same time, being aware ability and the ability to use appropriate tools and of the perspective of others. According to Chiesser (2015), leaders with human skills techniques are more advantaged in handling skilled customer within the supply chain towards effective forecasting? For example, in computer software adapt their own ideas to those of others (Weil, 2014). Furthermore, company, technical skill might include knowing software they create an atmosphere of trust where employees can language and programming, the company's software feel comfortable and secure and where they can feel products and how to make these products function for encouraged to become involved in the planning of clients. Similarly, in an accounting firm, technical skill things that will affect them (Silva, 2013).

The employability skills refer to skills, attitudes, and behaviors, other than technical capability, to enable an individual to engage and advance in the constantly changing demands of the work setting and to remain as an asset to employers (Silva, 2013). These are skills that cut across all jobs from entry level to chief executive officer and that are necessary for both personal and career success and fundamental to good performance in the job. In today's competitive world, a degree is no longer a guarantee of employability unlike decades ago when enrolling in almost any degree program ensures a choice of employment offers in the graduating year. Mastery of content areas solely by graduates will not totally respond to employer requirements for they need transferable skills to improve their job opportunities (Creswell, 2014). Employers assert that graduates are deficient in transferable skills required of the workforce as a result of the unsuccessful development of their employability skills during their stay in the university (Baumeister et al., 2013).

Employers view that graduates are not yet ready to enter and face the complexities and challenges of the world of work and such unpreparedness leads to an apparent insufficiency of skills in the work settings Employers are convinced that the academe should be most responsible for equipping the graduates with generic skills. However, the skills, behaviors and

attitudes needed by job entrants differ from those taught in higher education. According to Creswell (2014), who observed that stress predicament of performance in the process of supply chain management and training their students that will address the requirements of employers? There has been a consistent global call for HEIs to help the graduates through various ways, like integrating the skills into the curriculum, to enable them to adequately acquire and develop the employability skills throughout the course of their studies (Hou et al., 2014). In this time of quickening change, improving the graduates' employability skills is an essential aspect in higher education and is consistent with the emerging needs of a world economy in a high performance workplace.

Studies have been conducted on the need to value the learning of general skills and to enhance such skills in order to get employed upon graduation and succeed in the work (Eberle, 2014). In this case, HEIs should demonstrate a greater commitment to develop the generalized expertise that graduates can transfer to whatever working environment they find themselves in after graduation. In other words, the graduates are expected to have developed not only subject specific skills but also employability skills to make them both specialists and generalists. Also, HEIs need to improve their linkage with industry sector to find out the skills preferred by employers when they recruit employees (Borgdorff, & Schwab 2014). The employers are the ones who are most familiar in everything that takes place in the work environment so higher academic institutions do not ignore their complaints regarding the quality of graduates produced. The institution can maximize the knowledge shared by employers in training future graduates.

2.4.2 Information and Communication Technology

The ICT revolution is reaching new milestones and is stimulating growth in other services. The mobile phone revolution has continued, with subscriptions peaking at 25.3 Million at the end of June 2011, which is more than the number of adults in

Kenya. Since June, 2010, subscriptions increased by more than 25 percent. In the same period, internet users increased by 60 percent, climbing to 12.5 Million (Lamas, Barrera, Otranto & Ugrinowitsch, 2014). This indicates that the data revolution is now also in full swing. A key factor in the growth of internet usage is the new affordable tools, including smart phones and social networking applications with both internet and mobile interface that are proving increasingly popular, especially among the urban youth. The sector has also generated additional innovations, including M-banking, linking mobile money with personal bank accounts, M-credit, and M-insurance, which are expanding the reach of financial services to previously unbanked segments of the population (Barrow, 2013).

Increased oil prices, together with global warming, are economy. In particular, the oil industry itself has an impact on the use of information and communication technologies (ICTs) in the global economy. According to Lamas, *et al*... (2014), higher oil prices increase the risk of squeezing information technology (IT) budgets in oil-using industries. In particular, they can affect oil-importing developing countries with regard to their increased consumption and their often limited capacity to respond to oil price shocks. On the other hand, increased revenues of energy producers give oil-producing countries an opportunity to increase their investments in IT (Borgdorff, & Schwab 2014). At the same time they will increase support for high-tech energy conservation efforts and for the production of alternative renewable energy sources.

ICTs play a major role in increasing productivity and cutting costs in many sectors of the economy (USDA, 2012a). And given the expectation of high oil prices for long periods of time, the question arises equitable distribution of this valuable energy resource are possible, inter alia, through the active use of modern ICTs. To what extent can ICTs help increase efficiency? In the production and allocation of crude oil and its products (Silva, 2013) .ICTs and modern petroleum technologies (which are also becoming information intensive technologies) provide new opportunities to improve economic performance at all stages of the oil supply chain. These will be through the technologies of production of crude oil and

downstream operations of oil product. For example, in upstream operations, ICTs and related technologies may provide possibilities for expanding proven crude oil reserves, improving the rate of crude oil extraction from existing wells, and providing further means to discover new wells, and so forth (Nasarullah & Raja, 2014).

Understanding to what extent new ICTs and related technologies might help to extend the lifespan of provide more predictability about future oil supply; it could also be a stabilizing factor helping to allay investors and consumers' fears, and could contribute to putting downward pressure on oil prices (Sakhuja & Jain, 2012). The use of ICTs in the oil industry is not only relevant for international oil companies (IOCs) in their competitive drive to stay in the forefront of technological progress, but also has also direct implications for National Oil Companies (NOCs) in Organization Petroleum Exporting Countries (OPEC) and other oil-exporting countries. Unlike in the 1970's, the major national oil companies in the OPEC region as well as in other countries have matured, accumulated considerable compete with IOCs also in the use of ICTs. However, they still have to address issues such as the lack of skilled human resources, and the need for increased knowledge of cutting-edge technologies, and business processes. The NOCs in some developing countries face the challenge of keeping up with new technologies, including ICTs. More importantly the upgrades of the technological capabilities of these ICT complement the whole process (Lamas et al., 2014).

Oil is the main non-renewable source of energy that is currently "fuelling" the world economy. In spite of many efforts to develop renewable energy sources, which have been further stimulated by major increases in international crude oil prices during last few years, the share of such sources in global energy consumption is still marginal. According to Mohan (2012), conventional wisdom suggests that the world economy will continue to be highly dependent on oil and gas: while in coming decades the share of gas might increase considerably and eventually surpass that of oil, the latter will still play a major role in the world energy balance. Increased oil prices, together with global warming, are economy and (Barrow, 2013). In particular,

the oil industry itself has an impact on the use of information and communication technologies (ICTs) in the global economy. Higher oil prices increase the risk of squeezing information technology (IT) budgets in oil using industries. In particular, they can affect oil-importing developing countries with regard to their increased consumption and their often limited capacity to respond to oil price shocks. On the other hand, increased revenues of energy producers give oil-producing countries an opportunity to increase their investments in IT (Kimani, 2013).

At the same time they will increase support for high-tech energy conservation efforts and for the production of alternative renewable energy sources (Orozco et al., 2014). ICTs play a major role in increasing productivity and cutting costs in many sectors of the economy (Salavasidis, 2012). And given the expectation of high oil prices for long periods of time, the question arises equitable distribution of this valuable energy resource are possible, inter alia, through the active use of modern ICTs. To what extent can ICTs help increase oil and its products? This is in particular pertinent to developing and transition countries whether they are oil exporters, or major or low-income oil importers (Silva, 2013).

According to Petroleum Industry prepared by Mohali and Panchkula (2012), ICTs Oil importers, as they further increase their oil consumption, particularly China and India, are interested in being able to buy petroleum at better prices and use it effectively. Reducing price volatility is especially important for developing countries' importers, from in coping with oil price shocks. Thus, determining the role of ICTs in the oil sector could be crucial for better assessing the economic development perspectives of developing countries in the coming decades. ICTs and modern petroleum technologies which are also becoming information intensive technologies provide new opportunities to improve economic performance at all stages of the oil supply chain. These will leads to technology productions of crude oil and downstream operations of oil products. For example, in upstream operations, ICTs and related technologies may provide possibilities for expanding proven crude oil reserves, improving the rate of crude oil extraction from existing wells, and providing further means to discover new wells, and so forth. Understanding to what extent new ICTs and related technologies might help to extend the lifespan of provide

more predictability about future oil supply; it could also be a stabilizing factor helping to allay investors and consumers' fears, and could contribute to putting downward pressure on oil prices (Saad et al., 2014).

The use of ICTs in the oil industry is not only relevant for international oil companies (IOCs) in their competitive drive to stay in the forefront of technological progress, but also has also direct implications for national oil companies (NOCs) in OPEC and other oil-exporting countries. Unlike in the 1970's, the major national oil is the main non-renewable source of energy that is currently "fuelling" the world economy (Kara, 2012). In spite of many efforts to develop renewable energy sources, which have been further stimulated by major increases in international crude oil prices during last few years, the share of such sources in global energy consumption is still marginal. Conventional wisdom suggests that the world economy will continue to be highly dependent on oil and gas: while in coming decades the share of gas might increase considerably and eventually surpass that of oil, the latter will still play a major role in the world energy balance. Increased oil prices, together with global warming, are economy. In particular, the oil industry itself has an impact on the use of information and communication technologies (ICTs) in the global economy (Mohali & Panchkula, 2012).

Higher oil prices increase the risk of squeezing information technology (IT) budgets in oil-using industries. In particular, they can affect oil-importing developing countries with regard to their increased consumption and their often limited capacity to respond to oil price shocks. On the other hand, increased revenues of energy producers give oil-producing countries an opportunity to increase their investments in IT. At the same time they will increase support for high-tech energy conservation efforts and for the production of alternative renewable energy sources (Wernet, 2014). ICTs play a major role in increasing productivity and cutting costs in many sectors of the economy (Mohali & Panchkula, 2012). And given the expectation of high oil prices for long periods of time, the question arises equitable distribution of this valuable energy resource are possible, inter alia, through the active use of modern ICTs. To what extent can ICTs help increase oil and its products? This is in

particular pertinent to developing and transition countries whether they are oil exporters, or major or low-income oil importers. Oil importers, as they further increase their oil consumption, particularly China and India, are interested in being able to buy petroleum1 at better prices and use it effectively. Reducing price volatility is especially important for developing countries' importers, from in coping with oil price shocks (Hou et al., 2 014).

Thus, determining the role of ICTs in the oil sector could be crucial for better assessing the economic development perspectives of developing countries in the coming decades. ICTs and modern petroleum technologies (which are also becoming information intensive technologies) provide new opportunities to improve economic performance at all stages of the oil supply chain. For example, in upstream operations, ICTs and related technologies may provide possibilities for expanding proven crude oil reserves, improving the rate of crude oil extraction from existing wells, and providing further means to discover new wells, and so forth (Fernández-Vara, 2014). Understanding to what extent new ICTs and related technologies might help to extend the lifespan of provide more predictability about future oil supply; it could also be a stabilizing factor helping to allay investors and consumers' fears, and could contribute to putting downward pressure on oil prices. The use of ICTs in the oil industry is not only relevant for international oil companies (IOCs) in their competitive drive to stay in the forefront of technological progress, but also has also direct implications for national oil companies (NOCs) in OPEC and other oil-exporting countries. Unlike in the 1970's when major national oil companies in the OPEC region as well as in other (Mohali & Panchkula, 2012)

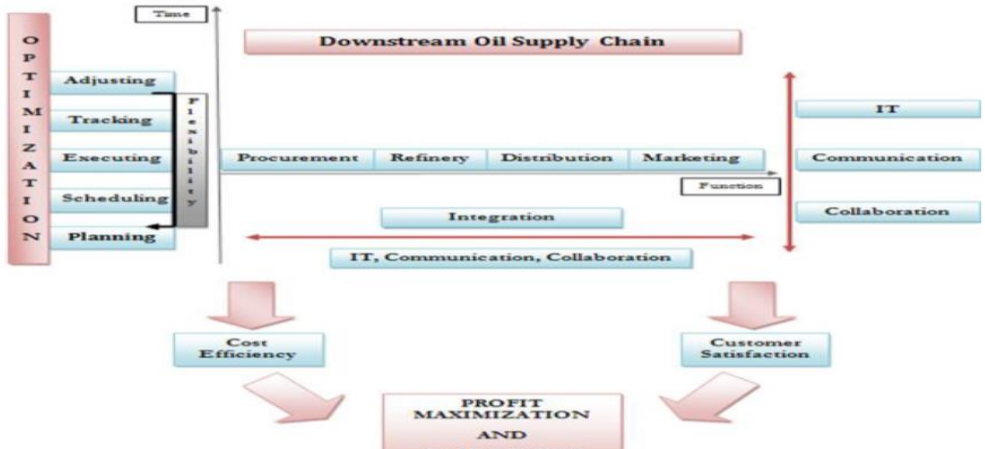

Figure 2.3 Optimization for Downstream Oil supply chain (compiled by authors from thesis, 2012)

The diagram aims to summarize and illustrate the optimization process and its factors in the downstream oil supply chain. It helps the readers to process and interpret the information more easily through this simple schematic picture. The vertical axle shows the steps of optimization in order of time and the horizontal axle shows the functions of oil downstream supply chain. Each of the optimization steps is linked to each functions, however the direct link has to happen at the executing steps when the plan actually materialized (Geisler & Wickramasinghe, 2015). The expected flexibility can be achieved through the optimization by making necessary changes in the plan triggered by the adjusting steps. The horizontal axle demonstrates the integrated nature of the supply chain which is achieved by IT, constant communication and collaboration between the functions (Silva, 2013).

2.4.3 Cost of Crude Oil

The real price of crude oil is a key variable in the macroeconomic projections generated by central banks, private sector forecasters, and international organizations (IMF) (Insala. 2015). The recent cutback in Libyan oil production, widespread political unrest in the Middle East, and ongoing concerns about the state of the global recovery from the financial crisis have sharpened awareness of the uncertainty about the future path of the real price of crude oil. It seems surprising that, to date, no studies have systematically investigated how best to forecast the real price of oil in real time. One reason is perhaps that there has been no readily available real-time database for the relevant economic variables (Caniato et al., 2012).

First, even preliminary data often become available only with a lag. For example, it may take months for the first estimate of this month's global oil production to be released. Second, the initial data releases are continuously revised. It takes successive data revisions until we know, to the best of our ability, the true level of oil production in the current month. Little is known about the nature of these revisions in oil market data or about how data revisions and delays in data availability affect the out-of-sample accuracy of oil price forecasts. This is consistent with (Baumeister & Kilian, 2013), who observed that there is need to address this problem. They construct a comprehensive monthly real-time data set consisting of vintages for January, 1991 through December, 2010, each covering data extending back to January, 1973. Back casting and now casting methods are used to fill gaps in the real-time data sets (Nasarullah & Raja, 2014).

This database allows the construction of real-time forecasts of the real price of oil from a variety of models. Perhaps surprisingly, it can be shown that suitably constructed model-based real-time forecasts of the real price of oil are more accurate than the no-change forecast at horizons up to one year. This result holds both for the US refiners' acquisition cost for crude oil imports, which may be viewed as a proxy for the price of oil in global markets, and for the West Texas Intermediate price that receives most attention in the media. The price of Brent crude oil is not available for a long enough time span to allow a similar analysis. These results are based on a forecast evaluation window covering January, 1992 through June, 2010.

This window includes recent periods of turmoil in oil markets and provides a challenging test of the forecasting ability of alternative forecasting models. The evaluation criteria are the recursive mean-squared prediction error of the forecasts and their directional accuracy (Chan et al, 2013).

According to CIMA (2014), like prices of many commodities, coincides with law of value, but it has its own singularity, for petroleum is a kind of special commodity. Intense fluctuation of petroleum price is one of the most spectacular phenomena during the process of international trade, for there is no price rising and falling rapidly in a short term (Ghanbari, 2014). Petroleum price's historic trace is like rolling alp and coulee rising and falling, but this kind of rising and falling presents periodical changes, because there is certain intrinsic link between petroleum price and major influencing factors (production capacity of OPEC, operating rate, world average Gross Domestic Product (GDP), price of coal, price of natural gas, demand of petroleum, expenditure coefficient, balance between supply and demand of OPEC, productivity of non-OPEC, balance between supply and demand of non-OPEC Ministry of Energy and Petroleum 2013, November.

The first problem is that the interpretation of crude oil as an intermediate input in the value added production function is questionable if we think of oil as an imported commodity. Under standard assumptions, imported oil enters the production function of domestic gross output, but it does not enter the production function of domestic value added (Chan *et al.*,2013). Since gross output is separable in value added and imported energy, holding capital and labor fixed, oil price shocks do not move value added. Hence, oil price shocks by definition cannot be interpreted as productivity shocks for real GDP (Nasarullah & Raja, 2014). Rather they affect the domestic economy by changing domestic capital and labor inputs. The second problem is that, to the extent that oil prices affect domestic output, under standard assumptions their impact should be bounded by the cost share of oil in domestic production, which is known to be very small. For example, for the United States, the ratio of imported and domestically produced crude oil in GDP has been fluctuating between 1 and 5 percent (Giovanni & Vinzi, 2012). Thus, if oil price shocks are viewed as cost shocks for the oil-importing economy, their effect by construction

cannot be very large. According to Bartlomiejczuk (2015).), standard production based general equilibrium models of the transmission of oil price shocks are not capable of explaining large fluctuations in real GDP (Sople, 2012).

As the vertical integration in the industry began to break down in the 1960s, transaction prices at each stage in the supply chain, and in each global refining and trading center, gradually became known and published (Geisler & Wickramasinghe, 2015). As with any fungible commodity, arbitrage ensured that the quality- adjusted price of a liter of gasoline or any other petroleum product in one center differed from that in another by only slightly more than the marginal cost of transport. More recently, long-term contracts gave way to contracts where prices are typically based on spot international reference prices at the time of purchase (British Petroleum, 2013).Eight have price control, including all five West African countries (Baumeister et al., 2013).

hey use different variations of an import parity structure with international spot reference prices, market marine freight rates, and the dollar-local currency exchange rates as the three key short-term adjustment parameters (CIMA, 2014). A system of price control consists of two basic elements: The price buildup structure, starting with import-parity landed costs and adding storage, transportation, margins, and other costs; The adjustment mechanism comprising short-term adjustment parameters, and the frequency of and the trigger for adjusting prices With the exception of Malawi, the countries with price control adjust prices monthly. Malawi has a price stabilization fund and has no pre-set automatic adjustment frequency. The stabilization fund ran up a large deficit in 2008. Only in Botswana, Senegal, and South Africa is the price adjustment automatic, based on pre-established administrative procedures (Silva, 2013).

In Burkina Faso, Côte d'Ivoire, Mali, and Niger, in spite of having pre-established procedures, ad-hoc interventions occur in each adjustment. Pan-territorial pricing by definition means that true costs are not reflected in market prices, and reduces

incentives to minimize costs because offering lower prices by improving supply efficiency is not an option. In Mali, for example, prices are maintained uniform through tax differentiation. Fuels obtained in the lowest-cost manner are taxed most heavily, and conversely highest-cost fuels are taxed the least. This means that cost savings cannot be passed onto consumers, and a firm cannot lower prices in the hope of expanding its market share. According to Chadha and Gagandeep (2013), in West Africa, for the most part, the prices are maintained uniform throughout each country. The only minor exception is Burkina Faso which adjusts ex-depot prices at Ouagadougou (Bingo depot) and Bobo-Dioulasso, and has two sets of prices depending on the location. The countries with sector liberalization have regional price variations established by the market. One exception is Madagascar where the logistics operator Société Logistique Pétrolière S*A*, a private firm that owns and controls all terminals and depots provides a common "postage stamp" ex-depot price from all the depots in the country. Such a setup is unlikely to lead to a strong drive to increase efficiency and reduce cost (Ghanbari, 2014).

A recent review of developing country governments' response to the oil price volatility of the past two years showed that, against the severe price rises of 2007 and 2008, few governments were able to withstand the pressure to use or increase fiscal measures to lower prices (Salavasidis, 2012). As a result, some countries that moved to automatic price adjustment mechanisms years ago suspended price adjustment and bore financial losses. In West Africa, four of the five study countries engaged in price smoothing during the run-up in international prices from 2007 through mid-2008. Only Senegal maintained a consistent automatic adjustment process (Alquist et al., 2013). The adjustment timing and process steps to be taken every four weeks are defined in the 1998 sector restructuring legislation and have been rigorously followed. The other four countries, Burkina Faso, Côte d'Ivoire, Mali, and Niger, suspended automatic price adjustment based on a clearly defined import parity structure. Price stabilization was achieved through large fuel tax reductions (resulting in a loss of government revenue) or making the state supply company bears the financial losses. An added positive element in Senegal's pricing regime is the

provision built into the legislation for a regular review of longer-term adjustment parameters such as distributor and retail margins (Geisler & Wickramasinghe, 2015).

According to Ghana Exploration and Production Forum (2013), four countries still rely on an ad-hoc approach to such adjustments three principal price components: Landed cost including cost, insurance, and freight, which covers the Free on Board (FOB) price at the port from which the petroleum product is imported, marine freight and all freight/cargo-related costs, evaporation and other losses en route, and port fees to land the product in the pertinent receiving port, or, in countries with price control, hypothetical import-parity price corresponding to the landed cost used to calculate retail prices; Government take (referred to as tax hereafter), which includes all taxes, duties, and government fees that are incurred in the supply chain that go to the treasury or to earmarked funds; Oil industry component, which covers all gross margins for storage, inland bulk transport, local delivery, wholesale, and retail distribution (Grimsley, 2016). The difference between the retail selling price and the sum of the landed cost and government take represents the gross margin component available to the downstream petroleum industry. In markets where prices are liberalized, this number is derived by difference and is the least accurate of the three components (Hoejmose, Brammer, & Millington, 2012).

Figure 2: The Petroleum Value Chain (Moore, 2005)

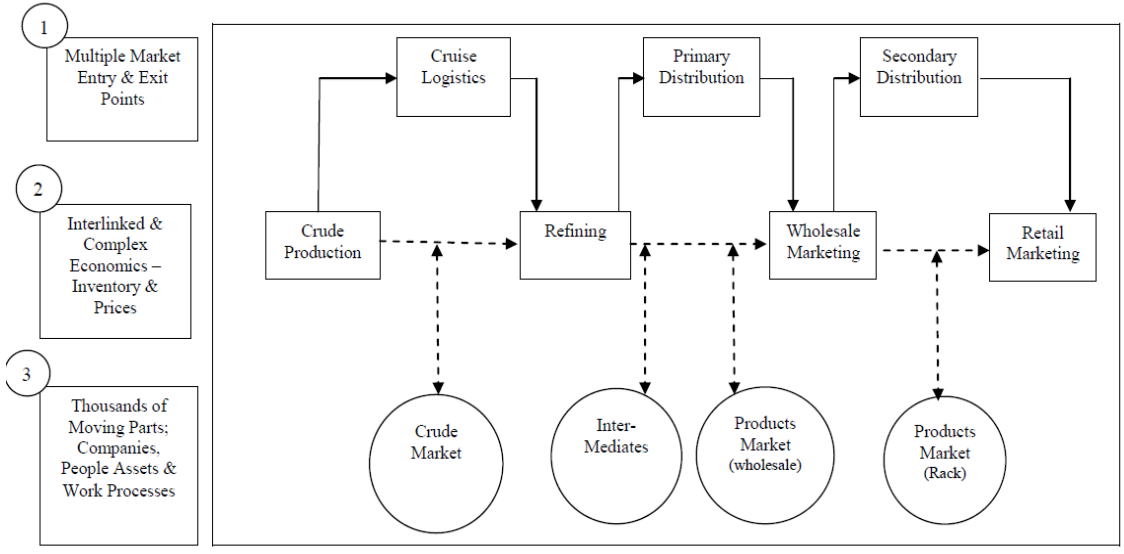

Figure 2.4 The Petroleum Value chain (Adopted from Moore, 2005)

Moore (2005) noted that when preparing for a petroleum value chain, the founder needs to ask herself some questions to guide the process. A set of such questions are in appendix III**.**

2.4.4 Tendering Systems

Procurement encompasses the whole process of acquiring property and/or services. It begins when an agency has identified a need and decided on its procurement requirement. Procurement continues through the processes of risk assessment, seeking and evaluating alternative solutions, contract award, delivery of and payment for the property and/or services and, where relevant, the ongoing management of a contract and consideration of options related to the contract. Procurement also extends to the ultimate disposal of property at the end of its useful life (Davis, 2014).

Sound public procurement policies and practices are among the essential elements of good governance (Hoejmose et al., 2012). Furthermore, according to Giovanni and Vinzi (2012), noted that the irregular procurement activities in public institutions provide the biggest loophole through which public resources are misappropriated. According to Lin (2013), the basic principles of good procurement practice include accountability, where effective mechanisms must be in place in order to enable procuring entities spend the limited resources carefully, knowing clearly that they are accountable to members of the public; competitive supply, which requires the procurement be carried out by competition unless there are convincing reasons

for single sourcing; and consistency, which emphasizes the equal treatment of all bidders irrespective of race, nationality or political affiliation. According to Mirhedayatian *et al*... (2013), process should also uphold integrity by ensuring that there are no malpractices; informed decision-making, which requires public bodies to base decisions on accurate information and ensure that all requirements are being met. More still, the Procurement practice should be responsive to aspirations, expectations and needs of the target society. Finally, there is need for transparency to enhance openness and clarity on procurement policy and its delivery (Davis, 2014).

As the world economy recovers and demand for oil rebounds, the oil market may go through another cycle of price shocks. It is therefore important that the four West African countries that engaged in ad-hoc price stabilization schemes during the 2007 to 2008 price run-up define more clearly the rules beforehand to mitigate the impact on the state companies or the national treasury. In Mali, equalization of prices of fuels obtained from different sources through differential taxation substantially reduces the incentives to minimize costs. Other means that do not interfere as much with market incentives are useful to consider. The size of the South African market is sufficiently large so that the country should be able to dismantle its price control, liberalize oil product supply, and achieve effective competition (Mirhedayatian et al., 2013).

Crude oil traded in world markets is priced in dollars. This fact has important implications for the relationship between the value of the dollar and the price of oil because oil importers who do not use the dollar as currency must, in effect, obtain dollars to purchase oil (Bartlomiejczuk, 2015). Thus, if the value of the dollar changes, the price they pay in terms of their own currencies will change. For similar reasons, oil exporters will also not be indifferent to fluctuations in the value of the dollar. To understand the way in which a change in the value of the dollar affects the price of oil, consider how they work (Davis, 2014). Assume that the curve labeled do represents the demand for oil by the oil importers and the curve labeled so represents oil supply. The world market for oil is then at equilibrium when the price of oil is $Po per barrel. Now suppose that

the dollar falls in value against the currencies of other oil-importing nations and against the currencies of the oil exporters. If the dollar price of oil remains unchanged, the other oil importing countries will find that the price of oil in terms of their own currencies has declined (Billy et al., 2013). Consequently, their consumption of oil will go up. In terms of the diagram, the demand curve for oil will shift to the right. It is worth pointing out that this increase in demand at an unchanged dollar price occurs only because oil is priced in dollars. If oil were priced in yen, for instance, a decrease in the value of the dollar would actually lead to a decrease in the U.S. demand for oil. The demand for oil by other oil-importing countries would not be affected (Salavasidis, 2012).

change in the value of the dollar affects the supply of oil as well. If the dollar falls, oil exporters will discover that the price of oil in terms of their own currencies has declined. Consequently there will be a contraction in the quantity of oil supplied at the prevailing dollar price (Grimsley, 2016). There are, of course, other factors that determine the price of oil. The ability of the members of OPEC to act in concert was the primary reason that oil prices approximately tripled in both 1973 and in 1979. The preceding discussion is not meant to deny a role to OPEC, but to point out a role for the dollar (Silva, 2013).

For instance, it is difficult to believe that OPEC does not take the value of the dollar into account when setting the dollar price of oil. The discussion above has shown how changes in the value of the dollar affect the price of oil. While we have not discussed what factors influence the value of the dollar itself, this should not be taken to imply that the dollar is immune to developments in the U. S. and the rest of the world (Davis, 2014). In fact, the dollar reacts to factors such as differences in the rate of inflation between the U.S. and the rest of the world, interest rate differentials, and shocks to productivity. For example, many economists contend that an important reason for the depreciation of the dollar during the two periods 1971-72 and 1978-79 was the relatively loose monetary policy being followed by the U.S. during those years (Kim et al.,2015).

The results demonstrating that changes in the exchange rate have a substantial effect on the price of oil have, in turn, important implications for studies that attempt to estimate the impact of oil supply shocks on the V.S. economy. They imply, first, that studies that omit exchange rates will mis-measure the impact that oil supply shocks have on the economy since some of the impact of exchange rate changes will be attributed to oil price changes. Second, they imply that it is incorrect to use changes in the price of oil as a measure of the underlying supply shock because some of these price changes are caused by other factors (Salavasidis, 2012). Thus, studies that attempt to analyze the effects of oil supply shocks must first isolate the component of oil price changes that is not due to these factors. Before proceeding to an empirical examination of these issues, we review the channels through which a shock to the supply of oil will affect the economy. The smaller impact is due to unpredictable exchange rate changes, captured in the line labeled "Pure Forecast plus Exchange Rate." This outcome supports our contention that omitting the exchange rate will cause the effect of exchange rate changes to be attributed to changes in the price of oil (Mohali & Panchkula, 2012).

According to Gist (2013) acknowledged that the study founding were true that the foreign exchange risk is the second most significant exposure to oil companies after fluctuation in global crude oil prices and therefore most of the companies find it as an important risk to manage. US Dollar is the currency to which all the oil companies are mostly exposed because importation costs are settled in this currency. It was established that all the companies practice internal hedging techniques while only 35% of the companies used external hedging techniques (derivatives). The study noted that the internal hedging technique of changing the currency of billing was the mostly used technique by the oil companies while use of forward contracts is most frequently used derivative. As a recommendation, oil companies should enhance their foreign exchange risk management practices by increasing the use of derivatives (Salavasidis, 2012).

Information about the downstream sector about prices and price structure, sources and volumes of imports, differences between domestic and international prices, and companies operating in the country is not readily available in many study

countries. One of the most important roles of government is to collect and make market information available, to inform both suppliers and purchasers. If the public is well informed, it becomes more difficult to ignore sector inefficiencies (Mohali & Panchkula, 2012). The policies in Tanzania provide up-to-date detailed prices throughout the country twice a month on its Web site. Where charges of price collusion and pressure on government to re-introduce price control are made, as in Kenya, it would be useful to have historical price information available to the public so that perceptions can be checked against actual price trends. Historical prices in countries where prices are not controlled require price surveys and can be resource-intensive to collect. But the government agency in charge of the sector can begin by collecting price information in the capital city, building a database, and, in due course (Weil, 2014).

Assessment of procurement procedures such as the Open Tender System in Kenya; port clearance procedures, particularly in Tanzania; and performance by monopoly suppliers in Burkina Faso, Côte d'Ivoire, Madagascar, and Niger may find less costly alternatives. Where price control is in effect, identifying aspects that reduce the incentive to minimize costs and substituting them with alternatives that distort the market less could enhance efficiency. South Africa, which is a large market, may benefit from more competition and less price regulation. A clearly defined and stable legal framework that takes into account lessons learned from national and international experience, along with effective monitoring and enforcement of the laws and regulations in effect, is important to create a level playing field and foster effective competition (Ghanbari, 2014).

The situation in the 12 study countries is mixed. With the exception of Senegal, the remaining four countries in West Africa need much work to strengthen their legal and institutional frameworks (Davis, 2014). The four countries have not modernized their legal framework in decades and rely on disparate texts from French colonial times. Their institutional setup also largely reflects the old French system, with the sector licensing and pricing reporting through each ministry of commerce, while the

equivalent of an energy ministry is mandated to deal with such technical issues as petroleum product quality and the mechanical integrity and safety of Installations (Silva, 2013).

Throughout the West African region, monitoring and enforcement of the regulations in effect are weak. Mali has made some progress with customs surveillance using a contracted inspection firm. Senegal has an updated legal framework and specialized regulatory institution, but has not yet developed effective enforcement (Grimsley, 2016). A frequently encountered deterrent to developing a comprehensive legal framework and centralized, specialized regulatory and enforcement institutions is the presence of a strong state company, dominating a major segment of the sector. The state entity all too often ends up regulating itself and, in some instances, other commercial operators. The seven countries in East and Southern Africa have established reasonably good legal and institutional frameworks, but oversight and enforcement are weak except in Botswana and South Africa. The remaining five countries need to strengthen their regulatory and institutional capacity. They have limited resources to afford the necessary structures required to achieve efficient pricing. Tanzania's EWURA appears to be doing a good job. It is the only regulator in East Africa that regularly makes available on its Web site; indicative retail prices and price ceilings for gasoline, kerosene, and diesel by location; and; wholesale prices (Creswell, 2014).

Its 2008 annual report provides detailed statistics about product quality test results, the number of operators and installations, capacities and physical conditions of the installations, import statistics, and monthly international and domestic retail prices British Petroleum (2013).An example of downstream oil sector legal texts that require review is fuel quality. On the books, Madagascar appears to retain a grade of leaded gasoline with a research octane number of 87 and with a maximum lead content of 0.30 grams per liter (Catapan, Colauto & Barros, 2013). Gasoline worldwide is unleaded today with a limit of 0.013 grams per liter. While gasoline in Madagascar is likely to be unleaded, aligning fuel specifications with minimally acceptable

international standards is important. The problem with fuel specifications is more serious for diesel British Petroleum (Grimsley, 2016).

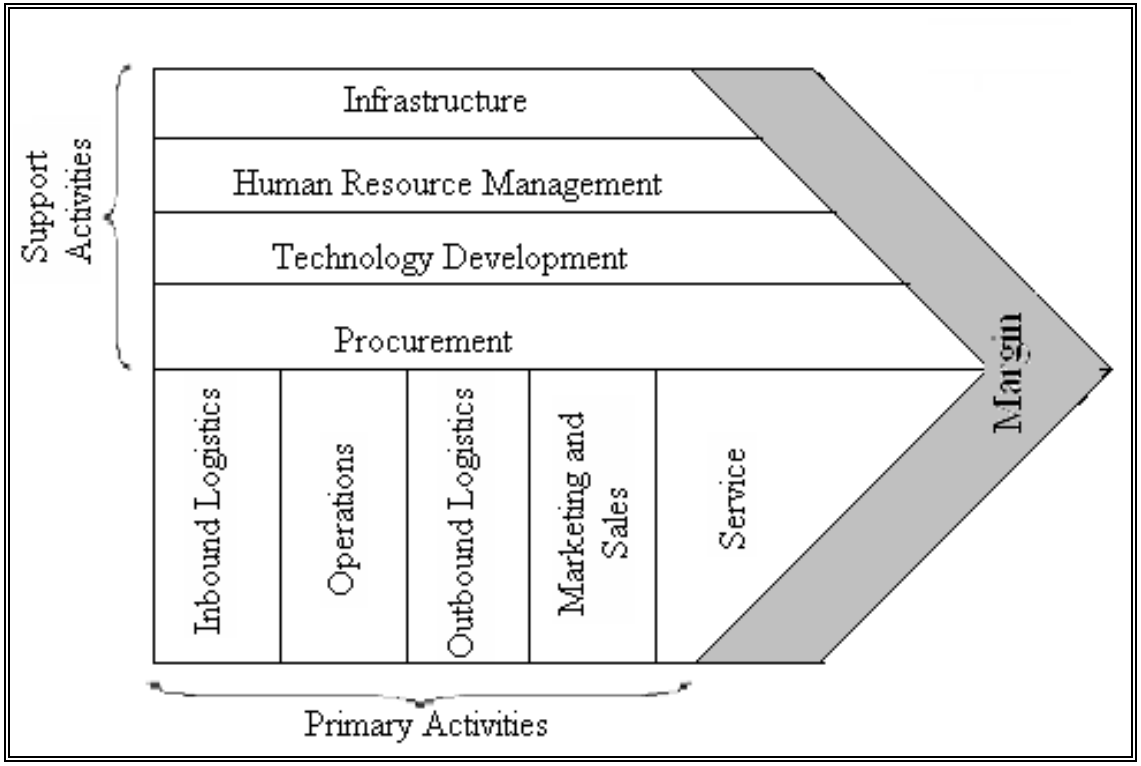

Figure 2.5 The Basic Model of Porters Value Chain (Adopted From Porter 2004)

Margin implies that an organization realizes a profit as a result of their ability to manage linkages between all activities in the value chain. The organization should be able to deliver a product/service for which the customer is willing to pay more than the sum of the costs of all activities in the value chain (U.S.EIA, 2012). Procurement, this is sourcing of and managing the

supply of the raw material to the refinery in the right time and in the right quantity. Refining: This is a complex, well planned process which involves the transformation of the crude oil into different types of derivatives based on demand forecasting (Olugu & Wong, 2012). Therefore, this has a tight link to the next stage, to the marketing activities and also involves inventory management. Distribution; Logistics management assures that the right products get delivered to the right customers in the right time preferably in a cost efficient way (Eberle, 2014). Marketing: This deals with marketing the different crude oil derivatives to the right customers. Marketing structure should have an accurate knowledge about the current inventory level and refinery activities in order to manage its sale function.

2.4.5 Legal and Regulatory Environment

The government policies was in the Kenyan market to moderated against the challenges affecting performance of supply chain systems in the petroleum industries in Kenya, to disclose the alternative hypotheses whether there are existing relationship among the independent variables; skills, information and communication technology, cost of crude oil and tendering systems and legal and regulatory with the oil companies. Grimsley (2016) observed that over the years, the oil and gas industry has continued to face growing challenges, from stricter government regulation, political risks, competition, emergent new comers and political hostilities, which has affected price hike and shortages. Due to the scramble for resources, many oil companies have been driven to explore and produce in some of the most hostile and harsh environments, which in turn tend to be extremely costly (Liu, Kasturiratne, & Moizer, 2012).

Also, there have been concerns in the industry about the growing scarcity of natural resources, which underlies fears of not being able to meet production levels and goals. However, in reality, the resources are not the cause of supply restrictions with vast potential still available due to continuous discoveries of oil reservoirs around the world (Cheng, 2014). The main

challenge facing the oil and gas industry is not the availability of oil and gas resources, but putting these reserves into production and delivering the final products to consumers at the minimum cost possible. Thus, a solid supply chain management competency program will enhance this goal, Tax analysis and revenue forecasting are of critical importance for a government in ensuring adequacy and stability in tax and expenditures policies (Chiesser, 2015).The broad function of tax policy units are: Monitoring of Revenue Collection, Evaluation of the Economic, Structural and Revenue Aspects of the Tax Policy. Tax policies have to be weighed against the following criteria: economic efficiency; economic growth; revenue adequacy; revenue stability; simplicity; and low administrative and compliance costs; Tax Expenditure Analysis; Evaluation of the Impact of Non-Tax Economic Policies and Forecasting of Future Tax Revenues. The several steps involved in the preparation of revenue forecasts are: evaluation of tax elasticity, evaluation of changes in economic conditions, and evaluation of the effect of inflation and price changes (Grimsley, 2016).

According to Olugu and Wong (2012), policies, laws and institutions that presently govern the mineral sector in Kenya need significant reform if the sector is to grow sustainably and contribute to economic development and poverty reduction in the counties. The highest priority must be given to finalizing the Geology, Mining and Mineral Bill (2013), which has remained in draft form for some years. Kenyans need a shared vision of how the development of mining will take place at the counties, building on experiences gained from Titanium mining in Kwale (Borgdorff, & Schwab, 2014). The Bill must define the role and mandate of the state and its public mining institutions, and make very clear what public institutions at the county level will exercise; what the regulatory roles are and the relationships between them; how, if at all, decentralization might apply to governance of the mineral sector; specify the environmental obligations of operators consistent with internationally recognized safeguard standards; define arrangements governing provision for community development and benefits sharing, including the roles to be played by different stakeholders; and address the rights of vulnerable groups that might be impacted adversely by mineral sector development and measures for their protection (Schrettle et al.,2013).

Oil and natural gas development faces political and environmental issues. Political issues stem from the overlapping and disputed claims of economic sovereignty. Environmental issues pertain to the preservation of animal and plant species unique to the areas where oil, gas or other minerals have been discovered, particularly Turkana and Kwale. The environmental impact of oil exploitation is a dominant driver for most technology development in the industry today. Although much of this effort is focused on waste treatment and disposal, a significant amount of waste prevention will be crucial. Development of technologies to displace less material during mining will result in reduced environmental impact (Zhu et al., 2013).
Burkina Faso, Côte d'Ivoire, Mali, and Niger retain an outdated maximum sulfur specification of 1.0 percent by weight. Senegal has a maximum specification of 0.5 percent, as do the countries in East and Southern Africa. The actual quality supplied in West Africa is generally in the range of 0.15 to 0.2 percent because the sulfur content of the crude oil used in local refining is low. However, having a high legally permissible maximum might tempt suppliers responding to open international competitive bidding, particularly those from outside the region, to exploit this lenient specification and use one or more of these countries as "dumping grounds" for high sulfur fuels Petroleum Industry (Kara, 2012).

Botswana in East and Southern Africa can be said to have reasonable to good systems. It is too early to draw conclusions about Kenya or Malawi where new regulators have very recently been established. The tables also show the results from Doing Business 2010, which tracks regulatory reforms aimed at improving the ease of doing business British Petroleum (2013). Doing Business ranks economies based on 10 indicators of business regulation that record the time and cost to meet government requirements in starting and operating a business, trading across borders, paying taxes, and closing a business; the rankings do not reflect such areas as macroeconomic policy, security, labor skills of the population, or the strength of the financial system or financial market regulations and (Greene, 2013).

While Burkina Faso, Côte d'Ivoire, Mali, and Niger need to update and strengthen their legal and regulatory frameworks. With the exception of Botswana and South Africa, the study countries suffer from weak enforcement and policing, even in those countries where a strong legal and institutional framework has been established (Grimsley, 2016). Inadequate regulations and weak enforcement allow too many oil marketing companies to operate in Kenya, Tanzania, and Uganda. This overwhelms limited enforcement capacity, making commercial malpractice an attractive way of making profits (Lin, 2013).

The remedy, in a liberalized market, is not to limit these companies by number but to ensure that the licensing criteria for operators are stringent and that compliance with rules to obtain and retain a license is enforced (Kara, 2012). One approach is to establish a separate body for inspection and enforcement, as in other developing regions such as South America, where strong, specialized, independent inspection institutions have been developed. These institutions have encouraged the formation of a cadre of private, certified inspectors, to which the enforcement institutions outsource work, minimizing their requirements for permanent staff. Senegal has already identified the need to update the legal texts developed as part of the 1998 reform, particularly in the areas of product specifications, open access, security stocks, and regulatory institution building. Lin (2013) established that Senegal plans to convert the Comité National des Hydrocarbures into a regulatory body, the Regulatory Body for Downstream Hydrocarbon Sub-Sector Activities.

An assessment of the cost-effectiveness of Kenya's Open Tender System managed by the ministry of energy, given that the volume of imports can easily justify more than one tender a month, may be useful. The Open Tender System for crude oil is linked to the requirement that all oil marketing companies process crude oil at KPRL. Consideration may be given to applying modest duty protection, for example on the order of 5 percent, to the refinery as a temporary measure and liberalize product imports, allowing competition between domestic refining and imports (Silva, 2013).

2.5 Critique of Existing Literature

It is evident that effect of managing the challenges affecting performance of supply chain systems in the petroleum companies is critically important because customer satisfaction is paramount in any petroleum industry worldwide. On the contrary however, a clear picture of effect of performance on supply chain systems has not emerged from previous studies. It was also noted; the available studies are inclined toward financial aspects such as Billy *et al*... (2013); Cheng (2014) and Giovanni and Vinzi (2012), also noted that most of the available studies are based on drilling and economic growth from developing countries in Africa. Due to paucity of research on the oil companies in Africa or Kenya, Borgdorff (2012) and Catapan *et al*...,2014), who recommended oil based companies study in this area and survey in order to develop efficacious strategies managing performance of supply chain systems.

Empirical studies of (Lin, 2013; Gray et al.,2013; Conde, Valeiras & Sanches, 2014), employed the model of customer satisfaction based on performance theory which includes managing the supply chain systems, customer satisfaction, proper forecasting and designing supply chain modeling and also improving their concerns for their partners in developing countries. The manufacturing industry in developing countries has experienced fierce competition for their product and consequently, a loss of market share. Further, the Supply-Chain Operations Reference (SCOR) provides a standard description of supply chain processes, performance metrics, best practice and enabling technologies. It offers a Comprehensive methodology to improve supply chain operations.

Literature review has established that different studies on performance of supply chain have employed different study design. In a study on performance in the petroleum industry in Nigeria Weil (2014), observed that Gasoline sales were limited to an

equivalent of 20 liters per vehicle. These steps appear to have helped avoid the large price fluctuations observed in the neighboring countries. Over the longer term, ensuring sufficient fuel stocks is an often used mechanism to protect against supply disruptions. Establishing such stocks is expensive. As a result, a plan to establish security storage capacity, even if developed, may not necessarily be implemented for lack of financing. But fuel shortages also carry economic costs. Assessing the costs and benefits of maintaining contingency stocks and deciding how large, who maintains, and who pays is important. The value of maintaining some contingency stocks is universally accepted.

Greene (2013) and Olugu (2012), employed a case study method across Africa countries and while a case study analyzes an issue in detail, it is limiting in that the study concentrates only on one industry. Similarly, Gist (2013), carried out across sectional study using quantitative methods in his study on industrial commitment in the petroleum industry in Kenya, used random sampling to identify the oil companies for the study yet random sampling is one cause of biases. Grimsley (2016), established that rummage-sale quantitative study performance in the oil companies hence leaving out the qualitative aspects which is crucial in performance studies because they give insight into senior procurement officers' opinions and give room for suggestions. The study employed cross sectional design because of the required for completion of the study and used both qualitative and quantitative methods in data collection and analysis since these methods reinforce each other.

2.5 Summary of the Literature

As evident in the literature review, challenges affecting performance of supply chain systems on was of interest to all oil companies and the ultimate customers and the government, as both parties were interested to get value from the oil product, but not partly is interested to build mutual relationship to mitigate oil shortages in Kenya. This is in line with Sakhuja and Jain (2012), who established that EOQ model emphasizes the need for strategic forecasting of inventory levels with the

enshrined assumptions, the SCOR model also on how a supply chain was performing, drill down to identify contributing factors, and quickly initiate corrective actions. The conceptual framework was developed based on these models with dependent variable being performance of supply chain systems. Where the following independent variables were used; level of skills of staff, information and communication technology, cost of crude oil, tendering systems and the moderating variable being the legal and regulatory policies.

2.6 Research Gaps

From the foregoing literature review, it is evident that studies on the challenges affecting performance of supply chain systems in the petroleum industry in Kenya are scarce and even not known. Previous studies in this area of supply chain systems are mostly from developed countries, and even the few studies available from higher education of learning in Africa are addressing the issue of oil drilling for economic growth, finance and access to finance as critical success. Others were mostly concerned with forming a cartel like the OPEC issues. Additionally, most of the studies on performance of petroleum industry are case studies from other countries and only (Kimani, 2013; Mwaniki & Moronge, 2013), incorporated one Kenyan petroleum industry, Supply Chain Management Challenges and strategic planning on the performance of petroleum firms in Kenya.

Similarly, Kimani (2013), recommended studies on performance of supply chain systems to be carried out on all registered oil companies in order to develop effective strategies to address performance. This finding is in line with Mwaniki and Moronge (2013) and Hannum (2016), who established that since technology affects competitiveness, customer satisfaction and product diversification, technological advancements should be embraced within all department of the organization in order to have a uniform outcome and common objective with expected positive outcome all over the organization .On the other hand,

available literature also revealed that, funding or access does not represent the most critical factor for establishing and managing successful performance on supply chain systems while generally funding remains necessary (Gist,2013). It is not a sufficient condition for viable supply chain systems on performance.

There was lack of strategic thinking on managing performance of supply chain systems in the petroleum industry in the following areas that has resulted to a wide research gap: lack of level of skills of staff, lack of Information and communication technology, lack of cost of crude oil, lack of tendering systems and lack of legal and regulatory policies in the petroleum industries. This is tandem with the findings of Conde *et al*... (2014); Borgdorff, and Schwab (2014), who established that this is evidenced from the supply chain management systems. While supply chain forecasting performance is essential and can affect the competency in the oil industry, from the upstream to the down streams of supply chain systems, little studies have been carried on the same in Kenyan context to fill the existing gap. This has resulted to a wide gap from government policy makers and other stakeholders who are not fully informed of the constraints which are affecting supply chain shortages in the petroleum industry in Kenya.

While it is evident from the literature implementation of both the government policy makers and the final consumers who have impact on the issues affecting performance of supply chain systems, very few studies have been carried to evaluate how effective management of performance of supply chain system can affect the oil industry and more importantly the final consumers when it comes to the issues of satisfaction. This being a company's competitive strategy and how to face its key competitors, the set of customer needs that it seeks to satisfy through its products and services (Hannum (2016; Sakhuja & Jain, 2012). This warrants a study to be conducted in Kenyan context in the oil industry to fill the existing gap.

Researchers felt that institutions were to benefit if they were to adopt supply chain management systems on performance of supply chain systems. However the research revealed that planning in oil companies is ignored as it could not lead to immediate tangle out puts and pressure to address immediate problems and a accomplish high priority tasks becomes more important likewise research advances that can contextual factor that have some considerable influence on an institution performance (Shields & Rangarjan, 2013). These factors were based on cultural between supply and ultimate customers. In this thesis the researcher recommended what was to happen in future research after investigating the supply chain phenomena in different context or circumstances. This was also related to the supply chain performance framework adopted as previous researcher used some framework that was based on different context. These factors prompted the need for this study.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the methods of the study. It describes the research design and methodological approaches used in supply chain management research and how they were employed in this study. The main objective of this study was to establish the challenges affecting performance of supply chain systems in the petroleum industry in Kenya. The chapter is organized as follows; section 3.2 discusses the study design adopted flowing from the conceptual base of the study; section 3.3 discusses the population of the study; 3.4 the sampling techniques; while 3.5 presents the methodology of data collection and the research instruments used and finally, the data analysis methods and tools are discussed under 3.6.

3.2 Research Design

The aim of the study was to assess the challenges affecting performance of supply chain systems in the petroleum industry in Kenya and to achieve this, survey research design was employed. A survey was an attempt to collect data from respondents who are members of a population in order to determine the current status of that population with respect to one or more variables (Silva,2013).It is appropriate where large population are involved which are geographically spread which was the case in this study. A survey design was appropriate for this study because it allows collection of data for dependent and independent variables using interview and questionnaires (Creswell, 2014). The design enabled the study to combine both qualitative and quantitative research approaches. Qualitative approaches enables collection of data form of words rather than numbers. It provides verbal descriptions rather than numerical. This finding is in line with Anderson (2013) & Hughes (2013), who established that qualitative methods can be used to gain more in depth information that, may be difficult to be conveyed

quantitatively. Quantitative approach strives for precision by focusing on items that can be counted into predetermined categories and subjected to statistical analysis (Taylor, 2014). This is in line with the findings of Zhu *et al.* (2013), who observed that the use of these two approaches reinforces each other. The research used this approach because the data collected used the main questionnaire was quantitative and was analyzed using statistics. Qualitative on the other hand involve interpretation of phenomena without depending on numerical measurement or statistical methods (Styles et al., 2012). As noted in Anderson (2013), that mixed research is an approach that combines or associates both qualitative and quantitative research methods: Enables mutual corroboration each other via the use of multiple sources of collecting data, contextualizes the analysis by providing richer details and initiates new lines of thinking through attention and surprises, turning ideas around and providing fresh insights.

It serves a variety of research objectives such as descriptive of phenomenon or characteristics associated with a subject population, estimates of proportions of population that have these characteristics and discovery of associations among different variables (Creswell, 2014). The study explored the actual position of fuel shortages and the effect of performance on supply chain systems in Kenya leading to unpredicted forecasting the oil industry. In trying to investigate the effect of the independent variables on the dependent variable, the study did not manipulate the level of skills of staff, Information and communication technology, cost of crude oil, tendering systems, and performance of supply chain systems; the independent and dependent variables. They had already occurred. Interviews for the senior procurement officer and interviews on how their competent staffs perform their duties provided qualitative data. The approaches was used successfully in a study on ‘’The competent staffs in the area of crude oil on how it effects of performance of Argentina organization (Kara, 2012’’.A study on Rising prices of fuel on the effect of performance manufacturer of Ghana (Wil, 2014).A study on Three skills affecting performance on supply chain systems of Indonesia ‘’ also used the two approaches successfully.

3.2.1 Research Philosophy

A research Philosophy is a belief about the way in which data about a phenomenon should be gathered, analyzed and used. There are two major research philosophies have been identified in the western tradition of science, namely positivist such as building scientific philosophy and Phenomenology such as explore theory (Merleau-ponty, 2012). The belief that science sometimes incorporates new ideas that are discontinuous from old ones; the belief that science involves the idea of the unity of science, that there is, underlying the various scientific disciplines, basically one science about one real world. The belief that the science is nature and nature is science and out of that all theories and postulates get evolved and applied (Chiesser, 2015). Positivist philosophy is considered relevant in understanding the challenges affects positivist on performance of supply chain systems in the petroleum industry in Kenya and hence provides the philosophical background for this study. According to Friedman (1956, 1957), Positivism believe that reality is stable and can be observed and described from an objective viewpoint, without interfering with the phenomenon being studied. The belief that science is markedly cumulative; The belief that science is predominantly transcultural; The belief that science rests on specific results that are dissociated from the personality and social position of the investigator; The belief that science contains theories or research traditions that are largely commensurable; The belief that science sometimes incorporates new ideas that are discontinuous from old ones; The over-riding concern for any research is to ensure that the research should be both relevant to the research hypothesis (Topal, 2014).

Positivism is a philosophy of science based on the view that information derived from logical and mathematical treatments and reports of sensory experience is the exclusive source of all authoritative knowledge, and that there is valid knowledge (truth) only in scientific knowledge. According to Gist (2013), substantiated data received from the senses are known as empirical evidence. This view holds that society, like the physical world, operates according to general laws. Introspective and intuitive knowledge is rejected. Although the positivist approach has been a recurrent theme in the history of Western thought, the modern sense of the approach was developed by the philosopher and founding sociologist Auguste Comte in the early 19th century. Comte argued that, much as the physical world operates according to gravity and other absolute laws, so also does society. In view of this, the intent of the researcher believes that a positivist philosophy was required for this purpose; where the researcher uses the old and new knowledge of science to bridge the existing gap (Zhu et al., 2013).

3.3 Population of the Study

Population in this study was the larger group from which the sample was taken. The targeted population for this study was 73 registered oil companies in Kenya. According to Barnat (2015), population, is the entire group of individuals, events or objects having common observable characteristics. This was our unit of observation. They comprised all 73 senior procurement officers. For this study, our unit of analysis comprised all the senior procurement officers from the seventy three registered oil companies in Kenya by June 2014. Newly registered oil companies were not involved since they had not acquired the necessary requisite to respond to professional issues.

3.4 Sample and Sampling Techniques

A census survey was conducted to all the registered 73 oil companies. This was our unit of analysis. This involved all heads of procurement in all the registered oil companies, which finally resulted to our unit of observation. The study carried censuses

survey to all the 73 registered oil companies as per ERC records. Where, all the respondents were requested to indicate the price of fuel for the period between July 2014 and January 2015. Mohamed, Rahman and Aziz (2014),a census with population of 100 per cent response rate has an advantage over a sample in that there are no concerns as to whether the people who take part are representative of the population. Total population sampling is a type of purposive sampling technique where you choose to examine the entire population that have a particular set of characteristics such as specific experience, knowledge, skills, exposure to an event. In such cases, the entire population is often chosen because the size of the population that has the particular set of characteristics that you are interest in is very small (Topal, 2014).

3.5 Instruments

This section outlines the questionnaires which were administered to the respondents while collecting primary data using questionnaire. Primary data was collected by the using of structured and semi-structured questionnaire that captured the various variables of the study. The questionnaire was designed to address specific objectives; test hypothesis (Frezatti et al., 2014). A questionnaire with closed and open ended questions was administered to all heads of procurement in all the Oil companies who participated in this study. The open ended items gave true information which minimized information biasness and also facilitate data analysis (Hou et al.,2014). Chiesser (2015), open ended items were used because they gave respondents freedom to express their views or opinion and also to make prudent decisions

The Administration of Research Instruments

Research assistants were thoroughly trained both in interpretations of responses from respondents and also in the procedure of administration. They then accompanied the researcher in piloting and modifying the research instruments so that they could

comprehend fully the purposes and methods of data collection. Flatworld Solutions Research. (2015) the research assistants administered the questionnaires personally to the respondents. They also asked investigative questions where the answers from the respondents were not clear. They also entered responses from the respondents in the questionnaire. The researcher made observations on the behaviour of the respondents concerning the variables of the study.

According to Mohamed *et al...* (2014), Pilot testing involves conducting a preliminary test of data collection tools and procedures to identify and eliminate problems, allowing programs to make corrective changes or adjustments before actually collecting data from the target population. The suitability of the questionnaire for this study was tested by first administering it on 73 heads of procurement, the total number of respondents. They were asked to evaluate the questions for relevance, comprehension, meaning and clarity. Pilot test enables the researcher to ascertain the validity and reliability of the instrument. A typical pilot test involves administering instruments to a small group of individuals that has similar characteristics to the target population, and in a manner that simulates how data was collected when the instruments are administered to the target population (Sidola, Kumar & Kumar, 2012).

3.6 Data Collection Procedure

The researcher obtained an introduction letter from the University and a permit from Energy Regulatory Commission of Kenya (ERC). Permission to collect data was sought to collect information from all registered oil companies. This is consistent with the findings of Muhammad (2013), who established that this was followed by recruitment of research assistants whom has competency in data collection. The research assistants dropped and picked questionnaire during data collection. The respondents were given a one week to fill the questionnaires, and then the filled questionnaires were collected. However, the period was to be extended if the respondents failed to return the filled questionnaire at the stipulated time. This

method is appropriate considering the length of the questionnaire, the availability of the respondents and the geographical dispersion of the sample selected (Cheng, 2014).

3.6.1 Questionnaires

The main research instrument that was used in this study was the set of questionnaires. In developing the questionnaire items, both closed ended and open ended formats of the item were used. This format was used in all categories of the questionnaires. However, in the fixed choice item, it involved 'putting words' in the respondents' mouth, especially when providing acceptable answers, there was temptation to avoid serious thinking on the part of the respondent. These results tally with the findings of Topal (2014), who observed that the respondent ended up choosing the easiest alternative and provided fewer opportunities for self-expression. It is because of these reasons that it was necessary to combine this format of items with open–ended response items to attract qualitative responses which gave the study in-depth feelings and perceptions of the respondents. The closed-ended items adopted local structure but not likert scale. The interviewer used survey questions to deeply probe the relationship between the variables under study. Chadha and Gagandeep (2013) renowned that, survey questions address each research question satisfactorily and meet each objective.

3.7 Pilot study

Validity refers to the extent to which a test measures what was actually intended to be measured. It is based on the adequacy with which the items in an instrument measure the attributes of the study (Lin, 2013). Pilot test was administered to 10 of the respondents which enabled the researcher to test the instruments for validity and reliability, and where necessary to make an

adjustment before the actual circulation questionnaires to other respondents. The following measures were taken to ensure the research instruments yielded valid data.

3.7.1 Reliability

Reliability is the extent to which a measurement of an instrument or procedure yields the same results on repeated trials (Garanina, 2014).. Without reliable measures, scientists cannot build or test theory, and therefore cannot develop productive and efficient procedures for improving human wellbeing Validity and reliability reflect the quality of the research design and its administration. Billy Gray *et al*... (2013), reliability is chiefly concerned with making sure the method of data gathering leads to consistent results. The reliability coefficient (alpha) can range from 0 to 1, where 0 representing an instrument with full of error and 1 representing total absence of error. A reliability coefficient (alpha) of .70 or higher is considered acceptable reliability. The instrument to be chosen to produce a measurement of variable (s) must be proven to be reliable and valid. Higher alpha coefficient value means there is consistency among the items measuring the concept of interest. According to Frezatti et al, (2014), as a rule of thumb acceptable alpha should be at least 0.70 or above. Cronbach's alpha is a general form of the Kunder-Richardson (K-R) 20 formula derived as follows:

$$KR_{20} = \frac{(K)\,(S^2 - \sum_s{}^{2})}{(S^2)\,(K-1)}$$

Where; KR_{20} = Reliability coefficient of internal consistency, K= Number of items used to measure the concept, S^{2}= Variance of all scores, s2 = Variance of individual items. The Cronbach's alpha for all the variables were above 0.70 and hence the questionnaires was therefore considered reliable.

3.7.2 Validity

According to Cheng (2014), validity is the extent to which an instrument measures what it is supposed to measure and performs as it is designed to perform. Validation involves collecting and analyzing data to assess the accuracy of an instrument. There are numerous statistical tests and measures to assess the validity of quantitative instruments, which generally involves pilot testing. But basically validity boils down to whether the research is really measuring what it claims to be measuring (Chadha & Gagandeep, 2013).

3.8 Data Processing and Presentation

Since the study was both quantitative and qualitative in nature, both descriptive statistics and inferential statistic was employed. Inferential or statistical induction means the use of statistics to make inferences concerning some unknown aspects of a population from a sample of the population. Taylor (2014), the intent is to give estimation or it gives prediction after taking a sample of the needed population. Once data is collected it's checked for completeness. The data from the field will be then coded first according to themes research methinks on the study. This finding is in line with Cheng (2014), who observed that analysis was done with the aid of the statistical package of social science (SPSS) using version 22 which is an America association with certainty of the result statistical mode required.

Inferential Statistics Analysis

Inferential data analysis was done using Pearson Correlation Coefficient, regression analysis through enter method and multiple regression analysis through stepwise method. This finding is in line with Maheshwarkar and Sohani (2013), who observed that in many statistical methods in particular parametric measures one presumes a normal distribution of variables. Therefore, for the purposes of using parametric statistics as such as Pearson Correlation and regression analysis, normal distribution of variables is needed; hence the variable was internally standardized. However the regression analysis equation is given for standardized and unstandardized Coefficient (Taylor, 2014).

Correlation Analysis

According to Chadha and Gagandeep (2013), correlation technique is used to analyze the degree of relationship between two variables. The computation of a correlation coefficient yields a statistical that ranges from -1 to +1.This statistical is called correlation coefficient (r) which will indicate the relationship between the two variables being compared. This relationship is vital as +1 means that there is a positive relationship between two variables or when one variable increase the other also increases, while -1 implied that when ones variable decrease the other also decreases (Fowler,2014). If there is no relationship existing in the coefficient is equal to zero. Pearson's product moment correlation coefficient was to determine the strength and the direction of the relationship between dependent variable and independent variable. This was carried among the 73 companies. In this research the researcher carried for each oil companies in Kenya. The hypothesis used as follows:

H_2 : pxy =0

H_1 : p_{xy} = ±

The analysis using Pearson's product- moment correlation was based on the assumptions that data was normally being distributed and also because the variables were continues (Ghanbari, 2014).

Multiple Regressions Analysis

Multiple regressions is an extension of simple linear regression. It is used when we want to predict the value of a variable based on the value of two or more other variables. According to Cheng (2014) and The Federation of American Societies for Experimental Biology (2014), the variable we wanted to predict was called the dependent variable (or sometimes, the outcome, target or criterion variable). The variables we used to predict the value of the dependent variable was called the independent variables (or sometimes, the predictor, explanatory or regress or variables).

According to Hou, *et al*... (2014), multiple regressions also allow you to determine the overall fit such as the variance explained of the model and the relative contribution of each of the predictors to the total variance explained. For example, you might want to know how much of the variation in oil performance can be explained by revision time, test anxiety, customer satisfaction and gender's response "as a whole", but also the "relative contribution" of each independent variable in explaining the variance.

Statistical Measurement Model

According to Topal (2014), a multiple regression model has one dependent and more than one independent variable; hence it has the following format of computation:

$Y=\beta_0 +\beta_1 X_1 +\beta_2 X_2 +\beta_3 X_3 +\beta_4 X_4+\beta_z Z +\beta_{1z} X_1 Z +\beta_{2z} X_2 Z +\beta_{3z} X_3 Z+\beta_{4z} X_4 Z +\varepsilon$

Where

Y is the dependent variable, supply chain competency,

β_0 is the constant

β_1 is the coefficient of X_1 for í =1,2,3,4,…..

X_1 is the level of skills

X_2 is the information and communication technology

X_3 is crude oil price

X_4 is the Tendering systems

Z = the hypothesized moderator (supply chain performance of oil companies)

B_i z is the coefficient of Xí Z the interaction term between competency and each of the independent variables for í =1, 2, 3, 4

ε - is the error

The null hypothesis for interaction is $H_{0:}$ $\beta íz$ =0. Rejecting the null hypothesis that the coefficient of the product term $\beta íz$ =0 indicates the presence of moderating or interaction effect.

Moderating Effect Analysis

A moderating is a variable that affects the direction and strength of the relationship between an independent or predictor variables and a dependent criterion variable. This variable may reduce or enhance the direction of the relationship between a predictor variable and a dependent variable, or it may change the direction of the relationship between the two variables from positive to negative. A moderator was supported if the interaction of predictor and moderator on the outcome of the variable is significant (Saad et al.,2013).

The study used multiple regressions analysis (stepwise method) to establish the moderating effect of competency on the relationship between independent variable and dependent variable. Competency was measured as follows: 0=below 40% and 1=40% and above and responsiveness will be measured as follows: (0=Below PhD and 1=PhD).

Qualitative data: Data frequency distribution and cross tabulation was used in describing and explaining the situation as it is in the companies. Data was coded and analyzed simultaneously as collected. Through content coding, a list of key ideas and themes for each variable was generated and this guided the nature of integration needed for both qualitative and quantitative data collected. Views and ideas that were frequently expressed were noted. This formed the basis for cross checking and comparing the two sets of data and drawing of conclusions. Data was then operationalized through scoring for cross checking with the quantitative data.

Quantitative data: Data was analyzed using descriptive statistics; measures of central tendency, measures of dispersion and measures of symmetry and inferential statistics. Scatter plots were used to show if the relationships wear linear. SPSS software version 22 was used as a statistical tool for analysis. Linear regression analysis showed the correlation and strength of the relationship between variables both independent and dependent and the effect of the intervening variables on each relationship. Multiple regression analysis was thereafter conducted to test the overall effect on the study model (Kara, 2012). Analysis of Variance (ANOVA) was also to test the goodness of fit of the regression models and finally to test the hypothesis of the multiple regression models.

Data Presentation: The information was presented using a combination of statistical techniques and graphical techniques. Statistical techniques include: frequency distribution for grouped and ungrouped data, measures of central tendency; mean, median and mode to present characteristics that determine performance of supply chain systems; measures of dispersion these include range, variance, deviation ,coefficient of variability and percentiles. Graphical representations: This is presenting grouped data diagrammatically, the most common from being histograms, and polygon. At a glance once is able to make conclusions about the study (Yang et al., 2013).

Operationalize and Measurement of Variables;

Performance: This is the dependent variable and was measured using two dimensions competency to have buffer stock to satisfy ultimate clients with the ability of monitoring the re-order levels and replenishment of stock at the right time and competency of proper control and placing orders will be combined to measure the same indicators, such as the 5Rs right quality, quantity, price, time and source (Zhu et al., 2013). The four items will be aggregated to capture competency of oil companies in the supply chain. The researcher used structured and semi-structured questionnaire. These dimensions and combining of the items was successfully used in this study on ‘’It has been successfully been used earlier in a study of (Ossai, 2012).

Level of Skills of Staff: This is an independent variable and was used to measure the three dynamic skills i.e. technical, human and conceptual skill of all the personnel who are working in the oil industry. Why there are often oil shortages, how they are handling the customer, and at the same time placing of orders from the source. The researcher used closed and open ended questionnaire. This was measured in PART II of the questionnaire.

Information and Communication Technology: This is an independent variable and was used to measure the e- sourcing in each of the registered oil companies in Kenya. Whether the companies believe that e- transaction can bring efficiency and effectiveness, to all inbound and outbound customers. The instruments used six items to measure how technology is affecting supply chain systems on performance in the petroleum industries in Kenya. How each company has implemented E-Procurement and the number of computers they have. The researcher used structured and semi-structured questionnaire. This was measured in PART III of the questionnaire

Cost of Crude Oil: This is an independent variable and was used to measure the price of fuel from all the registered companies operating in Kenya for the period indicated in table form. The instruments had items to measure price of fuel in all the registered petrol station in Kenya and its effects on performance of supply chain systems in the petroleum industries in Kenya. What are the Causes of price rising or falling? What is the mode of transportation? The researcher used semi-structured questionnaire. This was measured in PART IV of the questionnaire.

Tendering Systems: This is an independent variable and was used to measure the types of tendering methods they embrace when replenishing stock. The instruments had six items to measure the methods of tendering within supply chain systems on performance in the petroleum industries in Kenya. Which methods do they use between open or alternative methods, when doing replenishing stock and reasons behind justifying their consensus agreement before the ward of tender. This was measured in PART V of the questionnaire.

Legal and Regulatory: This is the moderating variable and was used to measure the existing legal policies and regulation in all the oil companies and on how they affect their performance. The key moderating variables are regulations and policies. Regulations were indicated in formulated regulations and policies by the available as per ERC mission and visions. This was measured in part VI of the questionnaire. To capture holistically critical variables affecting supply chain systems, PART VI of the questionnaire asked respondents to evaluate all the variables using logic by separating the national and international registered companies (critically important).

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSION

4.1 Introduction

The study sought to establish the challenges affecting performance of supply chain systems in the petroleum industry in Kenya. Specifically, the study looked at level of skills of staff, information and communication technology, cost of crude oil and tendering systems. This chapter presents the empirical findings and results of the application of the variables using exploratory, descriptive survey and ex-post facto research design. The data from the field was then coded first according to themes research methinks on the study. This finding is in line with Cheng (2014), who observed that analysis was done with the aid of the statistical package of social science (SPSS) using version 22 which is an America association with certainty of the result statistical mode required. This chapter presents information on the findings of the study using descriptive and inferential statistics as well as the quantitative and qualitative data.

4.2 Response Rate

After circulating the questionnaires to the (73) respondents who were targeted under this study (refer target population). The response rate was 97.26 % (71). A total of 71 senior procurement officers filled and returned the questionnaires. This response rate indicates a reasonable representation of the sample and nearly the entire population. Therefore, 97.26% response rate in this study is adequate for analysis. These results echoes the findings of Taylor (2014) and Frezatti (2014), who observed that the response rate as the extent to which the final data set includes all sample members and it is calculated as the number of

people with whom interviews are completed divided by the total number of people in the entire sample, including those who refused to participate and those who were unavailable (see Table 4.1).

4.3 Personal Information

In this section the personal characteristic of the respondents are discussed as follows: The age, experience, gender and academic qualification. The purpose was to understand the educational background of the respondents under this study.

4.3.1 Gender of the Respondents

Out of the 60 (84.51%) were men and 11 (15%) were female from the sampled oil companies as provided in Table 4.1. Most of the respondents were male for this study and a few were females indicating there was wide disparity between male and females in employment of this cadre of staff in the oil companies. This finding is in line with Luthra *et al*... (2013) and Hanafi and Fatma (2015) who had observed that the results above may be attributed to the strong male domineering culture in Kenya where until recently women were relegated to domestic work. This culture is dying off and a large population of women population is now strongly competing with their male counterparts in most jobs. The cultural, customary and religious beliefs governing performance and forecasting may also have contributed to the same.

Table 4.1 Gender of the respondents

	Frequency	**Valid Percent**
Male	60	**85**
Female	11	**15**
Total	**71**	**100**

4.3.2 Age Bracket of the Respondents

From the age of respondents it show that 0.8% were between 20-24 years, 10.1% were between 25-29 years, 11.2% were between 30-34 years, 13.4% were between 35-39 years,16.1% were between 40-44 years,17.2% were between 45-49 years ,10.9% were between 50-54 years and 20.3% were over 55 years. The high response were received from 55 and above age brackets and 45-49 brackets giving 20.3% and 17.1% respectively (refer Figure 4.1).Lower responses were received from 20-24 and 25-29 age brackets as this categories mostly comprises of newly graduates who have joined the job market who are normally few. The study shows that the petroleum oil companies have all age groups representing the work force .This finding is in line with Chiesser (2015) and Mwaniki and Moronge (2013), who established that majority of workforce were over 55 years which paused a challenge of aging professoriate with no equivalent replacement at lower cadres.

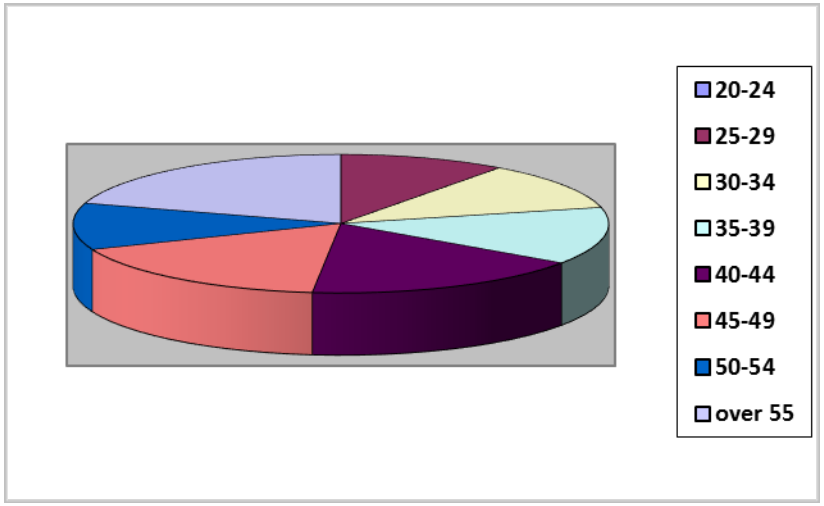

Figure 4.1 Ages of respondents

4.3.3 Academic Qualifications

The level of education was also sought in the questionnaire. Those with masters were 10% (7). About 41% (28) possessed degree, while 40% (27) hold diploma and 9% (6) were certificates holders. The findings that majority of the respondents possessed less than 1st Degree 49% indicates that the staff did not meet the requirements of providing quality services (refer Table 4.2). These findings tally with Topal (2014) and Wernet (2014), who established that the level of education influences the impartation of academic staff working in the petroleum industry. The roles of education as a change agent is indisputable, and has always been a central mechanism for transmission of skills and values for the sustenance of shortages and enhance proper forecasting of real lead time (Yang *et al.*,2013). Therefore, the fuel shortages can be attributed to the level of education of the staff (see Table 4.2).

Table 4.2 Academic qualification of the respondents

	Frequency	**Valid Percent**
Post Graduate	7	10
Bachelors	28	41
Diploma	27	40
Secondary	6	9
Total	**68**	**100**

4.4 Years of Working in Current Company

On average, the statistics from the respondents 71 of the 73 targeted population, giving a mean of 6.31 years, standard deviation of 3.51, skewness of 1.070%, standard error of skewness .285%, kurtosis of .900%, standard error of kurtosis of .566 years , minimum of 1 years and maximum of 16 years respectively (refer Table 4.3).A high percentage of 56.1% (41) had worked in their current company for less than 10 years, while 43.9% (31) had over 10 years' experience. These findings tally with Huges (2013) and Hanafi and Fatma (2015), who observed that for investments on human capital to be realized staff, should remain in a company for long period. In company set up it is reasoned that more than 10 years is ideal because below 10 years the staff may be engaged in 2nd Degree and any professional course.

Table 4.3 Years of Working in Current Company (Statistics analysis)

Valid	Missing	Std. Deviation	Skewness	Std. Error of Skewness	Kurtosis	Std. Error of Kurtosis	Minimum	Maximum
71	1 .31	3.516	1.070	.285	.900	.563	1	16

A significant percentage of 56.1% (41) had worked in the same company for less than ten years. This finding is in line with Barrow (2013) and Hanafi and Fatma (2015), who established that there is a substantial number of staff who leaves oil companies generally. According to Weil (2014), more than half of the staff leave their oil company during the first five years of their employment and this should be of great concern to the employees because it can affect performance, hence efficiency and effectiveness delivery of fuel. These findings are conjoined with Mohali and Panchkula (2012) & Petroleum Insight

(2012), who observed that technical skills are important in businesses that relate to engineering and other technical orientations. This finding is in line with Wernet (2014), who observed in his theory of management competencies view technical skills as very important to lower level managers. Entrepreneur/managers of the small and medium family enterprises mainly play both roles of top and lower level management. In his management theories Daft (2012) shows the importance of technical skills in supervising employees and notes that they are required by all levels of managers though in different degrees. He noted that technical skills include specialized knowledge, analytical ability and the competent use of tools and techniques to solve problems in that specific discipline.

Further this implies that majority were young and pointing a challenges off replacement once leaving their job. Therefore, with good management level of staff with technical skills in petroleum companies can employ professionals in the specialized departments like procurement while those in the trade stratum require good financial and management skills. With a good succession plan, these companies can positively forecasting of fuel of such companies when it arises (Saad et al., 2013).

4.5 Where they Obtained Academic Qualifications

Where they obtained their academic qualification from was also sought in the questionnaire. Those with national qualification were 90% (46). A bout 10% possessed international academic qualification. On average, only 51 respondents indicated where they had obtained their qualification from (refer Table 4.4 below). These results tally with the findings of (Lin, 2013; Taylor,2014; Mwaniki & Moronge, 2013), who established that majority of employees working in the petroleum industry had low educational background which may not have adequate introspection requisite to do competent task of doing proper forecasting of stock level which is a crucial to service delivery.

Table 4.4 Place they Obtained Academic Qualifications

	Frequency	Valid Percent
Local Training	46	90
Abroad/Overseas	5	10
Total	**51**	**100**

A significant percentage 90% (46) obtained their training locally. This is an indicative of a significant number with high number of staff acquiring skills in this area. This is in tandem with the findings of Hannum (2016) & Mwaniki and Moronge (2013), who contended that there is a substantial number of staff who acquires this training so as to execute their roles diligently in the oil companies generally. This finding is in line with Davis (2014), who observed that more than half of the staffs have petroleum trainings during the first five years of their employment and this should be of great concern to the employees because it can affect performance, hence efficiency and effectiveness delivery of fuel. Further this implies that majority of the young and old were interested in this area to mitigate any challenges thereof. A descriptive analysis by obtaining qualifications showed that the respondents were locally trained.

4.6 Your First Employer

From the results, most of the respondents 52% (24) indicates that this was their first employer and the remaining 48% (22) indicated that they had worked somewhere other than where they working currently (refer Table 4.5). The Study suggests that for investments on human capital to be realized staff should remain in a company for long period. In company set up it is

reasoned that more than 10 years is ideal because below 10 years the staff may be engaged in 2nd Degree and any professional course. This finding echoes those of Fernández-Vara (2014), Hannum (2016) and Saad *et al*... (2013), who observed that proper forecasting and efficient management is key to sound business management for employees who are satisfied by their employer,. Of all businesses that fail, seventy percent of them fail due to poor forecasting and analysis management. Forecasting management entails planning for the future of a person or a business enterprise to ensure a positive flow of goods and service. Sound financial management is one of the best ways for any business to remain profitable and solvent.

Table 4.5 Your First Employer

	Frequency	Valid Percent
Yes	24	52
No	22	48
Total	**46**	**100**

4.7 Years working in Current position

On average, A descriptive analysis by years worked in current position showed that the 71 respondents who were senior procurement officers from all the registered oil companies in Kenya and under our 73 targeted sample size, indicated mean of one year and a maximum of 15 years, finally standard deviation of 2.563 years, skewness of 1.545 years, standard error of skewness .285 years , kurtosis of 3.815 years standard error of kurtosis of .563 years , minimum of 1% and maximum of 15% respectively (refer Table 4.6). A high percentage of 71% (41) had worked in their current company for less than 10 years, while 43.9% (31) had experience over 10 years. These results tally with the findings of Barrow (2013) and Mwaniki and Moronge (2013), who observed that for investments on human capital to be realized staff should remain in a company for long period. In company set up it is reasoned that more than 10 years is ideal because below 10 years

the staff may be engaged in 2nd Degree and any professional course. A descriptive analysis by years working in their organization showed that the respondents had worked for less than ten years.

Table 4.6 Years Working in Current Position Statistics

N Valid	Msg	Mean	Std. Deviation	Skewness	Std. Error of Skewness	Kurtosis	Std. Error of Kurtosis	Minimum	Maximum
71	1	4.17	2.563	1.545	.285	3.815	.563	1	15

4.8 Competent staffs in the area of Crude Oil

From the result, most of the respondents 51% (33) don't have competent staffs in the area of crude oil and the remaining of the respondents 49% (32) indicated that they have competent staffs in the area of crude oil. On total, only 65 respondents were able to respond to this questionnaire of competent staff in their company. The figures could be higher as some respondents were only adamant that their enterprises were only private companies without giving further details. These findings are in line with Creswell (2014) and Petroleum Insight (2012), who had noted that petroleum companies have long been the backbone of worldwide natural resources and range between 65% and 80% of worldwide natural resources. Therefore, the findings of this study are representative and it can be inferred that, of all registered and unregistered oil companies in Kenya, approximately 75% are registered companies (see Table.4.7).

Table 4.7 Competent staffs in the area of Crude Oil

	Frequency	Valid Percent
Yes	32	49

No	33	51
Total	**65**	**100**

4.9 Level of Skills of Staff

From the results, those with human and conceptual skills were 99% (66) and were being ranked No.one. About 92% possessed technical skills and being ranked No. two respectively. Those with human skills are able to work with all the staff/people in their company. Respondents from the former indicated that they have technical skills meaning they have proficiency in specific activity or type of work in the oil industry and finally the rather indicated they conceptual skills meaning they have the ability to work with broad concepts and ideas. These results tally with the findings of Zhu *et al...* (2013) and Davis (2014) who had observed that lack of skills had contributed to poor performance in service delivery in the supply chain. The study sought to investigate the influence of human skills on performance of supply chain systems towards the fuel shortages in the petroleum industries in Kenya. Particularly the study focused also on technical and conceptual skills; the functions of effective and efficient management of the industries.

Table 4.8 Level of Skills of Staff

Skills	Yes	No
Human	66(99%)	1(1%)
Technical	24(92%)	2(8%)
Conceptual	66(99%)	1(1%)

From the results, those with technical skills were (99% and 99% respectively). This is in tandem with the finding of Sakhuja and Jain (2012) and Orozco, Capelleras & Vaillant, 2014), who observed that petroleum firms require professional skills as they deal with specialized products and services. The sectors are more professional oriented and the founders are professionals

in their specialized areas as opposed to trade which does not require such skills to operate. On the other hand staffs in the trade stratum do not require specialized technical skills as they deal in buying and selling.

The written response indicated that were not fully embraced by the level of staff skills in most of the petroleum industry, leading to poor forecasting, shortages and even complaints from the ultimate customers. The three-skill approach which argues that effective leadership required three skills: technical, human and conceptual skills. Technical skill refers to proficiency in a specific activity or type of work. Human skill refers to being able to work with people and conceptual skill refers to the ability to work with broad concepts and ideas. These findings are in line with Tseng and Chiu (2013) and Davis (2014), who established that although both National and International registered oil company are in business, majority 99% are not encouraging their staff to go for further studies to boast their level of skills (refer Table 4.8).

4.10 Ranking of the Three Skills

A descriptive analysis by ranking the three skills shows that a large number of respondents were human skills followed by conceptual skill and technical skills I that order of ranking as follows; with 58% (31) low, 36% (19) high and 6% (3) respectively. Where ranked it high and the remaining 6% (3) very high respectively. The technical skills was also ranked by the majority respondents 54% (7) as low,38% (5) respondent ranked it as high and the remaining 8% (1) respondents ranked it as very high. Finally majority of the respondents 56% (30) ranked Conceptual skills as high, 33% (18) of the respondents ranked it low and only 11% (6) of the respondents ranked it very high. These results tally with findings of (Orozco et al.,2014) (refer Table 4.9).

These results tallies with the findings of Salavasidis (2012) and Davis (2014), who observed that ranking of the three skills, are important in businesses firms that relate to petroleum and other technical orientations. Yang *et al.*. (2013) in his theory of skills competencies view technical skills as very important to lower level officers Procurement managers of the national and international firm mainly play both roles of top and lower level management. This finding is in line with Borgdorff, and Schwab (2014), who established the importance of technical skills in supervising employees and notes that they are required by all levels of managers though in different degrees. He noted that technical skills include specialized knowledge, analytical ability and the competent use of tools and techniques to solve problems in that specific discipline. Therefore, with good leadership staff with technical skills in petroleum industry and natural resources firm where they employ professionals in the specialized departments like procurement while those in the trade stratum require good human and conceptual skills. With a good succession plan, these staffs can positively mitigate fuel shortages of such firms after the integrating free in the global business.

Table 4.9 Ranking

Ranking	Low	High	Very High
Human skills	31(58%)	19(36%)	3(6%)
Technical skills	7(54%)	5(38%)	1(8%)
Conceptual skills	18(33%)	30(56%)	6(11%)

4. 11 Computers in the Company

From the results, most of the respondents 85% (57) indicated that their oil companies had only five computers. A bout 7 % (5) of the respondents indicated that they had between five to ten computers, also 4% (3) of the respondents indicated that

they had have between 10-15 computers, and finally the remaining 3% (2) of the respondents indicated that they don't know the exact numbers of computers (refer Table 4.10). Most of the respondents 89.91% they did not indicate whether they have any policy in place to embrace e-procurement in their company and the remaining about 10.09% indicated that they have embraced e-sourcing by customizing their systems. These are in consistent with the findings of Borgdorff, and Schwab (2014) and Davis (2014), who did a study on workers 'negotiation patterns in Lagos found out that integrated computer are the vehicles for attaining organizational goals and that with adequate networking within the supply chain systems; workers would be able to maintain good links with the management of their respective organizations.

Table 4.10 Computers in the Company

Number of computers	Frequency	Valid Percent
5	57	85
5-10	5	7
10-15	3	4
I don't know	2	3
Total	**67**	**100**

4.12 Company Embracing E-sourcing

From the results, most of the respondents 58% (39) agreed that they were embracing e-sourcing in their company, whereas 42% (28) were not (refer Table 4.11). An average number of the respondents 41% indicated that they hold 1st degree in ICT and most of the respondents 40% had certificate in ICT. These results tally with the findings of Tseng & Chiu (2013) and Hanafi and Fatma (2015), who had established that E-transaction is good since it can enhance transparency, efficient and more importantly service delivery between the upstream and downstream customers within the supply chain systems through

proactive forecasting of stock levels. This means nearly all the respondents were in agreement that e- procurement, but were not enhancing its implementation, as they preferred the old way of doing things.

Table 4.11 Company Embracing E-sourcing

	Frequency	**Valid Percent**
Yes	39	58
No	28	42
Total	**67**	**100**

4.13 Transactions Customized by E-procurement

From the results, most of the respondents 62% (40) indicated that have already customized by their company's documents towards e-procurement. A bout 38% (25) of the respondents indicated they have not customized their documentation (refer Table 4.12). This finding is in line with (Taylor, 2014).

Perception Whether ICT Affects Performance of Supply Chain Systems

Majority of the respondents 62% (40) disagreed that the ICT used by their oil companies does not influence performance, whereas 38% (25) were satisfied (see table.4.12). When asked further about the percentage of retentions occasioned by the performance, majority 62.3% (45) respondents indicated 1-25%. About 26-50%, 18.2% indicated 51-75% and only 2.8% indicated 76-100% respectively. This finding is in line with (Hanafi & Fatma 2015).

Written response indicated that senior procurement officers were satisfied with the effect of ICT and how it's affecting their performance on supply chain systems. The study established that performance was not adequate in the registered oil companies. Other favourable aspects related to performance that were cited included lack of relevant skills form the staff, failure to use open tendering systems, failure to do proper forecasting of stock levels and responding to issues was slow instead of being proactive with firsthand information towards prudent decision making. These results tally with the findings of Schrettle *et al...* (2013) and Taylor (2014),who established that similar aspect such as lack of competency in decision making and failure to disseminate to ultimate customers regularly especially in this volatile world may result to dissatisfaction among the oil staff in the petroleum industries.

The responses from the senior procurement officer indicated that performance was cited as reason for performance of supply chain systems. Further they showed that staffs were not involved in ICT decision making through integrations in their company meetings resulting to fuel shortages and other short comings can be discussed. Then other Staffs will be informed thereafter the outcome through memos and circulars. These findings are in line with Mohali and Panchkula (2012) and Mwaniki, and Moronge (2013), who observed that the respondents suggested that the oil company management needs to establishes other means of involvement in decision making other than through committees systems, impartiality in treatment of employees should be practiced always, managers should listen and act promptly to staff issues, encourage more studies on the area if ICT to enhance dynamic skills especially employees of the lower cadre.

Table 4.12 Transactions Customized by E-Procurement

	Frequency	**Valid Percent**
Yes	25	38
No	40	62
Total	**65**	**100**

4.14 Motivation of Employees to Develop ICT Skills

A high percentage of 68% (42) agreed that time off can enhance their level of skill for their job performance. This tally with the analysis of respondents on academic qualifications since an average percentage (51%) possessed 1st Degree which is the main requirement for management officers. On average 16% (10) disagreed that time off cannot enhance skill of employees and a similar percentage 13% (8) disagreed that getting scholarships and attending workshop 3% (2) cannot enhance level of skills (refer Table4.13). This finding is in line with Schrettle *et al*... (2013), observed that technical skills are important in businesses that relate to engineering and other technical orientations. Creswell (2014) in their theory of management competencies view technical skills as very important to lower level managers. Entrepreneur/managers of the small and medium family enterprises mainly play both roles of top and lower level management. These findings are in line with of Dacker (2013) and Orozco *et al*... (2014), who observed the importance of technical skills in supervising employees and notes that they are required by all levels of managers though in different degrees .He noted that technical skills include specialized knowledge, analytical ability and the competent use of tools and techniques to solve problems in that specific discipline as there was Tutelage.

Most of the respondents (68%) indicated that international registered oil firm's employees possess technical skills (68%). This finding is in line with Wernet (2014), who observed that most sectors require professional skills as they deal with specialized products and services. The firm staffs are more professional oriented and the founders are professionals in their specialized areas as opposed to trade which does not require such skills to operate. On the other hand senior procurement officer the trade stratum do not require specialized technical skills as they deal in buying and selling.

Table 4.13 Motivation of Employees to Develop ICT Skills

	Frequency	Valid Percent
Time Off	42	68
Study Leave	2	3
Training Workshops	10	16
Scholarships	8	13
Total	**62**	**100**

4. 15 Effect of E-Transactions to Inbound and Outbound Customers

Most of the respondents 91% (59) agreed that e-transaction has an impact in both in-bound and out-bound logistics customers, whereas 9% (6) disagreed. This finding is in line with (Muhammad, 2013) (refer Table4.14). On their perception of the percentage of understanding resulting from e-procurement manual in the oil industry 95 % o indicated 30-35%. This echoes the findings of Taylor (2014) and Oyadomari, Lima, Pereira and Silva, (2014), who observed that given a clear networking environment and proper forecasting strategy the role of supply chain systems is to begin the process of designing, monitoring and eliminating defects towards quality service delivery and timeliness. The networking function entails making decisions about the division of efficient and effectiveness (Barnat, 2015).

Table 4.14 Effect of E-Transactions to Inbound and Outbound Customers

	Frequency	Valid Percent

Yes	59	91
No	6	9
Total	**65**	**100**

4.16 Diesel Price

From Table 4.15,substantial average number of respondents 67 were senior procurement officers from all the registered oil companies in Kenya, indicated the price for diesel between the following period July, 2014 to January, 2015, where it was noted that the minimum and the maximum price of diesel during the month of July,2014 @ ksh.80.00 ksh.116.00 respectively with standard deviation of 7.149 and a mean of ksh.100.37.67 respondents indicated that the minimum and maximum price of the same product in the month of August, 2014 @ ksh.90.00 and ksh.117.00 respectively. Where they gave mean to be ksh.101.16 and standard deviation of 4.843. 67 respondents indicated the minimum and maximum price of diesel for the month of September, 2014 as ksh.89 and Ksh.111.00 with a mean of ksh.191.24 and standard deviation of 5.565. During the month of October, 2014 67 respondents indicated the minimum and maximum price of diesel @ ksh.83.00 and ksh110.00, with mean price of ksh.100.87 and standard deviation of 6.749. This finding is in line with (Muhammad, 2013). The same number of respondents during the month of November, 2014 indicated the minimum and maximum price of diesel @ ksh.80.00 and 110.00, with mean of 99.94 and a standard deviation of 8.917. Also during the month of December, 2014, 67 respondents indicated the minimum and maximum price of diesel @ ksh.59.00 and ksh.110.00, with mean of 98.93 and standard deviation of 9.351. Finally the same number of respondents during the month of January, 2015 indicated the minimum and maximum price of diesel as ksh.80.00 and ksh.106.00 respectively and with standard deviation of 5.839).

These results tally with the findings of Oyadomari *et al*...(2014) and Luthra *et al*... (2013), who observed that fuel prices being very crucial to any business success. They also found out that the right pricing of fuel is paramount to growth of business hence an ideal to resolving most shortages problems, especially in matters concerning who would monitor pricing of petroleum, who is responsible for decisions, and how to incorporate all the stakeholders in these industry. This is in line with the finding of Dacker (2013), who observed that this can offers strategies, such as regular meetings and behavioral process analyses, and how to apply these concepts with minimal effort. This shows that all registered national and international firm in the industry value effective communication for success and right pricing this product.

Table 4.15 Diesel Price

Descriptive Statistics	N	Minimum	Maximum	Mean	Std. Deviation
Diesel July 2014	49	80	116	100.37	7.149
Diesel August 2014	67	90	117	101.16	4.843
Diesel September 2014	67	89	111	101.24	5.565
Diesel October 2014	67	83	110	100.87	6.749
Diesel November 2014	67	80	110	99.94	8.917
Diesel December 2014	67	59	110	98.93	9.351
Diesel January 2015	67	80	106	91.45	5.839
Valid N (listwise)	67				

4.17 Petrol Price

From the results, on average that 65 of the respondents were senior procurement officers from all the registered oil companies in Kenya, they provided the price of petrol between the month of July, 2014 to January, 2015 respondents indicated the minimum and the maximum price of petrol was between ksh.111.00 and ksh.113.00 respectively, with standard deviation of 7.149 and a mean of ksh.100.37. A bout 67 of the respondents indicated the minimum and maximum price of petrol for the

month of August, 2014 @s ksh.111.00 and ksh.111.00 respectively, with mean of @ ksh.104.00 and standard deviation of 12.286. This finding is in line with Shields and Rangarjan (2013), who observed that the other group of 67 respondents indicated the minimum and maximum price of petrol for the month of September, 2014 @ksh.93.00 and Ksh.113.00 respectively, with a mean of ksh.105.76 and standard deviation of 5.155. A bout 67 respondents in the month of October, 2014 they indicated the minimum and maximum price of petrol @ksh.90.00 and ksh112.00, with mean price of ksh.105.42 and standard deviation of 6.488. Also another group of respondents in the month November, 2014 66 indicated the minimum and maximum price of petrol as ksh.111.00 and 111.00, with mean of 105.02 and a standard deviation of 13.428. Also during the month of December, 2014, 66 respondents indicated the minimum and maximum price of petrol @ ksh.81.00 and ksh.130.42, with mean of 105.71 and standard deviation of 11.611 Finally the same number of respondents during the month of January, 2015 they indicated the minimum and maximum price of petrol @ ksh.83.00 and ksh.117.00 respectively and with standard deviation of 6.414 (refer Table 4.16).

This echo the findings of Topal (2014) and Delai (2013), who had observes that performance is the organization's ability to attain its goals by using the right price in an efficient and effective manner. Performance towards standardizing price are the only way to stay competitive in the marketing business with an edge and any good forecasting explain how pricing is done, plus the customer satisfaction through service delivery and performance. They tell the customers what a good job lays the value of the right price and also communicate their expectations. Performance standards measure quality, quantity, timeliness and cost effectiveness (Hughes, 2013). This finding is in line with Shields and Rangarjan (2013), who recommended that senior procurement officers of national and international firms exercise the control function of forecasting effectively in their respective company. Senior procurement officers/ managers of national and international firms should deploy performance standards in their companies in order to improve productivity, profitability and motivation in their ultimate customers (refer table 4.16)

Table 4.16 Petrol Price

Descriptive Statistics	N	Minimum	Maximum	Mean	Std. Deviation
Petrol July 2014	48	111	113	102.83	15.085
Petrol August 2014	67	111	111	104.00	12.286
Petrol September 2014	67	93	113	105.76	5.155
Petrol October 2014	67	90	112	105.42	6.488
Petrol November 2014	66	111	111	105.02	13.428
Petrol December 2014	66	81	82	105.71	11.611
Petrol January 2015	66	83	117	97.24	6.414
Valid N (listwise)	65				

4.18 Kerosene 4.18 price

From the results, most of the respondents 49 senior procurement officers from all the registered oil companies in Kenya provided the following price for Kerosene between the periods July, 2014 to January, 2015. On average the minimum and the maximum price of Kerosene for these periods was between @ksh.70.00 and @ksh.88.00 respectively, with standard deviation of 5.690 and a mean of ksh.78.80. A bout 22 of the respondents indicated the minimum and maximum price for the month of August, 2014 @ ksh.71.00 and @ ksh.87.00 respectively, with mean to be ksh.79.00 and standard deviation of 4.504. From another group of 22 respondents in the month of September, 2014 they indicated the minimum and maximum price of Kerosene @ksh.73.00 and @Ksh.87.00 respectively, with a mean of ksh.80.50 and standard deviation of 4.668. During the month of October, 2014 another 22 of the respondents indicated the minimum and maximum price of @ ksh.69.00 and @ksh 86.00, with mean price of ksh.79.73 and standard deviation of 5.692. About 22 of the respondents in the month November, 2014 they indicated the minimum and maximum price @ ksh.69.00 and 94.00, with mean of 78.86 and a standard deviation of 7.383. Also another 22 of the respondents in the month of December, 2014 they indicated the minimum and maximum price of Kerosene @ ksh.65.00 and @ksh.94.00 with mean of 77.59 and standard deviation of 7.836. Finally the same number in the month of January, 2015 indicated the minimum and maximum price of Kerosene @ ksh.62.00 and @ksh.79.00 respectively, with a mean of 69.05 and standard deviation of 4.815 (refer Table 4.17).

These results tally with the findings of Oyadomari *et al...* (2014), who observed that some fuel stations have a distinct competitive advantage over other firms which results from their creativity and innovativeness. In a study conducted on United States Energy Information Found out that fuel shortages can invite panic buying and hoarding, worsening the shortages. Even when supplies are adequate, rumors or prospects of imminent price increases may prompt panic buying by consumers while sellers hold back selling. If a pricing mechanism is based on an average over a fixed period of time of benchmark world prices and adhered to strictly, it might be relatively easy to predict when the next round of price increases is likely to occur.. The United States Energy Information Administration (EIA) in its 2011 International Energy Outlook projects that the world's energy consumption will increases by 53% by the 2035 (Creswell,2014). In Europe and Asia, oil accounts for 32% of energy consumption, whilst in the Middle East, 53%. For South and Central America the figure is 44% whereas in North America it is 40%. Solutions than conservative thinkers and valued new ideas and liked to improvise. This finding is in line with Topal (2014), who observed that creativity is the development of novel solutions to perceived organizational problems while innovativeness involves transferring creativity into price setting. Grimsle (2016) further observes that the drive for revenue growth means that companies must be creative and innovative in right pricing and this means embracing their customers towards their daily consumptions enhancing the free flow of information and shared learning among customers.

Table 4.17 Kerosene price

Descriptive Statistics	N	Minimum	Maximum	Mean	Std. Deviation
kerosene July 2014	20	70	88	78.80	5.690
Kerosene august 2014	22	71	87	79.00	4.504

Kerosene September 2014	22	73	87	80.50	4.668
Kerosene October 2014	22	69	86	79.73	5.692
Kerosene November 2014	22	68	94	78.86	7.383
Kerosene December 2014	22	65	94	77.59	7.836
Kerosene January 2015	22	62	79	69.05	4.815
Valid N (list wise)	22				

4.19 Method of Tendering

Most 100% (60) of the respondents indicated that they apply open tendering methods. On average over 80% of the respondents indicated that they apply open tendering method because is the most recommended methods by both private and public sector, A bout 79% agreed that what in stated in the Public Procurement and Disposal Act 2005 and the revised 2015 Acts as an indicators of performance in the supply chain systems in Kenya. This finding is in tandem with Schrettle *et al*... (2013), who established that majority of staff, felt that tendering systems was based merit. High percentage of 74% of the respondents agreed that the tendering systems would be the best criterion over proper forecasting and expatiating the lead time after placing an order. This finding is in line with Mohali and Panchkula (2012), who observed that the tendering systems were paramount to success in the present volatile world of business that minimizes the risk. They concluded that a well-seasoned tendering technique requires careful decision making. He found out that American staff have rich procurement

professional which involve high risk-mitigation during tendering decisions also efficient value for their money which resulted to transparency and accountability (refer Table 4.18).

Table 4.18 Methods of Tendering

	Frequency	Valid Percent
Open	60	100

From the results, high percentage of the respondents 100% agreed that the tendering systems can enhance performance when properly executed within the supply chain networking, but the remaining respondents 26.45% indicated that they were undecided. Most of the respondents indicated that they were using open tendering method against the alternative method of tendering. In the written responses, the respondents indicated that they preferred open tendering yet when asked how it's applied; it became an uphill task to explain its application comprehensively. This echoes the findings of Mirhedayatian *et al.*,(2013), who also established that tendering systems has a well stipulated procedures and guideline when executing it. These results tally with the findings of Chadha and Gagandeep (2013), who observed in their study on risk-mitigation businesses that the process of risk-mitigation involves both making the decision to take a risk control and developing a strategy that minimizes the risk. They concluded that a well-seasoned risk-control strategy requires careful decision making. This finding is in line with Silva (2013), who established that American staffs have high procurement skills which involve high policy propensity than other unskilled staff from other countries which made them more successful.

4.20 Orders for Replenishment of Oil

From the results, most 92% (47) of the respondents indicated that they place their orders with National vendors. A bout 8% (4) indicated they work with International vendors. In Kenya the only agent for importing oil is the National Oil Company. It

act the as the Government's agent and distribute the same as per shares. These findings are in line with Caniato *et al*... (2012) and Baumeister and Kilian (2013), who established that replenishment, is not only orders which are passed on, but also the complete specification. The complete specification refers to honesty, credibility, modesty and respect towards quality of the petroleum products. They also found out that when a business is treated like a family, its policies are driven by norms and cultural human needs which in return creates firm with status quo instead of visa vie (see Table 4.19).

Table 4.19 Order Replenishment

	Frequency	**Valid Percent**
National Vendors	47	92
International Vendors	4	8
Total	**51**	**100**

4.21 How reliable are they

A high average 62% (42) of the respondents indicated that their vendors are always reliable. Once they receive their orders from them they respond expediently and the rating them between 50-75%. A bout 32% (22) of the respondents they rated their vendors are reliable with over 75% and finally 6% (4) of the respondents they rated their vendor reliability to be between 25-50% (refer Table 4.20). These results tally with the findings of Giovanni and Vinzi (2012) and Oyadomari *et al*...(2014), who observed that the issues of how reliable are the respondents have been found to be relevant factor in determining the success of fuel companies. The common belief that respondent performance measures should be strictly derived from strategy is incorrect. It is the wants and needs of respondents that must be considered first. This finding is in line with Lin (2013), who

observed that, the strategies can be formulated. Thus, it is not possible to form a proper strategy before the responded and their needs have been clearly identified. In this way, the framework ensures that the responded performance measures have a strong foundation. The responded performance prism also considers new stakeholders who are usually neglected when forming responded performance measures.

Table 4.20 How reliable are they

	Frequency	**Valid Percent**
25-50%	4	6
50-75%	42	62
over 75%	22	32
Total	**68**	**100**

4.22 Measures to Ensure Transparency in Tendering

From of the results, a highest percentage 95 % (61) of the respondents indicated that they don't maintain comprehensive record keeping as a measure of ensuring there is transparency in and accountability in the tendering systems. A bout 5 % (3) of the respondents indicated they see advertisement of bids as the best means of being transparency in tendering systems' (refer Table 4.21). When asked further, Most of the respondents 95%, agreed they practice comprehensive record keeping in their company. A bout 5% of the respondents agreed adverts was the best method. Most of the respondents indicated that they were using open tendering method against the alternative method of tendering. In the written responses, the respondents indicated that they preferred open tendering, when requested to respond they were unable. This finding is in line with Mirhedayatian *et al...* (2013) established that tendering systems has a well stipulated procedures and guideline when executing it.

About 73.2% of the respondents disagreed with that tendering systems they have, and were not aware of the new circulars and legal notice governing the tendering system which is tandem with tools of procurement. This is in consistent with (53) respondents who recommended that fuel shortages possess a challenging, hence the need for cognizance of the current methods of tendering systems towards proper forecasting of stock level. On average (54.2%) of the respondents indicated that they were not satisfied with the tendering system (see Figure 4.5). These results tally with the findings of Delai and Takahashi (2013), who observed that tendering systems was as cumbersome as it's tedious to a layman or incompetent person.

Table 4.21 Measures to Ensure Transparency in Tendering

	Frequency	**Valid Percent**
Comprehensive Record Keeping	61	95
Advertising all Bidding	3	5
Total	**64**	**100**

4. 23 Last Date Company Tendered for the Supply of Oil

From the results, majority 93 % (51) of the respondents indicated that their companies tendered for the supply of oil this year. A bout 7% (4) of the respondents indicated their companies tendered for the supply of oil last year (see Table 4.22). This finding is in line with Topal (2014), who established that, most the fuel companies tendered for replenishment of stock annually putting fuel shortages at random and /or after two years resulting to poor forecasting on the industry. This finding is in line with Matusov and Brobst (2013), who also noted that through experience in the industry, the ability to understand and articulate various issues concerning tendering procedures the senior procurement officer can assist in this area, as they view

these as lack of the appropriate knowledge, they are able to broaden the dialogue from an elusive focus of facts to a wider view, encompassing both proactive planning and implementation, so that better decisions can be made towards the best practices tendering systems.

Table 4.22 Last Date Company Tendered for the Supply of Oil

	Frequency	Valid Percent
This Year	51	93
Last Year	4	7
Total	**55**	**100**

4. 24 Company Embracing Competition

From the results, majority 56% (37) of the respondents indicated that they use direct procurement method, which is an alternative tendering method. A bout 44 % (29) of the respondents indicated that they use open tendering through advertisement on widely circulated newspapers (see Table 4.23). These results tally with the findings of Delai and Takahashi (2013), who observed that many oil companies tend to procure using the old method of partnership so as to maintain relationship, which is status quo. Studies have also shown that firms often adapt to procurement old methods of competition like single sourcing without labelling them as open or alternative method of tendering/competition. This finding is in line with Muhammad (2013), who observed that instead they are considered simply as good

open tendering in nearly most tendering companies. Thus, often oil firms particularly national registered generalizes these methods without understanding.

Table 4.23 Company Embracing Competition

	Frequency	**Valid Percent**
Open Biding	29	44
Alternative Biding	37	56
Total	**66**	**Ā**

A significant high majority 97% (35) of the respondents indicated that they used open tendering method to pre-qualified suppliers for this financial year (see Table 4.24). A bout 3% (1) of the respondents indicated that they used an adoption style, where they borrow a list of pre-qualified suppliers for from other sister companies. These results tally with the findings of Muhammad (2013); Anderson (2013) and Oyadomari *et al*... (2014), who established that apart from ensuring that pre-qualification of suppliers for this financial year are obtained from a competent vendor by competitively sourcing, fuel firms opted to procure direct from National oil company as its mandated by ERC and in adherence to Kenyan Oil sector and also liberalized in October 1994. It is regulated by Ministry of Energy through the Energy Act of 2006 and enforcement is done by Energy Regulatory Commission (ERC). This finding is in line with Cheng (2014), who observed that Part IV of the Act of Petroleum and Natural Gas deals with the issuance of business licenses for importation, storage, refining, exportation, sale and resale, transportation of petroleum and natural gas.

Table 4.24 Pre-Qualification of Suppliers for this Financial Year

	Frequency	**Valid Percent**
Open Tender	35	97
Adopted	1	3
Total	**36**	**100**

4. 26 Verification of Quantity of Oil Delivered

Most 100% (67) of the respondents indicates that they verify quantity of fuel through a tipping fuel stick before receipting delivery (refer Table 4.25). These results tally with the findings of Zhu *et al.* (2013) and Khan and Khalique (2014), who observed that the diffusion theory, verification of quantity of oil delivered to customers also explains the extent to which

satisfaction ultimate customers' usage without shortages would impact on performance. This is because early users of fuel satisfaction would be more likely to accrue more benefits than the later users, who would simply jump onto' bandwagon' without carefully tailoring the scarce of the oil product in the local market and Total Quality Management (TQM) to the unique conditions of their firms. These findings are in line with Luthra *et al...* (2013) and Alquist *et al...* (2013), who established that there is significant relationship between the customer satisfaction of quantity of oil delivered and the level of accrued profit from the industry in the long run. The quantity of oil is also significantly correlated to quality performance, which has a similar scope with quality performance

Table 4.25 Verification of Quantity of Oil Delivered

	Frequency	Valid Percent
Tipping the Fuel Stick and Reading the Level	67	100

4. 27 Customers Complain of the Right Quality of Oil after Usage

From the table below, an average of 53% (30) of the respondents indicated that their customers have complained about the quality of oil after usage. A bout 47% (27) of the respondents indicated that their customers have never complained about the quality of oil after usage (see Table 4.26).

Table 4.26 Customers Complain of the Right Quality of Oil after Usage

	Frequency	Valid Percent
Yes	30	53

No	27	47
Total	**57**	**100**

4. 28 Percentage of Complaints

From the results by descriptive statistics on average of 24 of the respondents indicated that they have received customer complaint after using fuel from their oil companies. The following were provided by the respondents; a minimum of 1%, maximum 25 %, with a mean of 9.46 and standard deviation of 8.092. This finding is in line with Fernández-Vara et al. (2014) (refer Table 4.2

Table 4.27 Percentage of Complaints

Descriptive Statistics	N	Minimum	Maximum	Mean	Std. Deviation
What Percentage	24	1	25	9.46	8.092
Valid N (list wise)	24				

4. 29 Observing the Right Time in Every Delivery

A significant majority 58% (23) of the respondents indicated that their company always observe the right time any day they receipts delivery of fuel. A bout 43% (17) disagreed they don't observe the right time when they receipt delivery of fuel after placing an order (refer Table 4.28). These results tally with the findings of Luthra *et al*... (2013), Khan and Khalique (2014) and Alquist *et al*... (2013), who established that there is significant relationship between the customer satisfaction of time of oil delivered and the level of accrued profit from the industry in the long run. The right time of oil is also significantly correlated to quality performance, which has a similar scope with quality performance

Table 4.28 Observing the Right Time in Every Delivery

	Frequency	Valid Percent
Yes	23	58
No	17	43
Total	**40**	**100**

4. 30 Period of Delays

A significant high majority 93% (37) of the respondents indicated that the delays normally take 24 hours. This finding is in line with Khan and Khalique (2014) , who observed that about 5% (2) of the respondents indicated that the delays can take up to 38 hours and the remaining respondents 3% (1) indicated that the delays can last up to 96 hours. (refer Table 4.29).

Table 4.29 Periods of Delays

	Frequency	Valid Percent
One Day (24hrs)	37	93
Two Days	2	5
Four Days	1	3
Total	**40**	**100**

4.31 Lead Time Period

A significant high majority 98% (58) of the respondents indicated that their lead time ranges between one hour and 24 hours. These results are in line with the findings of Hin, Kadir and Bohari (2013), who observed that about 2% (1) of the respondents indicated that they have a lead time of less than five days. (Table 4. 30).

Table 4.30 Lead Time Period

	Frequency	Valid Percent
Less Than 24 Hours	58	98
Less than 5 Days	1	2
Total	**59**	**100**

4. 32 Market Price percentage at which you set your crude oil

From the results, three of the respondents indicated by descriptive statistics that the written questionnaire; provided a minimum market percentage of @ ksh.10.00, maximum price of @ksh.45.00, with mean of @ksh.31.67 and standard deviation of 18.930 (Table 4.31).These results tally with the findings of Topal (2014); Hin *et al*... (2013) and Delai (2013), observed that performance is the organization's ability to attain its goals by using the right price in an efficient and effective manner. Performance towards standardizing price are the only way to stay competitive in the marketing business with an edge and any good forecasting explain how pricing is done, plus the customer satisfaction through service delivery and performance.

Table 4.31 Market Price Percentage

Descriptive Statistics	N	Minimum	Maximum	Mean	Std. Deviation
what % of market price at which you set your Crude Oil Price	3	10	45	31.67	18.930
Valid N (list wise)	3				

4. 33 Experienced Oil Shortages

Majority 65% (35) indicated that they have experienced oil shortages in one way or the other., A bout 35 % (19) of the respondents indicated that they have never experienced fuel shortages in their companies (refer Table 4.32). These results tally with the findings of Hin *et al...* (2013); Mwaniki and Moronge (2013) and Alquist *et al...* (2013), who established that this is in line with what was reported in the EIA ,where the ERC categorically stated that vendors of fuel are hoarding waiting for announcement of this month's maximum pump price, hence no selling of super due to speculations by the marketers. The same was observed by the chairman of East Africa and director of Vivo Energy Kenya who also attributed the blame of fuel shortages to bad regulations at Kipevu. The sharing of capacity at Kipevu is skewed, whereby nine out of 100 distributors

have 50% storage shares yet they have 3% of the market shares. They agreed that this was signs of corruption at Kipevu where small investors are getting bigger shares at the expense of giant firms.

Table 4.32 Experienced Oil Shortages

	Frequency	Valid Percent
No	19	35
Yes	35	65
Total	**54**	**100**

4. 34 Diesel

From the results, descriptive statistics showed a significant high number 72 of the respondents indicated the range for minimum and maximum order for diesel to be between 10,000 and 25,000 litres, with a mean of 15,416.67 and standard deviation of 5223.862. About 72 respondents indicated the actual range for minimum and maximum litres for each order to be 10,000 and 25,000 litres, with a mean of 14,722.22 and standard deviation of 5233.215. Also the same number of respondents indicated that the re-order level ranges between 2,000 and 15,000 litres, with a mean of 4,138.89 and standard deviation of 1988.031. This is in tandem with the findings of Hin *et al*... (2013), who observed that a small number (two) of the respondents had indicated the range between minimum and maximum for either shortages or surplus to be 10,000 and 10,000 litres, with a zero mean and standard deviation. (refer Table 4.33).

Table 4.33 Diesel

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation

Quantity of Litres of Fuel Diesel Expected July 2014	72	10000	25000	15416.67	5223.862
Actual Diesel July 2014	72	10000	25000	14722.22	5233.215
Re-Order Level July 2014	72	2000	15000	4138.89	1988.031
Shortage /Surplus July 2014	2	10000	10000	10000.00	.000
Valid N (list wise)	2				

4. 35 Petrol

From the results, a descriptive statistics showed a high number 72 of the respondents indicated the range to be between minimum of 6,000 and maximum of 20,000 litres quantity of petrol they expect at each time they want to replenish their stock, with a mean of 12,861.11 litres and standard deviation of 4636.978. These results are in line with the findings of Hin, Kadir and Bohari (2013), who observed that about 71 of the respondents indicated the range between the actual minimum and maximum litres for each order was between 5,000 and 20,000 litres, with a mean of 11,985.92 and standard deviation of 4244.300. This finding is in line with Barnat (2015). A bout 70 of the respondents indicated that the re-order level for monthly consumption was ranging between minimum and maximum order; 1,000 and 15,000 litres, with a mean of 3600.00 and standard deviation of 2156.218. Only two respondents indicated that minimum and maximum of either shortages or surplus to be 5,000 and 10,000 litres, with a mean of 7500.00 and standard deviation of 3535.534 (refer Table 4.34).

Table 4.34 Petrol

Descriptive Statistics

	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**

Quantity of Litres of Fuel; Petrol Expected July 2014	72	6000	20000	12861.11	4636.978
Actual Petrol July 2014	71	5000	20000	11985.92	4244.300
Re-Order Level July 2014	70	1000	15000	3600.00	2156.218
Shortage/Surplus 2014	2	5000	10000	7500.00	3535.534
Valid N (List Wise)	2				

4. 36 Kerosene

From the results, survey descriptive statistics showed that (30.5%) 22 of the respondents indicated the range was between minimum and maximum quantity of kerosene expected to replenish their stock at each time was 5,000 and 50,000 litres per order, with a mean of 7409.09 litres and standard deviation of 9589.970. The same number of respondents indicated the actual minimum and maximum litres at between 1,000 and 50,000 litres, with a mean of 6818.18 and standard deviation of 9786.465. A bout 21of the respondents indicated the range of litres for the re-order level per month was between 1,000 and 5,000 litres for minimum and maximum, with a mean of 1285.71 and standard deviation of 902.378. These results tally with the findings of Alquist *et al*... (2013), who observed that none of the respondents attempted to respond to written inquiries for either shortages or surplus (refer Table 4.35).

Table 4.35 Kerosene

Descriptive Statistics

	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Quantity Of Litres Of Fuel Kerosene Expected July 2014	22	5000	5000	7409.09	9589.970
Actual Kerosene July 2014	22	1000	5000	6818.18	9786.465

Re-Order Level July 2014	21	1000	5000	1285.71	902.378
Shortage/ Surplus July 2014	0				
Valid N (list wise)	0				

4. 37 Excess of Oil Supply

When asked about excess of oil supply in their companies, a high percentage 93% (52) of the respondents indicated that they have never experienced excess fuel supply in their company. A bout 7% (4) agreed that they have experienced excess fuel supply. This is consistent with the findings of Barnat (2015), who established that excesses oil supply can result to fuel shortages were based on merit. High percentage of 74% agreed that fuel shortages are the criterion over proper forecasting and expediting the lead time after placing an order. This tallies with the findings that majority 69% agreed that the tendering systems were paramount to success in the present volatile world of business (see Table 4.36).

Table 4.36 Excess Oil Supply

	Frequency	**Valid Percent**
Yes	4	7
No	52	93
Total	**56**	**100**

4. 38 Shortages between the National and International Company

When asked about shortages in between national and international companies, a high percentage 94% (33) of the respondents indicated that National oil companies have experienced fuel shortages in one way or the other. Also, about 6% (2) of the respondents indicated that International fuel company have experienced shortages (refer Table 4.37). These results tally with

the findings of Gist (2013); Mwaniki and Moronge (2013), who observed that fuel shortages are far more common when fuel suppliers cannot fully recover costs with reasonable returns and cut back on fuel acquisition and sales, or when they decide to pursue higher return opportunities elsewhere, such as exports, diversion, and out smuggling.

Table 4.37 Shortages between the National and International Company

	Frequency	Valid Percent
National Oil Company	33	94
International Oil Company	2	6
Total	**35**	**100**

4. 39 Company Belongs

From the results, a high percentage 95% (53) of the respondents indicated that they belong to the locally registered oil companies. This finding is in line with Alquist *et al*... (2013) who had observed that about 5% (3) of the respondents indicated that they are from internationally registered oil companies (refer Table 4.38).

Table 4.38 Company Belongs

	Frequency	Valid Percent

Locally Registered	53	95
Internationally Registered	3	5
Total	**56**	**100**

4. 40 Challenges Experienced

When asked whether fuel shortage was a challenge to the performance of supply chain systems, a high percentage 89% (57) of the respondents indicated that fuel shortage was a major challenge. A bout 11% (7) of the respondents indicated that it was not challenge in the performance of supply chain systems in the petroleum industry in Kenya. A significant percentage of 87% (55) of the respondents indicated that insecurity was not challenges, about 86% (54), but 13 %(8) of the respondents it's a challenge to the performance of supply chain systems in the petroleum industries in Kenya.

While (86%) (54) of the respondents indicated poor forecasting was a challenges, but 14% (9) of the respondents indicated it was not a challenge, a high significant 69% (44) of the respondents indicated that employees skills was not a challenge, about 31% (20) of the respondents indicated that it has a challenge. These results are in line with the findings of Alquist *et al*... (2013), who had observed that a high significant 63% (40) of the respondents indicated that tendering systems was a challenge, about 38% (24) of the respondents indicated that it has a challenge in the performance of supply chain systems, a small 8% (5) of the respondents indicated that unpredictable price increase was not a challenge, a high significant 92% (60) of the respondents indicated that it's a challenge, relatively few of the respondents indicated that legal and regulatory policy was not a challenge (see Table 4.39).

A bout 5% (3) of the respondents indicated that legal and regulatory policy has no challenges, but majority of the 95% (60) respondents indicated that it has a challenge in the performance of supply chain systems in the petroleum industry in Kenya. Significant percentage 81% (52) of the respondents indicated that information dissemination has challenge, about 19% (12) of the respondents indicated that it has a challenge in the performance of supply chain systems in the petroleum industry in Kenya. These results tally with the findings of Hin *et al*... (2013); Barnat (2015); Delai and Takahashi (2013), who observed that smuggling and black marketing, can push up domestic prices markedly above the official prices; Power shortages in a number of countries have increased demand for diesel for emergency power generation, causing diesel fuel shortages in some markets and higher diesel prices. A growing cause of power shortage is declining rainfall, leading to falling hydropower generation in East Africa and elsewhere; Piracy in the Gulf of Aden and the Indian Ocean has increased insurance costs, led to shipping delays, and at times caused fuel shortages in East Africa;

Table 4.39 Challenges Experienced

Challenges Experience;	**No**	**Yes**
Fuel Shortages	7(11%)	57(89%)
Employee Skills	20(31%)	44(69%)
Information Dissemination	12(19%)	52(81%)
Unpredictable Price Increase	60(92%)	5(8%)
Tendering Systems	24(38%)	40(63%)
Poor Forecasting	9(14%)	54(86%)
Insecurity	8(13%)	55(87%)
Legal And Regulatory Policy	60(95%)	3(5%)

4. 41 Ranking of Challenges

From the results, most 71% (17) of the respondents ranked level of skills very high. A bout 60 % (9) of the respondents ranked poor forecasting second, on average 56% (9) of the respondents ranked insecurity as third, also 44% (9) of the respondents ranked cost of crude oil fourth, was followed 48% (21) of the respondents who ranked tendering systems at fifth, another 36% (11) of the respondents ranked information dissemination sixth and 27% (51) of the respondents ranked legal and regulatory policy as very low

These results tally with the findings of Wernet, (2014), Khan and Khalique (2014); Barnat (2015); Hin, *et al...* (2013) and Hannum (2016), who observed that the main challenge of upstream operations that include exploration and production (E&P) of crude oil is to extend the life of this depleting resource ICTs are becoming more and more important for the upstream operations of the oil industry. Because of the up with this demand from the supply side, the sector is facing the challenge of increasing production and improving oil recovery rates. Similarly, Cheng (2014*)*, who also observed that this situation has caused the oil sector to invest more and more in research and development, and as a result, improved drilling and extraction technologies have been introduced**.** The findings were validated by the findings of the qualitative analysis where the senior procurement officers indicated employees skills was one ranked as very high resulting to fuel shortages. The other findings was that most of these companies had poor forecasting guidelines either in form of criteria, procedures or tools of anchoring their prudent decisions.

Table 4.40 Ranking of Challenges

Challenges Experience Ranks	Low	High	Very High
Fuel Shortages	4(44%)	1(11%)	4(44%)
Employee Skills	2(12%)	3(18%)	12(71%
Information Dissemination	3(27%)	4(36%)	4(36%)

Unpredictable Price Increase	25(48%)	20(38%)	7(13%)
Tendering Systems	6(29%)	5(24%)	10(48%)
Poor Forecasting	1(10%)	3(30%)	6(60%)
Insecurity	1(11%)	3(33%)	5(56%)
Legal And Regulatory Policy	17(33%)	20(39%)	14(27%)

Most 28% disagreed with the legal and regulatory policies available as they were not addressing the problems of often fuel shortages in the petroleum industry. About 56% of the respondents indicated from the written interview that the industry to mitigate the general problem shortages of fuel within the supply chain systems it must improve insecurity, control of the crude oil process and improve tendering systems. These results tally with the findings of Hoque (2014) ; Agami, *et al*...(2012), who observed that some oil companies were not satisfied with the way their companies were performing, since most of them were not embracing the new trends for being proactiveness and efficiency in service delivery so as to satisfy their customers (refer table 4.40).

4.42 Reliability and Construct Validity

Reliability refers to the extent to which a measuring instrument contains variable errors, that is, errors that appear inconsistently from observation to observation during any one measurement attempt or that vary each time a given unit is measured by the same instrument. Construct validity is established by relating measuring instruments to a general theoretical

framework in order to determine whether the instrument is tied to the concepts and theoretical assumptions they are employing (Schrettle et al.,2013). SPSS version 22 programme was used as the tool of analysis to test the relationship between the dependent variable and the four independent variables, the intervening variable and the results are as indicated in Table 4.40 (page 112). Cronbach's alpha type of reliability co-efficient value of .70 or higher is considered as usually sufficient (Muhammad, 2013). The results in the tables below show Cronbach's alpha of well above 0.7 and most of it above 0.8 implying that the instruments were sufficiently reliable for measurement. This is in line with the findings of Taylor (2014), who observed that as most item total correlations were reasonably high, the construct validity of the instruments was considered reasonable. However a few items had 0.0 correlation meaning no correlation and very low standard deviation implying that the sub-variables were not valid and therefore omitted.

This finding is in line with Wernet (2014), who observed that reliability is the extent to which a measurement of an instrument or procedure yields the same results on repeated trials. Without reliable measures, scientists cannot build or test theory, and therefore cannot develop productive and efficient procedures for improving human wellbeing Validity and reliability reflect the quality of the research design and its administration (Taylor, 2014). Reliability is chiefly concerned with making sure the method of data gathering leads to consistent results. The reliability coefficient (alpha) can range from 0 to 1, where 0 representing an instrument with full of error and 1 representing total absence of error. A reliability coefficient (alpha) of .70 or higher is considered acceptable reliability. The instrument to be chosen to produce a measurement of variable (s) must be proven to be reliable and valid (Billy *et al.*,2013).

Higher alpha coefficient value means there is consistency among the items measuring the concept of interest. As a rule of thumb acceptable alpha should be at least 0.70 or above. Cronbach's alpha is a general form of the Kunder-Richardson (K-R) 20 formula derived from Barnat (2015). The formula was as follows:

$$KR_{20} = \frac{(K)\,(S^2 - \sum_s{}^{2})}{(S^2)\,(K-1)}$$

Where; KR_{20} = Reliability coefficient of internal consistency

K= Number of items used to measure the concept

S^{2}= Variance of all scores

s^2 = Variance of individual items

The Cronbach's alpha for all the variables were above 0.70 and hence the questionnaire was therefore considered reliable. This finding is in line with Wernet (2014), who observed that *v*alidity is the extent to which an instrument measures what it is supposed to measure and performs as it is designed to perform. Validation involves collecting and analyzing data to assess the accuracy of an instrument. There are numerous statistical tests and measures to assess the validity of quantitative instruments, which generally involves pilot testing. But basically validity boils down to whether the research is really measuring what it claims to be measuring and (Zhang & Huo, 2013). Validity refers to the extent to which a test measures what was actually intended to be measured. It is based on the adequacy with which the items in an instrument measure the attributes of the study (Lin 2013).

Table 4.41 Reliability and Construct Validity Test

	Cronbach's Alpha
Skill	0.8793
ICT	0.886676
Cost	0.960274
Tendering	0.862037
Performance	0.708313

4.43 Multicollinearity

Multicollinearity is a state of very high inter-correlations or inter-associations among the independent variables. It is therefore a type of disturbance in the data, and if present in the data the statistical inferences made about the data may not be reliable (Muhammad, 2013. There are certain reasons why multicollinearity occurs: It is caused by an inaccurate use of dummy variables, It is caused by the inclusion of a variable which is computed from other variables in the data set, Multicollinearity can also result from the repetition of the same kind of variable, Generally occurs when the variables are highly correlated to each other (Khan & Khalique, 2014).

This finding is in line with Greene and William (2012), who observed that multicollinearity can also be detected with the help of tolerance and its reciprocal, called variance inflation factor (VIF). If the value of tolerance is less than 0.2 or 0.1 and,

simultaneously, the value of VIF 10 and above, then the multicollinearity is problematic. Collinearity is a linear relationship between two explanatory variables. Two variables are perfectly collinear if there is an exact linear relationship between the two. This is in line with the findings of Barnat (.2015), who observed that formal detection-tolerance and the variance inflation factor (VIF) are used to test multicollinearity.

In the presence of high multicollinearity, the confidence intervals of the coefficients tend to become very wide and the statistics tend to be very small. It becomes difficult to reject the null hypothesis of any study when multicollinearity is present in the data under study. Multicollinearity makes it tedious to assess the relative importance of the independent variables in explaining the variation caused by the dependent variable. This is in consistent with the findings of Sidola *et al*... (2012), who contended, that it's better drop one of the variables. An explanatory variable may be dropped to produce a model with significant coefficients, obtain more data; if possible. This is the preferred solution. More data can produce more precise parameter estimates; Make sure you have not fallen into the dummy variable trap; including a dummy variable for every category; standardize your independent variables. This may help reduce a false flagging of a condition index above 30;-Some authors have suggested a formal detection-tolerance or the variance inflation factor (VIF) for multicollinearity:

$$\mathbf{tolerance} = 1 - R_j^2, \quad \mathbf{VIF} = \frac{1}{\mathbf{tolerance}},$$

where R_j^2 is the coefficient of determination of a regression of explanatory j on all the other explicators (Table 4.42).

Table 4.42 Multicollinearity Test

Model	Collinearity Statistics	
	Tolerance	VIF
(Constant)		

Skill rank	.916	1.092
ICT	.877	1.141
Cost	.911	1.098
Tendering	.851	1.175

4.43 Autocorrelation Test

Chadha and Gagandeep (2013), serial correlation, or autocorrelation, can be defined as the correlation of a variable with itself over successive observations. It often exists when the order of observations matters, the typical scenario of which is when the same variable is measured on the same participant repeatedly over time. For example, serial correlation is an important issue to consider in any longitudinal designs. This is in tandem with the findings of Fernández-Vara (2013), who established that autocorrelation test was made by using Durbin and Watson (1951). Durbin Watson (DW) is a test for first order autocorrelation that is it tests only for a relationship between an error and its immediately previous value. This study used Durbin Watson (DW) test to check that the residuals of the models were not auto correlated since independence of the residuals is one of the basic hypotheses of regression analysis. Clearly, you should reject the null in favor of AR (4) based on the B-G LM test results.

If the test is rejected, there is evidence for AR (1) or first-order serial correlation (auto-regressive Process of order; after your regression, issue the command DW state to obtain the Durbin- Watson statistic. By checking the DW table for critical values, you can test for the above hypothesis. Note; If d=2, no serial correlation. If d<2, there is positive serial correlation and if d>2, there is negative serial correlation. If there is no serial correlation $\hat{\rho} = 0$ then $d \approx 2$ .If there is positive serial correlation

$\hat{\rho} > 0$ then. If there is negative serial correlation, i.e. $\hat{\rho} < 0$ then d'< 2.If there is negative serial correlation i.e. p < 0 then d' > 2. b). DW test is not valid if there are lagged values of the dependent variable on the right hand side of the equation (in this case use Breusch-Godfrey LM test or Durbin's h-Test). The results in the table 4.43 show that there was no DW statistics that were close to the prescribed value of 2.0 for residual independence; this implied that the data had no autocorrelation. This result is similar to that of (Eberle, 2014).

Serial correlation has mainly been considered in multiple regression and time-series models. Multiple regression models are designed for independent observations, where the existence of serial correlation is undesirable. So the main focus in multiple regressions is on testing whether serial correlation exists. This finding is in line with Al-Majali and Sunna'a (2013), who established that conversely, the purpose of time-series analysis is to model the serial correlation to understand the nature of time dependence in the data. The pattern of serial correlation is essential for identifying the appropriate model. This presentation on serial correlation is around regression and time series (Muhammad, 2013). This finding is in line with Eberle (2014), who observed that autocorrelation test was made by using Durbin and Watson (1951). Durbin--Watson (DW) is a test for first order autocorrelation that is it tests only for a relationship between an error and its immediately previous value.

This study used Durbin Watson (DW) test to check that the residuals of the models were not auto correlated since independence of the residuals is one of the basic hypotheses of regression analysis (Table 4.43). The results in the table 4.43 show that Durbin–Watson statistic is a test statistic used to detect the presence of autocorrelation such as a relationship between values separated from each other by a given time lag in the residuals such as prediction errors from a regression analysis. When DW is closer to 2.0 value- means Data had no autocorrelation. Good data. Autocorrelation is a characteristic of data in which the correlation between the values of the same variables is based on related objects; it generally exists in those types of data-sets in which the data, instead of being randomly selected, is from the same source. This finding is in line

with (Miles et al.,2014). If autocorrelation occurs for scores on the dependent variable in ordinary least square (OLS) regression, then the regression residuals will also be auto-correlated, creating a systematic bias in estimates of the residuals and statistics derived from them.

Table 4.43 Autocorrelation Test

	Durbin Watson
ICT	2.004
Cost	1.989
Skills	1.971
Tendering	1.965

Predictors: (Constant), Level of skills of staff, ICT, Cost of crude oil and tendering systems

Dependent Performance

4.44 Heteroscedasticity

Homoscedasticity describes a situation in which the error term that is, the "noise" or random disturbance in the relationship between the independent variables and the dependent variable is the same across all values of the independent variables. Heteroscedasticity such as the violation of homoscedasticity is present when the size of the error term differs across values of an independent variable.

This is in tandem with the findings of Eberle (2014), who observed that a more serious problem associated with heteroscedasticity is the fact that the standard errors are biased. Because the standard error is central to conducting significance tests and calculating confidence intervals, biased standard errors lead to incorrect conclusions about the significance of the regression coefficients. Another approach for dealing with heteroscedasticity is to transform the dependent variable using one of the variance stabilizing transformations. Similarly, Miles *et al*... (2014), contended that the existence of Heteroscedasticity is a major concern in the application of regression analysis, even in the analysis of variance, as it can invalidate statistical tests of significance that assume that the modeling errors are uncorrelated and uniform: -hence that their variances do not vary with the effects being modeled. Heteroscedasticity often occurs when there is a large difference among the sizes of the observations. Heteroscedasticity is the absence of homescedasticity.

According to Topal (2014) and Weil (2014), in statistics, a collection of random variables is heteroscedastic. Null hypothesis: Heteroscedasticity not present (homoskedasticity) if sig-value is less than 0.05, reject the null hypothesis. This finding is in tandem with Wernet (2014), who observes that one of the key assumptions of regression is that the variance of the errors is constant across observations. Typically, residuals are plotted to assess this assumption. Standard estimation methods are inefficient when the errors are heteroscedastic or have non-constant variance. Breusch-Pagan test is a large sample test and assumes the residuals to be normally distributed. Heteroscedasticity is not present since Breusch pagan test =1.867 with a non-significant p value of 0.760 >0.05 at 5 % level of significance. This is consistent with the findings of Miles *et al.*,(2014) who agreed that its true if there are sub-populations that have different variability's from others. Here "variability" could be quantified by the variance or any other measure of statistical dispersion. Thus heteroscedasticity is the absence of homoscedasticity (refer Table 4.44). This is in line with the findings of Miles *et al*... (2014), who observed that existence of heteroscedasticity is a major concern in the application of regression analysis, including the analysis of variance, as it can invalidate statistical tests of significance that assume that the modelling errors are uncorrelated and uniform, hence that their

variances do not vary with the effects being modeled. For instance, while the ordinary least squares estimator is still unbiased in the presence of heteroscedasticity, it is inefficient because the true variance and covariance are underestimated. Similarly, Zhang and Huo (2013), argued that testing for differences between sub-populations using a location test, some standard tests assume that variances within groups are equal.

Table 4.44 Heteroscedasticity Test

Ho	Variables	Chi2 (4)	Prob > Chi2
Constant Variance	Skills, ICT, Cost and Tendering	1.867	.760

------- Breusch-Pagan and Koenker test statistics and sig-values –

	LM	Sig
BP	1.867	.760
Koenker	3.267	.514

4.45 Normality Test

Table 4.45 indicates, the test for normality, the Shapiro-Wilk test shows that the Standardized residuals are significantly normally distributed with a significance 0.118 which is greater than 0.05. The findings proof that the independent variable, supply chain systems has a strong effect on performance of supply chain systems in the oil industries. This finding is in line with Shields and Rangarjan (2013), who established that the null-hypothesis of this test is that the population is normally distributed. Thus if the *p*-value is less than the chosen alpha level, then the null hypothesis is rejected and there is evidence that the data tested are not from a normally distributed population. In other words, the data are not normal. On the contrary, if the *p*-value is greater than the chosen alpha level, then the null hypothesis that the data came from a normally distributed population cannot be rejected. For example an alpha level of 0.05, a data set with a *p*-value of 0.02 rejects the null hypothesis

that the data are from a normally distributed population. This finding is in tandem with Greene (2012), who observed that, since the test is biased by sample size, the test may be statistically significant from a normal distribution in any large samples.

Table 4.45 Tests of Normality on Supply Chain Systems

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	Df	Sig.
Unstandardized Residual	.097	58	.200*	.967	58	.118

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Descriptive Statistics of Variables

Descriptive statistics is the discipline of quantitatively describing the main features of a collection of information, or the quantitative description itself. Descriptive statistics are distinguished from inferential statistics (or inductive statistics), in that descriptive statistics aim to summarize a sample, rather than use the data to learn about the population that the sample of data is thought to represent (Fernández-Vara, 2014). This generally means that descriptive statistics, unlike inferential statistics, are not developed on the basis of probability theory. Even when a data analysis draws its main conclusions using inferential statistics, descriptive statistics are generally also presented. This finding is in line with Abebe and Angriawan (2013), who observed that some measures that are commonly used to describe a data set are measures of central tendency and measures of variability or dispersion. Measures of central tendency include the mean, median and mode, while measures of variability include the standard deviation such as variance, the minimum and maximum values of the variables, kurtosis and skewness. This echoes the findings of Miles *et al*... (2014), who observed that when a sample consists of more than one variable, descriptive statistics may be used to describe the relationship between pairs of variables. In this case, descriptive statistics

include: Cross-tabulations and contingency tables, Graphical representation via scatterplots, Quantitative measures of dependence and Descriptions of conditional distributions.

This is consistent with the findings of Alquist *et al*... (2013), who observed that the main reason for differentiating unbivariate and bivariate analysis is that bivariate analysis is not only simple descriptive analysis, but also it describes the relationship between two different variables. Quantitative measures of dependence include correlation (such as Pearson's r when either variables are continuous, or Spearman's rho if one or both are not) and covariance (which reflects the scale variables are measured on). The slope, in regression analysis, also reflects the relationship between variables. This finding is in line with Abebe and Angriawan (2013), who observed that the unstandardized slope indicates the unit change in the criterion variable for a one unit change in the predictor. The standardized slope indicates this change in standardized such as z-score units. Highly skewed data are often transformed by taking logarithms. Uses of logarithms make graphs more symmetrical and look more similar to the normal distribution, making them easier to interpret intuitive (Davis, 2014).

This finding is in line with Barrow (2013), who observed that positive skewed or right skewed distributions data is so named because the "tail" of the distribution points to the right, and because its skewness value will be greater than 0 (or positive). Salary data is often skewed in this manner: many employees in a company make relatively little, while increasingly few people make very high salaries. Left skewed or negative skewed distributions data is so named because the "tail" of the distribution points to the left, and because it produces a negative skewness value. Failure rate data is often left skewed. Consider light bulbs: very few will burn out right away, the vast majority lasting for quite a long time. This is consistent with the findings of Taylor (2014), who observed that data that follow a normal distribution perfectly have a kurtosis value of 0. Normally distributed data establishes the baseline for kurtosis. Sample kurtosis that significantly deviates from 0 may indicate that the data are not normally distributed.

This is consistent with the findings of Sharma and Bhandari (2013), who observed that a distribution with a positive kurtosis value indicates that the distribution has heavier tails and a sharper peak than the normal distribution. For example, data that follow a t distribution have a positive kurtosis value. The solid line shows the normal distribution and the dotted line shows a distribution with a positive kurtosis value. Negative kurtosis a distribution with a negative kurtosis value indicates that the distribution has lighter tails and a flatter peak than the normal distribution. For example, data that follow a beta distribution with first and second shape parameters equal to 2 have a negative kurtosis value. The solid line shows the normal distribution and the dotted line shows a distribution with a negative kurtosis value. This finding is in line with Hoque (2014), who observed that the test for normality, the Shapiro-Wilk test shows that the Standardized residuals are significantly normally distributed with significance of 0. 070 is greater than 0.05. The findings proof that the independent variable, level of skills of staff has a strong effect on performance of supply chain systems in the oil industries.

Regression model Tests on Normality: A normal distribution is not skewed and is defined to have a coefficient of kurtosis. Jarque-Bera formalizes this by testing the residuals for normality and testing whether the coefficient of skewedness and kurtosis are zero and three respectively (Barrow, 2013). This is in line with the findings of Ongore and Kusa (2013), who observed that the study used Jarque-Berra's statistic to determine whether the sample data have the skewedness and kurtosis matching a normal distribution. It is a test based on residuals of the least squares regression model. Similarly, a study by Creswell (2014), contended that for normal distribution JB statistics, is expected to be zero. In this study JB statistics values were: Capital requirement (skewedness 0.196, kurtosis 0.623), bank liquidity (skewedness 0.196, kurtosis 0.623), Credit risk transfer (skewedness 0.196, kurtosis 0.623) and financial stewardship (skewedness 0.196, kurtosis 0.623). This result was consistent with the findings of Taylor (2014), who contended that in his study even though their JB statistics result was 0.09

with skewedness of 0.14 and kurtosis of 3.38. Thus, the concluded that, since the JB is very close to zero and that the variables are very close to normal distribution. This implies that the research variables are normally distributed.

From the results, table 4.46 indicates, the regression model test of normality above, the statistic of Shapiro-Wilk is 0.979 with a significance of 0.812. If the Sig. value of the Shapiro-Wilk Test is greater than 0.05 then the data is normal, if it is below 0.05 then the data is not normally distribute. This finding is in line with Greene (2013), who observed that this shows that the data is normally distributed, since it's greater than 0.05.

Table 4.46 Regression Model Tests on Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Unstandardized Residual	.102	30	.200*	.979	30	.812

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

From the results, table 4.47 indicates, the coefficient of determination explains the extent to which changes in the dependent variable can be explained by the change in the independent variables or the percentage of variation in the dependent variable (performance) that is explained by all the four independent variables. This finding is in line with Taylor (2014), who observed that when R Square for a model is 0.597. This means that 59.7 % of the variation dependent variable (performance) can be explained by the four independent variables.

Table 4.47 Regression Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson

1	.773[a]	.597	.572	.00641	2.037

a. Predictors: (Constant), cost, ICT, skills, tendering, b. Dependent Variable: perform

ANOVAa

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	4.793	10	1.198	59.244	0.00b
	Residual	1.234	61	.020		
	Total	**6.027**	**71**			

a- Dependent Variable: performance-(2 tailed test)
b- Independent variables: skills, ICT, Crude oil price, tendering

Coefficient of model summary

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	T	Sig.
1	(Constant)	1.203	.151		7.984	.000
	ICT	.290	.144	.114	2.011	.049
	Skills	.608	.270	.292	2.249	.028
	tendering	-.011	.047	-.004	-.240	.811
	Cost	.318	.142	.135	2.235	.029

ICT, skills and cost are the significant predictors of performance, with t values greater than 1.96

Based on A nova Table 4.47 shown above, the F value is 59.244 with a p-value = 0.000 < 0.05 significance level. Thus, the overall regression model for these four predictors has

significantly explained the variation in performance. For example if we choose alpha to be 0.05, coefficients having p-value of 0.05 or less would be statistically significant.

This finding is in line with Lin (2013), who established that with a 2 tailed test and alpha of 0.05, we accept the null hypothesis that the coefficient for shortages is equal to 0.Table 4.47 indicates, the coefficient of the analysis, where the respondents indicated that skills is the predictor variables that contribute the highest to the variation of the performance; every unit increase in skill, it will increase a total of 0.608 unit of performance provided other independent variables remain constant. This finding is in line with Taylor (2014), who observed that the second highest predictor is cost (β = .318), it has a positive relationship with performance; every unit increase in cost, it will increase a total of 0.318 unit of performance provided that other independent variables remain constant. Then followed by ICT (β = 0.290), It has a positive relationship with performance; every one unit increase in ICT, performance will increase by 0.290 holding other variables constant. While Tendering Systems is not a significant predictor in the model with a regression coefficient of -0.011 (t-value=-0.240, p-value=0.811>0.05).

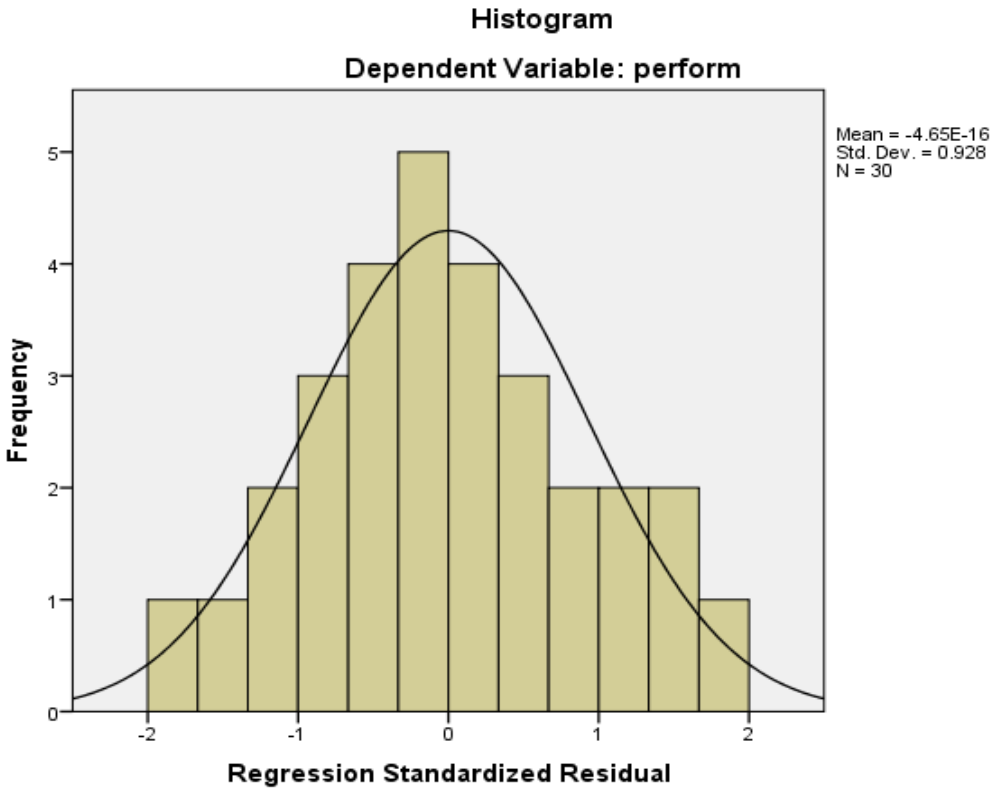

Figure 4.2 Histogram Dependent Variable On Shortages

The histogram in figure 4.2 indicates that there is normality. The residual describes the error in the fit of the model to the *ith* observation y_i and are used to provide information about the adequacy of the fitted model. This is in line with the finding of Taylor (2014), who observed that analysis of the residual is frequently helpful in checking the assumption that errors are normally distributed with constant variance, and in determining whether additional terms in the model would be useful. From

figure 4.3 indicates the dispersion of the distribution of a histograms showing the mean, median, and mode give us some measure of the central tendency in a list of numerical data, and the upper and lower figures for the range tells us the high and low scores and the same was observed. This is consistent with the finding of Creswell (2014), who observed that in order to understand a set of statistical data more clearly we obviously require a sense of the way in which the measured values are spread out from the central tendency. For example, are the values almost all clustered around the middle, or are there. The range and various "averages" tell us something, but they do not describe accurately the distribution of the values.

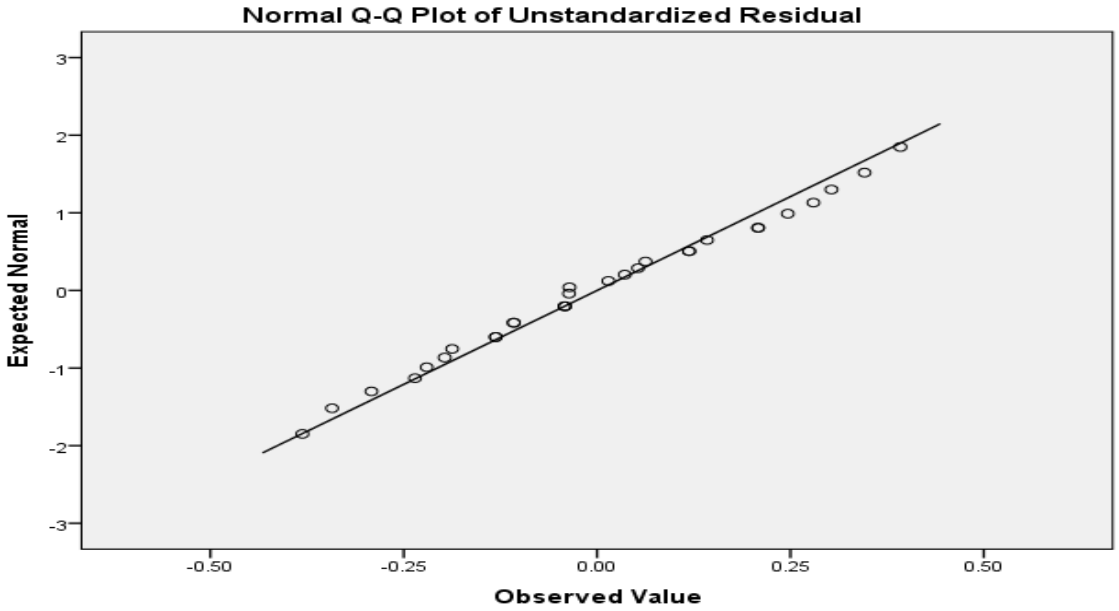

Figure 4.3 Scatter Plot of Normal Q-Q of Unstandardized Residual

Checking the Normal Probability Plot points lie in a reasonably straight diagonal line from bottom left to top right (Barnat,2015). This would suggest no major deviations from normality.

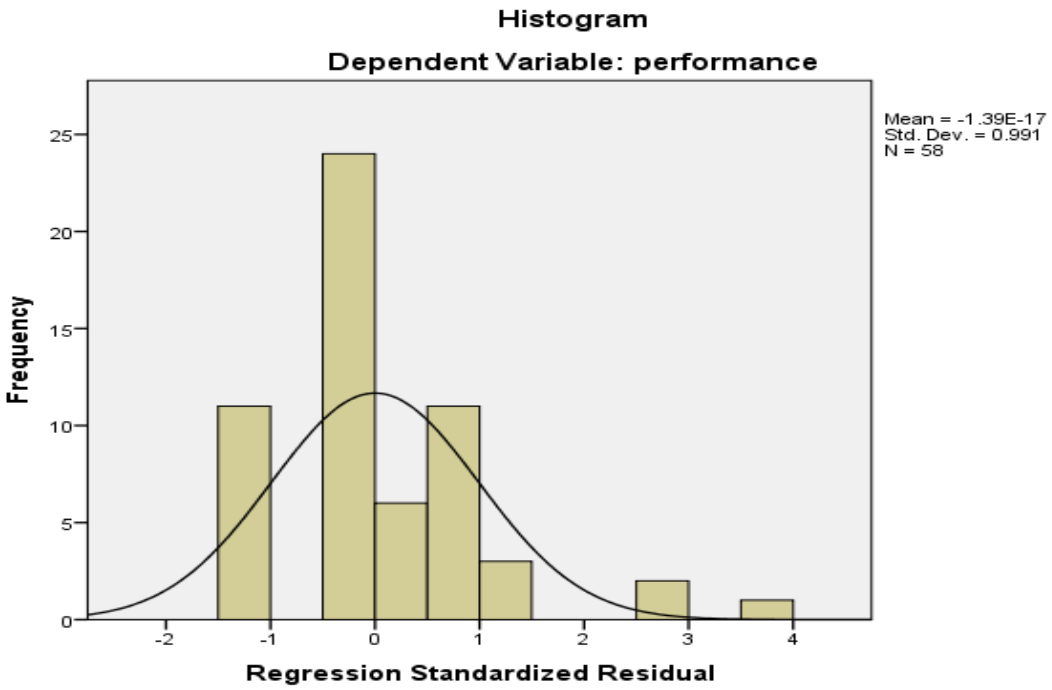

Figure 4. 4 Histogram on performance/supply chain systems

From the results, the figure 4.4 indicates, a visual examination of the histogram suggests a positive skewness of the standardized residuals as much as the statistics at the legend however show that the residuals have a mean of zero and a standard deviation of 1 as of a standard normal distribution (Abebe & Angriawan, 2013).

Table 4.48 Results of Overall Normality Diagnostic Test

Variables	Descriptive Statistical	Statistical Values	Std. Error	Comment

Level of skills of Staff	Skewedness	.327	.52715	Normally distributed
	Kurtosis	.644		Normally distributed
ICT	Skewedness	.325	.51532	Normally distributed
	Kurtosis	.639		Normally distributed
Cost of Crude Oil	Skewedness	. 327	. 54923	Normally distributed
	Kurtosis	.644		Normally distributed
Tendering Systems	Skewedness	.322	. 67542	Normally distributed
	Kurtosis	.634		Normally distributed

Factor Analysis of Variables

Exploratory Factor Analysis was done where components were extracted using principal component analysis. Exploratory Factor analysis seeks the least number of factors which can account for the common variance (correlation) of a set of variables. This finding is in line with Weil (2014) who established that all the rating data on different attributes can be reduced down to a few important dimensions. This is in tandem with the findings of (Taylor (2014), who observed that this reduction is possible because the attributes are related. The rating given to any one attribute is partially the result of the influence of other attributes. The factor loadings are the correlation coefficients between the variables (rows) and factors (columns).This finding is in line with Nasarullah and Raja (2014), who observed that the squared factor loading is the percent of variance in that indicator variable explained by the factor. To get the percent of variance in all the variables accounted for by each factor, the sum of the squared factor loadings are added for that factor (column) and divided by the number of variables. This is the same as dividing the factor's Eigen value by the number of variables. By a rule of thumb in confirmatory factor analysis, loadings should be 0.7 or higher to confirm that independent variables identified a priorities are represented by a particular factor, on the rationale that the 0.7 level corresponds to about half of the variance in the indicator being explained by the

factor. This finding is in line with Hou *et al*... (2014), who observed that for exploratory purposes, researchers use a level 0.4 as 0.7 is considered high for real life data to meet this criterion, the same was observed by (Barnat 2015).

All the variables were subjected to SPSS Version 22 for factor loading and analysis. In total they were components as shown in Table 4.54 (chapter four). According to the Table 4.54 (chapter four) of total variance, 5 components out of the 58 were surveyed. These were the components that had a level of .4 and above. The 5 components retained explain all the 100% of the total variance in the original variables. The results in the components matrix Table 4.20 (chapter five), factor loadings show good loading. All the Original variables load the components by at least values above 0.5. From the matrix it can be seen to which components each of the variables belong. This is in tandem with the findings of Taylor (2014), who observed that a variable belongs to the components it loads highest with a loading above 0.5. The highest loading above 0.5 of each original variable is highlighted. The results also confirm all the variables in the conceptual framework model for this study as given in chapter two.

Hypothesis Test of all Variables

To test a hypothesis means to tell whether or not the hypothesis seems to be valid (Hoque, 2014). The purpose of hypothesis testing is to determine the accuracy of the study hypotheses due to the fact that the researcher has collected a sample of data, not a census. In hypothesis testing the main question is: whether to accept the null hypothesis or not to accept the null hypothesis (Barnat, 2015). This finding is in line with Anderson (2013), who established that to test this hypothesis, which had the null hypothesis that there is no linear relationship between the two variables a linear regression F-test was carried out. Using the Analysis of Variance (ANOVA) to determine whether there is a regression relationship, between performance and adoption of quality in supply chain systems. To test the significance of regression relationship between performance and

supply chain systems, the regression coefficients, the intercept, and the significance of all coefficients in the model were subjected to the t-test.

The t-test, tests the null hypothesis that the coefficients is zero. Since it is based on a sample, the t-test is carried out to see if the regression relationship established was statistically significant (test whether the relationship established in the study, actually exists in the population or if it is the result due to sampling error). This concurred with Barrow (2013), who observed that the null hypothesis state that, β (beta) = 0, and therefore, there is no relationship between performance and supply chain systems. It was desired to test the null hypothesis that the slope β is equal to some specified value β0 (often taken to be 0, in which case the hypothesis is that x and y are unrelated. The t-test was done at n-2, degrees of freedom (Saad et al., 2013).

Correlation Analysis of all Variables

According to Gorard (2013), a correlation technique is to analyze the degree of relationship between two variables. The computation of a correlation coefficient yields a statistic that ranges from -1 to +1. This statistics is called a correlation coefficient (r) which indicates the relationship between the two and the bigger the correlation the stronger the coefficient between the two variables being compared (Lin,2013). The direction of the relationship is also very important in that if it is positive (+) it means that there a positive relationship between the two variables and this means that when one variables increase, the other variables or when one variable decreases the other variables also decreases. This is in tandem with the findings of Taylor (2014), who observed that a negative relationship means that as one variables decreases, the other variable increases and vice versa and hence an inverse relationship. The score 1 indicates perfect correlation, which is found only when a variable is correlated with itself, 0 indicates no correlation at all.

The researcher carried out correlation analysis between the variables of the study using Pearson correlation coefficient. Correlation coefficient was used to test whether there existed interdependency between independent variables and dependent variable, and also whether the independent variables were related to the department variable supply chain systems to performance to the oil companies. This section outlines the correlation analysis for each of the 73 oil companies in this study. Inferential Analysis Findings: Inferential statistics analysis was conducted through the use of correlation analysis and regression analysis to determine the relationship between the independent and the dependent variables.

4.47.1 Linear Regression of all Variables

Linear regression is an approach to modeling the relationship between a scalar variable *y* and one or more variables denoted *x*. In linear regression, data are modeled using linear functions, and unknown model parameters are estimated from the data. This is in line with the findings of Maheshwarkar and Sohani (2013), who observed that such models are called linear models. Most commonly, linear regression refers to a model in which the conditional mean of Y given the value of *x* is an affine function of *x* (Billy Gray et al., 2013). SPSS version 22 was used as a tool of analysis. For each variable a scatter plot was generated to show the kind of relationship that existed between each independent variable and the dependent variable holding the intervening variable constant. Any linear relationship generated called for linear regression to test the direction and magnitude of the relationship (Borgdorff, & Schwab., 2014).

4.49 Study of each Variables to test significant effect

Hypotheses 1

H_o: Level of Skills of staff does not significantly affect performance of supply chain

Systems in the petroleum industry in Kenya

Table 4.49.1 Regression Model Summary on Level of Skill of Staff

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.347[a]	.121	.105	.83378

ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	5.341	8	5.341	7.682	.000[b]
	Residual	38.930	63	.695		
	Total	**44.271**	**71**			

Dependent Variable: performance
Predictors: (Constant), skills

Coefficients[a]

Model 1		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.155	.070		-2.186	.000
	Skills	.298	.108	.347	2.772	.000

Dependent Variable: performance= -0.155+ 0.298 x skills

The linear regression analysis shows a relationship, R = 0.347 and R2 = .121 which means that 12.1% of the corresponding change in information and communication technology after the shortages can be explained by a unit change in performance. A

further test on the beta coefficient of the resulting model, the constant α = -0.155 is not significantly different from 0, and since the p value p = 0.000 is greater not than p= 0.050 with a p=0.000 which is less than p=0.05. This explains α that if were held constant then performance will be -0.155 (low) and therefore the gradient (β) and the performance would be very low Regression indicates the strength of the relationship between the independent variables and the dependent variable (performance). This is in tandem with the findings of Taylor (2014), who observed that the R square value in this case is 0.121 which clearly suggests that there is a strong relationship between the independent variables and the dependent variable. This indicates that the independent variables share a variation of 12.1 % of performance. This implies that if all the oil companies can enhance information and communication technology, skills, cost and tendering systems challenges affecting performance of supply chain systems in the petroleum industry in Kenya will minimize fuel shortages. R squared (R^2) - co-efficient of determination in linear regression relationship, tells how well the regression line fits the data. It is an important indicator of the predictive accuracy of the equation. Goodness of fit refers to how well the model fits the data (Sidola et al., 2012).

1. Testing hypothesis on level of skill of staff: The model performance = β (level of skills of staff) holds as suggested by the test above. This explains α that if were held constant then performance will be -0. 155 (low) and therefore the gradient (β) and the performance would be very low. The A nova test in Table 4.49.1 shows that the significance of the F-statistic is less than zero. This implies that the null hypothesis $\beta 1=0$ is rejected and the alternative hypothesis $\beta 1 \neq 0$ is taken to hold implying that the model $Y= \beta 0 + \beta 1X1 + \varepsilon$, is significantly fit.

The model Performance of supply chain System = α + β (skills) holds for as suggested by the test above. This confirms that there is a positive linear relationship between levels of skills of staff performance of supply chain systems in the oil industry in Kenya.

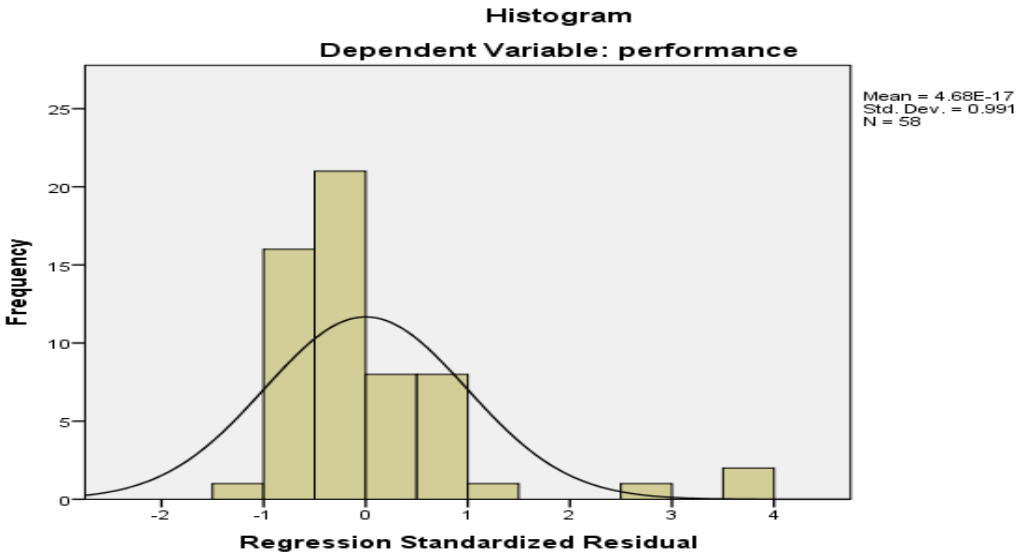

Figure 4.5 Histogram Dependent Variable on Level of Skills of Staff

The histogram in figure 4.5 indicates that there is normality. The residual describes the error in the fit of the model to the *ith* observation y_i and are used to provide information about the adequacy of the fitted model. According to Barnat (2015), analysis of the residual is frequently helpful in checking the assumption that errors are normally distributed with constant variance, and in determining whether additional terms in the model would be useful.

The multiple regression analysis findings indicate that the level of skills in petroleum companies is contributing to supply chain performance. These findings are supported by the descriptive analysis where majority (56%) of the respondents indicated that the level of skills commonly practiced in their companies were Human skills, hence unfavorable to supply chain

performance. This is in tandem with the findings of Taylor (2014), who observed that these findings are further validated by the qualitative data which highlighted unfavorable aspect of level of skills that staffs were not pleased with. It is worth noting that these findings therefore, confirms the hypothesized relationship that level of skills influence tendering systems in the petroleum industry. Level of skills is therefore affects supply chain performance in the oil industry and it is important for the population because with their high level of education and democratic revolution espoused by the 2010 promulgation of the constitution, level of skills behaviour is very critical to their service delivery.

This is consistent with the findings of Tseng and Chiu (2013), who observed that level of skills had direct influence on staff's performance on the supply chain in any country**.** Further, the quality of level of skills impacted on forecasting decisions. This is in tandem with Topal (2014), who also established that level of skills influence intention to performance on supply chain since when level of skill is perceived to be positive, there is decrease chance of voluntary supply chain performance. Locally, these findings are consistent with Ongore and Kusa (2013), who strongly argued that the three dynamics of level of skills such as conceptual skills will enhance integration in the whole process of supply chain performance as all are inclusive. This is in tandem with the findings of Yang *et al*... (2013), who observed that human skills were prevalent within the petroleum registered industry and was exemplified in information communication and technology. These findings therefore confirms the widely held view that performance is the ability, skills and knowledge of the staff and not the company and underscore the role of skills on performance towards proper forecasting in the petroleum industry in Kenya. The level of skills can create integrations among the stakeholders from the up streams to the downstream within the supply chain systems.

Hypothesis 2

H_o: Information and communication technology does not significantly affect performance of supply chain systems in the petroleum industry in Kenya

Table 4.49.2 Correlations on ICT

		Performance	ICT
Performance	Pearson Correlation	1	.643**
	Sig. (2-tailed)		.000
	N	71	
ICT 1	Pearson Correlation		.643**
	Sig. (2-tailed)		.000
	N	71	

**. Correlation is significant at the 0.01 level (2-tailed).

Cofficients b

		Performance	ICT
Performance	Pearson Correlation	1	.643**
	Sig. (2-tailed)		.000
	N	71	
ICT 1	Pearson Correlation		.643**
	Sig. (2-tailed)		.000
	N	71	

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4.49.2 Correlations on ICT

Table 4.49.2 1 Regression Model Summary on ICT

	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.643[a]	.414	.403	.68080

Predictors: (Constant), ICT

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18.316	8	18.316	39.518	.000b
	Residual	25.955	63	.463		
	Total	**44.271**	**71**			

Coffiecient [a]

Model 1	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	**Std. Error**	**Beta**		
(Constant)	-.168	.083		-2.027	.004
ICT	.534	.085	.643	6.286	.000

The linear regression analysis shows a relationship, R = 0.643 and R2 = .414 which means that 41.1% of the corresponding change in information and communication technology after the f the founder can be explained by a unit change in performance . A further test on the beta coefficient of the resulting model, the constant α = -0.168 is not significantly different from 0, and since the p value p = 0.004 is greater than p= 0.05, the constant is not significant. However, the coefficient β = 0.534 is significantly different from 0, model analysis of regression is shown the table 4.49 above. Regression indicates the strength of the relationship between the independent variables and the dependent variable (performance). The R square value

in this case is 0.414 which clearly suggests that there is a strong relationship between the independent variables and the dependent variable.

This indicates that the independent variables share a variation of 41.4 % of performance. This finding is in line with Topal (2014), who established that if all the oil companies can enhance information and communication technology, skills, cost and tendering systems affects performance of supply chain systems in the petroleum industry in Kenya will minimize fuel shortages. A visual examination of the histogram suggests that there is a strong positive linear relationship between affect performance of supply chain systems in the petroleum industry and Information and communication technology. Therefore the level of influence of ICT on the performance of supply chain systems in the petroleum industry can statistically be determined by performing a linear regression analysis.

2. Testing Hypothesis on ICT: This explains α that if were held constant then performance will be -0.168 (low) and therefore the gradient (β) and the performance would be very low. The A nova test in Table 4.49.2 shows that the significance of the F-statistic is less than zero. This implies that the null hypothesis $\beta 1=0$ is rejected and the alternative hypothesis $\beta 1 \neq 0$ is taken to hold implying that the model $Y= \beta 0 + \beta 1X1 + \varepsilon$, is significantly fit. The model performance = $\alpha + \beta$ (ICT) holds for as suggested by the test above. This confirms that there is a positive linear relationship between ICT and on performance of supply chain systems in the oil industry. The model performance = β (ICT) holds as suggested by the test above. This confirms that there is a positive linear relationship between Information and communication technology and performance of supply chain systems.

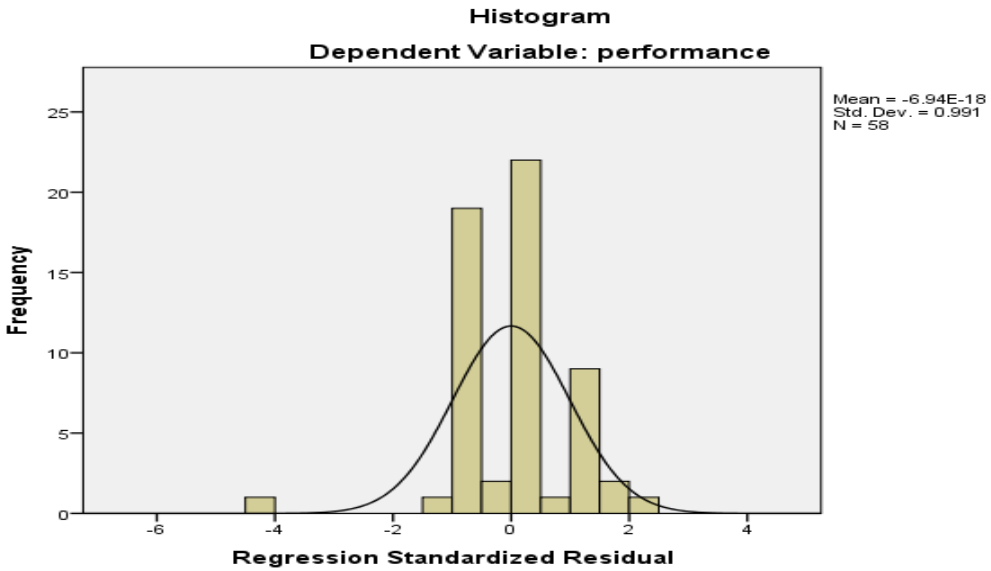

Figure 4. 6 Histogram Dependent variable on ICT

The figure 4.6 indicates, a visual examination of the histogram suggests a normal distribution of the standardized residuals. The statistics at the legend also show that the residuals have a mean of zero and a standard deviation of 1 as of a standard normal distribution.

In establishing the influence of information communication and technology on supply chain performance using correlation analysis, a comparison of the local and international registered oil companies revealed different findings. Correlation analysis on the two groups' basis indicates that information communication and technology is positively and significantly related to level of skills, crude oil price and tendering systems. Information communication and technology is negatively and significantly related to supply chain performance of local registered oil companies. This is in tandem with the findings of

Taylor (2014), who observed that the R square value in this case is 0.144 which clearly suggests that there is a strong relationship between the independent variables and the dependent variable. This indicates that the independent variables share a variation of 14.4 % of performance.

Table 4.49.2 indicates, the organization with above ten computers performed 0.571 better than those without computers, this was a significant predictor (t-value =3.202 value 0.002) at 5% level of significance. The explanation on why information communication and technology was a significant predictor for some companies and not for others is because although human and conceptual are a part of level of skills are defined at national levels, hence are uniform across the oil companies, qualitative data analysis from the senior procurement officers in these registered oil companies confirmed that, the level of skills practiced local and international registered oil companies are different across the companies. This can be explained by the fact that each oil company practice different level of skills and even others there is no consistency and this was confirmed by the senior procurement officers in these oil companies.

The hypothesis that information communication and technology influence staff supply chain performance was based on literature review and, hence the result showing contrary was unexpected. Consistent with this result however, is a study by (Lin, 2013), who established that staff do not leave due to level of skills but due to other factors such as poor forecasting. Another explanation may be derived from the common belief held that information communication and technology is not vital as longer as the companies are making profit. This aligns with Taylor (2014) who established that because of high return the economic added value is there the investor or stakeholders will be delighted. This finding is in line with a locally, a study by Mwaniki, and Moronge (2013), who established that information communication and technology did not predict the supply chain performance of the oil companies.

Additionally, an explanation for the research findings that information communication and technology is not a predictor of supply chain performance can be found in the relationship between information communication and technology and crude oil price which was found to be significant and positive in correlation analysis and also, relationship between tendering systems and level of skills which was positive and significant. This finding is in line with Mwaniki, and Moronge (2013), who observed that when staffs are trained they acquire new skills and there is high performance since they have the ability, skills and knowledge of executing their roles and responsibilities. Therefore, indirectly information communication and technology is addressed through the new skills, the research objective was achieved because although the hypothesis testing revealed that information was not a predictor of supply chain performance, the human skills and with written response brought out the issues related to information.

communication and technology that were the a cause of a challenges among the staffs.

Hypothesis 3

3. H_o: Cost of crude oil does not significantly affect performance of supply chain systems in the petroleum industry in Kenya.

Table 4.49.3 Correlations on Cost of Crude Oil

		Performance	Cost
Performance	Pearson Correlation	1	.643**
	Sig. (2-tailed)		.000
	N	71	
Cost	Pearson Correlation		.643**
1	Sig. (2-tailed)		.000

N	71	71

Table 4.49.3 Regression Model Summary on Cost of Crude Oil

R	R Square	Adjusted R Square	Std. Error of the Estimate
.643[a]	.414	.403	.68080

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	18.316	7	18.316	39.518	.000[b]
Residual	25.955	64	.463		
Total	**44.271**	**71**			

Dependent Variable: performance Predictors: (Constant), ICT

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std Error	Beta		
(Constant)	-.168	.083		2.027	.004
Cost	.534	.085	.643	6.286	.000

Dependent Variable: performance = -0.168 + 0.534 x Cost

Regression

The linear regression analysis shows a relationship, R = 0.643 and R2 = .414 which means that 41.1% of the corresponding change in cost of crude oil after the f the founder can be explained by a unit change in performance . A further test on the beta coefficient of the resulting model, the constant α = -0.168 is not significantly different from 0, and since the p value p = 0.004 is greater than p= 0.05, the constant is not significant. However, the coefficient β = 0.534 is significantly different from 0, model analysis of regression is shown the table 4.49 above. Regression indicates the strength of the relationship between the independent variables and the dependent variable (performance). The R square value in this case is 0.414 which clearly suggests that there is a strong relationship between the independent variables and the dependent variable. This indicates that the independent variables share a variation of 41.4 % of performance. This is consistent with the finding of Nasarullah and Raja (2014), who established that if all the oil companies can enhance cost of crude oil, skills, ICT and tendering systems affect performance of supply chain systems in the petroleum industry in Kenya will minimize fuel shortages.

3. Testing Hypothesis on Cost of Crude Oil: This explains α that if were held constant then performance will be -0.168 (low) and therefore the gradient (β) and the performance would be very low. The A nova test in Table 4.30 shows that the

significance of the F-statistic is less than zero. This implies that the null hypothesis $\beta 1=0$ is rejected and the alternative hypothesis $\beta 1 \neq 0$ is taken to hold implying that the model $Y= \beta 0 + \beta 1X1 + \varepsilon$, is significantly fit.

The model performance = $\alpha + \beta$ (cost) holds for as suggested by the test above. This confirms that there is a positive linear relationship between cost and on performance of supply chain systems in the oil industries. The model performance = β (cost) holds as suggested by the test above. This confirms that there is a positive linear relationship between cost of crude oil and performance of supply chain systems

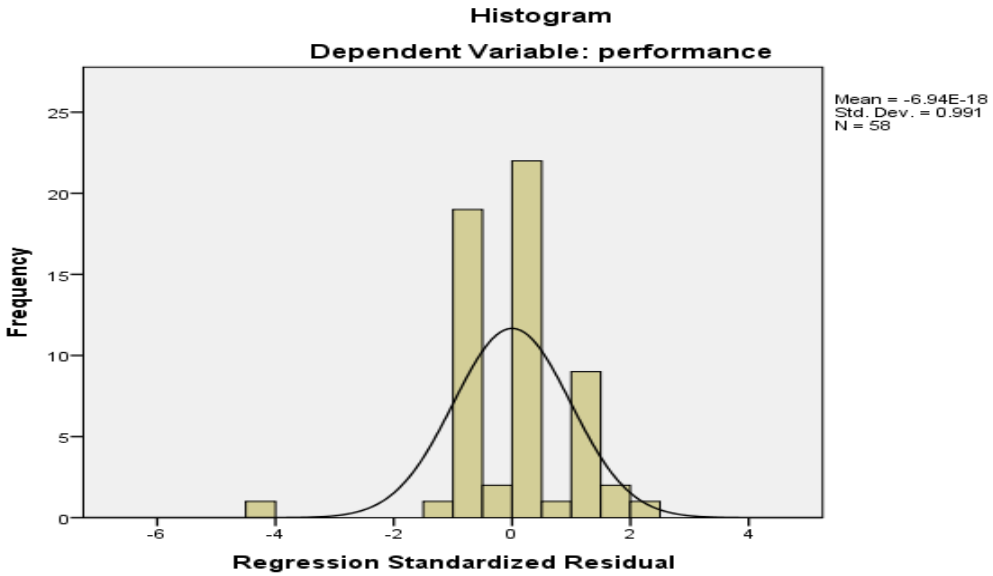

Figure 4.7 Histogram Dependent Variable on Cost of Crude Oil

The histogram in figure 4.7 indicates that there is normality. The residual describes the error in the fit of the model to the *ith* observation y_i and are used to provide information about the adequacy of the fitted model .Analysis of the residual is frequently helpful in checking the assumption that errors are normally distributed with constant variance, and in determining whether additional terms in the model would be useful. From figure 4.4 indicates the dispersion of the distribution of a histograms showing the mean, median, and mode give us some measure of the central tendency in a list of numerical data, and the upper and lower figures for the range tells us the high and low scores and the same was observed by (Weil,2014). But in order to understand a set of statistical data more clearly we obviously require a sense of the way in which the measured values are spread out from the central tendency. For example, are the values almost all clustered around the middle, or are there some very low and very high vales. The range and various "averages" tell us something, but they do not describe accurately the distribution of the values.

This objective was assessed using correlation and regression analysis on the local and international registered oil companies' basis and general analysis for all the oil companies. At the local level the correlation result indicate that crude oil price is positively and significantly related with level of skills information communication and technology, except at the locally registered oil companies where information communication and technology are not significantly related. The R square value in this case is 0.414 which clearly suggests that there is a strong relationship between the independent variables and the dependent variable. This indicates that the independent variables share a variation of 41.4 % of performance. Comparing with medium unpredictable price

Table 4.49.3 indicates, high unpredictable price compared with medium unpredictable has a significant regression coefficient of (-0.234) with a t-value of -3.557 (p-value =0.001). Low unpredictable price compared with medium unpredictable has a significant regression coefficient of (-0.192) with a t-value of -3.132 (p-value =0.003). Regression analysis result at the local

levels indicate that crude oil price contributed to supply chain performance at local registered oil companies (-0.234) with a t-value of -3.557 (p-value =0.001 and also international registered oil companies' ((-0.192) with a t-value of -3.132 (p-value =0.003 but not for the rest of the industry. Further, crude oil price was a stronger predictor of supply chain performance at local registered oil companies. In establishing the influence/performance of crude oil price in the supply chain, a comparison of the local and international registered oil companies revealed different findings. The explanation could be found in the practices which varied per each group. This is in tandem with the findings of Taylor (2014), who observed that for instance, most of the locally registered oil companies were not enthusiastic to get their staff time off for further studies to enhance their understanding in the crude oil pricing. However, in the general analysis, it was established that the effect of crude oil price on performance was not significant (-0.234) with a t-value of -3.557 (p-value =0.001). Significant level in the presence of level of skills, ICT and tendering systems, crude oil price does not affect supply chain performance in the petroleum industry.

From the finding based on the general analysis were unexpected because there are many studies indicating that pricing is a predictor of performance of supply chain and they were the hypothesized relationship. This is in line with the findings of Hannum (2016) who observed that the explanation could be because the registered oil companies' are supportive of the crude oil price, as they adjust their prices either up/down wards depending on the crude oil price adjustment. The ultimate customers are the sufferer in this case. This is evident in the findings on descriptive analysis where majority agreed that they were satisfied with the crude oil price for their current job in their respective companies. The interview confirmed that the staffs were supported in their crude oil price terms of supply chain performance.

This argument is supported by Anderson (2013), who established that while crude oil price may have an impact on staff performance mobility, crude oil price that is wholly paid by an entity is likely to prelude to staff search. In contrast, when supply chain performance for crude oil price the negative relationship to staff mobility is observed as supply chain are more

likely to perform. This is in the petroleum industry where the crude oil cost is factored in the retail price to cover the investment cost plus the accrued interest. The relationship between tendering and crude oil price which is in this study is positive and significant provides another explanation is. One cannot acquire crude oil without following the process of tendering systems unless they want to avoid competitive bidding. Therefore, indirectly in away, crude oil price is covered through tendering which has been found to be a predictor of supply chain performance in this study. The hypothesized relationship was not supported, however the unfavorable aspects related to crude oil price that came outing the interview and written responses are a pointer that there are crude oil price aspects that need to be addressed since they cause of non-performance in the supply chain.

Hypothesis 4

4.H_o: Tendering Systems does not significantly affect performance of supply chain systems in the petroleum industry in Kenya

Table 4.49.4 Correlations on Tendering Systems

		Performance	Tendering
Performance	Pearson Correlation	1	-.371**
	Sig. (2-tailed)		.004
	N	71	
Tendering	Pearson Correlation		- .371**
	Sig. (2-tailed)		.004
1	N	71	71

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4.49.4.1 Regression Model Summary on Tendering System

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.371[a]	.138	.122	.82565

a. Predictors: (Constant), tendering

ANOVA[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	6.096	9	6.096	8.942	.004[b]
Residual	38.175	62	.682		
Total	44.271	71			

Dependent Variable: performance. Predictors: (Constant), tendering

Coefficients[a]

Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
(Constant)	-.165	.080		2.057	.044
Tendering	.332	.111	-.371	2.990	.004

Dependent Variable: performance= -0.165 + -332x tender

The linear regression analysis shows a relationship, R = -0.371 and R2 = .138 which means that 13.8% of the corresponding change in tendering systems after the f the founder can be explained by a unit change in performance . A further test on the beta coefficient of the resulting model, the constant α = -0.165 is not significantly different from 0, and since the p value p =

0.044 is greater than p= 0.05, the constant is not significant. However, the coefficient β = 0.332 is significantly different from 0, model analysis of regression is shown the table 4.49 above. Regression indicates the strength of the relationship between the independent variables and the dependent variable (performance). This is in tandem with the findings of Taylor (2014), who observed that the R square value in this case is 0.138 which clearly suggests that there is a strong relationship between the independent variables and the dependent variable. This indicates that the independent variables share a variation of 13.8 % of performance. This implies that if all the oil companies can enhance tendering systems, skills, ICT and cost affect performance of supply chain systems in the petroleum industry in Kenya will minimize fuel shortages.

4. Test Hypothesis on Tendering Systems: This explains α that if were held constant then performance will be -0.165 (low) and therefore the gradient (β) and the performance would be very low. The A nova test in Table 4.49.4 shows that the significance of the F-statistic is less than zero. This implies that the null hypothesis $\beta 1=0$ is rejected and the alternative hypothesis $\beta 1 \neq 0$ is taken to hold implying that the model $Y= \beta 0 + \beta 1X1 + \varepsilon$, is significantly fit. The model performance = $\alpha + \beta$ (tender) holds for as suggested by the test above. This confirms that there is a positive linear relationship between Tender and on performance of supply chain systems in the oil industries. The model performance = β (tender) holds as suggested by the test above. This confirms that there is a positive linear relationship between tendering systems and performance of supply chain systems

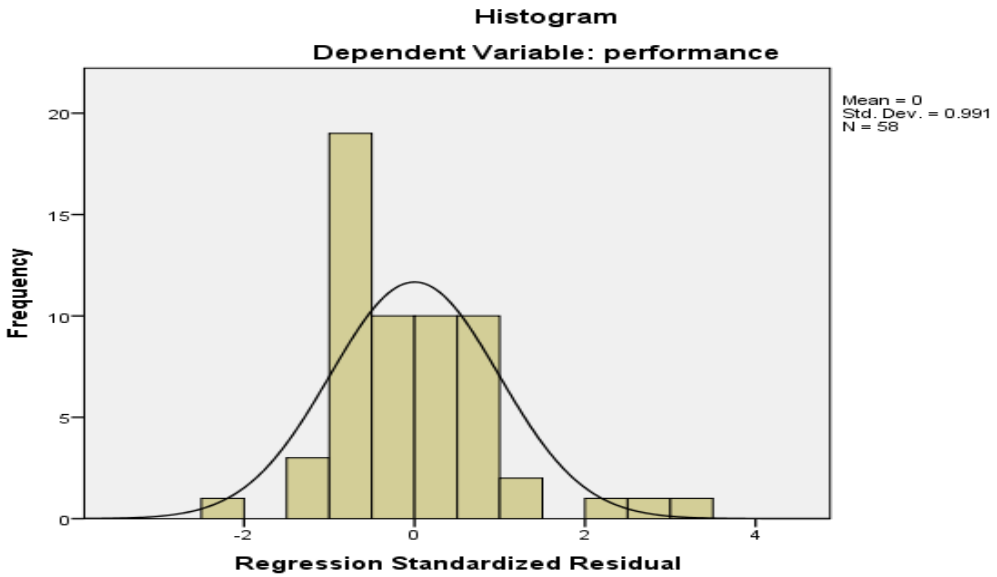

Figure 4.8 Regression Standardized Residual

The histogram in figure 4.8 above indicates that there is normality. The residual describes the error in the fit of the model to the *ith* observation y_i and are used to provide information about the adequacy of the fitted model .Analysis of the residual is frequently helpful in checking the assumption that errors are normally distributed with constant variance, and in determining whether additional terms in the model would be useful. From figure 4.3 indicates the dispersion of the distribution of a histograms showing the mean, median, and mode give us some measure of the central tendency in a list of numerical data, and the upper and lower figures for the range tells us the high and low scores and the same was observed by the study of Barnat (2015). But in order to understand a set of statistical data more clearly we obviously require a sense of the way in which the measured values are spread out from the central tendency. For example, are the values almost all clustered around the middle,

or are there some very low and very high vales. The range and various "averages" tell us something, but they do not describe accurately the distribution of the values.

These findings are in consistent with Cheng (2014), who established that staffs were dissatisfied with open tendering systems practiced in their companies. The finding is in line with Weil (2014), who established that tendering systems were not based on merit and that the whole process of tendering was not competitive which in turn influenced fraudulent and frivolous practices. This is consistent with the findings of Barrow (2013), who established that tendering systems and competitive bidding were predictors of proper forecasting of stock level which enhanced the supply chain performance. This echoes the finding of Miles *et al...* (2014), who established that tendering systems related issues were some of the complaints contributing to court disputes after the award of tender to vendors, which in turn leads to negative implications including seeking legal arbitrations. The implications of these findings are that oil companies should address tendering systems with the seriousness it entails in order to enhance competitive bidding of transparency and accountability.

Table 4. 50 Model Correlations of all Variables

		Performance	ICT	Cost	Skills	Tendering
performance	Pearson Correlation	1	.643**	.381**	.347**	-.371**
	Sig. (2-tailed)		.000	.003	.008	.004
	N	71	71	71	71	71
ICT	Pearson Correlation	.643**	1	.340**	-.116	-.391**
	Sig. (2-tailed)	.000		.009	.386	.007
	N	71	71	71	71	71

Cost of Crude Oil	Pearson Correlation	.381**	.340**	1	-.007	-.296*
	Sig. (2-tailed)	.003	.009		.959	.024
	N	71	71	71	71	71
Level Skills of Staff	Pearson Correlation	.347**	-.116	-.007	1	.138
	Sig. (2-tailed)	.008	.386	.959		.303
	N	71	71	71	71	71
Tendering Systems	Pearson Correlation	-.371**	-.391**	-.296*	.138	1
	Sig. (2-tailed)	.004	.007	.024	.303	
	N	71	71	71	71	71

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-

Table 4.51 Overall Regression Analysis Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.812[a]	.660	.634	.53286	2.030

Predictors: (Constant), tendering, skills, cost, ICT
Dependent Variable: performance

ANOVA[a]

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	29.222	8	7.305	25.728	.000[b]
Residual	15.049	63	.284		
Total	**44.271**	**71**			

Dependent Variable: performance

Predictors: (Constant), tendering, skills, cost, ICT

Coefficients[a] of all Overall Regression Model summary

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-.161	.070		2.294	.026
ICT	.740	.110	.892	6.699	.000
Cost	.158	.075	.179	2.100	.041
Skills	.349	.070	.406	5.022	.000
Tendering	.297	.118	.332	2.522	.015

Normality Test

A further test for normality was found necessary. Shapiro-Wilk test was found to be the most appropriate. The Shapiro–Wilk test, tests the null hypothesis that a sample $x1... xn$ came from a normally distributed population where $P < 0.05$ for W rejects this supposition of normality. It was published in 1965 by Samuel Shapiro and Martin Wilk (Luthra et al., 2013).The Test statics is:

$$W = \frac{\left(\sum_{i=1}^{n} a_i x_{(i)}\right)^2}{\sum_{i=1}^{n}(x_i - \overline{x})^2}$$

Where:

$x(i)$

(With parentheses enclosing the subscript index i) is the ith order statistic, i.e., the ith smallest number in the sample;

$x = (x1 + ... + xn) / n$ is the sample mean;

Most authors agree that this is the most reliable test for non-normality for small to medium sized samples (Topal, 2014; Shapiro & Wilk, 1965).

Table 4.52 Tests of Normality

	Kolmogorov- Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Unstandardized Residual	.097	58	.200*	.967	58	.118

*. This is a lower bound of the true significance.

Lilliefors Significance Correction

Outliers

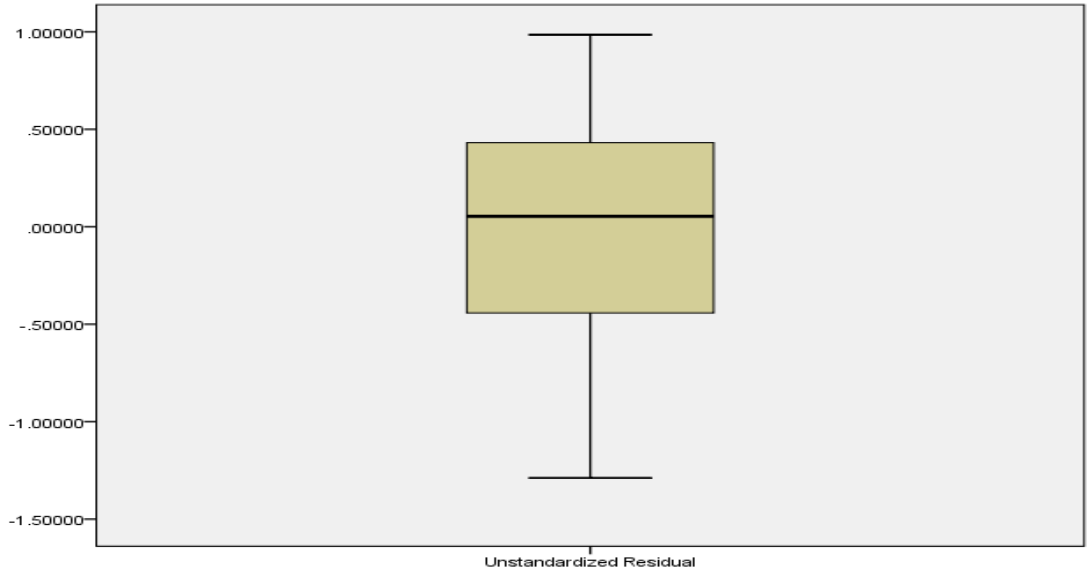

Figure 4.9 : Skewness and Kurtosis: the meaning Skewness and Kurtosis is good

Table 4.53 Skewness and Kurtosis

Descriptive Statistics

	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
Unstandardized Residual	71	-.072	.314	-.704	.618
Valid N (listwise)	71				

The further test for normality, the Shapiro-Wilk test shows that the Standardized residuals are significantly normally distributed with a standard error of .618 which is greater than 0.05. The findings show that the independent variable, level of skills of staff affects performance of Supply Chain Systems after the others are held constant.

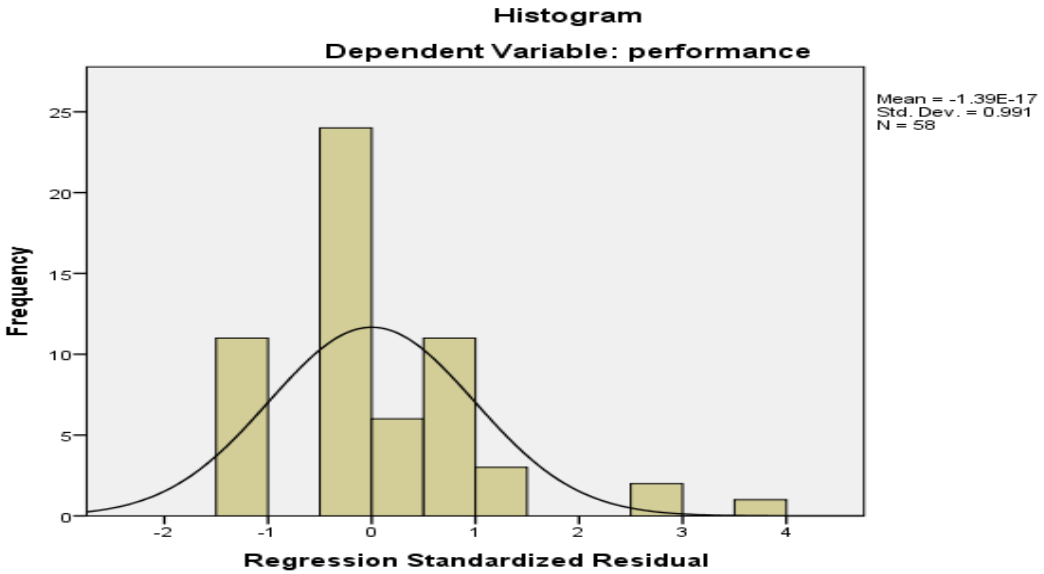

Figure 4.10 Histogram Dependent Test on Normality

The standaStandardized residuals illustrates that the statistics at the legend however show that the residuals have a mean of zero and a standard deviation of 1 as of a standard normal distribution. This means that the model yields a normal distribution giving normally distributed value.

5. H_o: Moderating effect does not significantly affect performance of supply chain systems in the petroleum industry in Kenya.

Table 4.54 Moderated Regressions Model Summary[b]

model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.848[a]	.719	.692	.49346

Predictors: (Constant), legal_ and_ regulatory, cost, skills, ICT, tendering ,

Dependent Variable: Performance

Hypothesis 5 on the moderating Variable (Gov't Policy)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	31.802	8	6.360	26.121	.000[b]
	Residual	12.418	63	.243		
	Total	**44.220**	**71**			

Dependent Variable: performance

Predictors: (Constant), legal_and_regulatory, cost, skills, ICT, tendering

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-.136	.066		-.2.054	.044
Cost	.172	.070	.195	2.460	.017
ICT	.711	.105	.856	6.774	.000
Skills	.333	.065	.388	5.150	.000
Tendering	.233	.115	.260	2.026	.048
Legal and Regulatory	-.296	.101	-.229	-2.929	.005

Dependent Variable: performance = -0.136 + 0.333x skills + 0.711 x cost + 0.172x cost +0.233x tender + -0.296x legal and regulatory , moderates variable = P-value 0.005

According to Chadha and Gagandeep (2013), a moderating is a variable that affects the direction and strength of the relationship between an independent or predictor variables and a dependent criterion variable. This variable may reduce or enhance the direction of the relationship between a predictor variable and a dependent variable, or it may change the direction of the relationship between the two variables from positive to negative. A moderator will be supported if the interaction of predictor and moderator on the outcome of the variable is significant (Weil, 2014). **Note:** The R Square when moderated it gives $_{0.719}$ (71.9%) and overall regression gives $_{0.660}$ (66%) showing an increase of 0.051 (5.1%).

Moderating Role of Legal and Regulatory Environment in the Oil Companies

In this section, the discussion of the findings of moderating effect of legal and regulatory environment in the oil companies which in this study were level of skills, ICT, crude oil price and tendering systems as stated in the fifth objectives and in relation to the staff age and academic qualifications. This finding is in line with Barnat (2015), who also used the study of multiple regressions analysis (stepwise method) to establish the moderating effect of competency on the relationship between

independent variable and dependent variable. Competency will be measured as follows: 0=below 40% and 1=40% and above and responsiveness will be measured as follows: (0=Below PhD and 1=PhD).
Legal and regulatory, moderates the independent variables with unstandardized coefficient of -296 with significant of .005 meaning there moderating variable has an effect.

Table 4.45 indicates, the regression analysis shows a very strong linear relationship. R = .848 and adjusted R^2 = .719 which means that there is 71.9% of corresponding affect performance of supply chain systems in every change for all the predictor variables jointly. A further test on the beta coefficients of the resulting model, as shown on Table 4.48,the constant α = -0.036 is not significantly different from 0, and as the p value p = 0. 634 is greater than p = 0.05. The coefficients β1 = 0.172, β2 = 0.711, β3 = 0.333, β4 = 0.233 and β5 = -0.296 are however significantly different from 0, with p values 0.017, 0.000, 0.000, 0.048 and 0.005 respectively which are all less than p = 0.05. According to Taylor (2014), who observed that Kenya Pipeline Corporation (KPC), which owns the major storage terminals has 60 per cent of its tankage in need of a major refurbishment. Given the forecast pattern of cargo importation, the required tank capacity for operating stocks to provide at least 20 days cover and with demand set to more than quadruple in the period to 2040, this requires a properly planned programme of capacity renewal and growth to achieve and then sustain sufficient operational storage capacity.

Optimal/Final Model

From the research findings above, the revised study model is as below (Figure 2.2)

Independent Variables **Moderating Variable** **Dependent Variable**

Legal and Regulatory Environments:

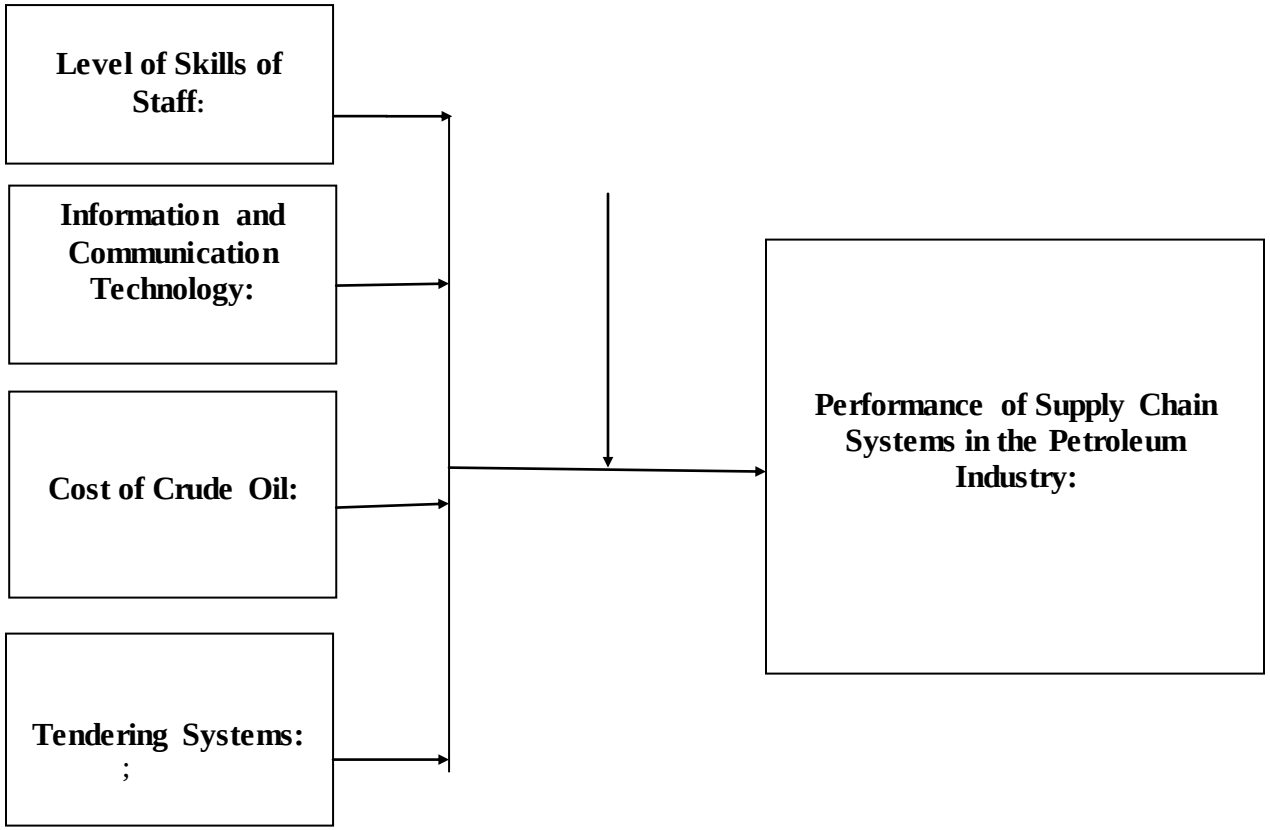

Figure 4.11 Revised Optimal Model

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the study as guided by the specific objectives, research hypothesis and conclusion reached based on the findings and recommendations for enhancing effective performance of supply chain systems in the petroleum industry as well as recommendations for further research.

5.2 Summary of the Study

The response rate by the respondents was 100% that is all the 73 registered oil companies issued with the data collection tools respondent positively. The instruments were administered to all the companies as in the selected sample above. A total of 73 respondents were sampled in the study (see Table 4.1). The response rate was 97.26 % since a total of 71 responded. A total of 71 senior procurement officers were sampled using questionnaires as this was 71 out of 73 representing 97.26% of the response rate. This response rate indicates a reasonable representation of the sample and nearly the entire population. Therefore, 97.26% response rate in this study is adequate for analysis.

Empirical literature showed that senior procurement officers contribute heavily towards the proactive forecasting in the supply chain systems. The literature further showed that as important as they are, senior procurement officers have very low survival rate. Less than a third of senior procurement officers survive in their first employment in the petroleum industries and of those that do, half do not survive in their first employment in the petroleum industry; hence shift to other areas of flexibility. Performance of supply chain is vital to the success of any petroleum industry in Kenya. It reflects supply chains

performance's efficiencies and effectiveness. Literature indicates that performance of the oil industries can give customer satisfaction on timeliness from the upstream to the down streams in the supply chain systems. This was anchored on the fundamental reasoning that the level of skills are critical resource for petroleum industry and their performance is of paramount importance because of the responsibility these companies play in the development on the country.

Therefore, the purpose of this study was to establish the challenges affecting performance of supply chain systems in the petroleum industry in Kenya. The specifics objective was to establish the extent to which level of skills affects performance of supply chain systems in the petroleum companies in Kenya, to determine the effects of information and communication technology on performance of supply chain systems in the petroleum industry in Kenya, to establish the extent to which cost of crude oil affects performance of supply chain systems in the petroleum industry in Kenya, to examine the effect of tendering systems on performance of supply chain systems in the petroleum industries in Kenya, to determine the moderating effect of legal and regulatory environment in the oil companies on the, relationship between level of skills of staff, information and communication technology, cost of crude oil and tendering systems in the oil industry in Kenya. Employees performance was also measured using level of skills.

In this research, survey design describing the phenomenon associated with the subject population was utilized in order to obtain information concerning the current phenomenon and where possible, to draw valid general conclusion from the facts discussed .Further, survey design allows testing of relationship between variables and this was fundamental for this study. In order to achieve this objective, the study utilized both quantitative and qualitative approaches as they reinforce each other. The target population comprised senior procurement officers from all the 73 registered oil companies in Kenya. Newly registered oil companies were not involved since they had not acquired the necessary requisite to respond to professional issues. In the second stage, a census with population of 100 per cent response rate has an advantage over a sample in that there

are no concerns as to whether the people who take part are representative of the population. Total population sampling is a type of purposive sampling technique where you choose to examine the entire population that have a particular set of characteristics such as specific experience, knowledge, skills, exposure to an event. In such cases, the entire population is often chosen because the size of the population that has the particular set of characteristics that you are interest in is very small.

Data was collected using questionnaire with assistance of research assistant in different industries coverage areas and locations in Kenya. This yielded a commendable response rate of nearly 100%.The collected data went through quantitative techniques, such as descriptive statistics (response rate, measure of central tendency, measure of dispersion, frequencies and percentages), correlation analysis and multiple regression analysis using SPSS. Reliability and internal consistency of the measurement items were tested using Cronbach's alpha and all the variables attained value above 0.70 implying that the measures was reliable. The qualitative data collected from the exit interview and written responses with the senior procurement officers was analyzed based on themes and the findings were integrated with the quantitative findings.

The analysis of the qualitative interviews with the respondents of the case companies brought the following interesting results: SCPM was mainly used as an internal approach as there are barriers for external measurement as well as the internal measurement process was not considered to be adequate enough for being used externally; The frequently used measures were rather short-term oriented and financial and the linkage between the overall strategy and the supply chain strategy was rather neglected; The choice on the SCPI was rather unstructured and not top-down and the degree of variation on the usage of SCPIs was very high and Suppliers and customers report on certain measures in an informal way as well as the companies inform their counterparts also rarely.

5.2.1 Objective1. Effect of level of skills of staff on performance of supply chain systems in the petroleum industry in Kenya

Aspects of level of skills of staff had been affecting performance of supply chain systems in the petroleum companies. The level of skills of staff in table 4.8 shows that majority of the respondents 99% (66) indicated that they have both human skills and conceptual skills being No. 1(1%) and only 92% (24) being No.2 (8) of the respondents indicated that they also have technical skills. Those with human skills are able to work with all the staff/people in their company. Respondents from the former indicated that they have technical skills meaning they have proficiency in specific activity or type of work in the oil industry and finally the rather indicated they conceptual skills meaning they have the ability to work with broad concepts and ideas. Lack of skills had contributed to poor performance in service delivery in the supply chain. The study sought to investigate the influence of human skills on performance of supply chain systems towards the fuel shortages in the petroleum industry in Kenya. Particularly the study focused also on technical and conceptual skills; the functions of effective and efficient management of the petroleum industry.

According to literature reviewed, level of skills of staff can help to enhance service delivery in the oil company and make it have a competitive edge to other companies with deficiency in skills toward customer satisfaction. This underscores that skills are very vital in proactive forecasting of stock levels and service delivery in the oil industry in Kenya. Therefore, the study sought to find out if the level of skills is affecting performance of supply chain systems in the petroleum industry in Kenya. Descriptive analysis showed that majority 97% (66) agreed that they have both human skills and conceptual skills being No. 1(1%) and only 92% (24) being No.2 (8) of the respondents indicated that they also have technical skills and level of skills contribute to the overall effectiveness and efficiency towards service delivery to ultimate customers or proper forecasting of the stock levels to enhance satisfactions to their customers. This supports the earlier argument that level of skills has vital role

to play in service delivery by enhancing customer relationship management in the petroleum industry. Majority 99% are not encouraging their staff to go for further studies to boast their level of skills.

Majority 58% (31) of the respondents ranked human skill as low, about 36% (19) of the respondents ranked it high and the remaining 6% (3) respondents ranked it very high respectively. The technical skills was also ranked by the majority respondents 54% (7) as low,38% (5) respondent ranked it as high and the remaining 8% (1) respondents ranked it as very high. Finally majority of the respondents 56% (30) ranked Conceptual skills as high, 33% (18) of the respondents ranked it low and only 11% (6) of the respondents ranked it very high (refer Table 4.9).Although both National and International registered Oil Company are in business, majority 99% are not encouraging their staff to go for further studies to boast their level of skills.

From the correlation analysis on petroleum basis level of skill was very vital and significant to staff intention to leave in all the oil industries. Level of skills has affected fuel forecasting on timeliness, officers move through the levels the organization (from lower to upper),skill importance move from technical to human to conceptual. This implies that the more skills one has the better for proper forecasting of stock levels in the petroleum industry. In the oil companies regression analysis level of skills was found to be a predictor of fuel shortages in national oil companies unlike the international one. In the general regression model analysis the result indicated that level of skills was negatively and significantly related to intention to leave. Therefore, these findings shows that the research which sought to establish the extent to which level of skills affects performance of supply chain systems in the petroleum companies was achieved because it established that level of skills affects performance of supply chain system in the petroleum industry. It established through qualitative data that, performance prefer the three levels of skills for proper forecasting toward stock levels to mitigate fuel shortages in the industry.

It is clear that performance has emerged as a strategic competitive tool for organizational success. In today's business environment, organizations cannot afford to ignore the strategic implications of performance for its competitive position. In the light of this, it is vital for supply chain systems to develop or adopt an effective Performance Management System (PMS) very often associated with Total Quality Management (TQM) such as ISO 9000 series. Furthermore, the study stresses the need for top management commitment as the essential element for safeguarding level of skills of staff performance implementation. In order to communicate level of skills of staff performance o across the organization, top management should create an organizational environment that focuses on continuous improvement. Their commitment promotes the creation of level of skills of staff values, along with a management system to guide all activities of the company towards performance implementation. The skills approach shows that leaders have certain behaviors that allow them to act as a leader in specific situations that they come across. Up until this time, I have been giving a lot of attention to "Three Skills Model" where the basic skills you need to be a leader are "technical skills, human skills, and conceptual skills". Using these three skills, it is easy to fit an individual into these skills categories based on whether or not they have them. The study concludes that the level of skills of staff affects performance of supply chain systems through the development and communication of a clear performance that identifies the nature and direction of the organization as including proper forecasting, thus, encouraging timeliness in delivery of the oil product to the respective customers. The active involvement, attention, and direction of the senior procurement officers are crucial in assuring firm- wide performance measurements.

5.2.2 Objective 2.The effects of information and communication technology on performance of supply chain systems in the petroleum industry in Kenya.

The study established that majority of the respondents 58% (39) were of the opinion that ICT used by the oil companies do influence performance. About 42% (28) felt that ICT has an impact, hence it can affect performance. When asked about the percentage of retentions occasioned by the performance, majority 62.3% (45) respondents indicated 1-25%. About 26-50%, 18.2% indicated 51-75% and only 2.8% indicated 76-100% respectively (refer table 4.12).

The survey response established that senior procurement officers were not satisfied with effect of ICT and how it's affecting their performance. The study established that performance was not adequate in the registered oil companies. Other favourable aspects related to performance that were cited included lack of relevant skills form the staff, failure to use open tendering systems, failure to do proper forecasting of stock levels and responding to issues was slow instead of being proactive with firsthand information towards prudent decision making. Similar aspect such as lack of competency in decision making and failure to disseminate to ultimate customers regularly especially in this volatile world may result to dissatisfaction a among the oil staff in the petroleum industry.

Firsthand information in the supply chain systems is a boaster competence towards proactive forecasting against fuel shortages .Also, information may be one way a company can measure its service delivery, whether they get it at the right time to make prudent decision in their daily service delivery to customers or its worthwhile. In petroleum industries scenario information and communication technologies was singled out as major issue and one that has often led to poor forecasting in the petroleum industry. Therefore, this study sought to establish effects of information and communication technology on performance of supply chain systems in the petroleum industry in Kenya.

The findings in the descriptive statistics showed that majority of the respondents 58% (39) were of the opinion that ICT used by the oil companies do influence performance. About 42% (28) felt that ICT has an impact, hence it can affect performance.

When asked about the percentage of retentions occasioned by the performance, majority 62.3% (45) respondents indicated 1-25%. About 26-50%, 18.2% indicated 51-75% and only 2.8% indicated 76-100% respectively. Other respondents also disagreed with information and communication technology one of the independent which was key to proper forecasting in the petroleum industry, hence the need to encourage their staff to go for further studies. Majority (91.3%) believe that e-transaction can bring efficiency and effectiveness to inbound and outbound customers. The study noted that qualitative analysis indicated that Information and communication technology was one of the reasons why there was often fuel shortages and cited lack of dissemination at the right time as a major aspect. The networking often goes off and this results to a paradigm shift to manual transaction. Other aspects that were cited include Information and Communication Technology skills, academic qualification of (1.37 %) which was to match with the international registered companies.

Correlation analysis on oil companies' basis indicated that performance was positively and significantly related to Information and Communication Technology. Computers were negatively and significantly related to intention to leave in most companies. However, the academic qualification in most of the respondents 42% (28) felt that ICT has an impact, hence it can affect performance. When asked about the percentage of retentions occasioned by the performance, majority 62.3% (45) respondents indicated 1-25%. About 26-50%, 18.2% indicated 51-75% and only 2.8% indicated 76-100% respectively. The result also shows that ICT had a positive significant relationship with intention to leave however, the relationship was moderate. This means that the higher the ICT dissemination less the intention to leave among the ICT staff in all the oil companies.

In the company based regression analysis (42 %) indicated that ICT was found to be a predictor of fuel shortages in the petroleum companies, but the rest of respondents from the companies (62.3%) indicated that the skills is vital. Therefore, these findings show that in the presence of three dynamic skills, tendering systems and cost of crude oil, ICT does not affect

performance of supply chain systems in the petroleum industry in Kenya. Although there is literature to validate that ICT cannot affect performance, this finding was an unexpected. This explanation could be found in the commonly held belief that performance of supply chain systems in the petroleum industry remained effective even when the ICT is not adequate and competitive because of their interest and passion for their job. This findings on the performance effects on supply chain systems are in consistent with the findings of other previous studies with similar aspect such as lack of competency in decision making and failure to disseminate to ultimate customers regularly especially in this volatile world may result to dissatisfaction a among the oil staff in the petroleum industry.

Another explanation for research findings that ICT is not a predictor of performance in the supply chain can be found in the relationship between proper forecasting and stock levels which was found to be significant and positive in the correlation analysis. Also the relationship between skills and performance was significant. When staff obtains the necessary dynamic three skills, tendering knowledge and crude oil price, hence ICT goes up. That indirectly ICT should be addressed through Level of skills. Level of skills of petroleum's industries affects performance of service delivery, which is addressed indirectly in the equation. Therefore, these findings indicates that the research which sought to effect of ICT performance of supply chain systems in the petroleum industry in Kenya was achieved because it established that ij some companies it affected performance. Further, although ICT was not directly affecting performance in the supply chain systems, interview and written response revealed aspects related to ICT that were unfavorable and hence requires serous attention.

5.2.3 Objective 3. Effect of cost of crude oil on performance of supply chain systems in the petroleum industry in Kenya

The study established that cost of crude oil affects performance of supply chain systems in the petroleum industry. The null hypothesis was tested through F-test and results indicated that there is a relationship between cost of crude oil and performance of supply chain systems. Pricing is important for any product as it can affect its demand in the market. Many of the world's best business organization would endeavor to sale more at higher price to sustain their trade. That the theory of any affirms when in business. They price products at a reasonable rate to enable them to compete with other sister companies. From the crude oil perspective, pricing products need proper forecasting as customers are always sensitive to any adjustment of price. The study sought to establish the extent to which cost of crude oil affects performance of supply chain systems in the petroleum industry in Kenya.

High unpredictable price compared with medium unpredictable has a significant regression coefficient of (-0.234) with a t-value of -3.557 (p-value =0.001). Low unpredictable price compared with medium unpredictable has a significant regression coefficient of (-0.192) with a t-value of -3.132 (p-value =0.003). Regression analysis result at the local levels indicate that crude oil price contributed to supply chain performance at local registered oil companies (-0.234) with a t-value of -3.557 (p-value =0.001 and also international registered oil companies' ((-0.192) with a t-value of -3.132 (p-value =0.003 but not for the rest of the industry. Further, crude oil price was a stronger predictor of supply chain performance at local registered oil companies. In establishing the influence/performance of crude oil price in the supply chain, a comparison of the local and international registered oil companies revealed different findings. The explanation could be found in the practices which varied per each group. For instance, most of the locally registered oil companies were not ready realize their staff to go for further studies to enhance their understanding in the crude oil pricing. However, in the general analysis, it was established that the effect of crude oil price on performance was not significant (-0.234) with a t-value of -3.557 (p-value =0.001). Significant level in the presence of level of skills, ICT and tendering systems, crude oil price does not affect supply chain performance in the petroleum industry

rom the qualitative analysis the respondents were satisfied with crude oil price. However, the customers were often not unhappy with the retail prices. They were also not satisfied with competency of the staffs who were handling crude oil. Further, there were no processes of assessing crude oil price needs and service delivery was not linked to crude oil pricing. The interview confirmed that the staffs were supported in their crude oil price terms of supply chain performance. This argument is supported by the results from the study which established that while crude oil price may have an impact on staff performance mobility, crude oil price that is wholly paid by an entity is likely to prelude to staff search. In contrast, when supply chain performance for crude oil price the negative relationship to staff mobility is observed as supply chain are more likely to perform.

The correlation analysis indicated that there was a positive significant relationship between crude oil price and shortages of fuel in most of the oil companies. Crude oil price speculation was also strongly correlated with retail pricing of fuel, hence shortages. That the crude price is the cause of often shortages of fuels in the oil companies. From, the correlation analysis on company's basis, crude oil prices has a positive significant which was affecting to all petroleum companies. The implication of this is that cheaper prices would enhance service delivery practices were consumers are sensitive to any price adjustment upwards.

In the oil companies' regression analysis, crude oil price was found to be a predictor of performance to deliver and shortages in the oil industry. In general multiple regression analysis, the relationship between supply chain systems and crude oil price was significant. This means that, in the presence of level of skills, tender systems, crude oil can affect performance on the supply chain systems. The findings, therefore shows that the study which sought to establish the extent to which cost of crude oil affects performance of supply chain systems in the petroleum industry. Further, although crude oil price was a significant

predictor in the general analysis for all petroleum companies and hence a challenge to supply chain systems, interview and written response gave a high in depth information on aspects to crude oil that were favourable for the registered oil companies' management performance.

5.2.4 Objective 4. Effect of tendering systems on performance of supply chain systems in the petroleum industry in Kenya

The study established that there is no linear relationship between the performance in Supply chain systems and tendering systems studied. Even though 100% (60) of respondents indicated that they apply open tendering methods (refer Table 4.18). When asked further to explain differentiate between direct and open tendering method as per PPOA Act 2005 and other tools of procurement, they were unable. On average over 80% of the respondents indicated that they apply open tendering method, agreed that open tendering systems is the most recommended methods both in private and public sector and 79% agreed that what is stated in the Public Procurement and Assets Disposal Act 2015 acts as an indicator of performance on supply chain systems in Kenya. Majority of staff felt that tendering systems was based on merit. High percentage of 74% agreed that the tendering systems are the criterion over proper forecasting and expatiating the lead time after placing an order. This tallies with the findings that majority 69% agreed that the tendering systems were paramount to success in the present volatile world of business.

Tendering systems is viewed a process of upholding integrity by ensuring that there are no malpractices; informed decision-making, which requires public bodies to base decisions on accurate information and ensure that all requirements are being met. For any oil company to succeed it must adhere to forecasting of their stock levels. From table 4.18, a majority (100%) 66 of the respondents agreed that the tendering systems can enhance performance when properly executed within the supply

chain networking, but the remaining 26.45% were undecided. Most of the respondents indicated that they were using open tendering method against the alternative method of tendering. In the written responses, the respondents indicated that they preferred open tendering yet when asked how it's applied; it was an uphill task to explain its application comprehensively. There is need for all tendering systems to have a well stipulated procedures and guideline when executing it. The only measures they indicated they had was the ERC guidelines on every mid of the month they revise their prices by either increasing or decreasing. Therefore, the study sought to find out whether tendering systems affect performance of supply chain systems in the petroleum industry in Kenya.

From the qualitative analysis, majority of those who had left cited lack of transparency as the major factor that affected performance of supply chain. Another one was the government .involvement by directing all import to be done by a particular company. Majority (100 %) of the respondents indicated that petrol price was higher in all petroleum companies, as it was the nub and core to personal cars. The senior procurement officers in charge of procurement confirmed that ring fencing was done especially in regard with international companies that was not easy to find after relocation, but also added that such cases were rare.

Company by company correlation analysis showed that performance was significantly and negatively related to intention to leave for local companies. Therefore, performance had a negative and significant relationship with supply chain systems for intention to leave for international registered companies and this means that increase in service delivery was being enhanced by performance from level of skills in this companies. When correlating with the independent variables the results indicated strong positive relationship. Tendering systems was positively and significantly related fuel shortages, level of skills and crude oil price. The general correlation analysis established that tendering system had a negative significant relationship with supply chain performance. This indicates that the efficiency and tendering systems in place, the less the intention to leave among the oil companies. Majority of the respondents 95 % (61) indicated that they do comprehensive record keeping as a

measure of ensuring there is transparency in tendering systems' and the remaining 5 % (3) of the respondents indicated they use advertisement of bids as a measure of ensuring there is transparency in tendering systems'. From table 4.21, a majority 95%, indicated that they do comprehensive record keeping in their company, but the remaining 5% were of the opinion that adverts are the best .In company by company regression analysis Tendering systems was found to be a predictor for intention to leave in local companies. In general regression model analysis the results indicated that tendering systems had a negative and significant relationship with intention to leave.

Therefore, these findings shows that the research which sought to examine the effect of tendering systems on performance of supply chain systems in the petroleum industry was achieved because it established that supply chain and conversely performance leads to fuel shortages. Also, through qualitative data, that the companies preferred consistent tendering systems and proper forecasting of stock levels, universal application of the criteria to all bidders, regular tenders so as to get the accrued benefits of competitive bidding systems and transparency and accountability. This was to have all inclusive criterions and to avoid ring fencing/biasness practices since they created inequality. Also, the tendency may be counterproductive in performance of oil companies as it encourages them to look a paradigm shift to where the environment is conducive for investment.

5.2.5 Objective 5. Moderating effect of legal and regulatory environment in the oil companies on the effect of performance on supply chain systems in the oil industry in Kenya

The study established the significance of effect of legal and regulatory environment in the oil companies on the, relationship between level of skills, information and communication technology cost of crude oil and tendering systems in the oil industries. The relationship between performance of supply chain systems, and the moderating variable tested using the Rank

correlation coefficient. The study established that performance affect supply chain systems. The correlation is moderate (0.848) and positive. That means the performance of supply chain systems was found to be 71. 9% (coefficient of determination, $r^2 = 0.719$).

Literature review indicates that a variety of personal variables such as age, gender, highest degree level, level of skills and experience exerted potential influence for intention to leave. The study sought to determine out whether age moderated the relationship between the independent variables of the study and the dependent variable. From the descriptive statistic, it was established that the age of the respondents shows that 0.8% were between 20-24 years, 10.1% were between 25-29 years, 11.2% were between 30-34 years, 13.4% were between 35-39 years,16.1% were between 40-44 years,17.2% were between 45-49 years ,10.9% were between 50-54 years and 20.3% were over 55 years. The high response were received from 55 and above age brackets and 45-49 brackets giving 20.3% and 17.1% respectively (refer Figure 4.1).Lower responses were received from 20-24 and 25-29 age brackets as this categories mostly comprises of newly graduates who have joined the job market who are normally few. Similarly, the study had revealed that earlier career phases comprises of two stages namely, establishment and achievement and this period can extend up to age 40.The findings indicates that age did not have a moderating effect on the relationship between the independent variables and the dependent variable. The expectation was that the young employees were the one who had high skills as opposed to the older employees. Therefore, from these findings, employees may choose to leave or stay regardless of their age since age does not influence whether they leave or stay.

This study also sought to establish whether education level moderated the relationship between the four independent variables of the study and the dependent variable. From the descriptive statistics, it was established that the level of education was also sought in the questionnaire. Those who were with masters and above were 10% (7). About 41% (28) possessed degree, 40% (27) diploma and 9% (6) were certificates holders. The findings that majority of the respondents possessed less than 1st

Degree 49% indicates that the staff did not meet the requirements of providing quality services (refer Table 4.2). Previously, studies established that majority of academic staff working in the petroleum industry did not possess the necessary requisite to do competent task of doing proper forecasting of stock level which was a crucial qualification to service delivery.

Literature reviewed indicates that employees with higher level of education had greater skills and expectations which were not likely to be met by their companies and hence were more likely to leave. The multiple regression analysis results indicated that education level did not have a moderating effect in the relationship between the independent variables and the dependent variable. Therefore, employees may choose to leave regardless of their educational level since their education level does not influence staying or leaving the oil company.

Matching and alignment between proper forecasting techniques and performance of supply chain systems and context is an important key concern for all petroleum oil companies, as strategy in paradigm. Also this study confirms the TQM and operations strategy theory, that the degree of fit between the chosen forecasting and the oil company's focus and context (such as competitive priorities, capability, resource usage, etc.) has a significant impact on quality service delivery to downstream of SCM (Cheng 2014).

5.3 Conclusion of the Study

The study was set out to establish the challenges affecting performance of supply chain systems in the petroleum industry in Kenya. The study generally concluded that mixtures of challenges affect performance of both national and international ERC registered oil companies. These were either intrinsic and extrinsic variables effect on performance of employees a s exemplified by level of skills which is an intrinsic and crude oil price as extrinsic variable which were identified as predictors of service delivery through supply chain systems.

The study further concluded that current trends such as timeliness forecasting, proactive stock level management, IT, just in time delivery and e-procurement has not been well embraced by the registered oil companies. Most of these companies' as confirmed from qualitative data, did not have performance policies or strategy and hence had not made performance of their staff apriority despite the current market competition in the level of skills. Finally, the needs to emphasize the importance of e- sourcing throughout the supply chain systems so as to achieve a competitive in the business markets. Basically three functions attributed to (supply chain) performance indicators (SCPI); Information functions in order to inform management, support decision making and to identify problem areas; Steering function in order to set targets and give directions to desired outcomes and Controlling function in order to supervise process execution.

5.3.1. Extent to which level of skills of staff affects performance of supply chain systems in the petroleum industry in Kenya

Based on the findings of the study, this research concluded that level of skills affects performance of supply chain in Kenya. There was an optimistic relationship between level of skills and performance of supply chain systems. Performance was the measure commonly used in these studies to assess the cause of fuel shortages in the oil companies. When oil companies, fail to perform intention to leave increases, hence poor forecasting and shortages. Further, this study established that level of skills had more predicting strength than other independent variables. This aligns to the argument that dynamic skills brings high turnover. In this research discussion it's well-articulated on how "leadership skills in action", is focused on the three excelled areas. Since the dynamics of performance measurement has been addressed, alongside of taking these three skills model, in has given me a good insight on how to determine "good leaders". These leaders can be born with leadership traits or learn behaviors through experience.

This study also concluded that the performance practiced by most local companies was not favourable for supply chain systems to work, since from the findings majority indicated that unskilled personnel were the cause of the poor forecasting in the whole systems. Further, the study concluded that the modern skills were not adequately embraced to mitigate fuel shortages. Similarly, the study also concluded that there was motivation to improve their level of skills by promotions.

5.3.2 The Effect of Information Communication and Technology on Performance of Supply Chain in the Petroleum Industry in Kenya.

Based on the findings, the study concluded that in the presences of level of skills, crude oil price and tendering systems in supply chain systems performance was high. In other words their efficiency and effectiveness was not as result of ICT, hence did not influence their stay or leaving that came out in the correlation analysis. Also company by company analysis, as they did not see the value of ICT. The study established that despite ICT not being a predictor of performance of oil companies, there were various aspects of ICT that did not meet performance of supply chain systems. The companies believed that were doing their business without the internet and computers in place, hence they were making high profit margin. Further, companies did not give regular computerized transaction and their manual records were fairly good. Therefore, the study concluded that such findings are appointer that performance cannot necessary be affected by ICT.

5.3.3 The Extent to which Cost of Crude Oil affects Performance of Supply Chain Systems in the Petroleum Industry in Kenya.

The findings led to the conclusion that cost of crude oil affects fuel shortages .In the presence of level of skills, tendering systems and crude oil price were the predictor of performance of supply chain in most of the oil companies. This results though unexpected because the hypothesis was based on research, led the researcher to conclude that since there was a strong relationship between crude oil price and supply chain performance, indirectly crude price had no much effect as ERC were the determining factor. However, the significant correlation results and the analysis on oil companies be regarded. Further, the findings indicated aspects of crude price practices and policies that were unfavourable such as the OPEC cartel and the national government regulation and regulatory framework. The study also concluded that the employees' qualification was vital; hence the need to have somebody competent in the crude oil trends in the world market. The researcher also drew conclusions that crude oil price offered outside the country was cheaper, hence influence the intention of the staff to leave. As any employees, who leave to work with international company rarely return. The study further concluded that crude oil prices analysis has an impact on the fuel shortages'

5.3.4 The Effect of Tendering Systems on Performance of Supply Chain Systems in the petroleum Industry in Kenya

Based on the findings, the study concluded that tendering systems affects performance of supply chain systems in the petroleum industry in Kenya. There was an inverse relationship between tendering systems and service delivery implying that the more efficiency to mitigate fuel shortages was hampered by the tendering systems in each oil company. The tendering systems practices were not favourable for oil companies. The researcher concluded that the tendering systems criterion or practices were not fairly applied through competitive bidding and there was not transparency in the while process. Further, the researcher concluded that the practices were not all inclusive and was skewed in favour of monopoly of giving orders at the expenses of other companies. The tendering practices did not meet the company's expectations and were not aligned to the current Public Procurement and Disposal Act 2015 (PPDA) and with the fundamental tenet of tendering system theory of

competitive bidding. Also the whole tendering process was encumbered by favourism procedures that caused unnecessary shortages in the oil industry.

5.3.5 Moderating effect of legal and regulatory environment in the oil companies on the relationship between independent variables and the dependent variable on performance of Supply Chain Systems in the petroleum industry in Kenya

Based on the study findings, the researcher concluded that personal features in terms of age that had been hypothesized to have a moderating effect on intention to leave had been on the relationship between the independent variables and the dependent variable. This finding implies that leaving or staying in their company was not influenced by age for the population under this study. Despite the fact that the hypothesized relationship was not backed by previous research, age related differences were not seen.

This study also concluded that education level of staff in the oil company had a moderating effect on the intention to leave and the employees in the oil industry in Kenya. Based on research, it was hypothesized that the staff with higher level of education in this case 1st Degree were more likely leave than those with lower education level because there were more green pasture and expectations outside the petroleum industry. Despite there was no backing, research, education level related difference was seen. The researcher concluded that since majority of the staff were below the 1st Degree level as shown in the descriptive statistics, the high level of education was an impetus on whether to leave or stay.

5.4 Recommendations of the Study

In this section, recommendations related to performance and for supply chain systems management as well as the areas for further research are provided below; **Policy Recommendations: A** policy and practical area that this research can be applied is in the level of skills of staff. Whereas it is clear that individual performance has control over the efficiency and effectiveness of supply chain systems in the oil companies, the petroleum companies can improve the three dynamics level of skills to supplement the inadequate of performance to ultimate customers and ensure their if efficiency and effectiveness on service delivery within the industry. This could forestall the regular fuel shortages in the petroleum industry in this sector. A policy and practical area that this research can be applied is in the level of skills of staff. Whereas it is clear that individual performance has control over the efficiency and effectiveness of supply chain systems in the oil companies, the petroleum companies can improve the three dynamics level of skills to supplement the inadequate of performance to ultimate customers and ensure their if efficiency and effectiveness on service delivery within the industry. This could forestall the regular fuel shortages in the petroleum industries in this sector.

Information and communication technology plays a key role of networking within the business sector; hence it's a critical resource in the forecasting of the stock level in the petroleum industry. The replenishment of orders relies so much on ICT to get firsthand information at the right time, from the right source and of the right quality and quantity. To do so, they need to embrace the modern way of doing things, with the e- sourcing systems within the supply chain systems, such as from the up streams to the down streams. There is great need to recognize performance in the supply chain by employing the new trends in the supply chain systems. The study shows that staffs remain in a company due to a mixture of inbound and outbound factors. The management of these companies should develop software where all petroleum documentations are customized towards effectiveness and efficiency service delivery, hence customer satisfaction for their needs and expectations are dynamics.

This study brought to the fore the critical role of Information Communication and Technology (ICT) and its strategy on performance of the supply chain systems. It is recommended that ICT in the oil company should embrace efficiency and minimize errors on their transactions, since management have an influence on reinforcement of oil companies to improve. Providing new ICT knowledge will enable the staff to improve on their services and communicate at the right time as the oil product is natural with often revolving dynamics. The competence of the staff does not meet the customer's expectations. While it is appreciated that management in the oil companies have diverse disciplines, experiences and natural cultures and some have little or no formal ICT knowledge, they are expected to deliver. The research recommends continuous management capacity development in the industry, so that management can keep abreast with new trends in the volatile business market to enhance performance.

The study justifies that, any performance of supply chain systems with right pricing of fuel, level of skills of staff, information technology and communication and tendering systems, a well forecasting plan in place has a deep understanding of the procurement dynamics of the national and international registered oil companies. These would help avoid fuel shortages in the petroleum industry. The Kenya government, policy makers, financial organizations and other stakeholders in ERC and petroleum industry should pay more attention on measures that ensures long term supply chain performance as they constitute over 75% of all national and international oil companies in Kenya. ERC and all national and international oil companies require level of skills of staff to be able to lead and manage the firms' long term sustainability towards effective performance within supply the chain. Particularly the senior procurement officers require technical, human and conceptual skills the right pricing of fuel in their petrol station or companies once the ERC announces new price adjustment. The senior procurement officers require to effectively performing the functions of the new trends of forecasting. Many procurement officers are able to take care of their oil company the networking within the supply chain. In this section, commendations related to policy and for the management of supply chain systems in the petroleum industries as well as for further research are given as follows:

Recommendations for the Management: A policy and practical area that this research can be applied is managing Tendering Systems. Whereas it is clear in managing tendering process and control over the efficiency and effectiveness of supply chain systems in the oil companies, the petroleum companies can improve the three dynamics level of skills to supplement the inadequate of performance to ultimate customers and ensure their if efficiency and effectiveness on service delivery within the industry. This could forestall the regular fuel shortages in the petroleum industry in this sector.

Petroleum industry in Kenya have largely dependent on ERC policy for regulating and price adjustment every 14th of each month, leading to hesitating to replenish their stock level as they don't anticipated to incur any loss in case there is decrease of prices. Therefore, the ERC has a role of managing the whole process, while in ensuring that information is proactively disseminated upfront to all oil companies. This will enable oil companies to delivery their services effectively and lead to customer satisfaction, hence no fuel shortages. The study suggests that petroleum companies should improve their level of skills of staff by encouraging their staffs pursue further studies toward enhancing their level of educations. It is also recommended that oil companies increase their support to their staff by advancing loans where appropriate to enable those who are interested to go back for further studies. This is to keep breast with best practices in their profession. Since those who have gone beyond 1st Degree are performing, hence the need to imitate their exemplary in the industry. The practice should outline clearly the stand of the oil company on internal motivation after the training versus the new employees. The policy should be revised to make continuous improvement that is skewed in favour of all staff once they are through with their studies.

5.5. Areas for Further Research

Due to constraints highlighted in the first chapter, this study could not exhaust all the challenges hindering performance of the supply systems in the petroleum industry in Kenya. Petroleum companies are registered by ERC and owned by first to third generation are not in the hands of unregistered Kenyans; therefore factors leading to effective and efficiency in forecasting by all the concerned parties in Kenyans like stakeholders needs to be incorporated in prudent decision making need to be established. Challenges like the existing legal and policy framework, logistics and procurement related courses available to be emphasized to enhance their knowledge in the industry. A review of literature indicated that there has been limited amount of resources on performance of supply chain in the Kenyan context. Thus, the finding of this study serves as a guide for future studies on performance and on this population. Performance in supply chain systems, has not been widely studied which presents gaps in Africa and Kenyan context. The study has contributed to knowledge by establishing that level of skills; cost of crude oil and Tendering systems can mitigate fuel shortages through competent staff in the Kenyan context. Some of the findings have generally vindicated the long held positions regarding various relationships that were studied. Other findings, however, such as role of ICT in the intention to leave and the moderating variable effect of age and education level on intention to leave were inconsistent with pertinent literature and results of previous studies thus preparing ground for paradigm shift in such factors in relation to this performance.

The study has clearly pointed out the responsibility of supply chain systems on performance of the petroleum industry. Studies have concentrated on financial aspects, profit making and their performance in this sector. This study therefore highlights the role of supply chain performance, an area that has not been much explored. This study used qualitative and quantitative techniques. It was also across sectional study of both National and international registered oil companies in Kenya to establish their competence in service delivery through supply chain. The interaction effects may be re-examined at a future date because of the volatile business within the petroleum industry in Kenya. This study confined itself to the 73 registered oil companies in Kenya. A comparative study should be carried out to compare whether the findings also can apply for the

unregistered oil companies in Kenya in order to validate whether the findings can be generalized to all oil companies operating in Kenya whether registered or not.

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APPENDIXCES 1

APPENDIX I:

LETTER OF INTRODUCTION

ANTHONY OSORO

JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY

COLLEGE OF HUMAN RESOURCE DEVELOPMENT

P.O BOX 62000

NAIROBI

Dear Respondent,

RE: QUESTIONNAIRE ADMINSTRATION

My name is Anthony Osoro. I am a student currently pursuing PhD of Science in Supply Chain at Jomo Kenyatta University of Agriculture and Technology. I wish to examine the challenges affecting performance of supply chain systems in the petroleum industry in Kenya. As I pursue the study for academic purpose only, the findings will help in improving the performance of supply chain in the petroleum industry in Kenya

There are no risks associated with participation. Your name, or any other identifying information, will not be mentioned in any written reports of this experiment. If you have any questions about this research, please contact Dr. Willy Muturi and Dr. Patrick K.Ngugi who are the Supervisor. Or Anthony Osoro; ansoroha@gmail.com who is the student undertaking this research.

Please take a few minutes and complete these questionnaires to enable me undertake the study. To guarantee confidentiality, do not indicate your name on this form. Your cooperation is highly appreciated.

Yours Faithfully

Anthony Osoro

APPENDICES: APPENDIX 11 QUESTIONNAIRES

Please tick where appropriate or fill in the required information on the spaces provided.

The questionnaire are structured in six parts, I, II, III, IV, V, and VI

PART 1: BACKGROUND INFORMATION

Please tick the appropriate box or fill in the blank space;

1, Name of the company [ ] Local [ ] International

b. Kindly indicate your business name…….(The name of the company will only be for the identifiable purpose for this research)

2. Gender [ ] Male [ ] Female

3. How old are you? (Please tick as appropriate)

[ ] 20-24 [ ] 25-29 [ ] 30-34 [ ] 35-39 [ ] 40-44

[ ] 45-49 [ ] 50-54 [ ] 55-59 [ ] 60- 64 [ ] 65 and above

PART 11: INDEPENDENT VARIABLES; LEVEL OF SKILLS OF STAFF

4. Which academic qualification do you have? [ ] post graduate [ ] Bachelors [ ] Diploma [ ] secondary [ ] others

6. How many years have you worked in this company? ……Years

7. Where did obtain your academic qualification from? [ ] local training [ ] abroad/overseas

9. Is this your first employer? [ ] Yes [ ] No

10. How many years have you worked in this position …….. years?

11. Do you have competent staffs in this area of crude oil? [ ] Yes [ ] No

12. Does your company embrace the three dynamic skills?

Level of skills	Yes	No	Rank
Human			

Technical			
Conceptual			

PART 111: INFORMATION AND COMMUNICATION TECHNOLOGY

12. How many computers do you have in your company? [ ] 5 [ ] 5-10 [ ] 15-20 [ ] I don't know

13. Does your company embrace e- sourcing? [ ] Yes [ ] No

14. Are all the transaction customized by e-procurement? [ ] Yes [ ] No

15. Is your company doing any of the following to motivate employees to develop ICT skills?

[ ] time off [ ] study leave [ ] training workshops [ ] scholarships.

16. Do you believe that e- transaction can bring efficiency and effectiveness, to all inbound and outbound customers [ ] Yes [ ] No.

PART IV: COST OF CRUDE OIL

17. Kindly indicate the price of fuel for the period given below?

Period Year 2014	**July**	**August**	**Sept**	**Oct.**	**\Nov.**	**Dec.**	**Jan.2015.**
Diesel							
Petrol							
Kerosene							

PART V: TENDERING SYSTEMS

18. What method of tendering do you use? [ ] Open [ ] Alternative [ ] I don't know

19. Where do you place your order for replenishment of oil? [ ] National vendors [ ] International vendors

20. How reliable are they? [ ] 1-25% [ ] 25- 50% [ ] 50-75% [ ] over 75 %

21. What measures do have in place to ensure there is transparency in tendering? [ ] comprehensive record keeping [ ] Advertising all bidding

22. When last did your company tender for the supply of oil? [ ] This year [ ] last year [ ] I don't know

23. What is your company doing to embrace competition? [ ] Open bidding [ ] alternative bidding i.e. Restricted tendering, Direct Procurement, Request for proposal, Request for quotation, Specially permitted procurement, or Low value procurement [ ] others, specify

24. How did you pre-qualified suppliers for this financial year? [ ] open tender [ ] adopted

PART VI: DEPENDENT VARIABLE; PERFORMANCE;

25. How do you verify the right quantity of oil delivered? [ ] tipping the fuel level and reading [ ] meter level

26. Have your customers' complained about the right quality of oil after usage? [ ] Yes [ ] No, yes, what percentage?

27. Do you observe the right time in every delivery of fuel after placing an order? [ ] Yes [ ] No. if no, how long are the delays? [ ] 24hours [ ] 36 hours [ ] 48 hours [ ] more than 48 hours, specify……

28. Can you estimate the lead time period? [ ] less than 1 days [ ] 2 days [ ] more than 2 days

29. What percentage of the market price at which you set your crude oil price……..

30. As below, have you ever experienced oil shortages? [ ] Yes [ ] No, if yes, what is the course?.....

Kindly indicate the price of fuel for the period given below?

Period Year 2014	July	August	Sept	Oct.	Nov.	Dec.	Jan.2015.
Diesel Expected Actual Shortage/surplus							
Petrol Expected Actual Shortage/surplus							

Kerosene Expected Actual Shortage/surplus							

32. Have you ever experienced excess oil supply? [ ] Yes [ ] N0, if yes, what was the cause?.....

33. As below and from your experience, between National and International Oil Companies where do we have often oil shortages? [ ] National oil company [ ] International oil company

34. Indicate where your company belong? [ ] a locally registered [ ] an international company

35. What kind of challenges do you experience in your business?.

Challenges	**Please tick where appropriate**	**Please Rank the challenges**
Fuel shortages		
Employee skills		
Information dissemination		
Unpredictable price increase		
Tendering systems		
Poor forecasting		
insecurity		
Legal and regulatory policy		
Others		

If others than the above challenges, specify……..

THANKS FOR YOUR PARTICIPATION AND CO-OPERATION

APPENDIX 1II: ERC OIL REGISTERED COMPANIES IN KENYA (LATEST LISTINGS)

TABLE 3.3

Premium Petroleum Limited, Nairobi	.National Oil Corporation of Kenya, Nairobi
Metro Petroleum Limited, Nairobi	Mid-Oil Africa Ltd, Nairobi
Kenya pipeline company limited, Nairobi	MGS International (K) Ltd, Nairobi
Tullow Kenya B.V., Nairobi	Metro Petroleum Ltd, Nairobi

Kobil Petroleum, Location: Nairobi	Libya Oil Kenya Ltd, Nairobi
Oceanic Bunkering & Oil Products Ltd, Mombasa	Kobil Petroleum Ltd, Nairobi
Mama Evans Greengrocer & Mafuta Taa, nairobi	Kenya Shell Ltd, Nairobi
MGS International (K) Ltd, Industrial area. Nairobi	Kenya Petroleum Refineries Ltd, Mombasa
Libya Oil Kenya Ltd, Industrial area. Nairobi	Kenya Oil Company Ltd, Nairobi
Mid-Oil Africa Ltd, Industrial area. Nairobi	Kenol - Kenya Oil Company Ltd, Nairobi
Mocol Kenya Ltd, Industrial area. Nairobi	Horn of Africa Oil Ltd, Nairobi
National Oil Corporation of Kenya, Industrial area. Nairobi	Hass Petroleum (K) Ltd, Nairobi
Riva Petroleum Dealers Ltd, Industrial area. Nairobi	Gapco Kenya Ltd, Nairobi
PARASIA GULF OIL COMPANY, Windsor hse 5th flr,university way	Galana Oil Kenya Ltd, Nairobi
Zuleka Auto, eldoret	Galana Oil (K) Ltd, Nairobi
Fuelex[k] Ltd, Nakuru	First Oil (K) Ltd, Nairobi
Century Oil Trading Company, Thika	Euro Petroleum Products, Nairobi
Al Hassan Oil [K] Ltd, Kisumu	Engen Kenya Ltd, Nairobi
Somken Petroleum Company Ltd, Mombasa	Emirafrica Oil Ltd, Nairobi
Mbaraki Bulk Terminal Ltd, Mombasa	Elgon Brook Products Company Ltd, Nairobi
Gapco (Kenya) Ltd, Mombasa	Earth Oil Kenya PTI EPZ Ltd, Nairobi
Fuels and Lubricants Ltd, Mombasa	Dalbit Petroleum Ltd, Nairobi
Ascot Investments Ltd, Mombasa	Chevron Kenya Ltd, Nairobi
Wata Expo Ltd, Nairobi	Chatered Oil Company Ltd, Nairobi
Trifoil Petroleum Ltd, Nairobi	Cape Suppliers Ltd, Nairobi
Triad Energy Ltd, Nairobi	Caltex Oil Kenya Ltd, Nairobi
Total Kenya Ltd, Nairobi	Bidco Oil Refineries Ltd, Nairobi
Topaz Petroleum Ltd, Nairobi	Benin Oil Kenya Ltd, Nairobi
Sulphod Petroleum Ltd, Nairobi	Bell Oil (K) Oil, Nairobi
Riva Petroleum Dealers Ltd, Nairobi	Bakri International Energy Company Kenya Ltd, Nairobi
Riva Oils Company Ltd, Nairobi	Anyrok Oil Investments, Nairobi
Ral Ltd, Nairobi	Al-Numeiri Oil Trading Company (K) Ltd, Nairobi
Pick Oil Ltd, Nairobi	Alba Petroleum Ltd, Mombasa
Petro Oil Kenya Ltd, Nairobi	Aegen Oil Ltd, Nairobi
Orix Oil Kenya Ltd, Nairobi	Addax Kenya Ltd, Nairobi
Oil Com (K) Ltd, Nairobi	Al Hassan Oil (K) Ltd,Kisumu

National Oil Corporation of Kenya, Depot, Nairobi	-

APPENDIX IIV: DESCRIPTIVE STATISTICS

Gender of the respondent

	Frequency	Valid Percent
male	60	85
female	11	15
Total	71	100

Academic qualification of the respondent

	Frequency	Valid Percent
post graduate	7	10
bachelors	28	41
diploma	27	40
secondary	6	9
Total	68	100

Years of working in current company .

Statistics

years of working in this company

N		Mean	Std. Deviation	Skewness	Std. Error of Skewness	Kurtosis	Std. Error of Kurtosis	Minimum	Maximum	
Valid	Missing									
71	1	6.31	3.516	1.070	.285		.900	.563	1	16

Where did you obtain your academic qualifications from?

	Frequency	Valid Percent

Statistics

how many years have you worked in this organization

N	Mean	Std.	Skewness	Std. Error of	Kurtosis	Std. Error of	Minimum	M

local training	46	90
abroad/overseas	5	10
Total	51	100

Is this your first employer?

	Frequency	Valid Percent
yes	24	52
no	22	48
Total	46	100

How many years have you worked in current position?

Do you have competent staffs in the area of crude oil?

Valid	Missing		Deviation		Skewness		Kurtosis		aximum
71	1	4.17	2.563	1.545	.285	3.815	.563	1	15

	Frequency	Valid Percent
yes	32	49
no	33	51
Total	65	100

Skills

skills	Yes	No
Human	66(99%)	1(1%)
Technical	24(92%)	2(8%)
Conceptual	66(99%)	1(1%)

Ranking

Ranking	Low	High	Very High
Human skills	31(58%)	19(36%)	3(6%)
Technical skills	7(54%)	5(38%)	1(8%)
Conceptual skills	18(33%)	30(56%)	6(11%)

How many computers do you have in your company?

Number of computers	Frequency	Valid Percent
5	57	85
5-10	5	7
15-20	3	4

	Frequency	Valid Percent
yes	39	58
no	28	42
Total	67	100

yes	59	91
I don't know	2	3
Total	67	100

Does your company embrace e-sourcing?

Are all transactions customized by e-procurement?

	Frequency	Valid Percent
yes	25	38
no	40	62
Total	65	100

Is your company doing any of the following to motivate employees to develop ICT SKILLS?

	Frequency	Valid Percent
time off	42	68
study leave	2	3
training workshops	10	16
Scholarships	8	13
Total	62	100

Do you believe that e-transactions can bring efficiency and effectiveness to all inbound and outbound customers?

Diesel price	no	6	9
	Total	65	100

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
diesel July 2014 49	49	80	116	100.37	7.149
diesel august 2014	67	90	117	101.16	4.843
diesel September 2014	67	89	111	101.24	5.565
diesel October 2014	67	83	110	100.87	6.749
diesel November 2014	67	80	110	99.94	8.917
diesel December 2014	67	59	110	98.93	9.351
diesel January 2015	67	80	106	91.45	5.839
Valid N (listwise)	67				

Petrol price

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
petrol July 2014	48	11	113	102.83	15.085
petrol august 2014	67	11	111	104.00	12.286
petrol September 2014	67	93	113	105.76	5.155
petrol October 2014	67	90	112	105.42	6.488
petrol November 2014	66	11	1011	118.65	112.333
petrol December 2014	66	81	182	105.71	11.611
petrol January 2015	66	83	117	97.24	6.414
Valid N (listwise)	65				

Kerosene price

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
kerosene July 2014	20	70	88	78.80	5.690
Kerosene august 2014	22	71	87	79.00	4.504

Kerosene September 2014	22	73	87	80.50	4.668
Kerosene October 2014	22	69	86	79.73	5.692
Kerosene November 2014	22	68	94	78.86	7.383
Kerosene December 2014	22	65	94	77.59	7.836
Kerosene January 2015	22	62	79	69.05	4.815
Valid N (list wise)	22				

What method of tendering do you use?

	Frequency	Valid Percent
open	60	100.0

Where do you place your order for replenishment of oil?

	Frequency	Valid Percent
comprehensive record keeping	61	95
advertising all bidding	3	5
Total	64	100

	Frequency	Valid Percent
national vendors	47	92
international vendors	4	8
Total	51	100

How reliable are they?

	Frequency	Valid Percent
25-50%	4	6
50-75%	42	62
over 75%	22	32
Total	68	100

What measures do have in place to ensure there is transparency in tendering?

When last did your company tender for the supply of oil?

	Frequency	Valid Percent
this year	51	93
last year	4	7
Total	55	100

What is your company doing to embrace competition?

	Frequency	Valid Percent
open biding	29	44
alternative biding	37	56
Total	66	100

How did you prequalified suppliers for this financial year?

	Frequency	Valid Percent
open tender	35	97
adopted	1	3
Total	36	100

How did you verify quantity of oil delivered?

	Frequency	Valid Percent
tipping the fuel level and reading	67	100

Have your customers complained about the right quality of oil after usage?

	Frequency	Valid Percent
yes	30	53
no	27	47
Total	57	100

what percentage

Descriptive Statistics

	Frequency	Valid Percent
yes	23	58
no	17	43
Total	40	100

	N	Minimum	Maximum	Mean	Std. Deviation
what percentage	24	1	25	9.46	8.092
Valid N (listwise)	24				

Do you observe the right time in every delivery of fuel after placing an order?

If no how long are the delays

	Frequency	Valid Percent
one day (24hrs)	37	93
two days	2	5
Four days	1	3
Total	40	100

Can you estimate the lead time period?

	Frequency	Valid Percent
less than 5 days	58	98
5-10 days	1	2
Total	59	100

What % of market price at which you set your crude oil price

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
what % of market price at which you set your crude oil price	3	10	45	31.67	18.930
Valid N (list wise)	3				

As below have you ever experienced oil shortages?

	Frequency	Valid Percent

yes	19	35
no	35	65
Total	54	100

Diesel

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
quantity of litres of fuel diesel expected July 2014	72	10000	25000	15416.67	5223.862
actual diesel July 2014	72	10000	25000	14722.22	5233.215
re-order level July 2014	72	2000	15000	4138.89	1988.031
shortage /surplus July 2014	2	10000	10000	10000.00	.000
Valid N (list wise)	2				

Petrol

Ever experienced excess oil supply

	Frequency	Valid Percent

yes	4	7
no	52	93
Total	56	100

Which usually have oil shortages?

	Frequency	Valid Percent
national oil company	33	94
international oil company	2	6
Total	35	100

Where your company belongs?

	Frequency	Valid Percent
locally registered	53	95
internationally registered	3	5
Total	56	100

Challenges experienced

challenges experience;	Yes	No
fuel shortages	7(11%)	57(89%)
employee skills	20(31%)	44(69%)
information dissemination	12(19%)	52(81%)
unpredictable price increase	60(92%)	5(8%)
tendering systems	24(38%)	40(63%)
poor forecasting	9(14%)	54(86%)

Insecurity	8(13%)	55(87%)
legal and regulatory policy	60(95%)	3(5%)

Ranking of challenges

challenges experience Ranks	Low	High	Very High
fuel shortages	4(44%)	1(11%)	4(44%)
employee skills	2(12%)	3(18%)	12(71%)
information dissemination	3(27%)	4(36%)	4(36%)
unpredictable price increase	25(48%)	20(38%)	7(13%)
tendering systems	6(29%)	5(24%)	10(48%)
poor forecasting	1(10%)	3(30%)	6(60%)
insecurity	1(11%)	3(33%)	5(56%)
legal and regulatory policy	17(33%)	20(39%)	14(27%)

APPENDIX V Regression Analysis

Hypotheses 1

H_o: Level of Skills does not significantly affect performance of supply chain systems in the petroleum industries in Kenya.

Level of skills

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.674a	.454	.391	.327	1.616

a. Predictors: (Constant), LowTrank, lowHrank, lowCrank, HighHrank, HighTrank, HighCrank

b. Dependent Variable: performance

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	4.619	6	.770	7.207	.000[b]
	Residual	5.554	52	.107		
	Total	10.173	58			

a. Dependent Variable: performance

b. Predictors: (Constant), LowTrank, lowHrank, lowCrank, HighHrank, HighTrank, HighCrank

The F_ Value is 7.207, with a p value of 0.00<0.05. Hence the overall model is significant

Level of skill had three measures human skills, technical skills and conceptual skills .

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF

	1.201	.053		22.746	.000			
1	.601	.284	.275	2.118	.039	1.000	1.000	

a. Dependent Variable: perform

Hypothesis 2

H_o: Information and communication technology does not significantly affect performance of supply chain systems in the petroleum industries in Kenya.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.379[a]	.144	.104	.222611	1.537

a. Predictors: (Constant), Above_ten_computers, five_ten_computers, one_five_computers

b. Dependent Variable: perform

ANOVA[a]

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	.542	3	.181	3.643	.017b
Residual	3.221	65	.050		
Total	3.763	68			

a. Dependent Variable: perform

b. Predictors: (Constant), Above_ten_computers, five_ten_computers, one_five_computers

The F_ Value is 3.643, with a p value of 0.017<0.05. Hence the overall model is significant

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.179	.084		14.007	.000		
	one_five_computers	.140	.089	.240	1.563	.123	.556	1.797
	five_ten_computers	.221	.130	.246	1.699	.094	.629	1.590
	Above_ten_computers	.571	.178	.411	3.202	.002	.801	1.248

a. Dependent Variable: perform

Comparing with those without computers

H_o: Cost of crude oil does not significantly affect performance of supply chain systems in the petroleum industries in Kenya.

Cost of crude oil

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.444[a]	.197	.172	.214502	1.589

a. Predictors: (Constant), Low_unpredictable_price, High_unpredictable_price

b. Dependent Variable: perform

Comparing with medium unpredictable price

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	0.723	2	0.362	7.859	.001[b]
	Residual	2.945	64	0.046		
	Total	3.668	66			

a. Dependent Variable: perform

b. Predictors: (Constant), Low_unpredictable_price, High_unpredictable_price

The F_ Value is 7.859, with a p value of 0.001<0.05. Hence the overall model is significant

Hypothesis 4

H_o: Tendering Systems does not significantly affect performance of supply chain systems in the petroleum industries in Ken

Tendering system

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.535[a]	.286	.250	.311	1.946

a. Predictors: (Constant), Transparency, competition

b. Dependent Variable: performance

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1.547	2	.774	8.009	.001[b]
	Residual	3.864	40	.097		
	Total	5.411	42			

a. Dependent Variable: performance

b. Predictors: (Constant), Transparency, competition

Coefficients[a]

a. Dependent Variable: performance

APPENDIX V1 : OVERALL REGRESSION MODEL

Assumptions of regression

Normality test

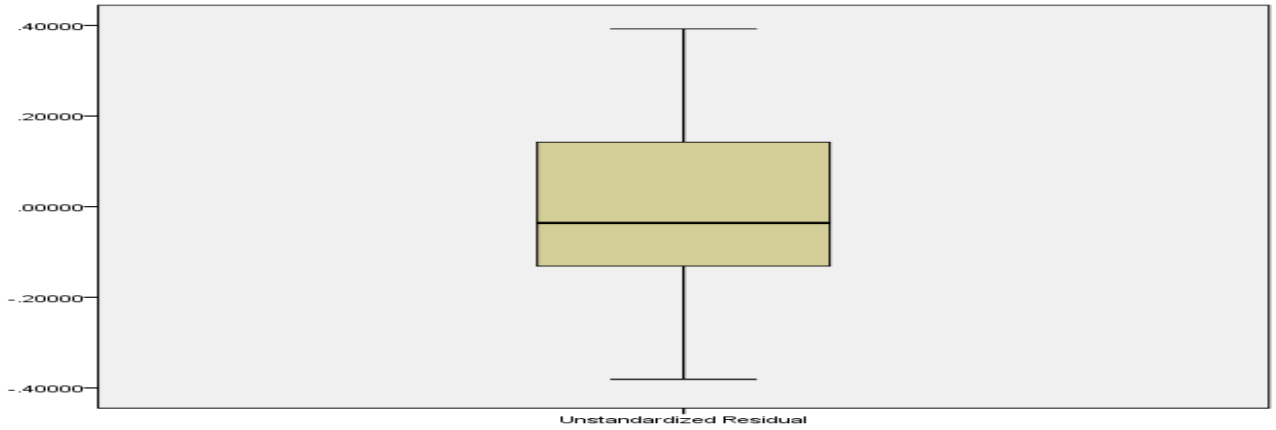
Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Unstandardized Residual	.102	30	.200*	.979	30	.812

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Outlier.



The Box plot shows that the outliers are not present .

Heteroscedasticity

------- Breusch-Pagan and Koenker test statistics and sig-values --------

	LM	Sig
BP	1.867	.760
Koenker	3.267	.514

Null hypothesis: Heteroscedasticity not present (homoskedasticity)

if sig-value less than 0.05, reject the null hypothesis

Note: Breusch-Pagan test is a large sample test and assumes the residuals to be normally distributed

Heteroscedasticity is not present since Breusch pagan test =1.867 with a non-significant p_ value of 0.760 >0.05 at 5 % level of significance.

Multicollinearity.

Model	Collinearity Statistics	
	Tolerance	VIF
(Constant)		
Skill rank	.916	1.092
ICT	.877	1.141
cost	.911	1.098
tendering	.851	1.175

Tolerance is the percentage of information of the dependent variable that cannot be explained by the other independent variables. The reciprocal of tolerance gives the VIF (Variance Inflated Factor).

When the tolerances are close to 0, there is high multicollinearity and the standard error of the regression coefficients will be inflated. Variance Inflation Factor (VIF) greater than 2 is usually considered problematic.

APPENDIX V1I: OVERALL REGRESSION MODEL

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.773[a]	.597	.572	.00641	2.037

a. Predictors: (Constant), cost, ICT, skills, tendering
b. Dependent Variable: perform

ANOVA[a]

	Sum of Squares	df	Mean Square	F	Sig.
Regression	4.793	4	1.198	59.244	0.00[b]
Residual	1.234	61	.020		
Total	6.027	65			

a. Dependent Variable: perform

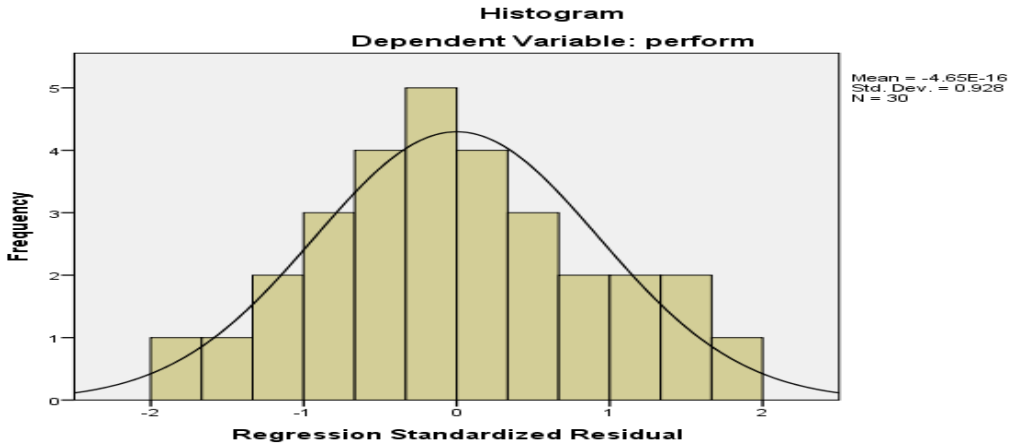
b. Predictors: (Constant), cost, ICT, skills, tendering

Based on Anova Table, the F value is 59.244 with a p-value 0.000 < 0.05 significance level. Thus, the overall regression model for these four predictors has significantly explained the variation in performance

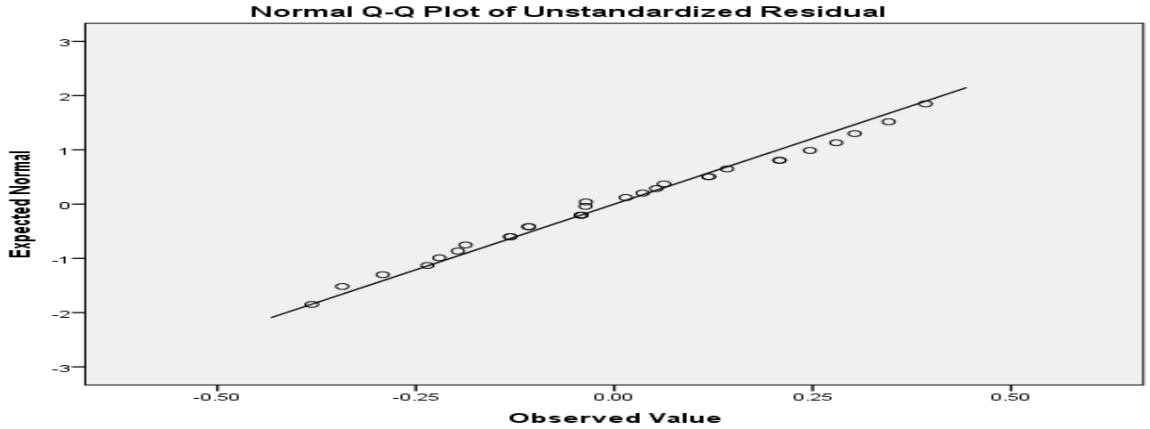
Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.203	.151		7.984	.000
ICT skills	.290	.144	.114	2.011	.049
	.608	.270	.292	2.249	.028
tendering	-.011	.047	-.004	-.240	.811
cost	.318	.142	.135	2.235	.029

Tendering is not a significant predictor in the model with a regression coefficient of -0.011 (t-value=-0.240, p-value=0.811>0.05)



The histogram above shows the normality.



Checking the Normal Probability Plot points lie in a reasonably straight diagonal line from bottom left to top right. This would suggest no major deviations from normality.

IC

Model Summary[b]

R	R Square	Adjusted R Square	Std. Error of the Estimate	**Durbin-Watson**
.706[a]	.498	.489	.51532	**2.079**

a. Predictors: (Constant), ICT

b. Dependent Variable: performance

ANOVA[a]

Model	Sum of Squares	Df	Mean Square	F	**Sig.**
Regression	13.710	1	13.710	51.626	**.000[b]**
Residual	13.809	52	.266		
Total	27.519	53			

a. Dependent Variable: performance

b. Predictors: (Constant), ICT

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients		Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.142	.071		-1.986	.052	
	ICT	.653	.091	.706	7.185	.000	1.000

a. Dependent Variable: performance

Descriptive Statistics

	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
Unstandardized Residual	54	.066	.325	-.993	.639
Valid N (listwise)	54				

Tests of Normality

	Kolmogorov-Smirnov[a]	Shapiro-Wilk

	Statistic	Df	Sig.	Statistic	df	Sig.
Unstandardized Residual	.209	54	.200	.890	54	.070

a. Lilliefors Significance Correction

Cost

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.290[a]	.084	.066	.54923	1.722

a. Predictors: (Constant), cost

b. Dependent Variable: performance

ANOVA[a]

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	**1.409**	**1**	**1.409**	**4.672**	**.035**[b]
Residual	15.385	51	.302		
Total	16.794	52			

a. Dependent Variable: performance

b. Predictors: (Constant), cost

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Co	-.2	.07		-3.	.001		

	nstant)	78	6		658			
	cost	.171	.079	.290	2.162	.035	1.000	1.000

a. Dependent Variable: performance

Descriptive Statistics

	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
Unstandardized Residual	53	.392	.327	-.610	.644
Valid N (listwise)	53				

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Unstandardize	.133	53	.007	.942		.053

d Resi dual			1		

a. Lilliefors Significance Correction
Skills

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.395[a]	.156	.140	.52715	1.855

a. Predictors: (Constant), skills
b. Dependent Variable: performance

ANOVA[a]

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	2.622	1	2.622	9.436	.003[b]
Residual	14.172	51	.278		

Total	16.794	52			

a. Dependent Variable: performance

b. Predictors: (Constant), skills

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.310	.073		4.280	.000		
	skills	.244	.080	.395	3.072	.003	1.000	1.000

a. Dependent Variable: performance

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Unstandardized Residual	.159	53	.092	.930	53	.064

a. Lilliefors Significance Correction

Descriptive Statistics					
	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
Unstandardized Residual	53	.270	.327	-.639	.644
Valid N (listwise)	53				

Tendering

Model Summary[b]

R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
.138	.121	.67542	1.891

a. Predictors: (Constant), tendering

b. Dependent Variable: performance

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	3.797	1	3.797	8.323	.006[b]
	Residual	23.722	52	.456		
	Total	27.519	53			

a. Dependent Variable: performance

b. Predictors: (Constant), tendering

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	S	Beta			Toler	V

		td. Error				ance	IF
(Constant)	-.211	.092		-2.285	.026		
tendering	-.351	.122	-.371	-2.885	.006	1.000	1.000

a. Dependent Variable: performance

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Unstandardized Residual	.160	54	.200	.895	54	.100

a. Lilliefors Significance Correction