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**Factors Affecting Distribution of Oil Products in Kenya: A Case Study of  
Kenya Pipeline**

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## **Factors Affecting Distribution of Oil Products in Kenya: A Case Study of Kenya Pipeline**

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### **Abstract**

**Purpose:** The study was on the challenges facing the distribution of oil product through the Kenya Pipeline. It aimed to establish the effect of pilferage on distribution of the oil products in Kenya, to determine the effect of infrastructure on distribution of the oil products in Kenya, to find out the effect of capacity on distribution of the oil products in Kenya and to determine the effect of Information Technology on distribution of the oil products in Kenya. The biggest beneficiary to this study may be the Kenya Pipeline.

**Methodology:** A descriptive case study design was appropriate for this study. The researcher used a self administered or self report questionnaire as a data collection tool. The questionnaire contained both open ended and close ended questions. The data was analyzed by use of descriptive statistics such as means and percentages. The data was then presented using graphs, charts and tables.

**Results:** On Pilferage 100% respondents agreed that it affects distribution of oil in Kenya. Forty one percent (41%) respondents agreed that the road infrastructure affects distribution of oil products in Kenya while the smaller group (13%) stated they did not think the road infrastructure did affect distribution of oil. Majority respondents (45%) agreed that capacity affects distribution of oil products in Kenya while 9% disagreed to capacity affecting distribution of oil products in Kenya. On Information Technology and its effects on distribution of oil products in Kenya, majority (37%) stated that Information Technology does not affect distribution of oil while 17% agreed it does affect oil distribution.

**Unique contribution to theory, practice and policy:** The study recommended that measures should be taken in order to safeguard against pilferage and improve oil distribution in Kenya; infrastructure should be well maintained while Capacity has a need to be increased. As for Information Technology it should be improved so as to meet the ever changing technological needs.

**Keywords:** *pilferage on distribution, supply chain infrastructure, storage capacity, Information technology*

## 1.0 INTRODUCTION

Distribution is the process of ensuring movement of products and ensuring they are in the right place at the right time. An oil product any of numerous mineral, vegetable, and synthetic substances and animal and vegetable fats that are generally slippery, combustible, viscous, liquid or liquefiable at room temperatures, soluble in various organic solvents such as ether but not in water, and used in a great variety of products, especially lubricants and fuels (Coyle et al., 2003).

The oil and natural gas industry is one of the world's largest and most capital intensive industries. In USA the industry has been able to effectively compete for global energy resources. The industry's earnings make possible the huge investments necessary to help ensure America's energy security. As a tremendous source of revenue that fuels the U.S. economy, major energy producers pay their fair share. The oil and natural gas industry pays income taxes, royalties and significant rents, royalties and lease payments for production—totaling more than \$110 billion since 2000 U.S. based oil and gas companies have structured their operations and invested substantial capital where the resource is found rather than where the best tax regime is located. As a result, U.S. based oil and gas companies' overseas income is often subject to very high effective tax rates (Spengler, 2010).

Petroleum is the most important source of commercial energy. Petroleum fuels are imported in form of crude oil for domestic processing and also as refined products, and mainly used in the transport, commercial and industrial sectors (Kenya Pipeline Company Ltd, 2006b). Fluctuations in international prices directly affect domestic prices. For instance, the international price of Murban crude oil rose by 46% from US\$ 62.05 per barrel in December 2008 to US\$ 90.60 per barrel in December 2009 and about US\$140 per barrel in August 2010, before plummeting to less than US\$ 50 by March 2011. Total quantities of petroleum imports registered a growth of 16.4% to stand at 3,691.8 thousand tonnes in 2010. The total import bill of petroleum products rose by 7.1% in 2010 compared to 8.9% in 2009. Total domestic demand for petroleum products also rose by 2.8% from 3,131.5 thousand tonnes in 2010 to 3,218.3 thousand tonnes in 2011. Trends in the sale or consumption of petroleum fuels indicate that retail pump outlets and road transport constitute the single largest consumer of petroleum fuels followed by aviation and power generation in Kenya (RoK, 2006)

Kenya Pipeline Company (KPC) is a state corporation that has the responsibility of transporting, storing and delivering petroleum products to the consumers of Kenya by its pipeline system and oil depot network. The Kenya Pipeline Company was incorporated on 6 September 1973 and started commercial operations in 1978. The company is a state corporation under the Ministry of Energy with 100% government shareholding.

Kenya Pipeline Company operates a pipeline system for transportation of refined petroleum products from Mombasa to Nairobi and western Kenya towns of Nakuru, Kisumu and Eldoret. Working closely with the National Oil Corporation of Kenya, KPC operates 5 storage and distribution depots for conventional petroleum products, located in Eldoret, Kisumu, Mombasa, Nairobi and Nakuru. Depots are fed by domestic-manufactured product from the Kenya Petroleum Refinery near Nairobi and imported, refined petroleum product from the Kipevu Oil Storage Facility near Mombasa. The company operates two aviation fuel depots at Jomo Kenyatta Airport, Nairobi, and Moi International Airport, Mombasa.

## **1.2 Problem Statement**

The Kenya Pipe line is one of the safest, low cost and effective methods of transporting the oil product compared to road or rail. However, it can also be faced by various challenges which may undermine its effectiveness. Some of the problems witnessed in the recent past were the pilferage and the resulting fire disaster in Sinai Slums in Kenya. In addition, problems of stock outs as well as overstocking have been rampant among the various depots (Otieno, Ondiek and Odera, 2012). While, excess inventory would easily lead to higher inventory holding costs and risks including possible obsolescence for both the pipeline and the oil marketers, Stock outs and overstocking are particularly harmful to the Kenyan economy because a significant section of the economy directly or indirectly depends on the oil product for powering the factories, vehicles and any other gadget that can use petrol, diesel or jet fuel.

Studies on the challenges affecting effective supply and distribution of oil product through the pipeline are few. Otieno et al (2012) conducted a study on Factors causing reversed bullwhip effect on the supply chains of Kenyan firms and took a case study of Kenya Pipeline but failed to tackle the challenges affecting effective supply and distribution of oil product through the Pipeline. Kimani (2013) sought to explore challenges facing implementation of effective supply chain management practices in petroleum industry in Kenya, a case of National Oil Corporation. Specifically the paper sought to explore the influence information technology, supply chain design, people issues and partnership/collaboration issues to the implementation of effective supply chain management but failed to tackle the challenges affecting effective supply and distribution of oil product through the Pipeline. The lack of comprehensive research on the area forms the study gap. Therefore, to bridge this evident research gap, this study attempts to establish the challenges affecting distribution of oil products in Kenya. A case study of Kenya Pipeline will be taken.

## **1.3 Specific Objectives**

- i. To establish the effect of pilferage on distribution of the oil products in Kenya.
- ii. To determine the effect of supply chain infrastructure on distribution of the oil products in Kenya.
- iii. To find out the effect of storage capacity on distribution of the oil products in Kenya.
- iv. To determine the effect of Information technology on distribution of the oil products in Kenya.

## **2.0 LITERATURE REVIEW**

### **2.1 Theoretical Review**

#### **2.1.1 Supply Chain Management and Oil Distribution**

The connections and nodes in a Supply Chain achieve functions that contribute to the value of the goods transporting through the chain and thus its achievement. Any connection that does not carry out well reduces the overall effectiveness of the whole Supply Chain. The notion of Supply Chain management as used in many research is usually linked with the globalization of producing and the penchant for manufacturers to source their inputs planetary, which necessitates management of profitable ways of regulating worldwide flows of inputs or outputs.

The principal focus of market competition in such situations is not only between goods, but between the Supply Chains delivering the goods. As competition in international markets is progressively



dependent upon the of arrival time of goods as well as their quality, coordination between suppliers and distributors has become an important characteristic of the Supply Chain. As the customer satisfaction is a crucial benchmark of the success of the Supply Chain, effective management of the linking processes is crucial (Trkman, Stemberger and Jaklic, 2005).

Additionally, market uncertainty necessitates Supply Chains to be easily flexible to changes in the situation of trade. Such flexibility in supply requires effective Supply Chain Management. According to Grant, Lambert, Stock and Ellram (2006), Supply Chain management refers to corporate business processes integration from end users through suppliers that provide information, goods, and services that add value for customers.

Supply chain can be summed up as a series of interconnected activities which are concerned with planning, coordinating and controlling materials, parts and finished products from supplier to customer (Lourenco, 2001). The key success of SCM will rely on the incorporation of the activities of the supply chain, meaning cooperation, information sharing and organization throughout the entire supply chain. The supply chain in the oil industry is considered a complex one where there exists a linkage between upstream suppliers, downstream distributors, information capital and flow through the chain.

### **2.1.2 Resource based view and Oil Distribution**

Firms in the same industry sector having the same opportunities with few if any, differences between them, remain that way only for a short period of time, (Cuervo, 1993). However, it is observed that an enterprise from the same industrial sector can be profitably different for a long time. Not only do external factors determine a firm's success and profitability but internal factors also play an important role. This idea is the origin of resource based theory.

Andrew (1971) defined a firm's "distinctive competence" as what it is that an enterprise does especially well. He considers that a competitive advantage depends on the relationship between environmental opportunities and a firm's distinctive competencies. The beginning of the resource based theory is found in a paper by Wernerfelt (1984). The resource based theory considers that internal aspects of an enterprise are very important.

Lado and Wilson (1994) asserted that a firm is viewed as a nexus of resources and capabilities that are not freely bought and sold in the spot market. To the extent that these firm-specific resources and capabilities yield economic benefits that cannot be perfectly duplicated through competitors actions, they may be potent sources of sustained competitive advantage.

Along general lines of this theory, two key concepts are resource and capability. Wernerfelt (1984) argued that a resource is anything which could be thought of as strength or a weakness of a given firm. More formally, a firm's resource at a given time could be defined as those (tangible and intangible) assets which are tied semi permanently to the firm. Examples of resources are: brand names, in-house knowledge of technology, employment of skilled personnel, trade contracts, machinery, efficient procedures, and capital.

Grant (1991), resources are "the inputs into the production process." Amit and Shoemaker (1993) defines resources as "all input factors, both tangible and intangible, human and nonhuman, that are owned and controlled by the firm and that enter into the production of goods and services to satisfy human wants." Itami (1987) distinguishes that the two categories of resources are tangible and intangible. The tangible resources are the easiest to identify and evaluate. They are reflected on the

balance sheets of the firm and are valued with accounting criteria. Intangible resources are more difficult to identify and value. No property rights are clearly defined as they are based on no codified information. Hall (1993) considers intangible resources as the intellectual property, rights of patents, trademarks, copyright and registered designs, trade secrets, contracts and licenses, databases, information in the public domain, personal and organization networks, employee know how, professional advisers, suppliers and distributors, reputation of products and company, and organizational culture.

Capabilities must be defined apart from resources. A capability is a joint resource to produce any work or activity (Grant, 1991). Grant established a hierarchy of resources and capabilities. Resources (first level) are combined to create capabilities (second level) which are the basis for a competitive advantage (third level). Therefore, this point of view allows evaluation of the firm's capacity to create a competitive advantage over time.

According to Coyne's study (1986), Hall (1993) established four sources for a competitive advantage this advantage is derived from one or more of the following sources: Regulatory capability is the result from possessing legal entities such as intellectual property rights, contracts and trade secrets, positional capability is a consequence of past actions and decisions, functional capability refers to the ability to do specific things. It proceeds from the knowledge, skills, and experience of employees and others in the value chain such as suppliers and distributors, cultural capability includes habits, attitudes, beliefs and values, which permeate individuals and groups in the organization.

Heterogeneous refers to the resource or capability as not being a generalized possession among enterprises. That is, this resource must be scarce and valuable. A resource is heterogeneous when it is unevenly distributed and deployed across firms within a given competitive environment. It is also necessary that competitors are not to imitate the resources or capabilities. Otherwise, the competitive advantage could rapidly disappear when another enterprise owns or develops those strategic resources.

Related to heterogeneity, the resources must not be appropriable by other companies. Rivals must not be able to take each other's resources and capabilities. This is the basis for a competitive advantage. The last necessary characteristic of being non-replaceable means that other resources should not be able to create the same advantage.

In summary, a firm's resources and capabilities must be scarce and valuable, and they must not be acquired, imitated, or replaced by the competitors. If resources do not comply with these conditions, the enterprise will rapidly lose its upper relative position.

## **2.2 Empirical Review**

To investigate the influence of staff training on effective stores management, the study will be based on scientific management theory. The theory basically consists of the works of Fredrick Taylor. Fredrick Taylor started the era of modern management in the late nineteenth and early twentieth century's; Taylor consistently sought to overthrow management by rule of thumb and replace it with actual timed observations leading to the one best practice Watson (2002). He advocated for the systematic training of workers in the one best practice rather than allowing them personal discretion in their tasks. He further believed that the workload would be evenly distributed between

the workers and management with management performing the science and instruction and the workers performing the labor, each group doing the work for which it was best suited. Taylor's strongest positive legacy was the concept of breaking a complex task down into a number of subtasks, and optimizing the performance of the subtasks, hence, his stopwatch measured time trials (Osdorne, M.J. & Rubinstein, 1990). As a result, he proposed four underlying principles of management.

Budiman (2004) found that supply fluctuation was due to capacity adjustment lead time, production lead time, order processing delay and order wait time. Svenson (2005) observes that the reversed bullwhip effect is caused by factors such as deficient information sharing, insufficient market data, deficient forecasts and capacity issues. Facilities with mass production are responsive to supply variability while customization platforms are prone to longer production lead times. Business processes sub optimization by design or default can lead to a butterfly effect where a small variation can lead to system wide variation. Most companies are no longer simply contented with price as a determinant in procurement services but also sustainability of the supply and ability to meet unpredictable and short notice supply instructions. Ability and expertise override costs where the cost curve minimization is already achieved.

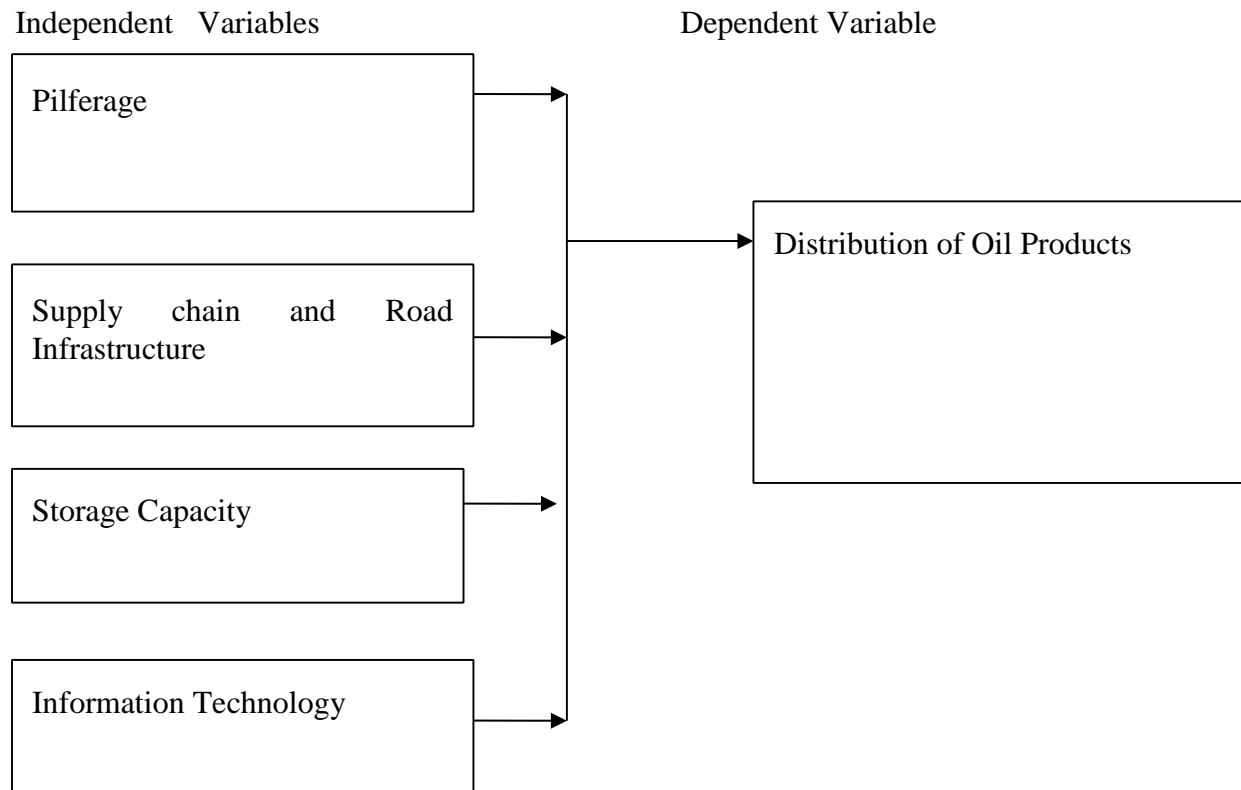
Shah et al. (2011) stated that, a typical petroleum industry supply chain is composed of an exploration phase at the wellhead, crude procurement and storage logistics, transportation to the oil refineries, refinery operations, and distribution and transportation of the final products. The upstream activities (exploration, development and production of crude oil or natural gas) and downstream activities (tankers, pipelines, retailers and consumers) are two important activities in the petroleum industry (Mohd and Ali, 2009). SCM in O&G industry requires the company to integrate its decisions with those made within its chain of customers and suppliers. This process involves relationship management of the company to their customers and suppliers. A firm can create long-term strategic relationships with their suppliers and in most cases there is a collaborative process between the oil and gas company with its suppliers (Chima, 2007).

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Weill (2003) observed that the relationship between use of information technology and firm performance was highly significant. The findings further indicated that when the technology used in stores operations becomes common, the competitive advantage is lost implying that there is need of constant replacement of obsolete or outdated technologies with modern ones. The findings of the study was in agreement with Frohlich and Westbrook (2002) who observed that IT investments have clearly played a leading role in growth of firms who have invested substantial resources in

new types of IT enabling them to improve efficiency in and coordination of material handling operations, thereby reducing inventory levels which gives them a competitive advantage.

### 2.3 Conceptual Framework



**Figure 1: Conceptual Framework**

### 3.0 RESEARCH METHODOLOGY

This study employed descriptive survey design. The target population of the study was composed of all the employees in Kenya Pipeline Company. There were approximately 600 employees who included a top manager, a middle manager, supervisor and Non managerial in the company. This was taken as the population of the study. Stratified random sampling technique was used to determine the sample size. The target sample is 10% of the population. A sample of 60 employees (10%) of the target population was used. This study used primary data which was collected through use of a questionnaire. Reliability tests were also carried to determine the reliability of the instrument. Simple descriptive statistics were used to generate frequencies and means were used. Tables and charts were used to present the data.



## 4.0 RESULTS AND DISCUSSIONS

### 4.1 Response Rate

A sample of sixty (60) questionnaires was administered. The duly completed and returned questionnaires were 54 which represented a 90% response rate. Table 1 shows that the rate of questionnaire answering and returning was relatively high and therefore the conclusion drawn here is that the data has a high validity in terms of the target population reviewed.

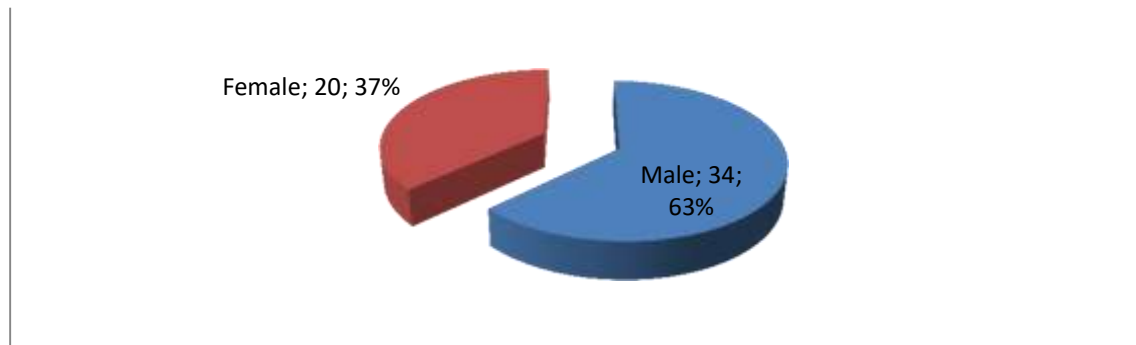
**Table 1: Response Rate**

Details	Number	Percentage
Returned Questionnaires	54	90
Non-Responses	6	10
Total	60	100

### 4.2 Demographics

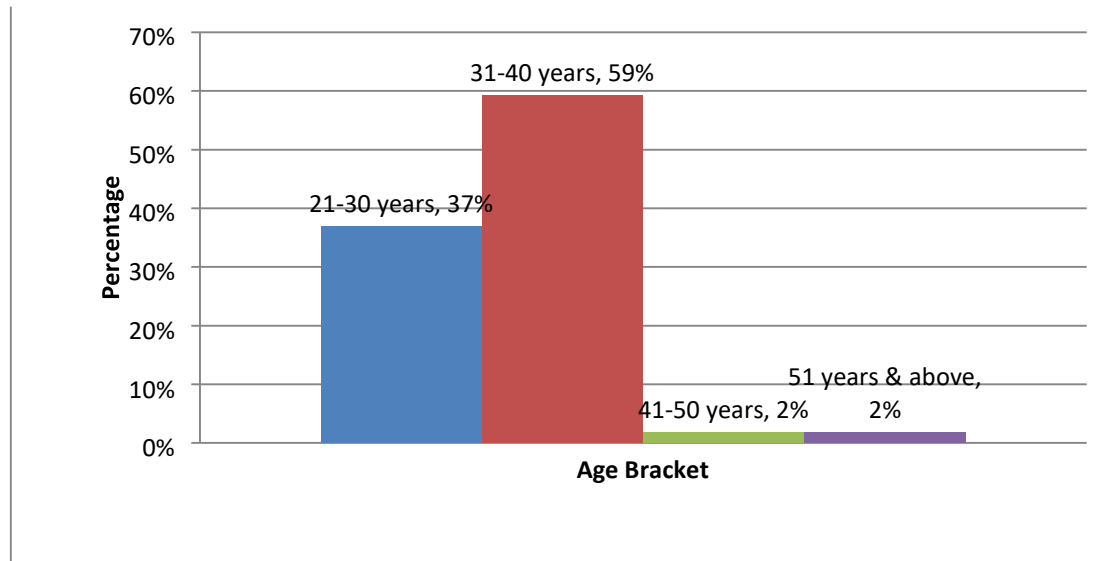
#### 4.2.1 Gender

**Figure 2: Gender of the Respondents**



Results in Figure 2 indicate that majority respondents (63%) were Male while 37% were female. This difference in gender can be explained by the fact that KPC is a labour extensive working environment and risky, that does not entice females.

#### 4.2.2: Respondents Age

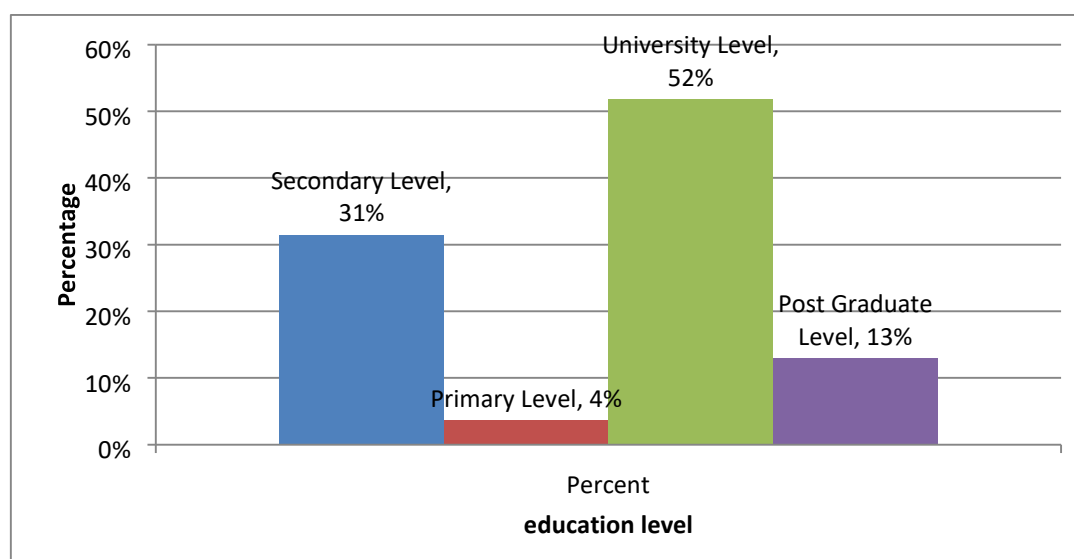


**Figure 3: age of respondents**

Results in and Figure 3 indicate that majority of the employees 59% were between 31-40 years followed by 37% with 21-30 years. The others 51 and above and 41-50 were at 2% respectively.

#### 4.2.3: Education Level

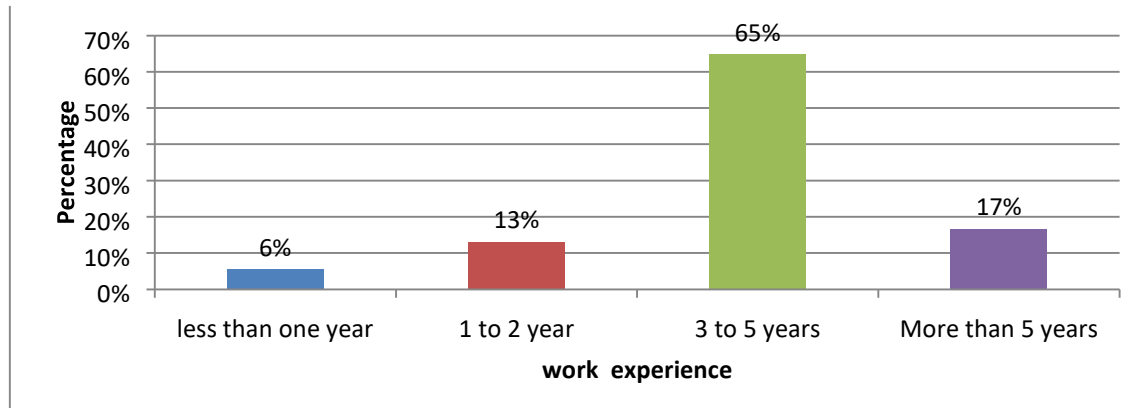
Figure 4 show results of respondent's education level. Fifty two percent (52%) attained a university level degree, 31% with Secondary level education and 13% with post graduate education. The least level with 4% had attained a primary level education. This is an indication that majority of the people in the different positions were learned.



**Figure 4: Education Level**

#### 4.2.4 Work Experience

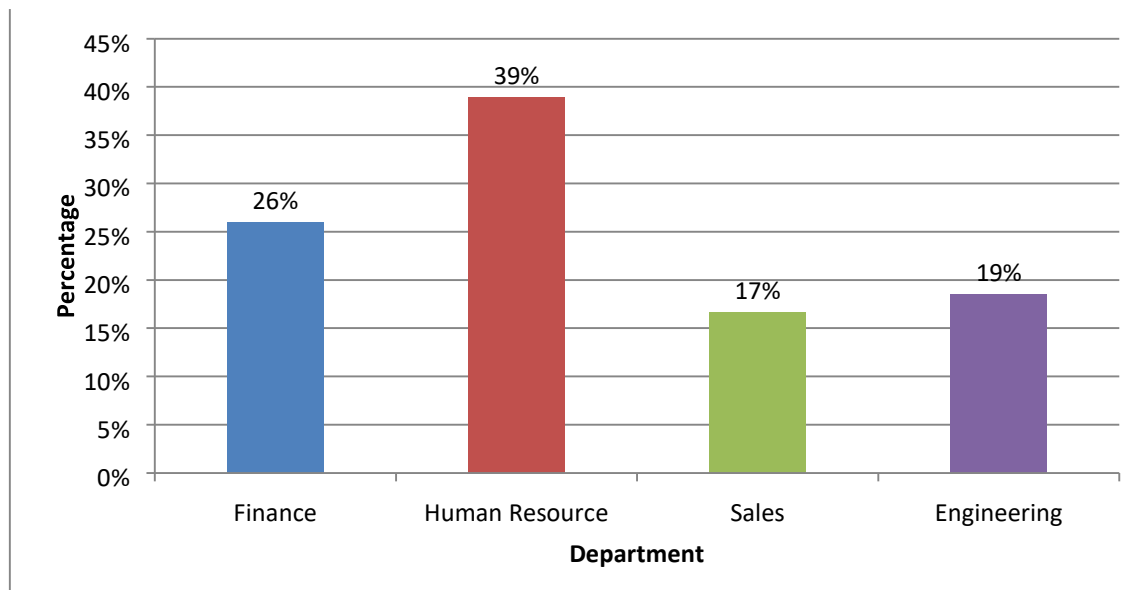
Findings on Table 4.5 and Figure 4.5 show that 65% respondents had work experience of 3 to 5 years. Seventeen percent had experience for more than 5 years, 13% with 1 to 2 years and 5% with less than an years experience.



**Figure 5: Work Experience**

#### 4.2.5 Department

Results in Figure 6 show those Majority respondents 39% were in the human resource department. Twenty six percent were in the finance department, 18% in engineering and sales had 13% personnel.



## Figure 6: Department

### 4.3 Descriptive statistics

#### 4.3.1 Pilferage

This section sought to establish the effect of pilferage on the distribution of oil products by Kenya pipeline. Results in Table 2 show that all (100%) respondents agreed that Pilferage affects distribution of oil products in Kenya

**Table 2: Effect of pilferage on distribution of oil products**

	Frequency	Percentage
Yes	54	100
Total	54	100

Further, table 3 indicates results from respondents on the extent of effect of pilferage and how it affects distribution of oil products in Kenya. Majority (41%) said it affects to a great extent. The lesser group (13%) said somewhat which could be a show of they understood pilferage was disadvantageous to oil distribution but were unsure of the extent.

**Table 3: Extent of pilferage effect on distribution of oil products**

	Frequency	Percent
Great extent	41	76
Somewhat	13	24
<b>Total</b>	54	100

#### 4.3.2 Infrastructure

This section sought to establish the effect of infrastructure on the distribution of oil products by Kenya pipeline. Findings from Table 4 explain the respondent's opinions on whether or not road infrastructure affects distribution of oil products in Kenya. Seventy six percent (76%) agreed that the road infrastructure affects distribution of oil products in Kenya while the smaller group (24%) stated they did not think the road infrastructure did.

**Table 4: Effects of road infrastructure on distribution of oil products**

	Frequency	Percent
Yes	41	76
No	13	24
<b>Total</b>	54	100

Further, Table 5 demonstrates the responses of respondents on the extent of infrastructure affecting distribution of oil products at Kenya Pipe line. Eighty three percent (83%) said to a greater extent while 17% stated somewhat.

**Table 5: Extent of the effect of infrastructure on distribution of oil products**

	Frequency	Percent
Great extent	45	83
Somewhat	9	17
<b>Total</b>	54	100

#### 4.3.3 Storage Capacity

This section sought to establish the effect of storage capacity on the distribution of oil products by Kenya pipeline. Table 6 shows that majority respondents (83%) agreed that capacity affects distribution of oil products in Kenya while 17 % disagreed to capacity affecting distribution of oil products in Kenya.

**Table 6: Effect of storage capacity on distribution of oil products**

	Frequency	Percent
Yes	45	83
No	9	17
<b>Total</b>	54	100

Further, Table 7 shows the answers given by respondents in regards to extent of capacity affecting distribution of oil products at Kenya Pipeline. Eighty one percent (81%) said to a greater extent while the rest (19%) said somewhat.

**Table 7: Extent of effect of capacity on distribution of oil products**

	Frequency	Percent
Great extent	44	82
Somewhat	10	19
<b>Total</b>	54	100

#### 4.3.4 Information Technology

This section sought to establish the effect of information technology on the distribution of oil products by Kenya pipeline. Table 8 demonstrates the opinions of respondents on whether IT affects distribution of oil products in Kenya. Majority (69%) stated that IT does not affect distribution of oil while 31% agreed it does.

**Table 8: Effect of information technology on distribution of oil products**

	Frequency	Percentage
Yes	17	32
No	37	69
<b>Total</b>	54	100

Further, Table 9 shows the opinions given by respondents on the extent IT affect distribution of oil products at Kenya Pipeline. Majority (41%) said to a greater extent, 35% said to a greater extent, while 15% and 9% said to no extent and little extent respectively.



**Table 9: Extent to which information technology affect distribution of oil products**

	Frequency	Percentage
Great extent	19	35
Somewhat	22	41
Little extent	5	9
No extent	8	15
<b>Total</b>	54	100

## 5.0 DISCUSSION CONCLUSIONS AND RECOMMENDATIONS

### 5.1 Findings

Findings show that all respondents (100%) agree that pilferage affects distribution of oil in Kenya. On extent to which pilferage affects oil distribution in Kenya, majority (76%) of the respondents said it was to a great extent while 24% said somewhat.

Forty one percent (41%) agreed that the road infrastructure affects distribution of oil products in Kenya while the smaller group (13%) disagreed that the road infrastructure affected distribution of oil.

Findings indicate that hat majority respondents (45%) agreed that capacity affects distribution of oil products in Kenya while 9% disagreed to capacity affecting distribution of oil products in Kenya. In regards to extent of capacity affecting distribution of oil products at Kenya Pipeline, forty four percent (44%) said to a greater extent while the rest (10%) said somewhat.

Findings on whether IT affects distribution of oil products in Kenya show that majority (37%) disagreed that IT does not affect distribution of oil while 17% agreed it does. On the opinions given by respondents on the extent IT affects distribution of oil products at Kenya Pipeline. Majority (341%) said to a greater extent, 35% said to a somewhat, while 15% and 9% said to no extent and little extent respectively.

### 5.2 Conclusions

The study concludes that pilferage is indeed a major setback to oil distribution in Kenya and hence the government should take urgent measures in order to safeguard and improve oil distribution in Kenya.

It is imperative to conclude that infrastructure has a great role to distribution of oil in Kenya. Despite there being other means of distribution of oil products in Kenya roads are the major infrastructure to distribution of oil products in Kenya and there is need to improve and work at better implementing strategies to improve them.

Capacity has a direct effect on Distribution of oil in Kenya. Greater capacity means greater returns and efficiency. There is need to enhance and improve on capacity from all angles to achieve the best of returns.

The study was able to show the different opinions on IT and distribution. It is important to note that despite the different responses given there is need to enhance and improve on IT since we are now in a digital word and everything revolves around IT.

### **5.3 Recommendations**

The study recommends that the government should introduce more advanced methods of distribution to curb and monitor oil pilferage among the oil groups and should also train people to better handle oil products to reduce on accidents. The government should also put stringent measures and laws to deal with perpetrators of oil distribution.

The study also recommends that the government should direct more funds to improve on infrastructure to enhance the efficiency of oil distribution in Kenya. The government can liaise with other foreign governments and stakeholders to expand and improve infrastructure all over the country so as to increase the efficiency of oil distribution on Kenya. Long and bureaucratic government procurement procedures which cause delay in maintenance of infrastructure should be abolished.

The study recommended that the government should educate and train people on better ways to improve on storage capacity. The government should also work to come up with more efficient ways of clearing the oil products by other stakeholders at the depots leading to delays in oil marketers collecting their products. The government should investigate its supply chain infrastructure to improve on its capacity. The Ministry of should develop Energy guidelines which impose stiff penalties on oil marketers whose oil products overstay in the pipeline system and installation of flow meters to enhance product flow and distribution.

The study recommends that there is need to improve on IT through trainings, advancement in new technology since we are living in the technological era. The government should change in technology/introduce new technology which made some equipment at the company obsolete.

### **5.4 Areas for Further Studies**

Further research should be conducted on how best the government can aid the effective distribution of oil in Kenya. It can for example provide a heavy public subsidy to petroleum companies, with major tax breaks at virtually every stage of oil distribution.

Since there is an unclear perception on whether IT affects oil distribution in Kenya, there is need for the government to do research on this matter.

There is also need to do further studies on other factors that affect oil distribution other than infrastructure, capacity and Information Technology.

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