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Factors Influencing Supply of Petroleum Products in Kenya; A Case of Kenya Pipeline Company, Eldoret Depot, Kenya

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Abstract

Petroleum products are typically in high demand in most economies around the globe with countries such as South Sudan, Congo, Rwanda, and Uganda rely on Kenya for petroleum products. Management of petroleum products has diverse effects on the supply chain. The research sort to establish the influence of fuel supply function on the management of petroleum products in Kenya: a case of Kenya Pipeline Company, Eldoret depot. The study used descriptive statistics to analyze obtained data. The study had a target population of 98 respondents which resulted in a sample size of 91 respondents by use of Yamane (1967). Data was collected by use of questionnaires which were tested and found reliable. Collected data was analyzed by use of SPSS and results presented inform of tables, frequencies, and percentages. From the findings of the study, storage capacity was found to be an issue that affected the supply of different petroleum products resulting to low throughput and increased lead time, infrastructure at the depot was found to be inadequate in meeting the supply-demand of different petroleum products needed by consumers. Regulations adopted by KPC Eldoret depot meet the consumer requirements and set standards but due to lack of enforcement have led to low standards in petroleum products handling. The quality of petroleum products availed at the depot meets the set quality standards but due to ignorance, quality at times is compromised leading to adulterated petroleum products being availed to consumers.

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The study concluded that, with increased storage capacity, lead time will be reduced hence increasing throughput, with an improved pipeline infrastructure, efficiency and effectiveness will be addressed leading to increased throughput and turnaround time, regulations adopted by KPC Eldoret depot were found to be effective which enhanced management of petroleum products but more enforcement was important. The researcher recommends that storage and loading capacity to be increased, reduce beauracratic structures in truck clearance and improvement on quality control measures to ensure quality products are supplied to consumers thus ensuring proper management of petroleum products.

Keywords: Fuel supply function; management of petroleum products.

1. Introduction

The oil industry continues to face a myriad of drawbacks in an endeavor to establish itself as one of the best sectors of the economy and these challenges include but not limited to hostile political environment, stringent government policies and regulations, and increased competition. Due to this myriad of challenges, the country continues to experience regular interruptions in terms of the petroleum products supply. Moreover, the petroleum products prices have been steadily rising time to time and this has been partly blamed on supply chains, which are inefficient and over-dependence on international crude oil. Another challenge that the oil industry has been facing in Kenya is the constant power outages as reported by consumer insight (2009) who observed that the distribution channel of KPC were proven to be inefficient as such their systems of handling products were outdated and, therefore, unreliable to provide the best products to the final consumers. Most oil refinery companies target large-scale consumers who use the products in heavy heating such as power plants or they target smaller consumers through franchised gas stations. However, there remain concerns that oil may be depleted naturally because of continued exploration, yet others point out that the exploration of the products will not precipitate its depletion; rather, the fears emanate from the inability of the present supply to meet market demand. Reference [1] suggests that the principal drawback facing the oil industry is not limited to the availability of the resource, rather the challenges premises on the ability refining the product and delivering it to the final consumers at a minimum cost and, therefore, the necessity to design sound supply chain programs with an objective of realizing the aforementioned goal.

Imported products are received into the common user government owned Kipevu Oil Storage Facility (KOSF) or private marketer's7 storage depots at Shimanzi. Shimanzi Oil Jetty handles Product for both local and transit, through loading into trucks and wagons at marketers depots. The product imported through the pipeline is temporarily stored at KOSF depot before pumping into mainline. Reference [2] notes that the line connecting Shimanzi and Kipevu depots, commissioned in March 2008 will enhance product movement flexibility in distribution and storage. As a way of solving the problem of shortage of strategic stocks in the country, Energy Ministry published the petroleum stock regulations 2008 in Legal Notice No. 43 that described the strategic national stocks as comprising petrol, kerosene, diesel, and LPG [3].

The strategic stock shall be acquired by National Oil Corporation of Kenya and kept by Kenya Pipeline Company. The Kenya pipeline company core business is the transportation, storage, and distribution of refined

petroleum products. The business process is characterized by low contact but technology-intensive processes. The main service contacts with customers in the petroleum industry include petroleum imports and receipts at Kipevu storage facility, storage depots, truck loading & pump over's and stock inventory. Supply function of Kenya Pipeline Company is defined in terms of the ability to deliver right volumes, right time and right quality at the right location [4] It is in light of the above that the study endeavors to examine the effects of fuel supply function on the management of petroleum products in Kenya with specific reference to Kenya Pipeline Company, Eldoret depot.

1.1 Statement of the problem

Petroleum products are typically in high demand in most economies around the globe. The supply chain of the commodities is characterized by transportation of crude oil from where it is extracted to refineries by ship or pipeline. At the refineries, processing takes place and this is a form of value addition that brings out various products. Transportation of the final products is also done to facilities that are closer to the final markets. Transportation requires a high degree of coordination of procurement and transport logistics to ensure that right volumes, prices and supply reliability are achieved.

According to [5] the repairing and continued constructions of pipelines across the country have made it possible for KPC to lower the costs of transportation within the country and across the neighboring countries such Uganda, which get their petroleum products from Kenya. For instance, the pipeline running to Nairobi from Mombasa has been experiencing challenges and as such, it has only been able to transport 50% of the protracted capacity and this has been partly attributed to poor administration. KPC customers have frequently complained of product outages in western Kenya depots, long durations taken to ascertain stock levels, communication bureaucracies within the company structure, time spent on queues waiting to load, rationed product transfers and delayed product arrival at delivery points.

Several studies have been done on petroleum supply chain management. Reference [6] carried out a research on management drawbacks that supply chain faces in the petroleum industry in Kenya by specifically focusing on the challenging facing National Oil Corporation, his focus was on efficiency and not effective supply chain management by oil companies. Reference [7] conducted a study on contemporary issues that face the gas and oil industry's supply chains. Research by [4] a petroleum refining expert in Hungary concluded that the successful companies of the future in the petroleum industry will be those who operate according to the demand-pull model, simply fulfilling the objective. Reference [8] also studied the petroleum industry in Kenya and established that leading petroleum companies have some level of power to influence activities in the industry. Irrespective of the operational drawbacks and significances, which the oil industry continues to face, the subject of supply chain function of pipeline companies continues to attract low scholarly attention in the strategic and SCM literature. Although some discussion on management of the supply of petroleum products can be found in literature evidenced by aforementioned studies, the basis of most of the literature is to oil marketing companies and in developed countries. This study, therefore, endeavors to examine the effects of fuel supply function on the management of petroleum products in Kenya with the specific case of Kenya Pipeline Company Eldoret depot.

1.2 Objective of the study

The purpose of the study was to establish the influence of fuel supply function on the management of petroleum products in Kenya with specific reference to Kenya Pipeline Company, Eldoret depot.

1.3 Secondary information

Refined petroleum products once ascertained that they have met the required specifications in terms of quantity and quantities are transported various means such as road, rail or pipeline to the storage facilities which are close to the market. This process requires proper coordination of supply chain management strategies such as procurement and logistics including the volume to be transported, price and reliability of supply [9]. Storage facilities and capacities exist at various points in the supply chain network and are considered very important because the stock held can be used to replenish the supply of petroleum products in case there is an artificial shortage [10]. Such kind of protection against artificial shortage is very important for countries that may not have a port. It is worth noting that building storage capacity is very expensive and also holding of stock within this capacity is also costly due to the financial cost involved. This has compelled the firms to hold contingency stocks to avoid a scenario where they run out of stock but also apply just in time inventory management similar to various other businesses; they focus on optimizing their capacity using other channels and connections in their supply and delivery chain. When this kind of optimization is achieved, maximum cost efficiency is achieved. Similarly, contingency stock levels are also achieved as a result of a rigorous assessment of risk.

Another important consideration is the storage depot terminal which refers to a place where petroleum products can be stored for a given period of time. A storage depot terminal is located strategically near markets or built at every production plant which is used to make decisions on the number of the storage depots required.

The end of the distribution line is the local retail outlet especially for consumer products but local retailers are primary display and selling locations that were bypassed by distributors. According to [11], product availability is determined by the number and location of warehouses because it determines the number of customers close to the warehouse. 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. Companies need an optimal balance between the possibility of idle capacity and having adjustable capacity facilities.

Most companies are no longer simply contented with price as a determinant in procurement services but also the sustainability of the supply and ability to meet unpredictable and short notice supply instructions [12].

Almost every country is making an effort to increase its capacity of petroleum whether crude or finished products because of the increasing demand for petroleum. India is building strategic crude oil storage facilities to contain a total of 5 million metric tonnes (about 35 million barrels, equivalent to 12 days of 2008 consumption) at three locations. Indian Strategic Petroleum Reserves Limited was established for this purpose;

it is owned by the Oil Industry Development Board of the Ministry of Petroleum and natural gas underground rock caverns will be used for the storage, and the plan is to complete the three sites by 2012 [13]. The National Oil Corporation of Kenya was charged in April 2008 with maintaining strategic stocks equivalent to 30 days of consumption and eventually to reach 90 days over the coming years [15].

Just as large storage capacity can be a measure in mitigating the effects of shortages of petroleum products in the market, it is incumbent on governments not to unnecessarily intervene in fuel price adjustment as this can encourage hoarding of the commodity by dealers resulting in artificial shortages. Wide price disparities in our neighboring countries can also lead to smuggling, thus causing shortages.

1.4 Methodology

This study used descriptive research design to establish the influence of fuel supply function on the management of petroleum products in Kenya with specific reference to Kenya Pipeline Company Eldoret depot. The researcher chose the case study research design because it enhances the understanding and evaluation of complex issues.

The target population of this research comprised of eighty-four (84) respondents consisting of seventy Oil Marketing Companies (OMCs) registered as per Ministry of Energy 2017 records operating at the Eldoret depot. Four supply and planning officers, six supply analyst, two loading superintendents for loading terminal and two product accounting officers dealing with product requests, transfers and billing at KPC as per human resource records 2017.

Table 3.1: Target population

Target group	**Target population**
Oil marketing companies (OMCs)	84
Supply and planning officers	4
Supply analysts	6
Loading superintendents	2
Product accounting officers	2
Total	**98**

Source: Ministry of Energy, 2017

The sample size was 91 respondents from the target population. By using Yamane's formula of sample size with an error of 3% with confidence levels of 97% [14] a population of 98 respondents translated to a sample size of 91 respondents as shown in table 3.4.

Table 3.2: Sample Size

Target group	Target population	Sample Size
Oil marketing companies (OMCs)	84	84/98*90 = 77
Supply and planning officers	4	4/98*90 = 4
Supply analysts	6	6/98*90 = 6
Loading superintendents	2	2/98*90 = 2
Product accounting officers	2	2/98*90 =2
Total	**98**	**91**

Source: Ministry of Energy, 2017

The study employed the use of questionnaires and data was gathered from both primary and secondary sources. As in most social research, the research instrument for collecting the necessary data in this study was developed and tested for consistency, coherence and reliability using a small sample of 15 respondents selected randomly from the target population. A questionnaire was used to collect both qualitative and quantitative data. The questionnaire was chosen because of its ability to reveal important data due to the fact that each item will be developed to address a specific objective. Both open ended and closed ended questions were used. A Likert scale of 1 to 5 (matrix type of questions) was used to test the various levels of responses. A total of 91 questionnaires will be administered. The researcher personally administered the research tools after a prior visit to seek conscience from the subjects. This also ensured that the researcher gets a rough picture of the respondents' expectations. The researcher agreed with the respondents when the research instruments would be administered and specifically dates of collecting the questionnaires. Data analysis is the process through which a researcher interprets the data systematically in order to make sense of it. The data obtained from the respondents was cleaned, coded, and analyzed using SPSS V.22 and Microsoft Excel 2013. Quantitative analysis was used for descriptive purposes where numerical data is involved while qualitative analysis was applied to non-numeric data. Data collected was presented in the form of tables, charts and figures.

1.5 Results

The study achieved a 95.6% respond rate as 87 out of 91 questionnaires given were dully filled and returned. The respondents were asked if batch size capacity within the Kenya pipeline Eldoret deport determines the lead time of petroleum product supply and their responses was presented in table 4.1

Table 4.1: Batch size and its effects on lead-time

	Frequency	Percent	Cumulative Percent
Strongly agree	33	37.9	37.9
Agree	44	50.6	88.5
Undecided	10	11.5	100.0
Total	87	100.0	

Table 4.1 showed that majority of the respondents 50.6% agreed that batch size at the depot affected lead – time, 37.9% also agreed while 11.5% were undecided.

Respondents were further asked if batch size distribution determined turnaround times at which different products were received and distributed at the depot and were represented in table 4.2

Table 4.2: Effects of batch size on turnaround time

	Frequency	Percent	Cumulative Percent
Strongly agree	22	25.3	25.3
Agree	49	56.3	81.6
Undecided	11	12.6	94.3
Disagree	5	5.7	100.0
Total	87	100.0	

Table 4.2 asserted that 56.3% of the respondents agreed that batch size distribution determined turnaround time at which different products are received and distributed at the depot, 25.3% strongly agreed, 5.7% disagreed while 12.6% were undecided.

Furthermore, respondents were asked how frequency at which the supply of petroleum products at the Eldoret depot determines the throughput of the products at different instances and their views were shown in table 4.3.

Table 4.3: Frequency of Supply and Distribution of petroleum products

	Frequency	Percent	Cumulative Percent
Strongly agree	45	51.7	51.7
Agree	26	29.9	81.6
Undecided	14	16.1	97.7
Disagree	2	2.3	100.0
Total	87	100.0	

The data obtained from table 4.3 showed that majority of the respondents 51.7% strongly agreed that the frequency of which petroleum products were supplied to consumers contributed to its distribution, 29.9% of the respondents also agreed while 2.3% disagreed and 16.1% were undecided.

The respondents were also asked whether the rate of distribution of the petroleum product at the Eldoret Depot affects the turnaround time of different or similar products and their responds presented in table 4.4.

Table 4.4: Rate of distribution and turnaround time of product

	Frequency	Percent	Cumulative Percent
Strongly agree	32	36.8	37.2
Agree	44	50.6	88.4
Undecided	8	9.2	97.7
Disagree	3	3.4	100.0
Total	87	100.0	

From table 4.4 showed that the bulk of the respondents 50.6% agreed that the rate of distribution of petroleum product affected the turnaround time of this products, 36.8% strongly agreed while minority of the respondents 3.4% disagreed and 9.2% were undecided.

The respondents were also asked how requisition of new petroleum products within the supply chain of Eldoret Depot determines the lead time of petroleum distributions and the findings represented in table 4.4

Table 4.5: Requisition of new product and lead time of petroleum distribution

	Frequency	Percent	Cumulative Percent
Strongly agree	39	44.8	44.8
Agree	37	42.5	87.4
Undecided	11	12.6	100.0
Total	87	100.0	

Information obtained from table 4.5 revealed that 44.8% of the respondents strongly agreed that requisition of new petroleum products at the depot contributed to lead – time thus distribution of these products to consumers, a further 44.8% of the respondents agreed while 12.6% were undecided.

2. Conclusions

The study concluded that Kenya Pipeline Company Eldoret Depot experienced the challenge of storing various petroleum products at the same time due to limited storage capacity. This was a challenge that affected also the availability of other petroleum products at the depot. Studies that have been conducted by various scholars suggest that due to the presence of storage facilities within various points of distribution it becomes difficult to stock other products at that specific interval as if the product available at that time is not consumed quickly then the other products cannot be made available to the suppliers. This was in support of [11], who advised that product availability was determined by the number and location of warehouses because it determined the number of customers close to the warehouse. Facilities with mass production were responsive to supply variability while customization platforms were prone to longer production lead times. The availability of these

storage facilities contributed or hard effects on the lead time, throughput and turnaround time at the depot has only one product was supplied at that specific time. Further, [15] The National Oil Corporation of Kenya was charged in April 2008 with maintaining strategic stocks equivalent to 30 days of consumption and eventually to reach 90 days over the coming years. Just as large storage capacity can be a measure in mitigating the effects of shortages of petroleum products in the market, it is incumbent on governments not to unnecessarily intervene in fuel price adjustment as this can encourage hoarding of the commodity by dealers resulting in artificial shortages. Wide price disparities in our neighboring countries can also lead to smuggling, thus causing shortages.

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APPENDICES

Appendix i: Questionnaire

SECTION ONE: GENERAL INFORMATION

1. Position of the respondent (tick where appropriate)

Oil marketing manager (OMCs) ☐ Supply and planning officer ☐

Supply analyst ☐ loading superintendent ☐

Product accounting officer ☐

2. Level of formal education

Diploma ☐ Bachelor's degree ☐ MA/MSC/PhD ☐

3. For how long have you worked in your current position?

Less than 5 yrs. ☐ 5-10 yrs. ☐ Above 10 yrs. ☐

SECTION B: STORAGE CAPACITY

4. The statements below are concerned with the effect of storage capacity on the management of petroleum products by Kenya Pipeline Company. Tick appropriately using the following scale. **1-strongly agree, 2-agree, 3- neutral, 4-disagree and 5- strongly disagree.**

Table 5

Statement	**1**	**2**	**3**	**4**	**5**
The batch size capacity within the Kenya pipeline Eldoret depot determines the lead time of petroleum products.					
Batch size distribution determines turnaround times at which different products are received and distributed at the depot					
The frequency at which the supply of petroleum products at the Eldoret depot determines the through put of the products at different instances.					
The supply of petroleum products at a single instance at the Eldoret Depot determines the turn- around cycle of the petroleum products available for distribution.					
The rate of distribution of the petroleum products at the Eldoret Depot affects the turn-around time of different or similar products.					
The requisition of petroleum products within the supply chain determines the lead time of petroleum distributions					

5. In your own view, what is the effect of storage capacity on the management of petroleum products at the Kenya Pipeline Eldoret depot?

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