THE IMPACT OF STRATEGIC CAPACITY EXPANSION ON SERVICE DELIVERY IN PETROLEUM SUPPLY CHAIN: THE CASE OF KENYA PIPELINE COMPANY LIMITED

NAME: JEREMIAH MWANGANGI

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DECLARATION

Candidates Declaration

I declare that this project is my original work and has not been presented in this or any other University for the examination.

Signature …… Date ……

Candidates Name: JEREMIAH N. MWANGANGI

Registration Number: D61/7189/2006

Supervisor's Declaration

This project has been submitted with my approval as the University Supervisor.

Signature …… Date ……

Supervisors Name: ONSERIO NYAMWANGE

Department of Management Science

DEDICATION

This research project is dedicated to my dear parents, my dad Philip Mwangangi and Late Mum Agnes who passed on just before I started the program. Thanks for instilling in me a sense of hard work and believe that, with determination I can realize my dreams. You have led by example, and I have following with determination to exceed your achievements.

Thanks for having so much confidence in my ability to be what I wish to be.

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ABSTRACT

This study sought to determine the impact of capacity expansion on service quality in petroleum industry. This research surveyed all the oil marketing companies involved in the importation, storage and distribution of refined petroleum products through the pipeline system, and has been in operation for the last five years.

Primary data was collected through questionnaires which were distributed among the research population. Secondary data was collected from the company records and reports. The collected data was cleaned and organized for analysis.

The study results indicated that capacity expansion affects service quality in petroleum industry. It also revealed that the current capacity is constrained hence the service quality is low due to unavailability of product in western Kenya loading depots, and limited availability of ullage due to constrained evacuation of petroleum products from KOSF. It was found that capacity expansion enhanced quality service delivery in the industry.

In this study, the results revealed that 100% of all the oil marketers are operating below capacity due to unavailability of enough stocks for trading due to constraints on pipeline pumping system, with some opting to use alternative means which are expensive and risky for the sake of servicing their market segments. All the marketers felt that the system currently cannot meet the demand. In addition, the marketers felt that capacity expansion of western Kenya pipeline will improve the service quality in western Kenya.

LIST OF ABBREVIATIONS

KPC	Kenya pipeline company
KOSF	Kipevu oil storage facility
KOT	Kipevu oil terminal
SOT	Shimanzi oil terminal
KPA	Kenya ports Authority
KPRL	Kenya petroleum refineries Limited
MSP	Motor Spirit Premium
MSR	Motor Spirit Regular
AGO	Automotive Gas Oil
WKPE	Western Kenya pipeline extension
ASE	Adjustment of Stock Entitlement

DEFINITION OF KEY TERMS

Ullage	Storage space in the tanks, available for filling with product
Hospitality	An arrangement between oil marketers whereby one marketer transports product and stores in another marketers depot at a fee.
ASE	An arrangement between oil marketters where they exchange product grades or borrow product from each other.
Custody transfer	Transfer of petroleum product from KPC to the oil Marketer
Flow rate	The total volume pumped in One Hour
Oil marketer	A registered company dealing in importing, distributing and retailing of refined petroleum products

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CHAPTER ONE: INTRODUCTION

1.1 Background

1.1.1 Capacity Management

Slack et al (2007) define Capacity as the maximum level of value added activity that an operation, or process or facility is capable of attaining over a period of time. Brown et al (2000) define capacity as the potential output of a system that may be produced in a specific time, determined by the size, scale and configuration of the systems transformational inputs. Lovelock (1984) defines Capacity management as the ability to balance demand from customers and the ability of the service delivery system to satisfy the demand. Slack et al (2007) argues that the fundamental responsiblity of operations management is to provide the capability to satisfy current and future demand. This is possible by matching the capacity and demand right thus satisfying customers cost effectly.

Waters (1996) points out that there is a difference between ‘’Designed capacity’’ defined as the maximum output of a process under ideal conditions and ‘’Effective capacity’’ defined as maximum output which can be realistically expected under normal operating conditions. Waters (1996) further notes that effective capacity is less than designed capacity due to set up times, break downs and stoppages.If the effective capacity is not managed well, then the actual output is always lower than effective capacity. The ratio of actual output to effective capacity gives a systems capacity utilisation which is crucial in determining a resource productivity.

Capacity management is the balancing act which service managers face day to day in attempting to match the level of demand with the available capacity (Armistead, 1992b). When there is a perfect balance between the demand for the services and the resources giving the capacity to satisfy them, the services are delivered to the desired service quality standards whilst still meeting resource productivity targets. Either there is more resource capacity than is needed for the level of demand, or demand from customers is in excess of available capacity. When demand from customers is greater than resource capacity, service quality is likely to suffer. On the other hand, when there is insufficient demand, resources cannot be used productively.

Strategic capacity management enables a firm to make vital strategic decisions (Hill, 1995). These Capacity decisions have a real impact on the ability of the organization to meet future demands for products and services. These decisions often involve long-term commitment of resources and the fact that, once they are implemented, those decisions may be difficult or impossible to modify without incurring major costs. The drive to achieve higher productivity on available resources has increased the importance and the complexity of capacity decisions.

Because capacity decisions often involve substantial financial and other resources, it is necessary to plan for them far in advance in line with the firms future plans (Imram ,2007).The decisions on how much capacity to require and when to require it can affect an organisation's competitiveness.These capacity decision involves the type of equipment or facilities to be employed in producing the product or service, how much capacity or equipment is needed, and when it is needed. These decisions are often costly and difficult to modify once initiated.

1.1.2 Service Quality In Petroleum Industry

Kitchroen (2004) defines Service as an identifiable, intangible activity that is the main objective of transaction that serves to meet the needs of customers. He views Service quality as the ability of the organization to meet or exceed customer expectations. Parasuraman, et al (1985) described service quality as the ability of an organization to meet or exceed customer expectations. Gronroos (1991) conceptualized that service quality as being made up of three dimensions: the "Technical quality of the outcome", the "Functional quality of the encounter", and the "Company corporate image". Lehtinen (1982) also described service quality in three dimensions: the "physical quality" (of products and/or services), the "corporate quality" (the company image) and "interactive quality" (interaction between the consumer and the service organization).

Parasuranman et al. (1985, 1988) developed SERVQUAL, which is the most widely used tool to measure service quality to date. The SERVQUAL model measures service quality on five dimensions namely: reliability, responsiveness, tangibles, assurance and empathy. The model focuses on Five Service Gaps namely: positioning gap, specification gap, delivery gap, communication gap and perception gap. Based on the SERVQUAL model, the parameters for measuring service quality include in Kenya pipeline include: Timeliness and quantity of imported product stored at KOSF, Timeliness and quantity of stored product in the depots,

processing of product transfer orders, management of stock levels and addressing of customer complaints.

1.1.3 Service Delivery in Petroleum Industry in Kenya

A Service is a time-perishable, intangible experience performed for a customer acting in the role of a co producer (Fitzsimmons, 2006). Services can be deeds, processes or performances without a tangible experience (Zenithal et al, 2003). Service enterprises are organizations that facilitate the production and distribution of goods, support other firms in meeting their goals, and add value to our personal lives (Fitzsimmons, 2006).

According to Turban et al. (2002), "Customer service is a series of activities designed to enhance the level of customer satisfaction – that is, the feeling that a product or service has met the customer expectation." Service delivery therefore refers to the implementation of the activities or processes aimed at meeting customer needs in a timely and in the way it is needed or better than it is needed. The service delivery process can meet, surpass or fall below the customer expectations. Service quality is most often related to customers' perception and satisfaction. As the old adage, "beauty is in the eye of the beholder", "service quality is in the eye of the customer."

According to Zeithmal et al (1996) customer hold two types of expectations: desired, defined as the wished for level of performance, which is a blend of what customer believes can be and should be and the lower level expectation termed adequate i.e. the level of service the customer will accept in the light of certain controllable and uncontrollable resource constraints. Thus the adequate level is always less than desired service.

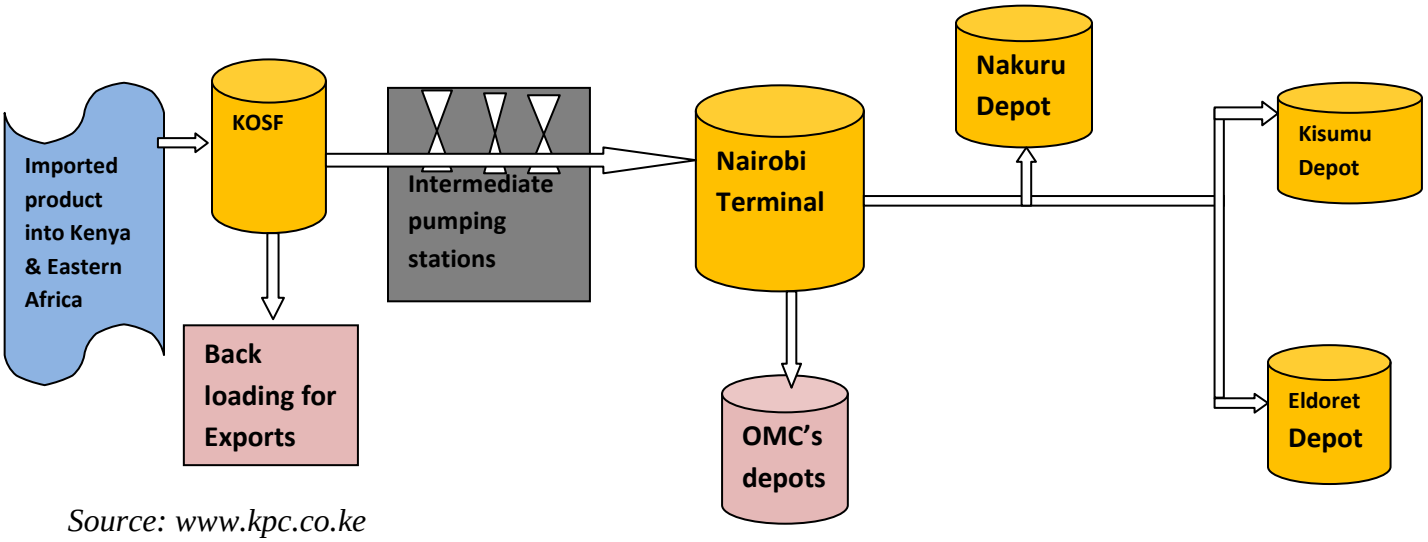
The Kenya pipeline company core business is the transportation, storage and distribution of refined petroleum products. The business process is characterized with low contact but technology intensive processes. The main service contacts with customers in the petroleum industry include petroleum imports & receipts at Kipevu storage facility, storage depots, truck loading & pump over's and stock inventory. Service delivery in petroleum industry is defined in terms of the ability to deliver right volumes, right time and right quality at right location (Kelemen, 1997).

The main attributes of quality service delivery by KPC entail: Timely delivery of product to customers, Timely availability of required storage space for imported products, availability of products in the hinterland depots, Timely availability of truck loading gantries, product quality certification and stock inventory management.

1.1.4 Petroleum Supply Chain In Kenya

Petroleum supply chain in Kenya can be grouped into Three Phases: *First*: the importation and storage of the refined product at the Kipevu oil storage facility (KOSF) and refined petroleum product from Kenya petroleum Refineries in Changamwe, Mombasa, *Secondly* the transportation of the product from Mombasa to hinterland depots and *Thirdly*, the transfer of the products from KPC depots to marketer's depots or truck loading. The modes of transport available for transporting petroleum product from Mombasa to hinterland include: Road, Railway and Pipeline. Pipeline mode remains the mode of choice transporting more than 90% due to its ability to transport in bulk, low handling cost, provide storage and ensure quality of the various grades at various depots across the country for the marketer's convenience. This places the challenge of proper capacity management on the company.

Fig 1 Schematic Illustration Of Petroleum Supply Chain In Kenya



Source: www.kpc.co.ke

Due to its strategic role in oil transportation, the 800km oil pipeline is the backbone of the petroleum distribution in eastern and central Africa. The pipeline feeds the depots in Nairobi,

Nakuru, Eldoret and Kisumu. Petroleum products are transferred directly from Nairobi terminal to the oil marketer's depots for truck loading and subsequent delivery to marketers fuelling stations. In the western Kenya depots, truck loading is done within the pipeline company owned common user truck loading gantries.

Imported products are received into the common user government owned Kipevu Oil Storage Facility (KOSF) or private marketer's storage depots at Shimanzi. Shimanzi Oil Jetty (SOT) handles Product for both local and transit, through loading into trucks and wagons at marketers depots. The product imported through pipeline is temporary stored at KOSF depot before pumping into mainline. Sanga (2008) notes that the line connecting Shimanzi and Kipevu depots, commissioned in March 2008 will enhance product movement flexibility in distribution and storage.

The limited storage capacity at KOSF and mainline pumping flow rate has impacted negatively on evacuating product from KOSF into mainline. This results in ship delaying in the high seas and incurring high demurrage charges. In an effort to alleviate the problem, the ministry of energy acted to expand the storage capacity of imported white oils, Sambu (2008). The underutilized storage capacity at the Kenya petroleum refineries (KPRL) was incorporated into the existing storage capacity at Kipevu storage facility. the capacity integration will enhance Smooth docking of the ships in Mombasa and speedy discharge which should help the importers eliminate the penalties charged by ship-owners for the time they are kept waiting at the port as well as cut storage costs and pass on the benefits to the consumer.

The western line is currently over constrained by demand for products for export to great lakes region. Wahome (2006) observes that Poor reinvestment by the government parastatal culminated in a growing demand that was not matched by expanded capacity either at its Kipevu Oil Storage Facility (KOSF), the upcountry depots and pipeline itself. To mitigate against the capacity constraint in the short term, the Kenya government has allowed transportation of products from Mombasa to Rwanda and Uganda by road to make up for the short fall. The two countries predominantly uplift their supplies from Eldoret terminal which sometimes runs out of supplies taking time before replenishment from mainline.

To streamline procurement and importation of white oils in the country, the government introduced the Open Tender System popularly referred to as OTS (Sambu, 2009). The logic behind OTS is that it enables Kenya to procure petroleum at better prices due to economies of scale. OTS supply system is supposed to offer the market cheaper products because the tender is awarded to the bidder with the lowest freight and premium rates. Under OTS, any oil company registered in Kenya can bid to supply the market with crude oil or refined products. The system evolved following deregulation of the local energy market in 1994.

To improve the supply of premium motor spirit in the country, the Energy ministry decreased KPRL quota from 70 % to 50%, with the extra volume procured through the open tender system (Akolo, 2009). To expand the storage capacity of imported products, the ministry has integrated the spare storage capacity available at KPRL to the available storage capacity at KOSF and counted as part of ullage available. This is meant to reduce demurrage and handling costs at the jetty due to partial discharges at the Kipevu jetty (Senelwa, 2004).

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. (Senelwa, 2008). The strategic stock shall be procured by National Oil Corporation of Kenya (NOCK) and stored by Kenya Pipeline Company. In case of consumption or draw-down, it shall be replenished according to its optimal level,"

1.1.5 Capacity Planning At Kenya Pipeline Company

Strategic planning at Kenya pipeline for capacity enhancement consisted of Three phases:

Phase I: Recognition of the existing capacity constraints, and thus assessing the available possible options for alleviating the capacity constraint in both the short and long term. This is achieved by analyzing the throughput of the existing facility against the prevailing market demand. The planning section is responsible for carrying out projections of demand which is matched to the available supply capacity. A capacity constraint exists where demand outstrips the supply.

Phase II: Adoption of a capacity enhancement strategy at corporate level, aimed at expanding the current capacity to facilitate handling of more product within a shorter time and allow operational flexibility. The planning section prepares a management paper for discussion in the top management detailing the current situation, implications to the company and proposed corrective measures to alleviate the problem.

Phase III: Planning for the actual implementation of the enhancement strategy in phases with a view of realizing the vision of providing a world class service in transportation and distribution of refined oils in the region. Once the proposal is approved, the management provides a budgetary allocation and delegates to projects section to initiate the process of capacity expansion. This results in actualization of the capacity expansion by working towards expanding the capacities of various sub units in the entire pumping, storage and distribution system.

Strategic capacity planning at Kenya pipeline has as its objective, to determine the overall capacity level of capital-intensive resources – storage capacity, pumping capacity, equipment requirements, and overall labor force size that best supports the company's long-range competitive strategy. The main parameters in a oil pipeline capacity are: storage space available at the storage resevoir and transfer depots, pumping flow rates, delivery flow rates, capability to handle more than product. The table below summarises the kind of capacity, where required and its implications.

Table 1.1 Capacity Areas In Petroleum Supply Chain In Kenya

Location	**Activity**	**Capacity required**	**Implication**	**Remarks**
KOSF	Reciept of imported product	Capacity to store imported product	Ability to store enough product	Enough product for trading by marketers
		Pumping Capacity from ship to KOSF	Ability to discharge product quickly	Minimum time at Jetty reducing demurrage
	Delivery of product to mainline	Pumping capacity to mainline	Capacity to supply enough product to pump station	Enough product for pumping into mainline

Intermediate pumping stations	Boosting pressure of pumped product	Pumping capacity from one station to next	Sustain higher flow rates	Delivery of demanded product volumes to Nairobi terminal
Nairobi Terminal	Reciept of product from pipeline	Storage capacity	Reciept of enough product for distribution to OMC's	Delivery of requested volumes to customers
	Storage of received product	Storage capacity	Storage of enough product for timely delivery to customers	Delivery of requested grades & volumes to customers
	Transfer of product to oil marketters	Pumping capacity	Time to transfer products	Delivery of enough product on time
	Transfer of product to Western Kenya pipeline	Pumping capacity	Volume and Time to transfer products	Delivery of enough product on time
Western Kenya depots (Nakuru, Eldoret & Kisumu)	Reciept of product from pipeline	Storage capacity	Reciept of demanded product for distribution to OMC's	Delivery of requested volumes to customers
	Storage of reciept product	Storage capacity	Capacity to store enough product to meet customer's demand on time for all demanded grades	Time and place utility of the transported and stored product
	Truck loading volume	Loading capacity	Capacity to deliver enough product through the gantries to meet customer's demand on time	Timely and total delivery of requested volumes
	Truck loading time	Duration of loading	Time taken to deliver requested product on the loading gantries	Timely and total delivery of requested volumes
Customer care centre (Nairobi Terminal)	Product stock control	Capacity to respond to customer queries on time and satisfactorily	Timely communication Accuracy of information	Smooth loading and product storage

Source: www.kpc.co.ke

According to Wahome (2006) statistics from PIEA, the demand for white oils has risen exponentially resulting in demand for petroleum products to rise at an annual rate of 5.8 % against a static supply network .The throughput has increased from 0.9milion litres in 1978 to 3.6million litres in 2007. The deregulation of the petroleum sector coupled with the rising growth in demand for refined petroleum products has continued to create challenges for the company in adjusting installed capacity in consistent with demand. The rising demand for petroleum products in western Kenya and beyond have stretched the Nairobi – western Kenya line capacity beyond limit thus rendering it incapable of meeting demand.

To de-bottleneck the petroleum supply chain constraints, KPC in 2005 pointed out that the company needed to embark on various capacity expansion projects by constructing more tanks at KOSF, Kisumu and Eldoret, installation of more pumping stations and upgrade of control systems to enhance storage and pumping capacity to serve the customers better. Strategic capacity planning in the petroleum transportation and distribution aims at expanding the supply system in line with increasing demand. Supply system capacity expansion entails improvement on the pumping capacity, storage and distribution capacity.

To monitor the demand trends at the company, the planning department monitors the system performance against demand to ascertain whether the system output meets demand. Future demand is obtained by applying appropriate forecasting techniques to prorate on the future demand. The planning section analyses demand behavior and provide budgetary allocation based on the timing of the capacity expansion projects. Timing is critical in high investment capacity projects as delays may result in lost market share and business where as early investment results in tied up resources with less payback.

1. 2 Statement of the Problem

Research by Kelemen(1997), 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: ‘the right product, the right quantity, at the right time, safely in the right place, at the right price. 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.

Empirical evidence confirms that capacity expansion is critical in service supply chain in petroleum industry. The longhorn pipeline in UK increased its pumping capacity by constructing four additional pumping stations and upgrading the existing stations to handle higher flow rates. The enhancement included Upgrade of the existing stations, construction of Four (4) Stations and two more additional truck loading lanes *(Pipeline & Gas journal, May 2008 pg 10).* This was in response to the increased shipping demand and marketing conditions. The expansion increased the pipeline capacity from 72,000 bpd to 125,000bpd. The firm is now delivering service to its customers satisfactorily according to their general manager, commercial services. This is through reduced pumping duration, customers spending relatively shorter time in the gantry area and more product storage availability.

Caspian Pipeline in Kazakhstan doubled its capacity by constructing Ten (10) additional pumping stations and six new tanks erected in line with the firm's vision of doubling the system capability. This was in line with the company vision of moving higher quantities of the refined product to the midstream market to feed the emerging markets in Afghanistan (Nathan, 2008).

Evidence from the service sector confirms that strategic capacity planning improves on the service delivery. After experiencing capacity constraints leading to turning customers away, Shouldice Hospital in Northern Canada increased the bed capacity from 36 to 89 and expanded the surgical wards to improve the capacity to handle a higher number of patients within a shorter time (Aquilano R.B, et al , 2005). This resulted in better service delivery to customers due to its ability to provide its patients with a quick, quality and low cost surgery.

As a way of handling excess demand for education in Kenya, many public universities have opened campuses and introduced evening and part time courses to accommodate the soaring number of those seeking education (Chacha, 2004), he further notes that the current capacity cannot even meet the demand for higher education by the regular students alone hence the need for the public and private universities to be innovative and introduce programmes to make more competitive.

Kenya Airport Authority is also expanding both Jomo Kenyatta and Kisumu airports to facilitate handling of higher planes for both passenger and cargo. Marsh (2007) quotes the Kenya airports authority managing director (MD) as saying that JKIA was currently handling 4 million passengers against the designed capacity of 2.5million.The MD further noted that the increased passenger volume had compromised on the service quality on the airport. The capacity expansion thus was to facilitate flexible flight times, handling of more passengers and cargo.

As a result of the customer complaints, the Kenya pipeline company implemented a number of capacity expansion measures with a view of adjusting the supply capability to match the demand (Njoka, 2006). This has been through improving on the capability to transport, store and distribute more products at the customers required volumes, grades, place and time. Njoka further notes that with the new capacity the Kenya pipeline company will be able to build stocks in the storage depots ensure faster ship discharge at KOSF, Shorten mainline transfer durations, faster transfer of material from KPC to trucks and marketers depots, full transfer of requested volumes, provide assurance of product availability and create a good working relationship.

From the evidence gathered from the cases highlighted above, it is not guaranteed that capacity expansion automatically leads to better service delivery. This research will seek to find out whether capacity expansion in petroleum supply chain improves service delivery to customers?

1.3 Objectives of the Study

The objectives of this research were: -

i. To establish the strategic capacity expansion practises adopted by Kenya pipeline
ii. To establish the impact of the capacity expansion on service quality in the petroleum industry.

1.4 Importance Of The Study

i. Help in identifying the service gaps in petroleum transportation and distribution and help in service quality improvement through closing of those gaps.
ii. Help the Kenya pipeline company in responding to the customer service issues as a result of less capacity.

iii. Help in providing basic knowledge for further research in the relationship between capacity expansion and service delivery in service industry.

1.5 Scope of the study

The scope of this study will be limited to the impact of capacity expansion in petroleum industry to service quality. The study will seek to establish the relationship between capacity expansion and the service quality in petroleum storage, transportation and distribution.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Capacity of a service firm is "the highest quantity of output possible in a given time period with a predefined level of staffing, facilities and equipment" (Lovelock, 1992,). Capacity amongst service firms has one commonality. For each day a service is not put to profitable use, it cannot be saved (Bateson, 1977; Thomas, 1978) as cited by brown et al (2000). This perishability suggests a need for careful planning and management, as idle capacity due to slack demand, as well as turning away customers due to insufficient capacity, are serious problems critical to the success of many service firms (Harris et al, 1995).

The task of capacity management is to try to balance between too much or less resource utilization, within the constraints of the networks and facilities of the operation. Capacity management is therefore concerned with putting a plan in place that makes the best use of resources, given the forecasted or expected demand for services (Sasser 1976). Armistead (1993) observes that there is an interaction between capacity management, quality management, and resources productivity or efficiency management which is at the heart of the planning and control process for operations management in services.

The ability to change capacity to cope with changes in demand determines the degree of flexibility of the capacity (Slack, 1987). The key issues in this is range and response, how far the capacity can be altered, effect of changing capacity, cost of changing capacity, ease of changing capacity. Managers are concerned with ensuring that service process has sufficient resources to deal with anticipated levels of customer demand in such a way that the quality of service meets pre- set targets in the most cost – effective manner. This is a delicate balancing act because both underutilized and over stretched resources can be disadvantageous.

2.2 Capacity Management Strategies

There are two short term capacity strategies namely: - level and chase demand management strategies.

2.2.1 Level Capacity Strategy

The level capacity strategy is a medium term capacity management that attempts to keep output from an operation or its capacity constant, irrespective of demand (Slack et al., 2007). The prime objective of this strategy is to maximize utilization of expensive fixed resources. This strategy aims at varying demand by altering the prices and service levels to maximize on capacity utilization for fixed capacity (Sasser, 1976). The strategy is widely applicable in the airline and hotel industry.

The strategy involves marketing mix strategies to shift demand patterns according to capacity availability. The level strategy is applicable when demand is visible and the service provider can divert customer demand at a time of excess demand for the capacity available (Armistead & Clark 1994). When demand is low, strategies such as differential pricing, promotional approaches, off peak discounts, value added packages and incentives to create demand.

Level capacity strategy is not effective in the service operation due to low levels of utilization. At excess demand, there is the likelihood of customer service levels falling, unnecessary queues and low profit margins (slack et al, 2007). This strategy is applied in the loading terminals in Eldoret, Kisumu and Nakuru where by truck loading is extended to Saturdays and Sundays to ease congestation of trucks in the stations. The same is also attained by extended loading hours against the normal loading hours of 0800hours to 1700hours.

2.2.2 Chase Capacity Strategy

Chase capacity plan is a medium term capacity management that attempts to adjust output and/or capacity to reflect fluctuations in demand (slack, 2007).This strategy is usually adopted by high volume consumer services, since a major aspect of their competitive strategy is the provision of ready and rapid access to service. Capacity can be adjusted through flexible staffing policies, customer involvement in the process such as self service in hotels, contracting out some service during high demand, maintenance of equipment during low demand.

Clark & Armistead (1994) noted that this strategy applies when customers feel an immediate need to get involved in the process and want to avoid waiting for the service. Chase capacity

strategy in Kenya Pipeline Company is applied in the conversion of tanks to store other grades with more demand. This helps in keeping pace with the demand of products.

2.3 Capacity management strategies in services

Service capacity is defined as the maximum level of value added activity over a period of time that the service process can consistently achieve under normal operating conditions (slack et al, 2004). In service operations, capacity planning is the process of matching the system supply to the system demand. Therefore, managing Capacity in services to match supply and demand has a direct influence on the ability of the service delivery system to achieve service quality and resource productivity targets. Slack (2007) views capacity planning and control as the task of setting effective capacity of the operation so that it can respond to the demands placed upon it.

Selecting capacity often indirectly determines the level of service that is provided. Hert (1993), cited by brown (2003) argues that a superior service strategy requires a greater investment in capacity in the form of more employees, larger facilities or just a faster processing speed, all translate into higher service levels. The result is more ability to provide customer service and a greater reliability when demand is uncertain.

Cousins (1994) points out that Capacity management in services involves certain trade-offs between the objectives of profit maximization and operational cost efficiency. The key challenge in service capacity is perishability, thus, if a service is not rendered on time, revenue is immediately lost and cannot be recouped. Matching the ability of the operation to provide the services to the expected volume of business (i.e. achieving full occupancy levels) must take into account all the costs of providing service and where possible, match these costs with the volume of business.

Donaghy et al (1995) researching on capacity management on hotel industry found that the critical challenge in hotel service is the perishability of the service. A critical element therefore for hotel capacity is to make the most efficient use of the operation's capacity to satisfy the needs of owners without disrupting customer service quality. Harris (1989) argues that the hotel managers can control the work and ensure utilization of existing capacity and maximize revenue by using various means to control the work and ensure utilization of facilities, thus ensuring both resource productivity and customer satisfaction.

Sasser (1976) identified two strategies for managing capacity in service industries: the chase-demand strategy and level-capacity strategy. Under a strategy of chase-demand, capacity is adjusted in relation to demand fluctuations. Capacity can be adjusted through use of flexible staffing policies, which adjust the supply of labour during off-peak and low-demand periods. Another example may be the cross-Skilling of employees to facilitate peaks and troughs in business at certain times of day or week (Lovelock, 1988). Other Chase-demand strategies may include the contracting-out of certain services in the service delivery. This benefits the service provider, due to the cost burdens being passed on to contracting companies during volatile demand periods (Sasser, 1976). Employee Capacity can be flexibly adjusted in some firms like hotels, with contracted services in non core areas such as laundry, maintenance, accounting, security, information technology, marketing, and cleaning.

Sasser (1976) notes that level-capacity strategies are used where the influence of demand minimizes the need to change capacity. This involves the use of marketing-mix strategies to shift demand patterns according to available room supply. For example, promotional strategies, special discounts and pricing strategies and appropriate distribution strategies. These level-capacity strategies are applicable when demand is more visible and the service provider can divert customer demand at a time of excess demand for the capacity available (Armistead and Clark, 1994). Where demand is slow, other level-capacity strategies may be considered. For example, differential pricing schemes are one of the most common techniques used to attempt to divert demand from peak to off-peak periods. Some examples of the techniques include: Off-peak discounts, value-added packages and weekend-break incentives by hotels with a view of optimizing on resource utilization.

A commonly applied concept in service capacity management is yield management. Kimes (1989) define Yield Management as the process of allocating the right inventory unit to the right customer at the right time and for the right price. It guides the decision of how to allocate undifferentiated units to limited capacity and to available demand in a way to maximize profit or revenue." The concept of yield management has been adopted from principles used in the airline industry where similar problems are faced with capacity and demand imbalances, the perishability of inventories and customer characteristics (Smith, et al, 1992). In practice, altered demand is anticipated and an appropriate number of rooms in hotels are offered at the higher

rates. At certain times, rates are opened or closed for sale depending on the lead-time and level of demand for the product. In yield management, the use of price is dominant in helping service provider to influence demand thus effectively optimizing on resources.

According to Relihan (1989) and Kimes (1989), the best known applications of yield management are appropriate where capacity is fixed and when excess demand exists. Yield management can also be useful when supply exceeds demand as demand forecasting is a crucial element that enables a service provider to plan in advance for days of low demand. It can also help sales and marketing departments identify opportunities for new products to appeal to a wide range of market segments, resulting in the ability to forecast demand from different market segments at different periods of time.

Gaynor, 1995, Keeler, 1996 researching on capacity in Germany hospitals found concluded that Successful capacity management in hospital requires the flexibility to handle sudden surge in demand. He further points out that Hospital capacity is a complex mix of assets (buildings space, equipment), man power and medical equipment for operating theatres and intensive care units. Effective capacity utilization therefore results from maximizing productivity of each parameter.

Horman (1998) observed that flexible capacity comes from having multi-skilled resources and having them supplied in sufficient quantities to be able move between functions, absorbing demand fluctuations, while ensuring that system operation is sustained. In lean manufacturing, when the system is not operating at full capacity, personnel may operate the production line, assist other teams on off duty, perform machinery maintenance, research and develop improvements.

2.4 Strategic Capacity Management

Capacity expansion is the process of adding new facilities of similar types over time to meet a rising demand for their services (Ryan et al, 2002). Planning for the expansion of capacity is of vital importance in many applications within the manufacturing and service sectors. Ryan, et al (2002) further notes Capacity expansion planning consists of determining future expansion times, sizes, locations and types of facilities in the face of uncertain demand forecasts, costs, and completion times.

According to Inman (2007), capacity planning relates primarily to strategic issues involving the firm's major production facilities. Inman further notes that Long-term capacity planning evolves when short-term changes in capacity are insufficient. For example, if the firm's addition of an extra shift to its current shift plan still does not produce enough output, and subcontracting arrangements cannot be made, one feasible alternative is to add capital equipment and modify the layout of the plant as a long-term actions. It may even be desirable to add additional plant space or to construct a new facility.

Waters (2005) notes that Strategic capacity planning needs to address the issues: timing of capacity changes, amount of capacity to be added. The decision on whether to go for early expansion will depend on: availability of certain demand, low cost of spare capacity, high cost of unmet demand and variable efficiency. The push to have few large expansions include: capacity cushion required, fewer disruptions, low cost per unit of expansion, earlier economics of scale, potential to stimulate more demand.

Rajagopalan et al (2001) found that inventory management policies have considerable effects on capacity expansion decisions especially in cases where demand is growing rapidly and the firm periodically needs to add machine capacity. They studied the trade-off between using excess capacity to build inventory and hence postpone future capacity acquisition to using the excess capacity to increase changeovers and reduce lot sizes.

Hsu (2002) addressed a capacity expansion problem allowing incremental demand to remain unsatisfied by in-house capacity and use temporary capacity such as leasing or outsourcing. Such a decision is preferred especially in the case of a speculative motive e.g. a firm may delay acquisition of certain technology, which is expected to be cheaper in the near future. The objective of his model was to minimize the total acquisition, holding and operating costs associated with all capacity expansion incurred in a multi-period planning horizon.

Gaimon et al (2003) describe the primary trade-off in capacity expansion as “the total cost over all expansions is reduced through a small number of large-sized expansions (economies of scale), whereas the costs associated with deviating from demand are reduced through a large number of small-sized expansions”. They studied the relationship between the lead time for capacity expansion and the size of the expansion and also investigated the effects of learning from prior

design and implementation on this lead time. They showed that a lead time reduction generates benefits, which may exceed the cost savings from economies of scale. A firm thus is able to invest optimally in a larger number of smaller-sized expansions.

The argument by Gaimon et al. 2003 builds on the research work of Nickel (1977) who considered capacity expansion model including lead times for adding capacity. Nickell formulated a model with an uncertain future change in demand which showed that the existence of a fixed lead time for adding new capacity would cause a firm to introduce a capacity increase earlier. He also showed that a longer lead time results in earlier anticipation of demand increases.

Ryan (2004) emphasizes the risk of capacity shortages during lead time for adding capacity in environments with demand uncertainty and an obligation to provide a specified level of service. She concluded that expansion is needed even in the presence of Excess capacity to make up for a growing demand. Chakravarty (2005) proposed a model to optimize plant investment decisions for Capacity expansion while ensuring that the plant investment overhead is optimally absorbed by products produced from that plant. The model considers the effect of labor cost, transportation cost, demand and import tariff on production quantities, investment and overhead absorption pattern. The concept of productivity differences between countries is modeled and the result is a profile of investment allocation to different plants with a fixed total investment budget.

Melo et al. (2005) proposed a mathematical modeling framework to address many practical aspects of manufacturing network design simultaneously. These include dynamic planning horizon, distribution, supply of materials, inventory, facility configurations, availability of capital for investments and storage limitations. They address strategic issues of relocation of capacity, capacity additions in present and new facilities and link the issue of capacity expansion to overall supply chain strategy of a firm.

2.5 Supply Chain in Petroleum Industry

Chopra et al (2004) conceptualizes a supply chain as consisting of all parties involved, directly or indirectly, in fulfilling a customer request. The supply chain not only includes the manufacturer and suppliers, but also transporters, warehouses, retailers, and customers themselves. Within an organization, supply chain includes all functions involved in receiving, processing and filling a

customer request. These functions include, but are not limited to, new product development, Marketing, Operations, Distribution, Finance, and Customer service.

Supply chain management (SCM) can be defined as the configuration, coordination and continuous improvement of sequentially organized operations in different geographical locations and within varying timescales (Kelemen, 2008). The goal of supply chain management is to provide optimum customer service whilst obtain highest possible prices and lowest possible costs. This is critical in oil industry where by competition is rampant hence reducing the game to the capability to get petroleum products at the right volume at the right place. Magretta (1998) noted that supply chain has emerged as a major source of competitive advantage and an avenue for value addition.

From the definition of supply chain by Kelemen, it can be noted that the Petroleum supply chain basically entails the value addition as a result of moving the product from one point to the other on time. The key factors in ensuring quality service delivery in the chain is the ability to transport the right volumes, store enough volumes and transfer them to the customers on time and in the right quality. This calls for effective demand chain management to match with supply chain capability.

According to Wachira (2008), an oil pipeline is just part of the petroleum supply chain in and addressing pipeline capacity resolves only part of the total system problems. The petroleum supply chain is affected by the product entry issues i.e. Tanker dockage at the port, imports receipt storage capacity, refining efficiency and product delivery from the pipeline system that all need to be analyzed and acted on for adequacy and efficiency.

Cavinato et al. (2002), argues that the objective of every supply chain, including the global oil industry, is to maximize the overall value generated. The value [to an organization, or to a nation] a supply chain generates is the difference between what the final product is worth to the customer, and the effort the supply chain expends in filling the customer's request. For most commercial supply chains, value will be strongly correlated with supply chain profitability, the difference between the revenue generated from the customer and the overall cost across the supply chain (Chopra et al, 2003).

According to Kelemen (2008), The end consumer in the petroleum supply chain is supplied through the coordinated activities of the whole supply chain, starting from crude oil exploration and production deliveries through thousand kilometers pipeline or in oil tankers, to very capital intensive and complex refineries, to final marketable products, to distribution by pipeline, ship, railcar, barge or road tanker to the end user. Petroleum supply chain unlike the other supply chains is demand driven i.e. the demand pulls the movement of the material from the refinery to the end consumer.

According to Vollmann et al (1998) Demand Chain Management (DCM) starts with the customers, working backward through the entire chain, to the suppliers of the supplier. Hence, everything that is moved, handled or produced should ideally be in response to a known customer requirement. Baker (2003) stresses that managing a demand chain is fundamentally different from managing a supply chain. It requires turning the supply chain on its head, and taking the consumer as the starting point, rather than its final destination. From the work of Vollman et al. (1998), the description of the demand chain accurately fits the description of the petroleum transportation and distribution in Kenya. The observation by baker (2003) that demand chain inverts the supply chain is correct for the petroleum industry. Planning begins by forecasting on the market demand for the next three months and working backwards to the initial point of supply chain to work out the supply logistics.

Jenkins (1998), notes that the logistical network in the petroleum industry is highly inflexible, which arises from the production capabilities of the crude oil suppliers, long transportation lead times, and the limitations to the mode of transportation, which presents a challenge at every pint. Similarly, the supply chain network comprises of sub stages which present challenges to the planning logistics. The material to be transported are purchased and shipped into the country by the oil marketers.

To ensure stability in the petroleum supply, the demand chain is integrated into the supply process to ensure value creation and service delivery. According to Lang beer et al (2001), Demand chain management helps to improve organizations processes by advancing the coordination of supply chain and demand driven activities such as consumer demand analysis or the selection of markets which best meet organizations capabilities.

The downstream segment is the most pronounced in the petroleum supply chain .It is characterized by stiff competition, value addition and service benefits geared towards attracting and retaining customers. The segment is strongly branded to differentiate the services of one marketer from the others. Market share acquisition and penetration is attained through the aggressive marketing by the oil marketers. The downstream sector is deregulated with the marketers owning truck loading facilities and fuelling stations across the country.

Sahu (2005) cited by Chima (2007) notes that supply chains are transforming to demand chains. Most supply chain projects in the past have focused internally on reducing operating costs through inventory reductions, better transportation planning, lower transaction costs, and improved supplier management. However, industry-leading companies are transforming their supply chains externally to be demand-driven with the key objectives to grow revenue and profits.

According to chima (2007), all significant and important operations in the oil and gas industry are planned in advance. Thus, the whole process is organized and fine-tuned into a high performance money making machine. The goal of supply-chain management is to provide maximum customer service at the lowest possible cost. Chima further notes that there is a need to ensure that each company or operator along the supply-chain can respond quickly to the exact material needs of its customers, protect itself from problems with suppliers and buffer its operations from the demand and supply uncertainty it faces.

2.6 Impact Of Strategic Capacity Management On Service Delivery

Strategic capacity planning is a process of aligning organizations capacity requirements with the company vision and strategic business direction. Ruow (2004) cited by Brown (2007) points out that both profit and non profit organizations are focusing on services with the customers as the starting point. This is from the realization that quality and satisfaction emanates from the customer.

Empirical evidence from research capacity management in hotels indicates a strong relation between strategic capacity planning and service quality. According to Pattern (1998); Pownall (1996) the demand/ supply imbalance in the hotel capacity affects the productivity. In periods of

low demand and strong competitive pressures, hotel managers are faced with the challenge of balancing customer demand against available room capacity to cover the relatively high fixed costs in hotel properties, at the same time as achieving operational efficiency.

In periods of high demand, hotel managers are faced with the constant challenge of balancing customer demand against a limited room capacity to provide quality service, meet or exceed customer expectations. To cover up for low demand, most hotels schedule their equipment maintenance and upgrade during the low season. This ensures all the equipments are available for utilization during high season to maintain reliability of the service delivery systems. To maximize on staff, most of the staff are released to proceed on leave while the temporary staff are laid off.

Capacity represents firm's capabilities. Greater capacity implies a greater capability to supply service quality. Capacity allows a firm to deliver all the aspects of service quality (Parasuraman, et al, 1985), it is realized. Capacity strategy, therefore, directly impacts service strategy. For example, capacity can be increased by the number of servers. As the number of server's increases, customers may enjoy shorter waiting times in the service queue or benefit from a higher probability of service. With greater capacity, there is also a higher capability of providing each customer with more service. Increasing capacity, therefore, actually improves the quality of the service output. Capacity should be directly related to customer satisfaction (Anderson 1995) cited by Brown (2007).

In many service industries, superior service results from higher capacity. In retailing, for example, increasing the number of trained floor employees helps customers find assistance more quickly. In medical services, increasing the number of employees can decrease waiting times and allow health-care workers to spend more time with each patient. In the airline industry, increasing the number of flights might allow passengers to choose more convenient flight times. For many home repair services, having more employees increases the probability the home repair provider can make a repair on the same day that the customer calls. From the research conducted, that customer satisfaction (Anderson, et al, 1994, 1997), is directly related to available capacity.

Strategic Capacity management in retail sector involves balancing the customer and servers. Adequate servers ensures customer receive timely service, eliminates queues, ensures customers

are assisted to locate the items faster, get personalized attention. This improves the responsiveness of the service attendants hence boosting the service delivery levels. Effective manpower planning involves matching available manpower to demand patterns, e.g. granting off duty to serves on low demand seasons and recalling shop floor staff to server counters during high seasons.

Strategic expansion in hospitals involves proper balancing of the service delivery side i.e. the equipments, doctors, buildings and bed capacity to the demand i.e the patients. Proper matching provides enhances service reliability, reduces waiting time, improves on the resource productivity resulting in higher profits (Gaynor 1995, Keeler 1996). Patients will receive better attention from doctors, hospital equipment will be adequately used and customers will wait for a shorter duration before the service.

According to Kelly (2007), Capacity planning through airport expansion results in more passenger & cargo handling which boosts revenue generation and ensures proper utilization of capacity. The hiring of more staff ensures faster handling of cargo reducing customer waiting duration. Larger airports facilitates a higher Frequency of flights which provides flexibility in customer selection of flights. Proper capacity planning guarantees service assurance, reliability and flexibility. Kelly further notes that an airport that operates at nearly fully capacity is likely to experience disruptions to service delivery causing delays or compromise on quality which can adversely affect an airports competitive position.

Sambu (2009) in an interview with KPC Coast region head of operations observes that, proper capacity planning in petroleum industry improves the ship discharge at the jetty, improves the pumping capacity which affects the ability to store and distribute petroleum products hinterland. Availability of product reserves in every terminal enables flexible product transfer in terms of grade and volume flexibility. The building of stocks in turn facilitates timely maintenance of equipment which enhances the pumping and distribution system reliability.

Empirical evidence from the available literature prove that strategic capacity planning directly influences service quality especially in a demand driven scenario. Faurice (2008) , the Lanseria international airport manager notes that due to surge in demand, the airport was prompted to embark on a series of capacity expansion projects meant to expand the runway, parking bay,

enhance service and landing, accommodating more planes of different sizes at different frequencies. This improves on the service delivery levels to the customers.

2.7 Measuring Service Quality In Petroleum Supply Chain

Service quality as conceptualized by Parasuraman et al (1988) is the comparison of consumer expectations with actual performance on several key dimensions. Service quality has been described as what users feel a service should rather than would offer (MacKay et al, 1990)

Service quality has been described as a form of attitude, related but not equivalent to satisfaction, which results from the comparison of expectations with performance (Parasuraman et al, 1988). Service quality involves a comparison of expectations with performance: it is a measure of how well the service level delivered matches customer expectations on a consistent basis. Service quality has been conceptualized as a function of consumer expectations towards the service situation and process, and of the output quality they perceived themselves to have received.

Ruow (2004) cited by Brown (2007) proposes that the service quality and service supply can only be managed and improved if there is a thorough knowledge of the fit between the supply and demand of facility services, and a thorough understanding of the facility process. A control structure to monitor the service quality in terms of its efficiency and effectiveness generates the necessary information. This information can be used to control, manage, guide and improve the service process. An understanding of service quality provides managers with insights into their users that can help inform budgetary, staffing and program related decisions (Veldkamp, 1995). This ensures efficient service delivery systems focused towards customer satisfaction.

The ultimate goal of service quality measurement is to assist managers in ensuring service quality and customer satisfaction (Webster, 1988). Measurement is a necessary step towards devising any action plan. However, because of its elusiveness and indistinctness, explication and measurement of quality also present problems for researchers, who often bypass definitions and use uni-dimensional self-report measures to capture the concept.

Parasuraman *et al.* (1988) identify five dimensions of service quality: Reliability: ability to perform the promised service dependably and accurately; Assurance: knowledge and courtesy of employees and their ability to convey trust and confidence. Responsiveness: willingness to

help customers and provide prompt service; Tangibles: staff, physical facilities, equipment, and appearance of personnel; Empathy: caring, individualized attention.

Parasuraman Five dimension model fits well in the service quality analysis in the petroleum distribution. Parasuraman (1990) defines reliability as ability to perform the promised service dependably and accurately. Pipeline Customers would expect a pumping system that is reliable in transporting their products to their point of convenience without failure. Any inability to transport the product to the customer's expectation erodes the customer's perception of the system reliability. This dimension in pipeline transportation can be measured by the number of times the system is not available, the number of product outages, number of times vessels wait (queue) to discharge due to lack of allocated ullage, the number of times the customer waits for product to arrive at the point of delivery,

In the SERVQUAL model of service quality, Parasuraman (1990) defines assurance in service as the Knowledge and courtesy of employees and their ability to convey trust and confidence (Competence, courtesy, credibility and security of the service). KPC customers need trust and confidence in the employees of KPC that they will be served as per their expectations. The customers want an assurance that they will get their products when and where they need it. This dimension can be measured on how well the company staff inspires trust and confidence of the customers in the service delivery.

One of the critical aspects affecting service quality is time. Customers expect to receive their products on time. This touches on the company's capability to deliver on time as per the promise as stipulated in the service charter. The capability to deliver on time defines the responsiveness dimension of service quality. Parasuraman (1988, 1990) conceptualized Responsiveness as the willingness to help customers and provide prompt service. This dimension can be measured on the time it takes to solve a customer issue.

According to parasunman (1998, 1990), the tangibles dimension of service quality focuses on the Appearance of physical facilities, equipment, personnel, and communication materials. The customers expect the service provider to install and operate appropriate technology to ensure proper product handling. This can be measured by how the customer sees the company facility capacity in terms of the volumes transferred against the volume requested to be transferred.

Empathy dimension of service quality is perceived as the Caring, individualized attention the firm provides its customers. This is through access to organization's representatives, communication and understanding the customer. KPC as a strategic service provider regularly holds meets with the customers, seeks their opinions in service delivery, regularly conducts customer satisfaction surveys where the issues raised are picked for action. This dimension can be measured by the number of customer complaints raised over a period of time, number of issues raised and not implemented and number of poor customer care incidences.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the procedure used in the study; more specifically it specifies the research design, the population of the study, the sample and the sampling procedure and finally data collection and analysis techniques. Chandran, (2004), defines research as a process of looking closely or objectively at specific activities to find evidence to establish a hypothesis or an answer to a research question.

3.2 Research Design

Research design is an arrangement of conditions for collection and analysis of data in a way that combines their relationship with the purpose of the research (Chandran, 2004). Cooper and Schindler (2007) define research design as the plan and structure of investigations so conceived to obtain answers to research questions.

In this project, research was done into the receipt of imported petroleum products, transportation into hinterland storage depots and distribution to oil marketer's depots for truck loading. In Kenya, the mandate of storage, transportation and distribution of bulk petroleum products is vested on Kenya Pipeline Company, a near monopoly. The company is a state corporation, 100% owned by the government and under the ministry of Energy.

3.3 Population

The population of this study comprised of all Oil Marketing Companies (OMCs) registered with the Ministry of Energy to trade in the importation, distribution and exports of petroleum products which were actively importing and transporting their petroleum products (all or partial) through the Kenya Pipeline, Railway, Road or operate through hospitality from other companies. The Oil Marketing Companies which met this criterion were 30(Appendix II).

The targeted respondents were supply and planning officers, supply analyst, loading superintendents for loading terminals or product accounting officers dealing with product requests, transfers and billing by KPC.

3.4 Sampling and Sample Size

In this study, sampling was not done since the entire population of the Oil Marketing Companies registered by the Ministry of Energy to trade in the importation, distribution and exports of petroleum products and which were actively importing and transporting their products through the Kenya Pipeline, Railway or Road or operate through hospitality from other companies were used; these companies were 30. Therefore due to the low number of companies using the Kenya pipeline installations, all the population were picked as the sample. Mugenda (1999) suggest that where the population is small, the entire population can be taken as a sample.

3.5 Data Collection

Questionnaires were used to elicit the primary data from the respondents (Appendix I). The questions were structured with choices for the respondent to pick from. Structured questions were necessary in order to allow the respondents to respond by selecting an answer from among a list provided by the researcher. Unstructured questions were avoided to restrict the respondents to give response within a given scope. This was to make data representation and analysis easiy and avoid complexities.

Pre-testing was done in order to make an assessment of the questions and instruments before the start of the study (Cooper & Schindler, 2007). The procedures used in pre-testing were identical to those used during the actual data collection (Mugenda & Mugenda, 1999). The pre-testing of the questionnaires for this study was done using one of the depot managers for Gapco. This was a private marketer's depot which handled both local and transit products and relied on Kenya pipeline for its stock supplies. The pre-testing exercise revealed any weaknesses in the questions which were corrected before the questionnaire were dispatched to the respondents.

In this study, both secondary and primary data were used. The throughput volumes for Mombasa – Nairobi, Nairobi – Western depots, transfers per depot, imports for the 1998 to 2008 were obtained from Kenya Pipeline (KPC), planning section. The sources were used because researcher intended to get the data in raw form and synthesize it to see the trends.

To collect the primary data, questionnaires were sent out to the respondents by email or hard copies. Those outside Nairobi were contacted on phone to ascertain whether they could fill the questionnaire online and send it back to the researcher. The email was followed with a telephone

call to make sure that the questionnaire had been received. Respondents who had difficulties filling it online were encouraged to print, fill and sent scanned copies of the filled questionnaires directly to the researcher by email. Hard copies were sent to those not in a position to access it by email.

The questionnaire comprised of three sub heading: sub heading A: Gathering data on capacity and service quality in petroleum import and storage, subheading B: Gathering data on petroleum transportation, storage and distribution of products into the upcountry depot. Sub heading C: helped in gathering data on customer care and service.

3.6 Data Analysis

Data analysis is a research activity during which the information collected is organized and related to the research questions (Laws, et al, 2003). Sekaran (2003) states that, after data has been collected from a representative sample of the population, the next step is to analyze them to test the research hypothesis.

The data analysis involved three major steps: First, Data preparation which involved data cleaning and organizing for analysis. Second, Descriptive statistics which involved describing the data and thirdly inferencing on the descriptive statistics to make conclusion from the data collected. Data Preparation involved checking or logging the data in; checking the data for accuracy; entering the data into the computer; transforming the data; and developing and documenting a database structure that integrates the various measures.

Descriptive Statistics were used to describe the basic features of the data in a study. They provided simple summaries about the data collected and the measures. Together with simple graphical analysis, they formed the basis of virtually every quantitative analysis of data. The conclusions were made from the inferential statistics from the organized and analysed descriptive statisctics. Recommendations were made from the conclusions derived from the data analysis.

CHAPTER FOUR: DATA ANALYSIS, FINDINGS AND FINDINGS

4.1 Introduction

This research explored the impact of capacity expansion on service quality in petroleum industry. This chapter presents the data collected in the course of the research and the interpretation of the findings.

The population of the study was the 30 registered of oil marketing companies licensed by the ministry of energy to trade in the importation, distribution and exports of petroleum products. The research targeted companies which are actively involved in importation, transportation and distribution of their products through the pipeline pumping and storage system. Four companies have market share less than 0.05% and are mostly resellers who buy their products from the other marketers hence were excluded from the data collection process. A total of 26 questionnaires were distributed to the population (Appendix II).The population comprised of multinationals, regionals, locals and resellers.

The response rate for the research was 85% of the target population since 22 out of 26 questionnaires were returned. According to Babbie (2004), a response rate of 60% is good enough, while 70% is very good. Welman & Kruger, (2001) state that, where the researcher is in full control of the completion of the questionnaires so that the respondent has no excuse of not completing the questionnaire, a response rate of close to 100% is the general rule. The response of the questionnaires of this research fell within what literature accepts. Therefore, the results were representative of the entire oil industry in Kenya as it was currently constituted.

4.2 Research Findings

4.2.1 Back Ground Information of Research Population

4.2.1.1 Areas Of Operation

The question sought to find out the areas of business operation by the respondents company. Of the respondents, 68% of the respondents indicated they imported petroleum products which was temporarily stored at Kipevu oil storage Facility (KOSF). All the respondents (100%) agreed to trading in petroleum distribution through truck loading from KPC depots. 9% of the respondents indicated that they were re- sellers of petroleum products to the retailers. 18 % of the respondents indicated their companies trade in LPG business.

Table 4.1: Areas of business operation

Areas of business	**Frequency**	**Percent (%)**
Importation of Petroleum product	15	68
Truck loading for local market	22	100
Truck loading for export market	12	54
Reselling imported products	2	9
LPG business	4	18

***Source**: Research data*

4.2.1.2 Category of Oil Company

The question sought to find out the category of the respondents company according to their scope of operation. Out of the total respondents, 64% indicated they were multinationals/regional, 27 % indicated they were local while 9% were resellers with no specific market. The multinationals comprised of oil marketers which were in operation before liberalization in 1994 and the regional marketers operating in eastern and central African states which were incorporated after the liberalization of the oil industry in 1994. The local marketers who were operating as independents had no branded stations and most of them operate under hospitality arrangements from both the multinationals and the regional marketers. The resellers bought the oil product from one marketer and sold directly to the retailers.

Table 4.2 Type of Oil Company

Category	**Frequency**	**Percent (%)**
Multinational/regional	14	64
Local	6	27

Resellers	2	9
Total	22	100

***Source**: Research data*

4.2.1.3 Target Market

The researcher sought to find out the respondents company target market. 68 % of the respondents said that they target both the domestic and export markets. 100 % target the domestic market and 15% target both the local and export market (see Table 4.3). The analysis shows that most of the new entrants target both the domestic and export market. One company (5%) said it targets the local market, that is, the Kenyan market.

Table 4.3: Target market by the Oil Marketters

Target Market	**Frequency**	**Percent (%)**
Domestic	22	100
Export	15	68
Both	15	68
Domestic only	1	5
Total	**22**	**100**

***Source**: Research data*

4.2.1.4 Mode of Transportation Of Petroleum Product

The respondent was asked to indicate the mode of transport chosen to transport their petroleum products from the port of Mombasa to Nairobi and western Kenya. 100 % of the respondents indicated using pipeline, 41 % indicated they used both pipeline and road transport, to supplement the limited pipeline capacity. None of the respondents indicated using road only as their preferred mode of transport.

Table 4.4 Choice of mode of transport

Choice of transport mode	Frequency	Percent (%)
Pipeline	22	100
Road only	0	0
Pipeline & road	9	41
Railway	0	0
Total	22	100

Source: Research data

4.2.1.5 Demand and Supply Situation for the Company

The respondent was asked to indicate their feeling on the demand and supply situation for Kenya pipeline. All the respondents (100%) were of the opinion that the demand for petroleum products has exceeded the supply. There seems to be a general feeling from the respondents that the demand for petroleum products transported by pipeline for trading exceeds the available supply. This is reinforced by the choice of marketers to use road to supplement the supplies they get from pipeline. (See Table 4.5). The inability of the pipeline system to avail enough volumes for the marketers on time has led to marketers reverting to alternative means such as road and railway to service their market segments at a higher cost. Some marketers are forced to operate below capacity due to the inability of the pumping system to supply enough product volumes to the customers.

Table 4.5: Supply demand situation for the Kenya Pipeline Company

Supply demand situation	Frequency	Percent
Demand exceeds supply	21	95
Demand equals supply	1	5
Supply exceeds demand	0	0
Total	22	100

***Source**: Research data*

4.2.2 Service Quality and Capacity Expansion for Imported Products

4.2.2.1 Ullage Provision at KOSF

The respondents were asked to indicate whether KPC provided enough ullage for their imported products. All the respondents (100%) indicated that they don't receive enough ullage to store their imported product. This confirms the incessant complain by the oil marketers in the media on unfair ullage allocation at KOSF (See table 4.6) the response is in agreement with the available literature that the capacity at KOSF is constrained which leads to vessels delaying in the high seas incurring demurrage costs.

Table 4.6: Satisfaction of Ullage allocation at KOSF

Satisfaction with ullage allocation at KOSF	**Frequency**	**Percent**
Satisfied	0	0
Not satisfied	22	100
Total	22	100

***Source**: Research data*

Njiraini (2009) argued that wrong ad hoc policies by the ministry of Energy are responsible for the mess in the ullage allocation which seems to favor few oil marketers. The argument is shared by the oil marketers who feel the industry is controlled by the government making it impossible for fair ullage allocation as per the marketer's market share.

4.2.2.2 Assurance of Getting Ullage at KOSF

The question asked the respondent to indicate whether the respondents company was assured of getting the requested ullage on time or not. 77% of the respondents indicated they were not assured of getting the ullage on time , 18% indicated they were assured while 5% were not sure whether they were assured or not. This had greatly hampered smooth operations of the vessels calling at KOSF as some vessels fail to get enough ullage forcing the shipping agents to result to multiple partial discharging which is expensive to the importing companies. The respondent's opinion confirms the general industry feeling that the issue of ullage allocation has not been adequately addressed.

Table 4.7 Assurance of getting Ullage on time

Assurance of getting ullage on time	Frequency	Percent
Assured	4	18
Not assured	17	77
Not sure	1	5
Total	**22**	**100**

***Source**: Research data*

4.2.2.3 Need for KPC to Expand Storage Capacity

The question sought to establish the respondent's opinion on whether the storage capacity at KOSF should be expanded or not. 55 % of the respondents felt there is need to expand the storage capacity at KOSF, 27 % felt there is no need of expanding capacity but there is need to increase the evacuation rate while 18 % were not sure of whether there was need to add or retain the current capacity.

Table 4.8 Whether there is need to expand capacity at KOSF

OMC Category	Need to expand	No need to expand	Not sure	Frequency	Per cent
Multinationals/ Regionals	10	6	0	16	**73**
Locals	2	0	2	4	**18**
Resellers	0	0	2	2	**9**
Totals	**12**	**6**	**4**	**22**	**100**
Per cent	**55**	**27**	**18**	**100**	

***Source**: Research data*

From the response, it is clear that the expansion of ullage may not absolutely provide solution to product outage in the hinterland. The marketers believe evacuating product faster would create

the ullage on time for any imported product. The marketers would prefer storing their products in the hinterland depots for ease of access. From Table 4.8 above, it was noted that the 18% that was not sure whether the ullage should be expanded or not are mostly the resellers and locals who buy from the multinationals and regional companies. These locals and resellers trade in less volume compared to the multinationals who trade in large volumes. The Locals and Resellers do not participate in the importation of the refined petroleum products or crude oil for refining at the Kenya petroleum refineries (KPRL). The ullage allocation issue at KOSF remains a thorny one with the larger companies participating in the open tendering system which requires large ullage allocation for the entire oil industry, leaving a small percentage for the private imports.

4.2.2.4 Capacity Enhancement On Mombasa – Nairobi Line

The question sought to find out whether there was improvement in flow rates and product stock management levels by KPC after the capacity enhancement of Mombasa – Nairobi pipeline.

Table 4.9: impact of capacity enhancement on Msa – Nbi pipeline

Impact of capacity enhancement on Msa Nbi line flow rates	**Frequency**	**Percent**
There is improvement	18	82
No improvement	2	9
Not sure	2	9
Total	**22**	**100.0**

***Source**: Research data*

From the respondents, 82% felt the capacity enhancement on the Mombasa Nairobi pipeline had slightly improved after the increasing the flow rate from 440m^3/hr to 550m^3/hr. 9% of the respondents felt there was no improvement while 9% were not sure whether or not there was improvement.

4.2.2.5 Impact of Capacity Enhancement on Mombasa – Nairobi Line on Ullage Creation

The question sought to find out the respondent opinion on whether there was improvement in Ullage creation at KOSF after the capacity enhancement of Mombasa – Nairobi pipeline. The respondents felt the commissioning of the capacity enhancement project had not improved the rate of ullage creation at KOSF due to low evacuation of products at KOSF to mainline and Nairobi to WKPE and OMC's as a result of filling up tanks at Nairobi

Table 4.10: Impact of Capacity Enhancement on Msa – Nbi Pipeline on Ullage Creation at KOSF

Impact of capacity expansion on Msa-Nbi line flow rates	Frequency	Percent
There is improvement	2	9
No improvement	20	91
Not sure	0	0
Total	**22**	**100.0**

***Source**: Research data*

The response concurs with the general feeling amonst the oil marketers that the capacity along the pipeline system was not balanced during the expansion hence the limited impact of the partial expansion on one pipeline segment only. It is worth noting that the bulk of the transported pipeline meant for export is pumped through the western Kenya pipeline which is seriously constrained.

4.2.2.6 Level of Satisfaction of Service at KOSF

The respondent was asked to indicate whether the respondent was satisfied with the level of service at KOSF. 82% of the respondents felt that they were not satisfied with the service delivery of product handling at KOSF, 18% said they were satisfied. (See Table 4.11). The high rate of dissatisfaction is due to inability of the pumping system to evacuate product fast enough to hinterland and delays in creating full ullage allocated.

Table 4.11 Satisfaction level with service delivery at KOSF

satisfaction level with service at KOSF	Frequency	Percent
Satisfied	4	18

Not satisfied	18	82
Not sure	0	0
Total	**22**	**100**

***Source**: Research data*

4.2.3 Custody Transfer & Truck Loading Services on Service Quality

The research sought to find out the impact of capacity on service quality in product custody transfer and truck loading from KPC to marketer's depots & trucks. The research further sought to establish the respondents' opinion on the impact of expansion of product transfer lines to customer service under different parameters.

4.2.3.1 Stock Inventory Position after Capacity Enhancement

The question sought to get the respondents opinion on the stock level in the hinterland after the capacity expansion of the Mombasa – Nairobi pipeline. 68 % of the respondents felt that stocks in the hinterland depots had not improved with the capacity enhancement while 27% of the respondents felt the capacity enhancement improvement resulted in improved stock storage. 5% of the respondents were not sure whether the capacity enhancement resulted in any improvement.

Table 4.12: Stocks position after Mombasa – Nairobi Line capacity enhancement

Position of stocks after capacity enhancement	**Frequency**	**Percent**
Stocks levels have improved	6	27
No improvement on stock levels	15	68
Not sure	1	5
Total	22	100

Source: Research data

The respondents who indicated improvement in stock levels were mostly the multinationals and locals with a strong domestic market presence serviced from Nairobi terminal. The capacity expansion had resulted to more product being pumped to Nairobi filling the tanks. There is no improvement in stock levels in western Kenya depots due to constrained pipeline to western Eldoret and Kisumu. The capacity expansion on Msa –Nbi pipeline had no impact on stock level

in western Kenya depots. The capacity balancing on the system was not done resulting in excess capacity on eastern side and under capacity on western Kenya.

4.2.3.2 Stock Volumes Received From Kpc Depots

The question asked the respondent to indicate whether they received total requested volumes from KPC or not. 68 % of the respondents said that they don't receive the total volumes requested from KPC depots while 32 % felt they received the total volume requested. (Table 4.13). Those indicating that they receive total volume requested are the smaller marketers, mostly locals and resellers who buy the product from the larger companies and trade with smaller volumes with a market segment of less than 1%. The multinationals operate their own storage depots in Nairobi and store product for truck loading. The product transfer lines from KPC to their depots are constrained to low flow rates which take long to transfer.

Table 4.13: Received against requested volumes by customers from KPC

Volumes received from KPC depots	**Frequency**	**Percent**
Requested volumes received	15	68
Less volumes received	7	32
Total	22	100

***Source**: Research data*

4.2.3.3 Need To Improve Flow Rates To Oil Marketer's Depots At Nairobi

The question asked the respondents to indicate their opinion on whether KPC should improve the flow rates of transfer lines to marketers depots or not. 56% of the respondents felt there was need to expand the flow rates of transfer lines to marketers, 9 % of the respondents felt there was no need while 35% was not sure.

Table 4.14: Whether there is need to improve custody transfer flow rates

Volumes received from KPC depots	**Frequency**	**Percent**
Need to improve flow rates	12	56
No need to improve flow rates	2	9

Not sure whether to improve or not	8	35
Total	22	100

***Source**: Research data*

The marketters who believed in expansion of the transfer lines had a strong domestic market presence while those not sure had their business interests in the export market which was actively in Western Kenya depots. The overwhelming response indicated the oil marketers would appreciate getting the requested volumes faster within a shorter time to replenish their stocks for loading during the loading hours. This would alleviate product outage in their depots which forced them to suspend loading to facilitate product transfer from KPC which took more than three (3) Hours results in lost man hours and idle time for the depot.

4.2.3.4 Sufficiency Of Loading Gantries

This question sought to find out from the respondents whether the loading gantries in the western Kenya depots were enough or not for truck loading. 45 % of the respondents felt the loading gantries in the loading depots were enough. 55 % of the respondents felt that the loading gantries were not enough for product truck loading. From the respondents, it is clear that the loading gantries are underutilized as a result of lack of products in the depots. The depots are idle for the time the depot lacks grades meant for export hence the utilization of the truck loading gantries is less than 50%.

Table 4.15: Sufficiency of loading gantries

Sufficiency of truck loading gantries	**Frequency**	**Percent**
Existing truck loading gantries are enough	10	45
Existing truck loading gantries not enough	12	55
Total	22	100

***Source**: Research data*

4.2.3.5 Need To Add More Loading Gantries

The question asked the respondents to indicate their opinion on whether there was need to increase more loading gantries or not. 77 % of the respondents felt that there is need to add more loading gantries, 18 % of the respondents felt there was no need while 5% were not sure whether there was need to add more loading gantries.

Table 4.16: Whether or not to add loading gantries

Whether to add truck loading gantries or not	Frequency	Percent
Need to add truck loading gantries	17	77
No need to add truck loading gantries	4	18
Not sure	1	5
Total	22	100

***Source**: Research data*

The respondents believe the addition of loading gantries will reduce the time wasted on queues to the loading gantries. Its worth noting that the loading is only done when the depots receive product supplies which leads to congestation and delays in the depots which forces the depots to operate from 0600hours to 2200hours then remain idle as soon as the depots run out of stock.

4.2.3.6 Cause Of Product Outages In Western Kenya

100 % of the respondents were strongly of the opinion that product outage in western Kenya is due to constrained flow rate in the western pipeline. This response agrees with the marketers frequent complains of the inability by KPC to deliver required volumes on time.

Table 4.17: Cause of product outage in western Kenya depots

Cause of product outage in Western Kenya	Frequency	Percent
Constrained flow rate causing product outages	22	100
Constrained flow rate not causing product outages	0	0
Not sure	0	0

Total	22	100

Source: *Research data*

4.2.3.7 Need To Improve Flow Rate To Western Kenya

On the need to improve the flow rate on the western Kenya line, all the respondents (100 %) felt that there is need to improve flow rates to western Kenya. It is hoped that improvement in the flow rate will improve stock availability in the storage depots and improve stock levels in the western Kenya storage depots.

Table 4.18 Whether there is need to improve flow rate of western Kenya line

Whether there is Need to improve flow rates to Western Kenya or not	**Frequency**	**Percent**
There is need	22	100
There is no need	0	0
Not sure	0	0
Total	22	100

Source*: Research data*

As part of the company's response to the customers need, the capacity of the western Kenya pipeline is being upgraded by constructing a parallel pipeline from Nairobi to Eldoret to increase the flow rate from the current $220m^3$/hr to $530m^3$/hr. the upgrade of the line will improve stock level maintance, reduce lost time by trucks on queues and loading gantries. The completion and commissioning of the new line will eliminate the perenual product shortage problem in western Kenya depots.

4.2.4 Customer Care and Service Quality

The research intended to find out the impact of customer care on service quality. The research intended to find out whether customer care staff availability in number and time period affects the quality of service delivered to customers.

4.2.4.1 Staffing On Customer Care Centers

The question sought to find out whether the customer care centers in KPC had enough staff to deal with customer inquiries. 59 % of the respondents felt the KPC customer care centers have enough staff to respond to customer queries on time while 41 % do not think KPC customer service centre have enough staff to deal with customers care issues.

Table 4.19: Staff sufficiency on KPC customer care centers.

Staff sufficiency on customer care centre's	**Frequency**	**Percent**
Customer care desk have enough staff	13	59
Customer care desk don't have enough staff	9	41
Not sure	0	0
Total	22	100

***Source**: Research data*

4.2.4.2 Need For KPC To Add More Customer Care Staff

Only 32 % of the respondents felt there was need to add more staff on the customer care centre's, 63 % felt there was no need while 5 % were not sure whether there was need to add more customer care staff. From the response, it seems the role of customer care is discharged satisfactorily by the existing team of customer care staff based at Nairobi depot.

Table 4.20: Need to add more Staff on KPC customer care centers

Need to add more customer care staff	**Frequency**	**Percent**
Need to add	8	36
No need to add	13	59
Not sure	1	5
Total	22	100

***Source**: Research data*

4.2.4.3 Effect Of Loading Hours On Service Quality

The question sought to find out whether the respondents were contended with the current loading hours. 36% of the respondents felt that the current loading hours of 0600hrs to 1800hrs were

enough for servicing loading orders while 64% of the respondents felt the loading hours were not enough. The product supply to the stations was erratic which resulted to truck loading being carried out from 0600hours to 1800hours. The marketers with trucks for export were forced to wait for some product grades in the stations for days.

Table 4.21 Satisfaction with the current Loading hours

Satisfaction with current loading hours	Frequency	Percent
Satisfied	16	73
Not satisfied	3	14
Not sure	3	14
Total	22	100

***Source**: Research data*

With the phasing of transportation of MSR from the system, some loading gantries were free for modification to handle highly demanded grades such as MSP and AGO. With more loading arms, it was to be possible to load more trucks within a shorter duration hence easing congestation in the depots.

4.2.4.4 Need For Extension Of Loading Hours

The question asked the respondents to indicate whether they wished the loading hours to be extended or not to 0400hrs to 2200hours to reduce congestation in the truck loading depots. 73 % of the respondents felt there was no need, 14 % felt there was need due to frequent product outage while 14 % were not sure whether extension of the loading hours will have any impact. The marketers appreciate that the current loading hours are enough for truck loading with truck loading done daily through out the week as opposed to being done only on the days the depots receive replenishment.

Table 4.22 Need for extension of loading hours

Extension of loading hours	Frequency	Percent
There is need to extend	3	14
There is no need	16	73
Not sure	3	14
Total	**22**	**100.0**

***Source**: Research data*

It is hoped with the completion of the capacity upgrade for the western Kenya line, higher flow rates will guarantee sufficient stock levels for truck loading through out the week as opposed to the current erratic loading. Availing more loading arms for loading through out the week was expected to deliver more product, reduce idle time and congestation in the depots. This was expected to improve the service delivery in the truck loading depots.

CHAPTER FIVE: SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter gives a summary of the research findings, conclusions and recommendations. The content of the chapter is based on what the researcher found from both the secondary and primary data collected. The summary of findings is based on the following objectives of the study, first, to establish the strategic capacity expansion practises adopted by Kenya Pipeline Company and Two, to establish the impact of the capacity expansion on service quality in the petroleum industry.

5.2 Summaries Of Findings

5.2.1 Capacity expansion practices adopted by Kenya Pipeline Company

It was found out that the company regularly monitored the pumping system performance, comparing demand against supply. This provided information which was important for planning. The growth of demand is monitored against the available supply capacity which gives an indication of when to plan for capacity upgrade.

It emerged that the company practiced the stable work force strategy in temporarily adjusting man power to meet temporary surge in demand. Chase expansion strategy was employed in expansion of the capacity for the tankage and flow rates where demand outstripped supply. Due to the growing demand over time, the company reverted to long term capacity expansion through construction of extra tanks at KOSF, Kisumu & Eldoret, construction of more pump stations to double flow rates, replacement of transfer pipes at KOSF to mainline and addition of more pumps to run pumps in parallel. Owing to the huge capital outlay required in the capacity expansion, the expansion is done both in single or multiple phases. Phased capacity expansion is practiced in storage depots where construction of new tanks is done in phases. Single phase capacity expansion in Kenya pipeline is done for capital intensive projects which require implementation at once like construction of pumping stations, laying of pipelines and upgrade of station tankage.

To cope with varying demand across the year, the company adjusts the capacity with respect demand. Stable work force strategy was adopted in the truck loading depots through extending the loading hours and adding more personnel to the loading gantries. To cope with seasonal surge in demand for some product grades, it was observed that the company has a system of swinging tanks to hold the highly demanded grades and revert once the surge in demand was over.

5.2.2 Impact Of Capacity Expansion On Service Quality In Petroleum Industry

It was found that most of the respondents (oil marketers) were not satisfied with the service quality from KOSF. This is as a result of not getting enough ullage, not assured of getting ullage on time.

On the product outage in western Kenya, it was found that the constrained flow rate was an issue that could not be ignored. The respondents emphasized the need to expand the flow rate to enhance product availability in the loading depots in western Kenya. The respondents strongly felt the construction of the parallel pipeline from Nairobi to Eldoret currently underway will to reduce the incessant product outages in the western Kenya depots.

The respondents felt the capacity expansion of Mombasa Nairobi line had little impact on the product supply to the western Kenya depots. The capacity expansion was carried on one leg of the pumping system which resulted in capacity imbalance on the system with the upstream section with excess capacity and downstream section with under capacity. This meant the company ought to have initiated the capacity expansion from western Kenya towards Mombasa and not vice versa. The company expansion strategy ought to have been driven by the demand.

5.2.3 Customer Care And Service Quality

It was found that the respondents were satisfied with the customer care staff availability and numbers. However, the respondents felt extension of loading hours can greatly reduce truck congestation and time spent in the queues for truck loading. Customers further expressed their wish to have the stock inventory to be available online to reduce the time wasted confirming on their stock position every morning.

5.3 Conclusions

From the response from data collection, it is evident the OMC's were not satisfied with the quality of service delivered by KPC due to constrained capacity on the pumping system. It is noted that the capacity expansion strategies were not considered for the whole system which resulted in capacity imbalance, with upstream section experiencing excess capacity and downstream under capacity. The net effect is the system storing and pumping excess product on the Mombasa - Nairobi section and no product on the western section.

To address this bottleneck, The Company needed to urgently balance the capacity across the pumping and storage network through expansion of pumping capacity to Western Kenya. This was to avail enough products to customers at the right volume, right place at right time which would greatly improve the quality of service Kenya Pipeline Company delivered to its customers.

It's clear from the response that capacity expansion in the petroleum industry improves the quality of service delivery to customers. It is hoped that the expansion of western Kenya pipeline will boost evacuation of product from both KOSF and Nairobi depots hence avail more product to western Kenya.

5.4 Recommendations

From the research findings, the following recommendations were proposed as per the importance of the study to aid in decision making and improving service delivery in the petroleum industry: -

i. Expansion of the western Kenya flow rates to address the frequent product shortage in the truck loading depots
ii. Upgrading of the truck loading gantries to deliver more products at a shorter time
iii. Extension of loading hours when necessary to load trucks to ease congestation in the depots.
iv. Adoption of IT in enabling the oil marketers to access the stock inventories online to reduce time and resources wasted commuting to stock control office or making calls daily.
v. Streamline the issue of ullage management at KOSF to restore confidence to the customers in terms of timely and allocated allocation of ullage.

5.5 Limitations to the study

A Number of challenges were faced during the research period.

i. Some of the respondents were suspicious about the study, regarded some information as confidential, while others were afraid of giving their company position on some questions. There is a lot of suspicion amongst the oil marketers due to cut throat competition which made some respondents not to return the questionnaire at all.

ii. Non-availability of some respondents when required. Some of the oil marketers physical location could not be traced hence the inability to make follow up to physically collect the questionnaires which has been emailed to their emails.

iii. Most of the target respondents i.e. logistics and stock personnel were always on the move hence getting them to respond to the questionnaire was a challenge.

iv. Research focused on the operations of the pipeline pumping system capacity. The pipeline operations were greatly controlled by government policies and parent ministry which provides directions on various issues.

5.6 Suggestions for further study

This research concentrated on the service delivery on pipeline industry to oil marketers transporting, storing and distributing imported petroleum products. It was noted that the research was not exhaustive to draw conclusions on general implications of capacity of oil industry due to the effect of government controls. The following areas are suggested for further research.

i. Research on the customer perception of the service delivery by the Kenya pipeline company to its customers to ascertain the perception of the service delivery by KPC.

ii. The company was in the process of expanding capacity for transfer lines to marketer's depots and western WKPE line. This will mark the conclusion of the capacity expansion across the entire pipeline network. It would be prudent to carry out another survey to assess the service quality for the services rendered by the Kenya pipeline company after completion of the capacity expansion across the whole pumping network.

iii. Carry out survey on the factors affecting service quality in petroleum industry as this research was conducted only on the impact of capacity expansion on service quality.

iv. Carry out a research on the impact of government regulation of petroleum industry in Kenya on the customer service.

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APPENDIXES

APPENDIX 1

RESEARCH QUESTIONAIRE

Part A :Areas of Business operation

The questions below aim to gather bio data on the company of research. Please answer by ticking [√] the most appropriate choice.

1. Name of the company you work for ……..

2. In which of the activities does your company actively participate?

   Importation of Petroleum products [ ]

   Truck loading in Western Kenya depots for local & exports [ ]

   Reselling of imported product through transfers [ ]

   LPG handling [ ]

   Any other (please specify) [ ]

3. What is your company's target market?

   Domestic [ ]

   Export [ ]

   Both [ ]

   Other (please specify)_____

4 In which category of Oil Marketing Companies does your company belong?

   Multinational [ ]

   Regional (East Africa) [ ]

   Local [ ]

   Other (specify) _____

5 Which mode of transportation do you use in the distribution of your Products?

KPC [ ]

Railway [ ]

Road [ ]

Any other, please indicate_____

6 What is your view of the current demand - supply position for your company?

Demand for petroleum products exceeds supply by pipeline [ ]

Demand for petroleum products equals Supply by pipeline [ ]

Demand for petroleum products is less than Supply by pipeline system [ ]

Part B Service quality and capacity expansion for imported products

The questions below relate KPC Capacity for handling imported petroleum products and service quality. Please indicate by ticking [√] whether you agree, disagree or neutral with the statement.

1 **Yes** **2** **No** **3** **Not sure**

		1	**2**	**3**
i.	Does KPC provide enough storage capacity (ullage) for your company's imported products at KOSF always?			
ii.	Are you always assured of getting storage capacity (ullage) on time for your imported products?			
iii.	Do you think KPC need to expand the storage capacity at KOSF			
iv.	Do you think evacuating product faster at KOSF to mainline will enable KPC to avail ullage on time for marketers imported products			

v.	Do you think the Capacity enhancement on the Mombasa – Nairobi pipeline has improved Ullage creation at KOSF			
vi.	Are you satisfied with the service your company gets from storage of imported product at KOSF.			

Part C: Custody transfer & Truck loading services

The questions below relate service quality and custody transfer and truck loading from KPC to marketer's depots & trucks. Please show by ticking [√] *whether the statements are correct (YES), you agree, disagree or are neutral to the statement.*

1 **Yes** **2** **No** **3** **Not sure**

		1	**2**	**3**
i.	Has stock levels at Nairobi terminal stock improved with Mombasa – Nairobi capacity expansion project			
ii.	Do truck loading depots have stocks for truck loading after Line I capacity enhancement?			
iii.	Do Marketers receive the total volume requested from KPC storage depots			
iv.	Will Upgrading the transfer lines to marketers depots ensure more quantities are delivered within a shorter time?			
v.	Are the Loading gantries operated by KPC enough for truck loading?			
vi.	Do you think adding more truck loading arms at the loading gantries will reduce waiting time for trucks?			
vii.	Do you think adding more arms on the loading gantries will deliver more product to trucks?			

viii.	Do you think the Product outages experienced in the western Kenya storage depots is due to constrained flow rate on western line?			
ix.	Do you think the Expansion of pumping capacity for western line will reduce stock outages in western Kenya storage depots?			

Customer care

The questions below relate customer service to service delivery. Please show by ticking [√] *whether you agree, disagree or are neutral to the statement.*

1 Yes 2 No 3 Not sure

		1	**2**	**3**
i.	Do you think KPC service centers always have enough customer care personnel to serve customers			
ii.	Do you think Increasing the customer contact persons will improve service delivery to customers?			
iii.	Do you think Loading hours between 0400hrs to 1800hrs are enough for truck loading			
iv.	Will Extending the loading hours from 0400hrs to 2200hrs l reduce truck congestation in the truck loading depots?			
v.	Do you think KPC customers are satisfied with the customer service they get from KPC.			

Which areas would you recommend for improvement?

Ship handling at the jetty [ ]

Product storage and release from KPC depots [ ]

Product transportation to hinterland [ ]

Expansion of transfer lines from KPC to OIL marketers [ ]

Customer care [ ]

Others (please specify) ……

Any recommendation for service delivery in KPC?

Thanks a lot for taking your time to respond to this questionnaire.

The End.

Appendix II: POPULATION

The Oil Marketing Companies to form the Target Population of this study

1. Hass petroleum
2. Gapco
3. Kenya shell
4. Kenol /kobil
5. Metro
6. Riva oils
7. Muloil ltd
8. Mogas
9. Pentoil
10. Addax
11. Rivapet
12. Bakri
13. Oil city
14. Royal
15. Petro oil
16. Gulf energy
17. Total Kenya
18. National oil corporation of Kenya (NOCK)
19. Fossil fuels

20. Oil com

21. Jade petroleum

22. Hashi energy

23. Dalbit

24. Intoil

25. Galana

26. Libya oil

27. Global petroleum

28. Sovereign

29. Engen

30. Trojan