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AN INVESTIGATION INTO CUSTOMER SATISFACTION ALONG THE OIL SUPPLY CHAIN IN GHANA

BY

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A THESIS SUBMITTED TO THE DEPARTMENT OF OPERATIONS AND MANAGEMENT INFORMATION SYSTEMS, UNIVERSITY OF GHANA BUSINESS SCHOOL, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF A MASTER OF PHILOSOPHY DEGREE IN OPERATIONS MANAGEMENT

DEPARTMENT OF OPERATIONS AND MANAGEMENT INFORMATION SYSTEMS - UGBS

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DECLARATION

I hereby declare that this study is my original work and has not been presented anywhere for academic award either in this University or any other University.

All criticisms with regards to any imperfection of this thesis should be attributed to me and me alone.

....

CHARLES GYAMFI OFORI **DATE**

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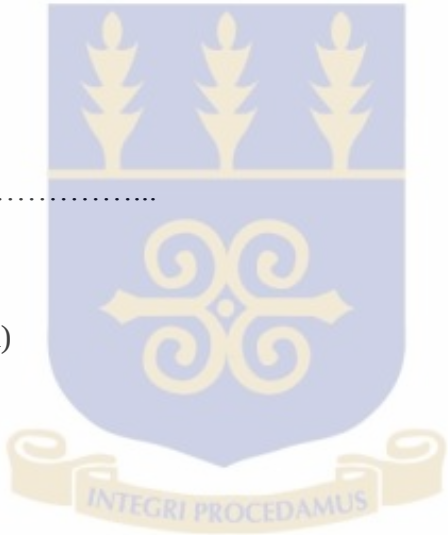
CERTIFICATION

I hereby certify that this work was duly supervised in accordance with procedures laid down by the University.



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DEDICATION

This work is dedicated to the Lord for bringing me this far. I also dedicate to my parents, Mr Charles Ofori and Madam Faustina Appiah, my siblings Linda, Eric and Vera and to Josephine for her love and encouragement.

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LIST OF ABBREVIATIONS AND ACRONYMS

ACSI	American Customer Satisfaction Index
AMOS	Analysis of Moment Structures
ANOVA	Analysis of Variance
AOMC	Association of Oil Marketing Companies
AVE	Average Variance Extracted
BDC	Bulk Distribution Companies
BOST	Bulk Oil Storage and Transportation
CF	Customer Focus
CFA	Confirmatory Factor Analysis
EDI	Electronic Data Interchange
GOIL	Ghana Oil Company
HRM	Human Resource Management
ISF	Information Systems Flexibility
IT	Information Technology
JIT	Just In Time
LPG	Liquefied Petroleum Gas
LSD	Least Significant Difference
ML	Management Leadership
MSW	Mean Square Within
NPA	National Petroleum Authority
NPV	Net Present Value
OMC	Oil Marketing Companies
PC	Petroleum Commission
PDCA	Plan-Do-Check-Act
PF	Product Flexibility
PLC	Product Life Cycle
PLS	Partial Least Squares
QD	Quality Data

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R&D	Research and Development
SD	Standard Deviation
SEM	Structural Equations Modelling
SOC	Star Oil Company
TQM	Total Quality Management
VF	Volume flexibility

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ABSTRACT

Globalisation and intense competition have compelled organisations to think of better ways to improve their performance and still remain competitive. It is therefore necessary to ensure proper management of the supply chain due to increasing costs and depleting resources. The oil industry involves complexities in its operations and hence a proper management of its supply chain is appropriate to ensure that customers are duly satisfied.

The focus of this study is to investigate the practices of Oil Marketing Companies and Bulk Distribution Companies in relation to quality, flexibility responsiveness and cost within the downstream oil supply chain in Ghana. These are considered to be the constituents of customer satisfaction. Secondly, the study seeks to explore the level of importance customers place on each of the four identified constructs of customer satisfaction. A mixed methods approach was used for this study where managers from six Bulk Distribution Companies and four Oil Marketing Companies were interviewed. Similarly, a survey of 240 end users of petroleum products were used to investigate the importance they place on the identified constructs of customer satisfaction. The qualitative data was analysed thematically whilst the quantitative data was analysed using Confirmatory Factor Analysis and statistical procedures of multiple comparison of means.

The findings show that whilst OMCs and BDCs mainly strive for quality, customers place more emphasis on responsiveness and cost. The findings of the study also indicate that a one size fits all strategy does not exist for all organisations. The study ends with a framework for an effective downstream oil supply chain. Research implications and future research directions are discussed.

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CHAPTER ONE

INTRODUCTION AND BACKGROUND OF STUDY

1.1 Background

The concept of managing supply chains has come to stay due to changes in the manufacturing and the service environment, particularly resulting from rising costs of manufacturing, shrinking resources, product life cycles that have been shortened, global partnerships and many other reasons. Thomas and Griffin (1996) add that costs and problems that arise from the management of large inventories or buffer systems have necessitated the need for efficient management of the operations from the raw material stage up to the end user.

Processes in the oil industry range from the exploration of crude oil to operations involving refining of the crude oil and the distribution of the final products through channels, pipelines and other transportation systems (Al-Othman, Lababidi, Alatiqi, & Al-Shayji, 2008). These are thus seen to be complex processes and in addition involve a wider range of activities on a global perspective. This therefore calls for an efficient coordination of these processes both in the upstream and the downstream sectors of the oil industry.

The supply chain consists of processes of converting raw materials into final products and then a final delivery to customers (Beamon, 1999). Each level within the supply chain comprises a number of facilities. Along each level of the supply chain, each firm at a succeeding level within the supply chain becomes a customer to the firm preceding it.

This means that the supply chain is not limited to only manufacturing and suppliers but also includes retailers, transporters as well as customers (Chopra & Meindl, 2007). The basic objectives that characterise the supply chain are namely, cost minimisation (Beamon, 1999; Chima & Hills, 2007), revenue maximisation and lastly, customer satisfaction (Al-Othman et

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al., 2008) . A perfect mix or trade-off of these objectives collectively indicates the maximisation of the overall value that is generated.

Customer satisfaction is an important point to consider in the supply chain and it is perhaps the primary concept or purpose of any supply chain. Providing and meeting customer needs end up in maximising the revenue of the firm thereby ensuring profitability. Extant research have shown positive relationships between customer satisfaction and organisational performances (Lin, Chow, Madu, Kuei & Pei Yu, 2005; Foster, 2008). Leong, Snyder and Ward (1990) further add that customer satisfaction can be determined or measured on the basis of cost, timeliness (responsiveness), flexibility and quality. It is on these four foundations that this study is based in the context of the oil industry.

1.2 Statement of problem

Customers demand value for the money they spend and hence quality has become a major factor in determining their satisfaction of a product or service. The dimensions of quality in terms of manufactured products and services centre on performance, reliability, conformance, completeness, courtesy and timeliness (Garvin, 1984; Evans & Lindsay, 1996). Quality has therefore become an important factor in customer satisfaction (Croom, Romano & Giannakis, 2000). In particular, an end user of a petroleum product would not like to be served with a contaminated or a diluted fuel product. Instead the product has to be of a genuine quality.

Responsiveness is seen as an important factor for competitive advantage. For example, the Just-In-Time (JIT) philosophy ensures waste elimination by simplifying the processes of production thereby ensuring efficiency (Kannan & Tan, 2005). Along the supply chain, timeliness in delivery and higher frequencies of deliveries also lead to improved customer satisfaction thus ensuring profitability. For example, the end user of a petroleum product pulls up to fill his/her tank and must be able to do just that within the appropriate timeframe.

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Customers would like to have better value for their money whereas producers would also like to run their operations with the barest minimum cost. Creating value is seen as the difference between the worth of the final product to the customer and the costs incurred by the supply chain in fulfilling the customer's demand. An end user of a petroleum product must also be able to buy the product he needs at an affordable price.

Croom et al. (2000) further add that flexibility is a determinant of customer satisfaction in addition to quality, cost and responsiveness. It is the ability for the systems within a firm to react to changes with little penalty in time, cost or performance (Upton, 1994). It thus also describes the ability for the firm to meet uncertain demands by customers as well as adapting to emerging trends in industry operations. For example, the end user of a petroleum product must be able to buy any amount of fuel be provided with the right quantity. Highlighting the importance of flexibility, Sanchez and Perez (2005) identified positive relationships between flexibility and firm performance.

These four areas have been researched in detail within manufacturing settings and have come with several benefits to organisational performance. Research within the supply chain that bring together dimensions of quality management, flexibility, cost as well as timeliness have, however received little attention.

In Africa, most studies conducted in the oil companies were from Nigeria. These studies were largely based on the impact of the oil prices on economic and stock market shocks (Akpan, 2009; Al-Fayoumi, 2009; Babatunde, Adenikinju, & Adenikinju, 2013) and thus did not consider any concept that relate to quality management in supply chains as well as supply chain flexibilities in the industry. This study addresses customer satisfaction dimensions of oil flexibility, cost, responsiveness as well as supply chain quality management in the oil industry.

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1.3 Study objectives

Generally, this study investigates supply chain practices of Oil Marketing Companies and Bulk Distribution Companies in Ghana highlighting quality management practices and supply chain flexibility, responsiveness as well as cost effectiveness. Similarly the research seeks to identify the level of importance customers place on each of quality, flexibility, responsiveness and cost. The specific objectives are as listed below:

1. To investigate practices of firms within the downstream oil industry in terms of quality, flexibility, responsiveness and cost.
2. To investigate the importance end users place on each of the dimensions of quality, flexibility, responsiveness and cost.
3. To develop a framework for managing the oil supply chain for efficiency and responsiveness.

1.4 Research questions

1. What are the practices of firms within the downstream oil industry in terms of quality, flexibility, responsiveness and cost?
2. What is the level importance that end users place on quality, flexibility, responsiveness and cost as customer satisfaction dimensions

1.5 Significance of the study

The significance of this study is viewed along three components namely contribution of the study to research, contribution of the study to practice and the contribution of the study to policy. Concerning the significance of this study to research, this study seeks to add to existing knowledge on supply chain quality management, flexibility, responsiveness and cost. It seeks to provide an in-depth background information to fill the gaps in supply chain quality management and flexibility in the oil industry specifically in Ghana. The study also blends qualitative and quantitative research approaches in investigating the industry practices along

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the four mentioned dimensions and seeking the views from end users as to which dimension is considered more important. Gaps for further research are also identified.

Secondly this study after its successful completion will give guidelines for firms within the oil industry to enhance their activities on the supply chain to provide best value to the end user. The study will help to provide guidelines that will ensure an effective quality management along the oil supply chain. It shall also provide guiding principles that ensure a better adaptation to changes within the supply chain for the firms within the industry.

Lastly the study will advise policy makers on the formulation of policies that will embrace the issues of quality management and flexibility along the oil supply chains in Ghana. These policies will in turn serve as a standard for existing and up-and-coming oil firms in Ghana particularly in the downstream oil industry.

1.6 Chapter outline

This study is organized into eight chapters:

Chapter one: This chapter gives a general background as well as an introductory remark for the study. It contains the statement of the problem, the objectives as well as the significance of the study.

Chapter two: This chapter provides the context on which the study is based. It gives information on supply chain management and an overview of the oil industry in Ghana.

Chapter three: This chapter reviews relevant literature on the supply chain management in the oil industry. It provides findings from other studies in this field and forms the basis for the study. It is out of this review that gaps are identified for the research.

Chapter four: Chapter four gives the methodology for the research. It shall give justifications concerning the sampling procedures, data collection methods and the approach to the analysis of data.

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Chapter five: This chapter presents details of analysis of the data that were collected.

Chapter six: This chapter gives detailed discussions of the results that have been presented in the previous chapter. The discussions are also made in line with the literature review.

Chapter seven: This chapter gives a description of the model that was formulated as part of the objectives of the study.

Chapter eight: This chapter shall conclude the study. It provides a final summary of the entire study and gives areas for further research.

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CHAPTER TWO

CONTEXT OF THE STUDY

2.0 Introduction

This chapter describes the contextual framework for the study. The first section of this chapter provides a brief overview of a supply chain highlighting the uncertainties within a supply chain. The second section looks at supply chain management and its aims. In the third section, the major operations in the oil industry are discussed. The fourth section focuses on customer satisfaction in the oil industry whilst the fifth section of this chapter takes a closer look at oil industry in Ghana.

2.1 What is a supply chain?

There is no single definition for the term supply chain. Ram and Harrison, (1995) define a supply chain as a network of facilities and distribution options that perform functions of procurement of material, the transformation of the materials into finished products and the distribution of the finished products to customers. Lambert, Cooper, and Pagh (1998) also define the supply chain network as the alignment of firms that bring products or services to the market. Chopra and Meindl (2007) give a general definition of the term by combining production and service as they define supply chain to be all the stages involved in fulfilling a customer request. A supply chain therefore incorporates all the activities that are associated with the flow of goods and services from the raw material stage to the end user which is the customer.

2.1.1 Supply chain uncertainties

The supply chain involves a continuum of demand and supply of raw materials and products. Uncertainties relate to the frequent randomness and volatility in predicting the demand for a product or the supply of materials in a supply chain. Given an uncertainty in demand, it becomes difficult to match supply with demand. Uncertainties along the supply chain result

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from inaccurate forecasting of customer demands, fluctuations in prices, long order lead times, incomplete shipments just to name a few (Lee, 2002; Saad, Udin, & Hasnan, 2014; Wu & Pagell, 2011). Uncertainties in material supplies could also be caused by environmental factors such as fluctuating weather conditions. For example though the demand for electricity could be at a steady rate, the supply of hydroelectric power could be inconsistent due to changes in the rainfall patterns. At other times, suppliers may choose not to supply raw materials to the manufacturers due to non-settlement of debts. Manufacturers may not be able to procure the right amount of certain materials from their suppliers due to increments in prices arising from higher exchange rates and could also cause their inability to meet the demand of customers.

Supply chain uncertainties eventually result in product lateness and incomplete orders. For example, in an oil supply chain, fluctuations in the supply of crude oil could affect the refining activities of the refineries and this could lead to bulk distributors receiving their orders late. These delays transcend to the Oil Marketing Companies and consequently to the eventual end user. Inaccurate information resulting from inaccurate demand forecasts could be transferred from one part of the supply chain to the other and could also lead to incomplete orders. These eventually cause the flow of goods along the entire supply chain to move at a slower pace resulting in poor customer satisfaction.

2.1.2 The bullwhip effect of uncertainties

The central cause of uncertainties is the distortion or the lack of accurate information across each stage of the supply chain. When fluctuations in orders occur from the consumers to retailers, they increase up the chain to wholesalers, manufacturers and suppliers thereby resulting in higher inventories, poor customer services and higher costs. This phenomenon is known as the bullwhip effect (Russell & Taylor III, 2010).

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In a bid to manage the variabilities or the fluctuations that are occurring down the chain, upstream supply chain members stockpile excess inventory at each end of the chain in order to compensate for the uncertainty. Transparency among the supply chain partners by accurately sharing information is necessary (Santos & Hanna, 2009). This is especially needed when forecasting demands.

2.2 Supply chain management and its aims

Supply chain uncertainties both at the demand and the supply ends arise from a variety of sources both internal and external. These include suppliers, competitors and other environmental factors such as inconsistent weather patterns (Moon, Yi, & Ngai, 2012). Given all these forms of uncertainties and their effects, it is therefore proper to manage the supply chain in order to avoid all these uncertainties.

Effective management of the supply chain ensures that all parts at each level of the supply chain function together as a whole. The management of the business functions is carefully designed to achieve the goal of the supply chain thus eventually satisfying the customer. The supply chain is managed by effectively coordinating production, inventory management, transportation and information flows across each level of the supply chain. It requires that suppliers and customers alike share accurate information. A systemic view of the supply chain is the one that coordinates all functional units of an organisation or the individual firms within the organisation in order to function as a whole (Maddern, Maull, Smart, & Baker, 2007).

The supply chain is managed to ensure the success of the operations within the chain. As outlined in the definition of supply chain management, a successful supply chain ultimately reflects in the customer being satisfied. Customers are satisfied when their requests are fulfilled on time and when quality products and services are rendered to them. In addition, customers are satisfied when the organisation can fulfil demands as and when they come and at a

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reasonable cost. It is, therefore the goal of the supply chain to provide quality products at the right time, at a lower cost and with the right quantities.

Chopra and Meindl (2007) assert that the customer is the major source of income for all the members of the supply chain. The members in the supply chain would not exist if there is no consumer. Literature on supply chain management issues have highlighted the importance of giving much attention to the customer. Customer is a key quality management variable and as such, it is the objective of the supply chain to ensure that the customer gets a value of money.

Another objective of the supply chain is to maximise the overall value that is generated. The overall value is the difference between the price paid by the customer for the product or service and the cost incurred by the supply chain in fulfilling the customer's request (Chopra & Meindl, 2007). This can also be termed as supply chain profitability. The success of a supply chain is also defined in terms of its profitability and it is achieved by minimising the costs of raw materials, production and inventory costs and maximising the values of the products

2.3 Operations in the oil industry

The operations within the oil industry mainly consist of three major sectors namely the upstream sector, the mid-stream and the downstream sector (Staples et al., 2000). Companies within the upstream sector of the oil industry deal mostly in the prospecting as well as the exploration of crude oil. Crude oil is transported to the refineries through channels, pipelines and other transportation systems. In the mid-stream sector are the Refineries whose core activity is to refine the crude oil into several petroleum products. These refineries serve as a link or a connection between the upstream oil companies and the downstream oil companies.

The downstream oil companies are concerned with the marketing and the distribution of the petroleum products. The downstream sector in Ghana particularly consists of two key organisations - The Bulk Distribution Companies and the Oil Marketing Companies. Whilst

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distribution is done by Bulk Distribution Companies or organisations, the activities of marketing the refined petroleum products are done by the Oil Marketing Companies (OMCs). Oil marketing companies mostly own retail outlets where they sell petroleum products to consumers. Bulk Distribution Companies in Ghana include Sage Petroleum and Chase Petroleum company whilst Oil Marketing Companies in Ghana include Total Oil, Ghana Oil Company (GOIL) and Shell Ghana Limited.

The process in the oil industry is thus seen to be complex and in addition involves a wider range of activities on a global perspective. The need for an efficient coordination of activities in this sector is therefore needed thus underscoring effective supply chain management systems and principles.

2.4 Customer satisfaction in the oil industry

Oil can be described as both product and a service. For example the bulk distributors provide services that relate to transporting petroleum products to Oil Marketing Companies. Customers therefore expect that the product must be delivered at the right time, the services provided are consistent at each point in time and services provided right at every point in time.

As already discussed in the preceding section, customer satisfaction can be achieved through the fulfilment of the requirements made by customers on the basis of quality, flexibility, cost and responsiveness. An unsatisfied customer is likely to give a bad feedback about the operations of a particular firm or organisation to others thereby damaging the reputation of the organisation.

In the oil industry, products are not much differentiated from one petroleum organisation to the other. However, an organisation can ensure that the quality of the petroleum product conforms to standards and it is fit for its use. Any organisation along the supply chain in the industry must ensure that the product at each stage conforms to product quality dimensions. This

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includes ensuring that the product meets pre-established standards and the assurance that the product does not cause injury or harm to the user.

Petroleum products are prone to uncertainties both within the demand and the supply levels. These uncertainties could result in higher demand fluctuations or the environmental causes hindering the ability of suppliers to meet the increasing demand of customers at any stage of the supply chain. Effective communication of members of the supply chain and accurate customer demand data are therefore needed to ensure demand flexibility along the chain. Even though petroleum products are not in themselves unique products, petroleum companies are breaking grounds to provide other range of products like fuel lubricants, bitumen and insecticides. This form of flexibility is known as Launch Flexibility (Sánchez & Pérez, 2005; Vickery, Calantone, & Dröge, 1999).

Meeting product demands is likened to meeting the demand at the right time. Customers are satisfied when they get quick response to their orders. For example, if bulk oil distributors are able to respond to demands of the Oil Marketing Companies in a timely manner, mining, construction and other companies that require petroleum products for their operations would get the product needed on time for their operations. Similarly, consumers would not have to queue at filling stations for fulfilment of their orders. As already stated, all Oil Marketing Companies typically have the same products. Pricing of the products become a very important factor in attracting customers and attaining a competitive advantage. Pricing should be done in a way that is competitive and attractive to customers whilst still maintaining significant profits for the organisation.

2.5 The oil industry in Ghana

There are two major regulatory bodies in Ghana that oversee the activities of oil related companies in Ghana. These are the Petroleum Commission (PC) and the National Petroleum

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Authority (NPA). The Petroleum Commission regulates all the upstream oil operators in Ghana. The commission was established by an act of Parliament (ACT 821) in 2011 to regulate and manage the petroleum resources and also to coordinate the policies in relation to the petroleum resources. As part of their core mandates, the Petroleum Commission ensures that the upstream petroleum operators comply with health, safety and environmental standards in their activities and ensure that such activities are in accordance with the laws, regulations and the agreements.

The National Petroleum Authority (NPA) was established by an act of Parliament (ACT 691) in 2005 to monitor and regulate oil activities in the country including the regulation of the prices of oil commodities in Ghana. The National Petroleum Authority regulates, oversees and monitor the activities in the downstream petroleum industry. As part of their duties, the NPA is tasked with monitoring price ceilings of petroleum products in accordance with the petroleum pricing formula. They also provide licenses to Oil Marketing Companies and Bulk Distribution Companies to enable them operate in Ghana.

Aside these two regulatory bodies is a third body known as the Ghana National Petroleum Corporation (GNPC). The Ghana National Petroleum Corporation was established as a statutory body by an act of Parliament in 1984 (PNDCL 64). The core objective of the corporation is to undertake the exploration, development, production and the disposal of petroleum products. It is also to ensure that the nation obtains the greatest possible benefits from the development of its petroleum resources (Ghana National Petroleum Corporation, 1983). The GNPC currently owns a total of 13.75% of the jubilee oil fields which is made up of 10% carried interest and 3.75% interest potential. The upstream activities of all the operators including the GNPC are regulated by the Petroleum Commission.

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2.5.1 Refinery and Bulk distribution

Ghana has only one refinery, the Tema Oil Refinery situated in Tema, the industrial city of Ghana. It is the government organisation that is responsible for refining crude oil into finished petroleum products. Established in 1963, the Tema Oil Refinery has a total capacity of refining 45 000 barrels of crude oil per day (45 000bpd) (Kastning, 2012.). However, the refinery has not been able to operate to its full capacity over the past few years due to its heavy indebtedness. In a statement by the Chief Executive Officer of the Ghana National Petroleum Corporation, he stated that refining crude oil at the Tema oil refinery is not a profitable venture (Osam, 2014)

The Bulk Distribution Companies are licensed by the National Petroleum Authority as bulk distributors of refined petroleum products to the Oil Marketing Companies. The companies include Fueltrade, The Bulk Oil Storage and Transportation Company (BOST), Chase Petroleum, Vihama Energy, Chadeco Oil and Gas Limited, among others. The Bulk Distribution Companies are pre-financed by the banks to purchase petroleum products for distribution to the Oil Marketing Companies. Petroleum products are stored in fuel storage tanks at specified locations for both the oil marketing and the Bulk Distribution Companies.

2.5.2 The Oil Marketing Companies (OMCs)

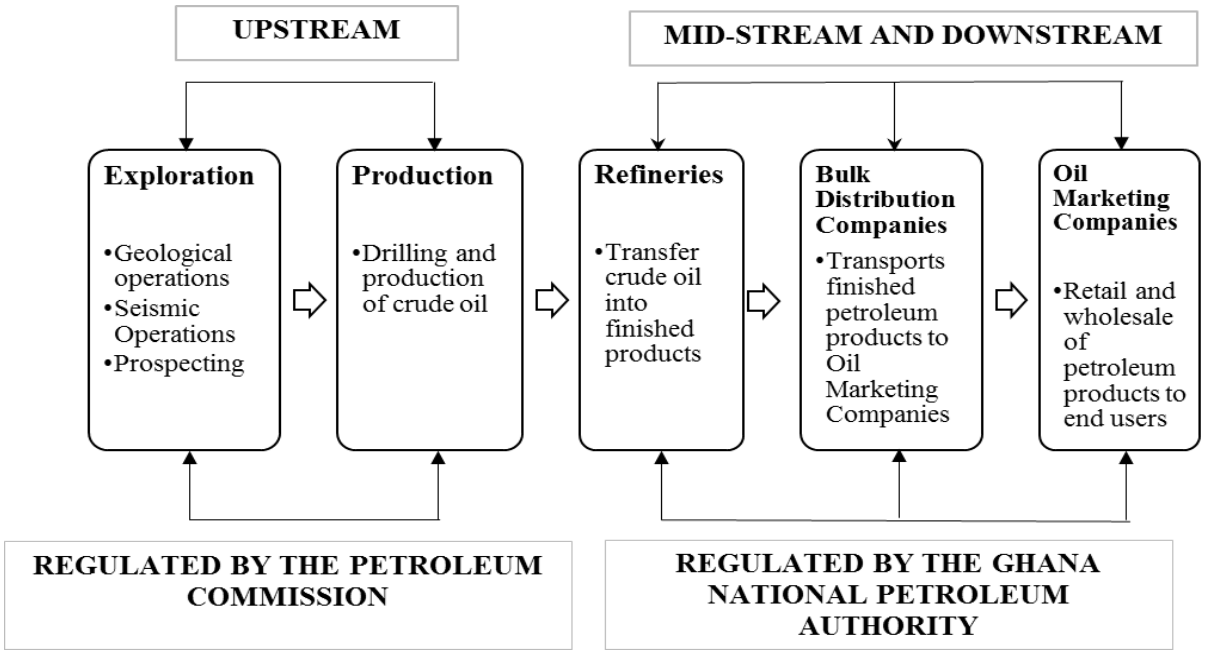
Oil Marketing Companies act as intermediaries between the Bulk Distribution Companies and the end users. Petroleum products are supplied by the Bulk distribution companies to the Oil Marketing Companies who in turn sell to the general public. Most of the retail marketing of petroleum commodities in Ghana is done through the various filling stations which are largely owned by the Oil Marketing Companies.

In Ghana there exists an industrial association of the Oil Marketing Companies. The group is known as the Association of Oil Marketing Companies (AOMC). Its main aim is to help direct the downstream oil policy, legislation and regulation as well as pursuing the research that is

geared towards developing the downstream sector. The association partners and coordinates with the major stakeholders of the oil industry in Ghana including the Ministry of Energy, Ministry of Finance and Economic Planning, the Ghana National Petroleum Corporation, National Petroleum Authority among others. These partnerships are made to ensure that the collective interests of the Oil Marketing Companies are duly protected.

Currently, the association has a membership of 59 accredited Oil Marketing Companies nationwide including major and minor Oil Marketing Companies. Even though it is believed that members of the association stand to benefit from corporate recognition, it is not mandatory for an Oil Marketing Company to belong to the association. The upstream, midstream and downstream sectors of the oil industry in Ghana are summarised in Figure 2.1 below:

Fig 2. 1: Upstream, midstream and downstream oil industry sectors



Source: Author's Construct, 2014

2.5.3 Oil exploration and discovery in Ghana

The license for offshore oil exploration was sold in 2004 to Tullow Oil PLC. Prior to that, crude oil was imported to be refined into petroleum products for use in Ghana. In 2007 oil was

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discovered in commercial quantities by the Tullow Oil Plc and Kosmos Energy. The area was named the "Jubilee Field" in commemoration of the Nation's 50th anniversary celebrations. It is located in the Gulf of Guinea, 60km off the Ghanaian coast (Kastning, 2011). A total of 800 million barrels with an estimated upside potential of about 3 billion barrels of light oil was estimated to result from the Jubilee Field (Ghana National Petroleum Corporation, 2008). The GNPC also reported that the probability of recording at least 800 million barrels of light crude oil from the jubilee field is 90%.

The Tweneboa oil field was discovered in March 2009 and it lies 6km to the east of the Jubilee field. In July 2010, it was confirmed that there are reasonably large quantities of oil deposited in the Tweneboa Field. The field is expected to contain up to the equivalent of 1.4 billion barrels of oil. Crude oil is measured in terms of barrels. Barrels of oil equivalent is used when the amount of oil find may contain some other materials other than pure crude oil. This is the second major oil find in Ghana since 2007. In addition to the Tweneboa field, there have been other discoveries such as the Odum Field. However, the quantities of oil deposits in these fields are not as much as those compared to the Jubilee and the Tweneboa fields. Given in Figure 2.2 below is a map that shows the oil drilling fields in Ghana (Kastning, 2012).

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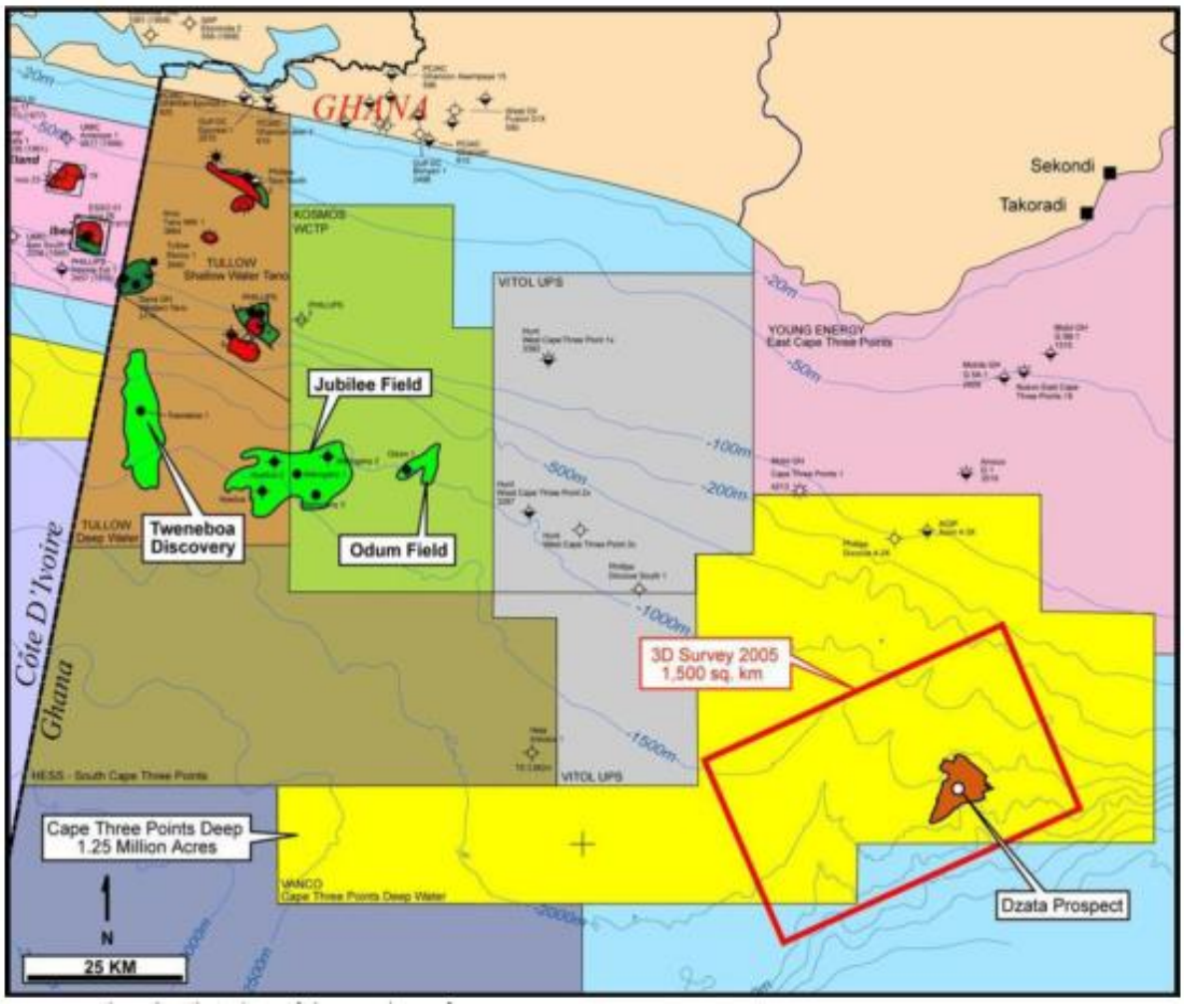
Fig 2. 2: Ghana's territorial oil drilling fields.



Source: Kastning (2012)

Drilling of crude oil commenced in mid-December 2010. Ghana currently produces up to one hundred and twenty thousand (120 000) barrels of crude oil on a daily basis. Tullow Oil and Gas is the operator for the Jubilee Field and has 30.705% ownership of the Jubilee field. The Kosmos energy who is the technical operator for development of the field and the Anadarko Petroleum Corporation have equal shares of 24.491% ownership of the jubilee field. The Ghana National Petroleum Corporation owns 13.75% of the field whilst the remaining percentage is shared between Sabre oil and Gas (2.813%) and the EO group (1.75%). The production is expected to increase with the addition of the Tweneboa field which was estimated to have a production capacity of about eighty thousand (80 000) barrels per day (Price Waterhouse Coopers, 2014).

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The upstream oil companies are responsible for exploration and drilling of crude oil. Exploration activities include geological and seismic operations as well as prospecting of crude oil. The upstream oil companies in Ghana include Tullow Oil Ghana, Kosmos Energy Ghana, Anadarko Oil and the Edusei – Owusu (EO) group (Ghana National Petroleum Corporation, 2008).

2.5.4 The consequences of the oil findings

Estimates of the quantities of oil as of the time of its discovery since 2009 has been 400 million barrels of oil. Statistics from the World Bank (2009) estimated that between 2011 and 2029, the revenue of Ghana shall stand at $1 billion annually. Currently, annual oil and gas revenues exceed $1billion and Ghana is growing to becoming one of the largest oil producing countries in Africa. In addition to the importance of the oil finding to the economy of the nation, customers expect that quality petroleum products are provided to them. Effective and timely distribution of petroleum products are also expected as they also form the basis of customer satisfaction.

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CHAPTER THREE

LITERATURE REVIEW

3.0 Introduction

This chapter presents a review of relevant literature on customer satisfaction and its identified components. The review is grouped into six major sections. The first section gives a general overview of customer satisfaction. In the second and third sections, quality management and flexibility issues are discussed respectively. The fourth and fifth sections provide reviews concerning responsiveness and cost efficiency. The sixth section provides a conceptual framework which forms the basis of the study.

3.1 Customer satisfaction

Customer satisfaction is defined as the customer's judgement that a product or a service provides a pleasurable level of consumption and a related fulfilment (Oliver, 1997). Thus, customer satisfaction is related to the contentment a customer shows towards a product or a service. A customer is therefore satisfied when his or her experienced level of performance outcome far outweighs the expected performance outcome.

Customer satisfaction is a consequence of organisational performance (van der Wiele, Boselie, & Hesselink, 2002). In earlier studies, conclusions have been drawn on the evidence of positive relationships between organisational performance and customer satisfaction in hospital settings (Koska, 1990; Nelson et al., 1992) in stock markets (Aaker & Jacobson, 1994) and also in retail banking services (Hallowell, 1996). Recent studies have also linked customer satisfaction as antecedents to organisational performance and profitability (Steven, Dong, & Dresner, 2012; Sun & Kim, 2013; Williams & Naumann, 2011) as well as customer loyalty (Gao & Lai, 2015; Orel & Kara, 2014)

In a competitive environment, it would be unsafe for an organisation to refuse to be customer oriented (Dimitriadis & Koh, 2005). Customer oriented organisations deliver products or

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services of superior value to customers and are less influenced by competitors (Sit, Ooi, Lin, & Chong, 2009). Sit et al (2009) further add that customer satisfaction should be an everyday priority that should be set by every organisation. Various studies have made conclusions of the importance of quality, flexibility, responsiveness and cost on customer satisfaction. This review present studies on the identified four constructs of customer satisfaction along the supply chain namely quality, flexibility, responsiveness and cost effectiveness. Supply chain performance forms an extension of organisational performance. The objective of supply chain management has been seen to improve upon the performance of the supply chain eventually leading to customer satisfaction.

3.2 Supply chain quality management

The term supply chain quality management is fairly recent and is defined as "the formal coordination and integration of business processes involving all partner organisations in the supply channel to measure, analyse and continually improve products, services and processes in order to create value and achieve satisfaction of intermediate and final customers in the marketplace." (Robinson & Malhotra, 2005).

This definition puts together concepts of supply chain as an integrated process (Beamon, 1999; Chopra & Meindl, 2007; Kannan & Tan, 2005; Neegaard & Pedersen, 2005) as well as quality being a continuous improvement process (Noshad & Awasthi, 2014; Russell & Taylor III, 2010). The definition lastly points out the goal of the supply chain which is to create value and achieve customer satisfaction (Chopra & Meindl, 2007; Hugos, 2006). Kannan and Tan (2005) opine that the interactions between supply chain management and quality management result in a greater organisational performance.

Kaynak and Hartley (2008) also argue in favour of integrating quality management practices of customer focus and supplier quality management into supply chain management concepts. Quality revolution began in the 1980s where managing quality took a different turn into a

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concept known as Total Quality Management (TQM). The American Standards of Quality defines TQM as a management approach to long term success through customer satisfaction. The core ideas of TQM were set up by quality experts Edward Deming, Joseph Juran and Kaoru Ishikawa. Over the past decades, the concepts of Total Quality Management have been studied across several fields of study.

The literature review shows extant studies in quality management practices across various industry sectors. Studies that link both quality management and supply chains are however limited as most studies have treated these concepts in isolation. Highlighting the importance of quality management along the supply chain, Robinson and Malhotra (2005) argue that quality management practices must move from firm centric mind-sets to more focus on the external supply chain.

In a literature review by Satish, Hoffman and Siras (2001), they identified five elements of Total Quality Management namely human resource elements, management structure, quality management tools, supplier support and lastly customer orientation. Boyne and Walker (2002) as well as Rahman and Bullock (2005) recognised two elements known as hard TQM and soft TQM. The hard TQM elements have to do with the management of the processes of production, quality data recording, statistical process control and continuous improvement. Soft TQM elements were identified to be basically based on leadership, organisational strategy and customer and supplier relations (Yunis, Jung, & Chen, 2013). Flynn and Flynn, (2005) note six elements on quality management namely customer and market focus, leadership, information and analysis, human resource development and management, process management and strategic planning. Elements identified by Zhang, Linderman, and Schroeder (2014) include leadership, customer focus, process management, employee involvement, training, supplier management and supplier quality management. Table 3.1 provides a summary of the dimensions of supply chain quality management.

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Table 3. 1: Dimensions of supply chain quality management

Items/ Constructs	Definition	References
Management leadership	The process of influencing others towards the attainment of a desired outcome	Ahearne, Mathieu, and Rapp, (2005), Kaynak and Hartley (2008), National Institute of Standards and Technology (2012), Sit et al., (2009), Wilson and Collier, 2000)
Customer Focus	The degree to which an organisation satisfies the requirements and the expectations of customer	Alolayyan, Ali, and Idris, (2011), Foster (2008) Jeong and Hong (2007), Sit et al. (2009)
Quality Data	The level of availability of data that can be offered by an organisation in order to meet the needs of the customer	Ellinger et al. (2014), Forslund and Jonsson, (2007), Rashid and Aslam, (2012), Singh (1996), Yu, Yan, and Cheng (2006)
Employee focus	The ability of the organisation to provide policies that are aimed at improving the human resources of the organisation.	(Satish et al., 2001; Sit et al., 2009; Yunis et al., 2013)

Source: Author's Construct (2015)

3.2.1 Management leadership

The concept of leadership is defined as the process of influencing others towards the attainment of a desired outcome. Leadership and management styles have become an important factor to be considered in quality management. Leadership has been placed as the driver of the performance of the system in an organisation (National Institute of Standards and Technology, 2012; Wilson & Collier, 2000). The earlier originators of Total Quality Management also outline Management behaviour as an important factor in implementing Total Quality Management in an organisation (Deming, 1986). For example, the Deming's plan-act-do-check cycle reflects management involvement in the business operations. Research has shown that the decisions that leaders or managers take in an organisation and for that matter a supply chain have consequences on the supply chain and then eventually on the overall satisfaction of the customer.

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Most studies have found direct as well as indirect relationships between management leadership and customer satisfaction (Ahearne, Mathieu, & Rapp, 2005; Kaynak & Hartley, 2008; Kaynak, 2003). Sit et al., (2009) also found significant relationships between leadership and customer satisfaction. In their empirical study of Malaysian service companies, they based their leadership items on the items outlined by Zhang, Vonderembse and Lim (2003). Noting these relationships, it therefore seems impossible to implement strategies or improve upon operations in an organisation or supply chain without good management involvement. The most critical items under the management leadership dimensions are the extent to which top management sets out objectives for quality performance and the completeness or the comprehensiveness of the process of setting the goals within the organisation (Kaynak & Hartley, 2008; Saraph, Benson, & Schroeder, 1989)

Top management is responsible for formulating best strategies that are geared towards meeting the objectives set out by the organisation. Strategic management and the involvement of top management are therefore important in considering customer satisfaction. Until the study made by Sit et al. (2009), research that examined strategic management and customer satisfaction were lacking. In their empirical study, Sit et al., (2009) found a positive significant relationship between strategic planning and customer satisfaction. They further concluded that quality policy is communicated through a quality vision statement.

3.2.2 Customer focus

This is referred to as the degree to which an organisation satisfies the requirements and the expectations of customers (Sit et al., 2009). The concepts of customer focus have been described as a fundamental principle in Total Quality Management (Danny & Vincent, 1999; Paula, 1997). This view has not just been heard in earlier studies but also in recent studies as well. In a review of quality related elements, Satish et al, (2001) as well as Foster (2008) note that the concept of customer orientation was highly mentioned in the literature and therefore

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concludes that customer focus is a key variable in supply chain quality management. Alolayyan et al. (2011) in their empirical study of Jordanian hospitals, note of a direct positive association between operational flexibility and Total Quality Management of which the customer forms an integral part. Total Quality Management therefore does not affect operational flexibility alone but also it goes ahead to affect the whole performance of the organisation (Alolayyan et al., 2011).

Customer focus along the supply chain involves a high level of integration. Jeong and Hong (2007) identified three forms of customer focus in the supply chain – customer closeness, customer flexible and customer accessible. Customer closeness is the commitment of the organisation to stay in close contact with customers while meeting their everyday needs. Customer flexible also reflects the willingness of firms to meet the changing customer expectations. Customer accessible describes the willingness of the firms in the supply chain to allow customers to access needed information.

The extent to which the organisation or the supply chain keeps in touch with customers is an important factor in considering supply chain performance (Nahm, Vonderembse, & Koufteros, 2004). In addition, due to the changes in tastes and the preferences of customers, the firms along the supply chain should be well aware of the needs of the customers and hence should be able to respond to their rapidly changing needs and preferences (Barad & Even Sapir, 2003; Zhang et al., 2003). Firms are required to make information available for customers within a dynamic environment. Critical information on the multiple requirements on customer needs is important for a supply chain in terms of its performance (Jeong & Hong, 2007). Essentially, customer focus can be seen as an important driver for customer satisfaction along the firm level and ultimately along the supply chain as a whole.

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3.2.3 Quality data and reporting

Data could be customer requests or demands, product information and demand forecasts. Rashid and Aslam (2012) propose that the improvement of products and processes throughout the supply chain is highly dependent on the timely collection and sharing of accurate quality data. The literature reveals two main levels of supply chain information quality – Information sharing and Quality Forecasting.

Uncertainties that arise in most supply chains are due to the unavailability of perfect information (Singh, 1996; Yu et al., 2006). The presence of uncertainties reflect in the non-performance of the supply chain leading to customer dissatisfaction. Inaccurate data and data which are not shared in a timely manner among the various entities within the chain cause distorted demand and supply forecasts resulting in higher inventories and poor customer service (Russell & Taylor III, 2010). This phenomenon also known as the bullwhip effect causes smaller variations in demand to be larger as their implications are transmitted backward through the supply chain (Chima & Hills, 2007) . Yu et al. (2006) point out that the negative impacts of the bullwhip effect are reduced or completely eliminated in a supply chain where there is accurate information flow in both forward and backward directions.

In an earlier study, Singh (1996) found that the complexities in the supply chain require that quality information must be shared among the members in the supply chain. He further noted that customer satisfaction can never be attained unless accurate and timely information is sent across all the members of the supply chain. Similarly Zailani and Rajagopa (2005) also added that higher levels of information sharing and an improved linkage between the customers and the organisation have positive impact on the relationship between the customer and the organisation. Ellinger et al., (2014) add quality information sharing as an important input for supply chain management competency and further concludes that higher levels of customer satisfaction are exhibited among organisations with superior supply chain competencies.

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Uncertainties also lie largely with the inability to match demand with supply. Forecasting therefore plays an important role in estimating future demands. Forslund and Jonsson, (2007) highlighted the importance of forecasting customer demands and further noted that the quality of the forecast depends on the quality of information that is provided (Ramírez, 2012). Ramanathan (2014) states that it is essential for proper supply chain information to be collected in order to ensure a correct forecast of demand. The bullwhip effect is not only a consequence of improper information sharing but also inclusive of inaccurate forecasting of demand (Bayraktar, Koh, & Gunasekaran, 2008).

3.2.4 Human resources

Human resources are the human capital of every organisation. For every organisation there are policies that are aimed at improving the human resources of the organisation. These are the policies and the practices that need to be carried out based on the 'people' aspects of the organisation (Dessler, 2000). These policies include training, recruitments, reward systems and appraisals. Studies have shown that efficient human resources management is positively associated with organisational performance as well as customer satisfaction. Adsit, London, Crom, and Jones, (1996) concluded that negative employee attitudes are detrimental to customer satisfaction and departmental performance. Empirical studies by Ott and van Dijk (2005) also noted positive relationships on effective human resource management and client satisfaction. Sit et al. (2009) in their empirical studies in hospitals found that human resource was significant towards achieving customer satisfaction and therefore stressed on the need for effective human resource management in order to better the course of Total Quality Management.

The quality management effort requires that employees work in teams across all organisational levels (Dale, Wiele & Iwaarden, 2009). Working in teams continues to help generate better ideas and prevent certain conflicts in a typical functional or firm centric organisation. This is

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therefore enhanced by the use of effective teams that well suit all disciplines along the chain. Employee development also thrives on effective training. Satish et al (2001) advocate for efficient training on quality management tools and statistical process control methods. In training, people are empowered to bear certain qualities that enhance organisations' growth. In a study by Yunis et al., (2013), they concluded that employee compensation, employee involvement and effective communication are important descriptors of employee relations which further describe effectively, supply chain quality performance.

Earlier research suggests that the human resource factors are key in achieving the performance of the supply chain (Ernst & Whinney, 1987; Bowersox, Daugherty, Dröge, Rogers & Wardlow, 1989; American Quality Foundation, Ernst & Young, 1991). Whilst Ernst and Whinney (1987) emphasised human resource as a critical factor in organisational performance, Bowersox et al. (1989) regard human resource factors as the best dimension for supply chain management performance. Kim (2009) includes human resource management as part of a structural initiative which has a direct effect on supply chain performance. In a later study, Gowen III and Tallon (2012) added that training in problem solving skills leadership skills, team building skills and job skills are positively related to the management support and employee support which also directly impact on supply chain performance and customer satisfaction.

3.3 The nature and scope of flexibility

Flexibility as defined by Upton (1994) is the ability for a firm to change or react with a little penalty in time, effort, cost and performance. In a review by De Toni and Tonchia (1998), flexibility was described as a buffer system against external disturbances such as frequency, measure, novelty and certainty. Flexibility therefore simply examines a firm's ability to respond to uncertainties that may occur in its business operations. Slack (1983) further sees flexibility as the ease of a firm in changing what it would want to achieve. This includes the

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firm's ability to bring out something new, the ability of the firm to change to a different product mix, the ability of the firm to change the level of quality of a product, the ability of the firm to change the volume of output and lastly the ability of the firm to change the delivery times of the products to the customer.

Globalisation and fast advancing technology have aided in shortened life cycles of products (Koste, Malhotra, & Sharma, 2004). Demands are being made by customers for variety of goods with good quality at a lower cost. These have given rise to a highly competitive environment and the quest for survival requires that a firm must be strategic in its operations (Dewan & Seidmann, 2000). Organisations are adding flexibility as one important aspect to consider in terms of their operational strategies. These are mainly due to the increase in diversities and the uncertainties in the business climate (Sánchez & Pérez, 2005).

Flexibility has been identified as both a reactive and a proactive process (Koste & Malhotra, 1999). It is reactive in the sense that it is used as a response to uncertainty experienced by the organisation. The proactive nature of flexibility ensures that the organisation is able to withstand future uncertainties that may occur. A flexible organisation can be seen as a way of dealing with challenges of uncertainties that occur in organisations (Koste et al., 2004). As a gateway to organisational performance, Anand and Ward, (2004) observed in their study of 110 manufacturing firms that the concept of flexibility is a stronger predictor of performance in an organisation.

The supply chain involves an integration of business functions, organisations and operations and it is therefore essential to consider issues regarding flexibility as a response to uncertainties within the supply chain. Vickery et al. (1999) opined that excellent performers in supply chain management are those that give due consideration to issues on flexibility. Vickery et al. (1999) stressed that meeting customer demands in terms of their product and volume flexibilities has

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a significant impact on the performance of the supply chain members and ensures that the customers at each level of the chain is satisfied. Notwithstanding the importance of basic flexibility capabilities like product flexibilities and aggregate flexibility capabilities, which are more akin with the customer-supplier relationships are also highly related to the performance of the firm (Sánchez & Pérez, 2005). Thus organisations in a supply chain need to also focus more on flexibility capabilities between the customer and the supplier.

Earlier research showed that flexibility was solely based on infrastructural aspects. This was without a regard for an overall systemic view of the concepts of flexibility (Buzacott, 1982; Gerwin, 1982; Slack, 1987). However, recent studies have shown that as uncertainties in the business environment are increasing, organisations are adding flexibility as an additional dimension to their business operations in various functional aspects (Alolayyan et al., 2011; Naim, Aryee, & Potter, 2010; Sánchez & Pérez, 2005).

Slack (1983) identified that all the forms of flexibility influence on the rates of change the systems in the operations could adopt, the cost of moving from one state to another and time to move from one state to another. These are also known as the elements that define flexibility. Koste and Malhotra (1999) stressed on the range assertion made by breaking range into two parts. Whilst the first part considered the number of available products, the latter considers the extent of heterogeneity or the extent of the availability of different products.

The literature reviewed identified product flexibility and volume flexibility as the most commonly mentioned dimensions of flexibility in both manufacturing and service contexts (Alolayyan, Ali, & Idris, 2011; Correa & Gianesi, 1994; Koste et al., 2004; Koste & Malhotra, 1999; Sánchez & Pérez, 2005; Slack, 1983; Tipu & Fantazy, 2014; Vickery et al., 1999). Sanchez and Perez (2005) extended the flexibility concepts of Vickery et al. (1999) and grouped the dimensions of supply chain flexibility in a three level hierarchy. The first level

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looked at system component flexibilities that comprised of product, volume and mix flexibilities. These forms of flexibility occur mainly at the manufacturing level. The second level incorporates the basic level flexibilities into a system level flexibility and they are namely the delivery, transhipment and postponement flexibilities. The last level is a composite of the first and second levels which looks at launch flexibility, sourcing, and response and access flexibilities.

Fantazy, Kumar and Kumar (2009) add a different dimension of flexibility as information system flexibility. This form of flexibility incorporates the use of information systems and technology as a response to supply chain uncertainties. Table 3.1 gives a list of the various dimensions of flexibility with the various authors that discussed them.

Table 3. 2: Flexibility Dimensions

Flexibility Dimension	Definition	References
Product flexibility	Ability of a firm to handle difficult and non-standard orders to meet customer specification	Vickery et al. (1999), Sánchez and Pérez (2005), Slack, (1987), Slack (2005), Stevenson and Spring (2007), Zhang, Vonderembse, and Lim, 2006)
Volume flexibility	Ability of a firm to operate profitably at different output levels	Suarez, Cusumano and Fine (1996), Duclos, Vokurka and Lummus (2003), Jack and Raturi (2002), (Jack and Raturi, 2003) Zhang et al., (2006),
Information Systems Flexibility	The ability of an organisation to meet the customer's changing information needs	Duclos et al (2003), Fantazy et al (2009), Tipu and Fantazy (2014)
Logistics Flexibility	The ability of a firm to respond quickly and efficiently to changing customer needs in inbound and outbound delivery, support, and services	Day (1994), Davis (1993), Van Hoek, Harrisson and Christopher (2001), Zhang et al (2005), Naim, Potter, Mason and Bateman (2006)

Source: Author's Construct (2015)

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3.3.1 Product flexibility

The definition of product flexibility as outlined by Vickery et al. (1999) introduces the concept of meeting specifications outlined by the customer thereby enhancing customer satisfaction. Product flexibility is seen as an attribute that adds value to the product and is visible to the customer (Vickery et al., 1999). This shows that product flexibility is a key component to consider in customer satisfaction along the supply chain.

Product flexibility in the literature has been noted to be a key contributor to competitive advantage (Sánchez & Pérez, 2005; Vickery et al., 1999). In a conceptual study by Duclos et al. (2003), they identified product flexibility as an important aspect of manufacturing flexibility. Further, Duclos et al. (2003) found out that product flexibility added value to a firm since it gives the ability for the market to respond to new market requirements.

When market requirements are met, firms are regarded to provide value to the customers. High levels of customer satisfaction are achieved through this value addition process of meeting customer requirements (Zhang, Vonderembse, & Lim, 2003). Zhang, Vonderembse and Lim, (2002) concluded that although product flexibility and volume flexibility are positively related to customer satisfaction, product flexibility relates more to customer satisfaction than volume flexibility. Their argument is based on the premise that more uncertainty is reduced with respect to meeting customer preferences than in meeting the required quantity of products demanded by the customers.

The product flexibility concept does not exist in isolation as a means to customer satisfaction. Studies have been found to link product flexibility and other dimensions as strong indicators of customer satisfaction. Zhang, Vonderembse, and Cao, (2009) concluded that even though customer satisfaction is enhanced through product flexibility, it is enhanced by some other variables. Zhang et al. (2009) outlined that product flexibility enhances customer satisfaction through gathering of customers' feedback. Earlier research have also discussed product

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flexibility contributors to customer satisfaction based on range (Leeuw & Volberda, 1996; Upton, 1994), Mobility (Sethi & Sethi, 1990) and uniformity (Thomke, 1997).

3.3.2 Volume flexibility

The definition of volume flexibility as given by Cleveland, Schroeder and Anderson (1989) show that volume flexibility is not about keeping large volumes of inventory to respond to higher demands. Volume flexibility is more about keeping the right amounts to respond to increasing decreasing demands. The onset of lean operations management has therefore come to increase the importance of volume flexibility. Volume flexibility is more appropriate to consider in our supply chains today than ever before (Slack, 2005).

A major purpose for volume flexibility is a key response to product and market uncertainties and to cope with high demand uncertainties (Jack & Raturi, 2002; Vickery et al., 1999). This illustrates the point that a firm that is flexible in terms of its production volumes shall not be overburdened with high inventory costs during low demand and costs associated with stock outs during seasons with high demands. Volume flexibility is also a contributor to firm performance and customer satisfaction (Sánchez & Pérez, 2005; Vickery et al., 1999). As a means of meeting customer needs, reacting to changing demand is a motive for ensuring flexibility in terms of volume (Seidel & Von Garrel, 2010, cited in Metternich, Böllhoff, Seifermann, & Beck, (2013). Ensuring that customer needs are met also ensures that customers are satisfied. Seidel and Von Garrel (2010) therefore link volume flexibility to customer satisfaction.

Earlier studies measured volume flexibility using sales yield over a period of time. (Fiegenbaum and Karnani, 1991; Mills and Schuman, 1985). However, the multidimensional concept of flexibility (Anand & Ward, 2004; Beach, Muhlemann, Price, Paterson & Sharp, 2000; Grigore, 2007; Javalgi, Whipple, Ghosh, & Young, 2005) flaws the notion that the antecedents of volume flexibility could stem from a single source (Jack &

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Raturi, 2002; Suarez et al., 1996). As a way to overcome this single dimensionality construct, Metternich et al., (2013) used a composite measure of demand quantity, production quantity and the capacity of demand as sources for volume flexibility. Four major sources were identified by Jack and Raturi, (2002) namely internal sources, external sources, long term and short term sources. Many of the items in these four sources have been discussed separately in other studies on flexibility. For instance Cox (1989) considered inventory management as a volume flexibility dimension in the internal sources. External sources of flexibility indicate that as practices such as outsourcing and strategic alliances exist, customer satisfaction is enhanced (Vickery et al. 1999; Jack & Raturi, 2002). Short term and long term sources stem from inventory systems arising from internal sources and major adjustments in the levels of the workforce respectively (Safizadeh & Ritzman, 1997)

3.3.3 Information system flexibility

The importance of quality information dissemination has been outlined in the earlier parts of this text. Distortions in information dissemination have been seen to cause bad effects on the supply chain. Information systems flexibility is defined by Duclos et al. (2003) as the ability of a firm to align information sources with changing information needs whilst responding to customer needs. It is therefore important to have a flexible information system along all the units within the supply chain. Zhang et al. (2006) noted that information systems and information dissemination flexibility is seen along four lines. These include the timely dissemination of information along the supply chain; joint information among supply chain partners and the accuracy of the information.

In an empirical study of supply chain flexibility, Fantazy, Kumar, and Kumar (2009) noted information system flexibility as an important contributor to overall firm performance and

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customer satisfaction. In another related study, Tipu and Fantazy (2014) followed the work of Fantazy et al (2009) and also concluded that information system flexibility was essential for supply chain performance. Though literature on information system flexibility is scanty as compared to the other dimensions of flexibility as mentioned, its importance cannot be overlooked in the pursuit of achieving customer satisfaction across the supply chain.

3.3.4 Logistics flexibility

The definition of logistics flexibility points out to the fact that logistics flexibility deals with service related elements other than manufacturing related elements. Logistics flexibility therefore considers the physical supply of goods, its distribution as well as purchasing and demand management (Zhang, Vonderembse, & Lim, 2005). The dimensions of logistics flexibility can therefore be grouped into internal and external sources. Thus, logistics flexibility aims at ensuring that customer service is enhanced by coordinating internal elements (purchasing and product delivery schedules) and external elements (demand management) (Van Hoek et al., 2001).

Flexibility in transport systems is identified as an integral part of logistics flexibility. Under flexibility in transport systems, Feitelson and Salomon, (2000) identified link, node and temporal flexibilities as dimensions that are more related to infrastructural provision. These provisions are meant to support the physical distribution of products from the source to the eventual customer. In terms of the criticality of meeting customer demands routing flexibility is much to be desired (Groothedde, Ruijghrok, & Tavasszy, 2005). This reflects the capacity to use different routes to meet the demands made by customers. Naim et al., (2006) in a conceptual model outlined nine sources of transport flexibility which they described as internal elements of logistics flexibility. That is to say that these elements are based on the competence of the firm. In a later study, Naim, Aryee, and Potter, (2010) applied the nine dimensions in

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an empirical study of a steel industry and concludes that all the nine dimensions are critical to supply chain performance.

3.4 Concept of responsiveness

Responding to the demands of customers within the acceptable timeframe has become a source of competitive advantage (Holweg, 2005; Neely et al., 1995; Reichhart & Holweg, 2007). Yunis et al, (2013) note the importance of timely delivery by stating it as a determinant for operational performance. Barclay, Poolton and Danni (1996) define responsiveness as the ability to react purposefully and within an appropriate timescale to significant events, opportunities and threats to bring about or maintain competitive advantage. It is also seen as the willingness of staff to be helpful and to provide prompt service to customers (Andaleeb & Conway, 2006; Parasuraman, Zeithaml & Berry, 1985).

The latter definition as identified relates responsiveness to the nature or the attitudes of employees of an organisation. However, Barclay et al. (1986) in their definition point to the fact that responsiveness is a decisive act by management and highlights the notion of an appropriate timescale which is very essential. Barclay et al (1996) further take note of the aim of responsiveness by stating that it is a means for assuming a competitive edge over other potential competitors.

The concept of responsiveness has become important in organisations today and it has been shown to bear positive relationships to organisational performance and customer satisfaction. Responsiveness is a major factor that leads to the operating performance of a firm (Daugherty, Ellinger, & Rogers, 1995). Asree, Zain, and Razalli (2010) studied the responsiveness of hotel facilities and identified that responsiveness is key to consider in improving the revenue of the organisations. Andaleeb and Conway (2006) in a study of restaurants also identified that responsiveness is positively related to customer satisfaction.

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The supply chain incorporates a number of activities in fulfilling a request and time is therefore essential in ensuring that customers are duly satisfied (Holweg & Pil, 2004). Supply chain responsiveness is defined by Reichhart and Holweg (2007) as the speed with which the system can adjust its output within the available range of product, the product mix, volume and delivery in response to an external stimulus for example, a customer order. Holweg and Pil (2004) therefore link responsiveness to the entire flexibility dimensions identified along the supply chain.

3.4.1. Dimensions of responsiveness

The literature reviewed notes of a number of forms of responsiveness along both service as well as manufacturing sectors. Kritchanchai and MacCarthy (1999) identify four components of responsiveness namely drivers of responsiveness (stimuli), awareness of the drivers of responsiveness (awareness), the ability to respond to the drivers (capabilities) and the targets of each firm in its environment (goals). Kritchanchai and MacCarthy (1999) further identified the drivers of responsiveness as demand fluctuations in terms of product variety and volume when the food supply chain was considered. In the oil supply chain, Kritchanchai and MacCarthy (1999) identified factors such as machine breakdowns and maintaining stock levels as critical in a responsive oil supply chain. In terms of delivery, a responsive supply chain considers drivers such as cycle time, truck scheduling as well as adequate storage capacities.

Catalan and Kotzab, (2003) assess that lead time, the reduction of bullwhip effect, information exchange and the cooperation among supply chain partners are indirectly related to responsiveness. In addition, they identified that the sources of responsiveness in a supply chain were time based. The time based sources were grouped into the time indications for the flow of information and the time indications for the flow of goods and services along the supply chain.

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The dimensions of responsiveness can also be discussed in terms of flexibility regarding volume, product variety and the production process (Holweg, 2005). The volume dimension is related to the nature of demand and customer expectations whereas the product dimension relates to the internal and external varieties of the product. The process dimension looked at the production lead times. The determinants of product, volume and process are underscored in a futher research by Reichhart and Holweg (2007) as they also add delivery as another dimension to responsiveness. Product and volume flexibility have been discussed in detail in the flexibility section of this literature review. Product responsiveness refers to the ease with which the organisation is responsive to changes in product variety. Thus, whereas product flexibility concerns the ability to introduce new products or modify existing ones (Slack, 1983), product responsiveness concerns the ease of providing such customised products within an acceptable timeframe.

In the same way volume responsiveness represents the ability to change the level of products with respect to demands within the acceptable timeframe. In a current study Danese, Romano, and Formentini, (2013) also use timely, the flexibility to change product mix and the flexibility to change volume as indicators of responsiveness. Holweg (2005) as well as Reichhart and Holweg (2007) identified significant relationships with flexibility and responsiveness and hence it does not become surprising these dimensions are found in literature on both responsiveness and flexibility.

Andaleeb and Conway (2006) identified responsiveness as a major determinant for customer satisfaction in the food service industry. Based on the results of an exploratory factor analysis, the study found that antecedents for responsiveness included the attentive nature of staff, prompt service provided by staff, their neat appearance as well as their level of understanding

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of customer needs. Their focus is therefore based on exploring the drivers of responsiveness and how they lead to a satisfied customer.

Asree et al. (2010) measured responsiveness using the concepts defined in the SERVQUAL model as outlined by Parasuraman et al (1985). Using concepts that were related to speed of service provision, the variety of service provision and the willingness to provide that service, the study found that the organisational culture and leadership are better predictors of organisational responsiveness.

Two major components of responsiveness can be identified from the literature review of the dimensions of responsiveness. The first component considers the major sources of responsiveness. Time based source of responsiveness is majorly existing in the literature as a dimension for responsiveness. The review showed that only the study from Andaleeb and Conway (2006) showed other physical attributes as measures for responsiveness in addition to the time based resources. The second component relates to the drivers of responsiveness. These are the other dimensions that are sought to impact on responsiveness (Catalan & Kotzab, 2003; Danese et al., 2013; Reichhart & Holweg, 2007). These could be identified as the drivers of responsiveness.

3.5 Cost

Another key issue to consider in achieving competitive advantage is to provide goods and services at lower cost levels whiles maintaining an excellent customer service. To this Thomas and Griffin (1996) believe that operational costs should be reduced whilst improving customer service. Researchers in this field believe that it is still essential to provide services at an acceptable cost whilst still maintaining the other customer satisfaction attributes of quality, flexibility as well as responsiveness.

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To this, much attention has been drawn towards steps in reducing costs in the operations of the organisations of the supply chain. That is to say, that working to reduce wastage in business operations is done to ensure that quality products and services are rendered to the customers at a reasonable cost and within the acceptable timeframe. These are models that have the objective of minimising costs of operations. The cost efficiency methods can be grouped into two non-exhaustive and overlapping groups namely cost reduction and cost avoidance strategies. The review of relevant literature on cost and customer satisfaction saw two major themes – cost reduction strategies and pricing strategies.

3.5.1 Cost reduction strategies

Cost reduction strategies are aimed at reducing the costs of obtaining a product or a service. In a review by Beamon (1998), she identified certain cost reduction strategies and these included material control, production control, inventory control and distribution. Satish et al. (2001) indicated the need for a reduction in the supplier base as a cost reduction alternative to operations within the supply chain as this promotes organisational performance. Zhang et al (2014) also grouped this assertion of a smaller supplier base under the supplier quality management dimension and further added the need for the supplier base to be more reliable.

Supply chain integration has been seen to form an integral part in the cost reduction processes. In an earlier study, Spekman, John, and Myhr (1998) note that supply chain coordination is an alternative to reduce costs within the chain. As also evidenced by Flygansvær, Gadde, and Haugland (2008) on the importance of coordination, they noted that the lack of effective coordination across a supply chain increases the costs and reduces the level of service thereby leading to customer dissatisfaction. Flygansvær et al. (2008) consider two aspects of coordination namely the coordination of physical flows along the chain and the coordination of the commercial interests which includes contracts, control and ownership structrures of organisations along the supply chain. This assertion also underscores the point that the supply

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chain does not only involve physical movenemt of goods or products but it encompasses a whole lot of activities in its domain.

The inventory control process falls under the production process in a supply chain. Large volumes of inventory have been noted to be a cost intensive operational strategy for the supply chain (Reichhart & Holweg, 2007; Shepherd & Günter, 2006; You & Grossmann, 2008). Although maintaining levels of inventory is important as a buffer against uncertainty (Davis, 1993), keeping high levels of inventory has cost implications on the organisation as well as the supply chain as a whole. Zhou, Cheng, and Hua (2000) describe inventory capacities and inventory holding as major constraints of supply chain optimisation and hence must further be reduced. Other cost reduction strategies in addition to the inventory costs include reduction in transportation costs, material handling costs as well as costs that are associated with quality control. With respect to quality control costs, much emphasis is laid on the reduction of external failure costs.

A cost avoidance strategy is an action that is aimed at escaping certain costs that are incurred in a supply chain. Costs avoidance strategies are therefore aimed at eliminating the costs or preventing their occurrences. According to Kauffman and Crimi (2004), approaches towards cost avoidance are known as soft cost saving elements as these are not really measurable costs and these lead to an effective performance of the organisation as they are able to avoid certain costs.

3.5.2 Pricing strategies

Whether selling a product or a rendering a service, it is essential to consider the pricing, as this could maximise the profitability of the organisation. Perceptions in pricing are seen to influence satisfaction judgements made by customers (Herrmann, Xia, Monroe, & Huber, 2007). Herrmann et al. (2007) further outline that the perceptions of price made by buyers shall

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influence the perceptions of price fairness. In a summary, the model they outlined showed that price considerations directly influence the satisfaction of customers with the selection of the product. Price fairness is measured using equal treatment of segments of customers, cost based pricing and pricing not based on needs. Segments of customers are used in line with the trade-off that exists between responsiveness and efficiency. Thus whilst being efficient would bring about less cost on the part of the customer, a customer that is very much interested in responsiveness will incur much cost. It is therefore necessary to consider these segments of customers in order to offer pricing strategies that are fair to these segments of customers.

Martín-Consuegra, Molina, & Esteban (2007) found that price fairness influences customer satisfaction and customer loyalty. In a study of airline companies with respect to ticketing, customer satisfaction was associated with price fairness and price acceptance. Hassan, Hassan, and Nawaz (2013) demonstrate that price fairness along with other variables were measures for customer satisfaction. In their model, fairness in pricing was described by the provision of best price plan that meets the needs of the customer as well as the ease of the organisation to change plans for pricing.

Fairness in pricing also influences behavioural intentions or the willingness to pay for a particular service (Calabuig, Núñez-Pomar, Prado-Gascó, & Añó, 2014; Martín-Consuegra et al., 2007). It is argued that extra fees that are charged to customers are unjustifiable and hence customers feel distressed when prices are inappropriate. Behavioural intentions are related majorly to price acceptance which involves the willingness to pay for a particular service, the knowledge of the price levels and customer's acceptance of the changes in price values.

Despite the identified influences of pricing on customer satisfaction, Iglesias and Guillén, (2004) found out that pricing had no substantial effect on customer satisfaction. The study concluded that quality was the best indicator or predictor for customer satisfaction. One major

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discrepancy that could be identified with their study was with the use of a single concept to describe the constructs related to pricing efficiency and customer satisfaction. The authors therefore did not regard the multidimensionality concept of the cost and pricing within organisations.

3.6 Conceptual framework

The literature reviewed reveals that there is a relationship between quality, cost, flexibility and responsiveness on customer satisfaction. In addition, the review makes reveals four important findings. Firstly the identified components of customer satisfaction are all multidimensional concepts. Thus there exist more than one item that describe each of quality, cost, flexibility and responsiveness. This concept therefore allows this research to propose that there is no one size fit all strategy for all organisations. Secondly the review shows that customer satisfaction is an antecedent for customer loyalty and organisational performance. This indicates that the notion of customer satisfaction is directly related to customer loyalty.

Thirdly, most of the studies were conducted on an organisational level basis without due consideration to the supply chain. Lastly, the review indicates that the identified items within each of the constructs of quality, cost, flexibility and responsiveness do not exist in isolation. Most of the items identified do overlap along each construct. For example, quality information was provided as a quality feature and also identified as a flexibility dimension known as information system flexibility. In addition, volume and product flexibilities were also identified as dimensions under responsiveness. Figure 3.1 shows the empirical constructs that are designed as constituents of customer satisfaction.

Quality

The construct of quality is measured using management leadership, customer focus, quality data and lastly the quality of human resources. As already discussed, management leadership is seen as the view of management concerning quality and how they plan to include quality in

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their strategic plans (Gowen III & Tallon, 2012; Kannan & Tan, 2005; Satish et al., 2001). In a factor analysis by Dow, Samson and Ford (1999), indicators of customer focus were identified as commitment, shared vision, benchmarking and the use of teams.

Yu et al., (2006) identified three levels of information sharing where the first level involves no proper sharing between the members of the supply chain. The second level involves an upward flow of information where the manufacturer can access demand information from the consumer and the retailer directly. The third level in the information sharing involved both forward and backward flow of information between the members of the chain with the help of an Electronic Data Interchange (EDI) system. Excellent performance of employees is an indicator of an effective human resource. Other measures of effective human resource include personal growth using effective training and a regular monitoring of employee satisfaction using the results of the review to support quality improvement (Prybutok, Zhang, & Peak, 2011)

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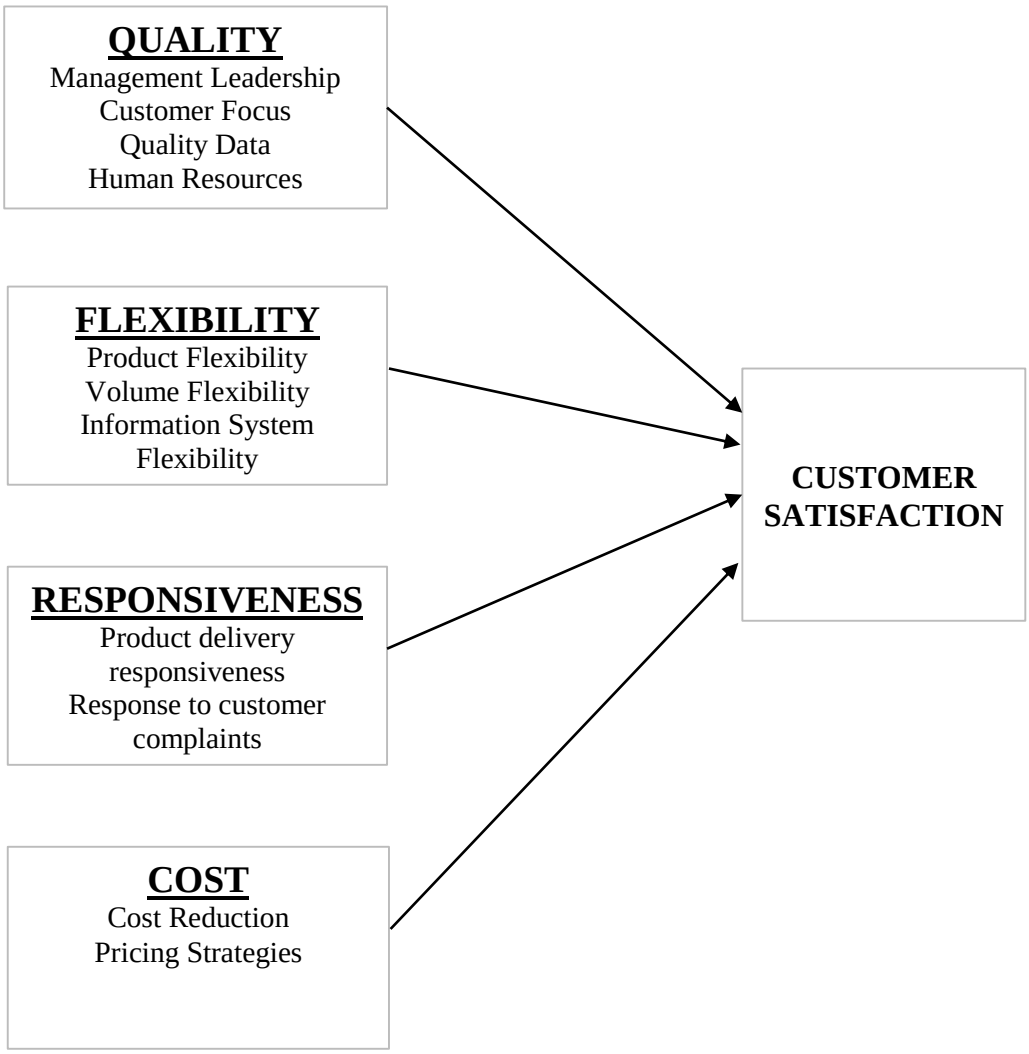
Fig 3 1: Conceptual Model of Customer Satisfaction



Source: Author's construct (2015)

Flexibility

Flexibility dimensions are measured using the dimensions of product flexibility, volume flexibility and logistics flexibility. Following the work of Fantazy et al. (2009) this study adds information systems flexibility as another dimension. New product flexibility is measured by the number of products that are introduced into production at the end of a period, and the number of product prototypes produced within the same period (Koste et al., 2004). Another measure for product flexibility is the ability of the organisation to customise the product in order to meet a specific customer demand (Duclos et al, 2003). Jack and Raturi (2002) grouped

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the dimensions of flexibility into internal and external sources. Internal sources are akin to the organisation with respect to issues relating to inventory management and workforce or labour flexibility. The external flexibility dimensions are related to issues that concern the relationships between the customer and the organisation and this includes just-in-time sourcing and providing the volume range for the orders within a given time.

Logistics flexibility responds to customer needs by enabling the firms to coordinate, make and deliver products in time. According to Zhang et al. (2006) logistics flexibility is a product of purchasing flexibility, flexibility in physical distribution systems, the flexibility in managing demand and the flexibility in ensuring the physical supply of product to the customer. Information systems flexibility has not seen much research as compared to the other dimensions of flexibility (Duclos et al., 2003). The flexibility in information systems is measured by the ability to timely meet changing information needs of customers, the nature of joint information sharing among the supply chain partners and the information accuracy (Zhang et al., 2006).

Responsiveness and cost

The responsiveness dimension is assessed by lead time reduction, reduction of bullwhip effect and information exchange. According to Reichhart and Holweg (2007) other measures for responsiveness are related to demand anticipation which relates to the accurate expectancy of demand and this goes with information accuracy. Other measures include manufacturing flexibility and a better organisational integration. Prior to this Holweg (2005) identified measures for responsiveness as customer lead times, stability in volumes and demand specifications, lead times in terms of distributions and lead times related to supply chain responses.

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Strategies in ensuring positive effects of cost on customer satisfaction is largely based on cost reduction strategies for the organisation and pricing strategies made by the organisations for the customers. Cost reduction strategies are related to strategies in managing inventory, reducing production costs and reducing transportation costs. Reduction in these costs have been identified to impact positively on the performance of the organisation as well as profitability.

Lastly, pricing strategies are also aimed at maximising the profitability of the organisation through customer satisfaction. Identified sources for pricing strategies include price fairness (Martín-Consuegra et al., 2007) and the willingness of customers to pay for the intended service (Calabuig et al., 2014) which forms part of behavioural intentions. Other identified constructs include price acceptance and the customer's awareness of the levels of pricing as determined by the organisation.

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CHAPTER FOUR

METHODOLOGY

4.0 Introduction

This chapter presents the methodology of the study and it is divided into seven major sections. The first section outlines the research approach that will be used for the study. The second section takes a look at the research design that will be used. The third and fourth sections describe the target populations to be used as well as the methods to be used in determining the appropriate sample size for the study. The fourth section describes the sampling techniques that will be employed in the process of gathering the data. A description of the data collection instruments to be used for the study is also included in the fifth section. The sixth section describes how the data will be analysed. It describes the mode of analysis as well as the computer programs that will be used for the analysis of the data. The last section deals with the ethical considerations that will be employed in the study.

4.1 Research approach

There are three main approaches to research namely the qualitative, quantitative and the mixed method approaches. Qualitative data comes in the form of impressions, text, symbols and images (Neuman, 2007). Qualitative research usually explores a phenomenon and the methods used include in-depth interviews, focus group discussions as well as direct observation of events.

The purpose of the quantitative research is mainly to verify or test existing theories or prior research findings. Another objective of the quantitative research is to describe characteristics of populations usually based on sample statistics or estimates. It also involves inferential tests that seek to test statistical hypotheses. The study begins with a concept and breaks them down further into items that can be empirically determined and expressed in numbers (Creswell, 2013). Unlike qualitative research, the instruments used in a quantitative study are more rigid

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in nature and responses to questions are mostly categorised. Quantitative research instruments are mainly structured questionnaires, surveys and secondary data and the formats of questions are generally closed ended.

Mixed methods research involve collecting both qualitative and quantitative data in the response to the research questions. The qualitative and quantitative data are both integrated in the research design and analysis. This study will use the mixed methods approach. This is based on the fact that the mixed methods approach will give a full understanding of the research problem at hand. The qualitative research will provide a framework for which the quantitative aspect of the work is placed.

Qualitative data will be in a response to the research questions that sought to investigate the quality management, flexibility, responsiveness and the cost effective practices of companies within the downstream oil industry in Ghana. The quantitative data will be for the end users of the petroleum product where some inferences will be made in order to build a suitable model for the management for the oil supply chains as stated as part of the objectives of this study.

4.2 Research design

Creswell (2013) outlines three major research designs in the mixed methods approach to research. This includes the explanatory sequential mixed methods design, the exploratory research design and the convergent mixed methods research. The intent of the explanatory sequential design is to use the qualitative data obtained to elaborate more on the initial findings presented by the quantitative results. The exploratory sequential design studies the variables using the qualitative techniques and then further ensures validation using quantitative techniques. Therefore, the qualitative data precedes the quantitative data in the exploratory sequential design whilst the vice versa occurs in the explanatory sequential design.

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The convergent mixed methods design will be used for this study. In this research design, the various sets of data will be collected separately and the findings will be compared to check whether the qualitative and the quantitative data do confirm each other or not (Creswell, 2013). In the convergent mixed method design, data is collected using the same variable or concepts across the quantitative and the qualitative strands. Thus, whereas the managers of the petroleum companies will respond to questions based on quality management, flexibility, responsiveness and cost effective practices of their organisation, the end users will also respond to statements that relate to these similar concepts. The qualitative data will therefore contain in-depth information on the industry practices in relation to the four aforementioned concepts whilst the quantitative data contained information from a larger sample size that satisfies requirements for rigorous statistical analysis.

4.3 Study population

The target population for this study is divided into two parts. The first population will be the managers of the bulk oil distributors and the Oil Marketing Companies. This set is the targeted population for the qualitative study.

The second set of the target population will consist of all the users of petroleum products whether for private, company or industrial uses. Private users of the petroleum product are those who use the products in their homes or to fuel their vehicles. Company users of the petroleum products are those that use these products to fuel vehicles belonging to their companies or organisations where they work. Industrial users of the petroleum products are mainly those who use these products particularly diesel to fuel their machinery and generators for use in factories. This set of population was the targeted population for the quantitative aspect of this study.

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4.4 Sample size determination

Statistics from the National Petroleum Authority shows that there are a total of 30 Bulk Distribution Companies in Ghana. Out of this population, ten companies shall be purposively sampled for the study. This indicates one third of the population. The operations manager from each of the ten companies shall be used as respondents for this study. This sample is deemed fit as the aim of a qualitative study is more geared towards meaningful insights drawn from the data collected and not necessarily the representativeness of the sample (Mason, 2010; WHO, 2004).

The Association of Oil Marketing Companies (AOMC) is a body of Oil Marketing Companies in Ghana that acts as an advocacy institution that direct the policies, legislation and regulations that governs the Oil Marketing Companies in the downstream oil sector. The association currently boasts of a number of sixty licensed Oil Marketing Companies. Similarly, a purposive sample of ten companies shall be used for this study where an operations manager shall be used as the respondents for the study just as in the case of the Bulk Distribution Companies. Reasons for this sample size is also based on the arguments as outlined by Mason (2010) and the World Health Organisation (2004) as seen in the preceding paragraph.

Due to the infinite nature of the population size for the quantitative study, the appropriate sample was determined by employing a mathematical formula to determine an ideal sample size. The ideal sample for infinite populations as outlined by Cochran (1977) is given as

$$n_0 = \frac{Z^2 \times p(1-p)}{e^2}$$

Where:
n_0 Is the sample size
Z is the two tailed area under the normal curve with α = 0.05 and the z value is 1.96
e is the acceptable sampling error
$p(1-p)$ is the estimate of the population variance

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Given these values and an acceptable sampling error of 5%, the sample size was determined as:

$$n_0 = \frac{1.96^2 \times 0.5(1 - 0.5)}{0.05^2}$$

This gives the acceptable sample size to be approximately 384.

A convenient sample of 384 respondents will therefore be used for the quantitative study. The quantitative data was collected with the aid of a structured questionnaire. Out of this size of 384, 20 copies of the questionnaire will be sent to 20 manufacturing companies that use diesel. One particular person from each company will fill the questionnaire. Mining companies will not be used since they are far from Accra and hence cannot be reached easily. The remaining will be administered to graduate students and other people within Accra who utilise petroleum products in their day to day activities. Data collection will be done between February and April 2015

4.5 Sampling techniques and data collection

This section introduces the techniques of sampling and the data collection instruments to be used for the study.

4.5.1 Qualitative study

For the qualitative aspect of this study, the purposive sampling technique will be applied. In this technique of sampling, the researcher intentionally selects the respondents for the study (Saad et al., 2014). The subjects in this population are the operations managers of the companies in the downstream sector of the oil industry. Purposive sampling, also known as judgemental sampling, allows the researcher to select respondents based on their possession of certain qualities. This is also referred to by Bernard (2002) as the key informant sampling technique.

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The managers to be selected for the research will be individuals who have much interest and knowledge concerning the issue under study and hence can provide information that is sufficient for what was being investigated. The qualitative data will be collected with the help of a structured interview guide. The interview guide will contain questions that are both open and closed ended in nature. This will give the respondents ample space to provide enough information concerning the study at hand. The questions in the interview guide will solicit information from the key informants on the practices of their firms with regard to issues of quality, flexibility, responsiveness as well as cost efficiency. The responses to be provided by the respondents will be audio recorded.

4.5.2 Quantitative study

For the quantitative aspect of this study, the respondents will be selected using haphazard technique of sampling. The haphazard sampling technique is a non-probability sampling technique where respondents are selected based on convenience or the relative ease of access of the respondents to the researcher. One major reason for using this technique is its ease in ensuring that a sufficient sample size for a quantitative study is met. Secondly, considering the infinite nature of the population under consideration for this study, it is practically impossible to consider probability sampling techniques such as simple random sampling or a systematic sampling.

The questionnaire will be divided into four sections. The first section covers the demographic attributes of the respondents in terms of gender, age groupings and the type of petroleum product they use. The second and third sections will capture items that are related to quality and flexibility respectively whilst the fourth section contains items that describe responsiveness and cost efficiency. The respondents will be made to rate the level of importance they attach to

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each of the items under the above listed constructs. The items are described as Likert type questions where respondents are to rate them on a scale of 1 to 7.

4.6 Analysis procedures

The data collected from the field will be brought together for analysis. Since this is a mixed methods research, both qualitative and quantitative studies will have different formats for the process of analysis. The qualitative data will be analysed using Microsoft Excel whilst the quantitative data will be analysed using SmartPLS and the Statistical Package for Social Sciences (SPSS) softwares.

4.6.1 Qualitative analysis

This qualitative analysis will be done to ensure that sense is made out of the textual data that will be collected on the field. Analysis of the data shall follow a four stage process. The first step of the analysis will be an organisation of the data that has been collected. This stage also involves a thorough reading or review of the data. This is done in order to get a general picture of the issues being discussed by the participants. In addition, it provides a general impression concerning the depth and the credibility as well as the usefulness of the information provided with respect to the problem under study (Creswell, 2013).

The second stage of the qualitative analysis procedure will be the coding process. This stage involves a detailed analysis of the data where concepts are grouped into categories. The iterative process of coding and recoding continues as the data is reviewed over and over again. The third stage of the analysis process will be a stage of developing the codes that will be identified into themes. Thus, the information collected from the managers on their respective organisational practices in the downstream oil sector shall be grouped into certain themes. These themes shall form the basis of the major findings in the qualitative study. The final step will be to make an interpretation of the data with reference to the findings that will be identified.

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This is done in order to properly investigate the downstream industry practices in relation to quality management, flexibility, cost and responsiveness.

4.6.2 Quantitative analysis

The quantitative aspect of the data was analysed using the structural equations modelling (SEM) technique and the Analysis of Variance technique.

4.6.2.1 The SEM technique

The SEM is a powerful technique for multivariate data analysis. In SEM, there are multiple regression model where one response variable could also be a predictor variable in another model. The Structural Equations Modelling technique helps to evaluate more than one regression models simultaneously by specifying a structural model which is analysed by the use of a computer program.

One limitation of the multiple regression model is its inability to handle more than one dependent variable at a time. Structural equations modelling has the ability to handle more than a single dependent variable. SEM therefore bears all the capabilities of regression analysis which include testing significance of models, determining error terms, and the provision of standardised and unstandardized coefficients. SEM also incorporates Confirmatory Factor Analysis (CFA) to access measurement error and the composite reliability of estimates. In addition it has an attractive graphical user interface which makes visualisation of items and the relationship of variables easier. The use of the structural equations modelling technique shall help in indicating the importance of each of the items under quality, cost, flexibility and responsiveness in the oil industry as perceived by the end users of the petroleum products. The SEM technique is also used in order to fit a suitable model for the management of the downstream oil supply chain.

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Notations

Endogenous Variables: Endogenous variables are the response variables in the model. They act as the dependent variables in a regression model.

Exogenous Variables: the exogenous variables are the predictor variables in the model and they act as independent variables in the regression model.

Latent Variables: Also known as the unobserved variables or constructs, they are variables that are not directly measured. However, this construct can be represented or identified by one or more indicators.

4.6.2.1.1 Measurement model assessment

As seen in this study, the constructs identified are multidimensional and as such very complex. The items used in identifying the constructs are taken from the literature that was reviewed. However, inaccurate responses can result in measurement errors of estimation. This occurs especially when respondents do not clearly understand the statements or questions posed in the questionnaire. Measurement errors also stem from inconsistencies on the part of the respondent especially when multiple items are used to measure a construct.

To minimise these sources of error, it is necessary to show the contributions of each indicator variable to the unobservable construct. This is known as construct reliability (Anand & Ward, 2004; Creswell, 2013). Construct reliability is assessed by a Confirmatory Factor Analysis (CFA). In this measure, the indicators will be tested to show whether they share enough commonality of variance to be considered as measures of a single factor or construct. CFA

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tests the null hypothesis that the items well describe the identified construct using a Chi-Square test statistic. At a significance level (α), the null hypothesis is retained if the p value is greater than the specified value of α. The confirmatory factor analysis calculates the individual reliability scores as well as composite reliability scores. Reliability measures the internal consistencies of the items that describe a factor. The individual reliability score measures the internal consistency of an individual item and it is computed as

$$\rho_i = \frac{{\lambda_i}^2}{{\lambda_i}^2 + \theta_i}$$

Where: ρ_i = the individual reliability score for the i^{th} item. Where i represents an individual item that measures a construct.

$\lambda_i =$ Factor loading of the item that connects the i^{th} item to the factor$(0 \leq \lambda_i \leq 1)$.

θ_i = Variance of the error term corresponding to the indicator $(\theta_i \geq 0)$

Similarly, composite reliability score measures internal consistency of all the items of a factor or a construct. Composite reliability is given as:

$$\rho = \frac{(\sum \lambda_i)^2}{(\sum \lambda_i)^2 + \theta_i}$$

Where ρ_i, λ_i and θ_i are as defined above.

As seen from the formulas given above, the reliability score ranges from 0 to 1. As the error variance becomes smaller, the reliability score becomes closer to unity depicting that the items are internally consistent. The often used benchmark for a satisfactory reliability is 0.7 or greater.

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4.6.2.1.2 Path modelling

Whilst measurement models are synonymous to factor analysis, the path models are also synonymous to regression analysis. Path models, also known as causal models test causal hypothesis and relationships between variables whether latent or observable. Causal models also test the relationships between the exogenous and endogenous variables. The notion of causality can be explained that at any value of an exogenous variable, there can be a predicted value for the endogenous variable. Causal models in SEM also make use of coefficients which test the magnitude and direction of the linear relationships between the latent variables. The coefficients may be standardised or unstandardized. Unstandardized coefficients indicate the average change in the dependent variable which is associated with a unit change in the value of the independent variable. Standardised coefficients on the other hand are basically used to compare the strength of each exogenous variable in predicting an endogenous variable. The standardised coefficients thus provide comparative bases for the different exogenous variables. It must however be noted that the values of the standardised coefficients are independent of the sign (whether positive or negative) and the variable with the largest absolute coefficient size has the strongest predictive power.

Figure 4.1 shows a simple model that can be evaluated using the structural equations modelling technique. In this model there are four latent variables (D_1 to D_4) each having three observed or measurable items. Each item has a specific measurement error e_i (i = 1 to 12). The model also posits that the variables D_1 and D_3 directly influence D_2 whereas D_2 also in turn together with D_3 directly affect D_4. Using the traditional regression analysis would have meant having three separate regression models. However, SEM is able to find estimates for this model simultaneously with each causal variable in each model. Well known programs used for the SEM analysis include AMOS, LISREL, SmartPLS and STATA.

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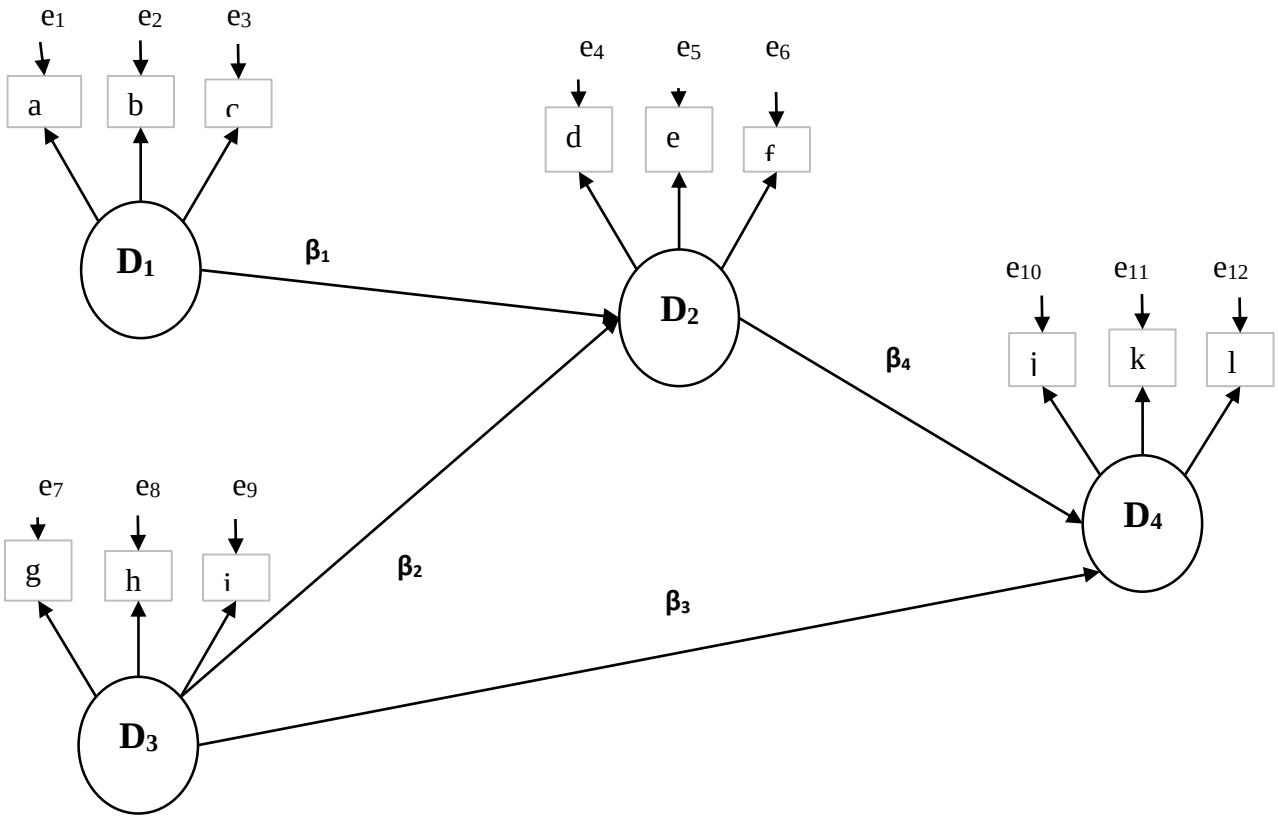
The SmartPLS software will be used in this study. The software employs the partial least squares technique and it also possess has soft assumptions of the distribution as compared to the Maximum likelihood technique which is employed by the AMOS software. The PLS technique can also handle both reflexive and formative constructs in a research framework (Chin, 1998). The SEM component in this study was primarily to assess the validity and the reliability of the items that were identified as indicators for the various dimensions of customer satisfaction.

Fig 4. 1: A simple example of a structural model



Source: Author's Construct (2015)

4.6.2.2 Analysis of variance and the LSD procedure

In order to construct a meaningful model for the downstream supply chain, respondents will be made to rate the importance of the four identified components of customer satisfaction on a seven point scale. The differences between these scores will be assessed using the One Way

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Analysis of Variance (ANOVA) technique. The One Way ANOVA technique identifies substantial differences between three or more variables.

Further tests will be carried out to identify where the actual differences were coming from. The Tukey's LSD procedure will be used. The Tukey's LSD procedure checks for significant differences using pairwise comparisons. The formula for the Tukey's LSD procedure is given as

$$T = \frac{M_1 - M_2}{\sqrt{MSW\ \left(\frac{1}{n}\right)}}$$

Where T = the Tukey's LSD test statistic

M_1 and M_2 are the average scores of the two variables

n is the sample size per group

MSW is the variance within the groups

4.7 Ethical considerations

This research complied with principles which aimed at protecting the dignity and privacy of every individual involved in responding to the questionnaire including those who provided personal or commercially valuable information about themselves or others

Before an individual becomes a subject of research, they will be notified about the aims, methods, anticipated benefits and potential hazards of the research. Issues of confidentiality will also be strictly adhered to. No person shall become a subject of research under duress and all who participate freely should give their consent.

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CHAPTER FIVE

PRESENTATION AND ANALYSIS OF RESULTS

5.0 Introduction

This section presents the findings of the data collected from the field. The data were collected through questionnaire administration and interviews. The chapter is divided into two major sections. The first section presents details of responses from respondents from the Bulk Distribution Companies (BDCs) and the Oil Marketing Companies (OMCs). The second section presents details of the responses from the end users.

5.1 BDC and OMC analysis

This section presents findings on the industry operations of the Bulk Distribution Companies and the Oil Marketing Companies. The Bulk Distribution Companies mainly serve as suppliers to the Oil Marketing Companies. The core task of the Bulk Distribution Company is to distribute petroleum in larger quantities to the Oil Marketing Companies. Ten copies of the structured interview guides were sent to Ten Bulk Distribution Companies. Out of this number, six completed questionnaires were received. This represents a response rate of 60%. Customers of the Bulk Distribution Companies are mainly local Oil Marketing Companies like the Ghana Oil Company (GOIL) and Star Oil Company (SOC). Other international oil trading companies like Shell and Total Oil are also customers of the Bulk Distribution Companies. Note that a Bulk Distribution Company can also be a customer to other Bulk Distribution Companies.

Similarly, there were a total of four respondents from the Oil Marketing Companies out of the Ten copies of the structured interview guides that were sent to the Oil Marketing Companies. This represents a 40% response rate. Oil Marketing Companies serve as retailers to the end users of petroleum products; mainly mining companies, vehicle owners, construction and haulage companies, home use, third party fuel retail companies and lubricant distributors. Some

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Oil Marketing Companies also take part in production of fuel additives and special types of lubricants.

5.1.1 Respondent characteristics

This section gives details of the characteristics of the respondents who are managers of the Oil Marketing Companies and the Bulk Distribution Companies. The characteristics are given in terms of their gender, their age groupings as well as their levels of management. Details are as given in Table 5.1.

Respondents were mainly males and their age levels were majorly within the range of 31 to 40 years for both BDCs and OMCs. It is also seen from the table that majority of respondents are either top level managers or middle level managers as only one respondent from the Bulk Distribution Companies was a lower level manager.

Table 5. 1: Demographic characteristics of respondents

	BDC		**OMC**	
Item	**Number of respondents**	**Percentage of respondents**	**Number of respondents**	**Percentage of respondents**
Gender				
Male	6	100%	4	100%
Female	0	0%	0	0%
Age Grouping				
Below 21 years	0	0%	0	0%
21-30 years	2	33%	1	25%
31-40 years	2	33%	2	50%
41-50 years	2	33%	1	25%
Above 60 years	0	0%	0	0%
Level of management				
Top Level	3	50%	1	25%
Middle Level	2	33%	3	75%
Low Level	1	17%	0	0%

Source: Field Data Analysis, 2015

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5.1.2 Quality management practices of BDCs and OMCs

A product is deemed as quality when it is fit for its intended usage and also meets the requirements of the customer. A customer is hence satisfied with a quality product as the requirements of the customer are met. This section therefore provides insight into the quality management practices of the Bulk Distribution Companies and the Oil Marketing Companies. The issues under quality management practices that are discussed include management leadership, quality data, employee focus and customer focus.

5.1.2.1 Management leadership

Top management's knowledge and involvement in quality issues is considered as a key driver in the performance of an organisation. Table 5.2 gives details for the issues considered under management leadership. Three issues were considered under management leadership and these are related to the objectives set for achieving quality standards, assessing quality efforts and mechanisms for checking their quality control.

All the respondents from the Bulk Distribution Companies identified efficiency as a major goal to achieve by implementing quality management efforts. Efficiency was also attested to by two out of the four respondents from the Oil Marketing Companies. Another respondent from the Oil Marketing Companies added that one major goal they would like to achieve is to prevent customer complaints. Three out of the four respondents from the Oil Marketing Companies (representing 75%) and two out of the six respondents (representing 33%) from the Bulk Distribution Companies outlined higher productivity as their objective for setting quality standards. In assessing the performance of their quality management efforts, managers of both BDCs and OMCs mostly analysed their costs accrued to them through their operations and their inventory management practices. Others also assessed the performance of their efforts through an assessment of their financial gains.

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The *magnificent seven* are seven well known tools for identifying quality problems and their courses (Russell & Taylor, 2010). These tools are histograms, check sheets, cause and effect diagrams, Pareto charts, scatter plots, process flow diagrams and statistical process control charts.

An investigation into the utilisation of the magnificent seven saw that most of the respondents (thus 67% of the BDCs and 75% of OMCs) noted that they utilise check sheets. Pareto charts, cause and effect diagrams and process control charts were not utilised by the Oil Marketing Companies but were utilised by some Bulk Distribution Companies. Process flow charts were also not used by the Bulk Distribution Companies. However the use of the process flow chart was confirmed by one respondent from an Oil Marketing Company. Others made use of scatter plots (majorly Bulk Distribution Companies) in identifying causes of variations in their efforts.

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Table 5. 2: Top management leadership details for BDCs and OMCs

	BDCs		OMCs	
Item	**number of respondents**	**percentage of respondents[1]**	**number of respondents**	**percentage of respondents**
Objectives for setting quality standards				
Higher productivity	2	33%	3	75%
Efficiency	6	100%	2	50%
Preventing complaints	0	0%	1	25%
Compliance with regulations	0	0%	1	25%
Assessing quality efforts				
Analysing inventory and operating costs	4	67%	3	75%
Response time analysis	2	33%	2	50%
Financial gains assessments	3	50%	2	50%
Customer feedback		0%	1	25%
Quality control efforts				
Check sheets	4	67%	3	75%
Pareto charts	2	33%		0%
Cause and effect diagrams	1	17%		0%
Scatter plots	3	50%	1	25%
Process control charts	1	17%		0%
Process flow charts		0%	1	25%

Source: Field Data Analysis, 2015

5.1.2.2 Quality data

As already noted in section two of Chapter three, the improvement of the processes that occur throughout a supply chain is dependent on the accuracy of the data available as well as its ease of accessibility. It was therefore inquired from managers concerning the kinds of data they kept and also made available for their customers. It came to light that data are collected and stored electronically with the aid of computer systems. Data that were kept customer and supplier details. These details included debts that were owed by customers in the case of the Bulk

[1] Responses do not need to sum up to a 100% since respondents could choose more than one option.

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Distribution Companies and debts that were owed to suppliers in the case of the Oil Marketing Companies.

However, certain pieces of information were made available to customers. For instance, in the case of the Bulk Distribution Companies, information on the efficiency of serving customers, product availability and product pricing were made available to customers and the general public. In the case of the Oil Marketing Companies, information on the quality of their product offered, product availability and their pricing were made available.

Also included were information and details of their initiatives geared towards their corporate social responsibilities. For instance, a look at the websites of the Oil Marketing Companies used for this study revealed their efforts made on community development projects. These included road safety interventions, educational initiatives and involvement in environmental projects in communities across the country.

As data are kept, it is important to make a conscious effort to carefully review the data on a periodic bases. All the respondents from both the Bulk Distribution and the Oil Marketing Companies attested to the fact that reviews and updates of their information were done consistently. However, the review of information depended on the kind of information. Thus, for some, review was done on a weekly, monthly or on a quarterly basis.

5.1.2.3 Customer focus

A focus on customers represents a measure that is taken by management to ensure that the expectations of the customers are met. Customers are satisfied when their expectations are met. To this end, the managers were made to indicate certain they take to ensure that the expectations of their customers are duly met. These include initiatives in making sure that the product requirements that are set by the customers are duly met. Secondly, the products must be

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delivered on a timely basis. This was attested to by all the respondents from both the Bulk Distribution Companies and the Oil Marketing Companies.

Whilst managers from the Bulk Distribution Companies mentioned close interactions with their marketing staff to determine product requirements, respondents from the Oil Marketing Companies made mention of constant research and development into new products, like the additives as already mentioned in Section 5.1 of this chapter. These respondents from Oil Marketing Companies also added customer feedback as another means of ensuring a good focus on the customer. A respondent from an Oil Marketing Company noted:

"We have an R&D department always researching and developing new products. Customer feedbacks is also very important and we also do periodic tests to confirm quality of products."

5.1.2.4 Employee focus

The last aspect of quality management practices that was considered is related to employee focus. Stressing on employee development, the study focused on investigating the ways in which employee development is enhanced. Oil Marketing Companies primarily focused on effective supervision in addition to working within a comfortable environment whilst the Bulk Distribution Companies focused primarily on training programs and reward systems. One respondent from a Bulk Distribution Company stressed on the need for capacity building and therefore stated that training in new technology, product safety and road safety among others form an integral part of their operations.

Training was basically conducted not on a periodic basis but as and when management deemed it necessary for such a training to be conducted for the employees. This holds for both Bulk Distribution Companies and Oil Marketing Companies. However, most respondents stressed

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on the fact that training was done mostly on the job. Thus employees go through series of coaching and a lot of informal training by their superiors whilst performing tasks assigned to them. The use of virtual libraries was also admitted by most of the managers both within the Bulk Distribution as well as the Oil Marketing Companies. Virtual libraries are catalogues of electronic books and materials. Employees are therefore trained with the help of these electronic materials mainly through the internet. The details are as given in Table 5.3.

As employees are motivated to perform their tasks, their performance on the job is also evaluated. Employee evaluations mainly took the form of in-house performance management tools. In-house performance management tools are performance appraisal systems like performance evaluation forms that are designed purposely to suit the organisation. Employee performance is also measured simultaneously as they perform on the job. Appraisals were majorly done by using the Management by Objectives method where the employees are evaluated according to the goals or objectives that are set for the employee to accomplish.

Table 5. 3: Employee focus initiatives for BDCs and OMCs

	BDCs		OMCs	
Item	**Number of respondents**	**Percentage of respondents**	**number of respondents**	**percentage of respondents**
Ways of motivating employees				
Training programs	5	83%	1	25%
Effective supervision	4	67%	3	75%
Serene work environment	4	67%	2	50%
Incentive and reward systems	6	100%	2	50%
Evaluating Employee performance				
Evaluating performance of employees on the job	2	33%	2	50%
In house performance management tools	5	83%	3	75%

Source: Field Data Analysis, 2015

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5.1.3 Flexibilities of OMCs and BDCs

This section covers the flexibility practices of the Bulk Distribution Companies as well as the Oil Marketing Companies. Flexibility examines the firm's ability to adjust to uncertainties that may occur in the operations of the business. A flexible organisation is believed to be more profitable than an organisation that is not able to adjust to changes within its business environment. The flexibility practices are described in terms of three main items namely product flexibility, volume flexibility and information system flexibility.

5.1.3.1 New Product flexibility

Most of the respondents from the Bulk Distribution Companies attested to the fact that they do not produce nor distribute any new product apart from the standard fuel types they are meant to distribute. However, respondents from the Oil Marketing Companies made mention of additives. These additives are special chemicals that are added to standard fuel commodities to improve upon the performance of the engines or machines that use the petroleum products.

For example, an Oil Marketing Company noted of a type of gasoline that has been enriched with nitrogen and is said to give an extra protection to the machine valves and fuel injectors. Another Oil Marketing Company added that they also provide diesel additives that provide extra advantages of reduced fuel consumption and a protection of the parts of the engine of the machine. An additive such as Tetra-ethyl lead is said to reduce rate of engine knocking particularly in jet engines. This form of additive is mostly called an "antiknock agent." Environmental conservation was said to be ensured as these additives are said to help reduce emission of carbon dioxide and other pollutants to the environment.

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5.1.3.2 Volume flexibility

Volume flexibility deals with the ways to adjust volumes of products so as to meet increasing or decreasing demands. It has also been noted that the purpose of ensuring volume flexibility is to meet changes or fluctuations in demand. In order to guarantee that customers' demands are met, the Bulk Distribution Companies ensured that they hold large volumes of fuel at every point in time. This is so as over 60% of companies had more than one storage facility. These storage facilities are to help them keep volumes of the product to meet increasing demands of the customers. When asked of actions taken in the case of a sudden decrease in demand, respondents of these BDCs noted that this occurred in extremely rare situations. However, occurrences of such nature allow for managers to consider selling off the products at cheaper prices to the Oil Marketing Companies. This does not occur in reality as respondents have even noted that events of a decrease in demand occur in rare instances.

Similar strategies were outlined by the managers of the Oil Marketing Companies. However they added that in addition to holding large volumes of fuel for their customers, they also make sure that they have sufficient number of tankers to carry fuel at all times. Respondents from the Oil Marketing Companies did not make any mention of additional storage facilities. They are also seen to have more than one Bulk Distribution Company as their supplier. Therefore in times of a rise in demand, they look out for other Bulk Distributors to deal with.

In responding to volumes of demand, a respondent from one Oil Marketing Company made mention of demand forecasting. In demand forecasting, they would anticipate the future demand based on existing data available to them. In addition, he made mention of constant communication between the Oil Marketing Company and their customers. Since most of these customers of the Oil Marketing Companies are mainly mining and construction companies that

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have major projects to undertake which will require different fuel usage, the Oil Marketing Companies keep in constant communication in order to have the needed information.

In responding to strategies for responding to lower demand, respondents from the Oil Marketing Companies noted that they would not consider selling at cheaper prices as a first option. They would rather look out for new customers and would only sell at cheaper prices if only they do not find new customers. They will thus present proposals to other organisations they would keep as new customers.

5.1.3.3 Information system flexibility

Information system flexibility ensures that the varying information needs of the customers are met. Managers of both Bulk Distribution Companies and Oil Marketing Companies attested to the fact that information needs of the customers are met through the periodic reports that are made available. These forms of information include information on product availability, product quality and other pieces of information as listed in Section 5.1.2.2 of this chapter. In addition, certain pieces of information are given on the websites of the companies for the customers to access. As it was investigated, all the companies that were involved in this study had websites where customers could easily access information such as product availability and pricing. This holds for both the Bulk Distribution Companies as well as the Oil Marketing Companies.

Keeping information on these computer systems requires that the hardware and software components need to be updated on a regular bases. Only a single respondent from a Bulk Distribution Company noted that the hardware and software components of the computer systems are changed consistently. Majority of the respondents noted that these updates are done as and when the need arises. Similarly, Oil Marketing Companies added that updates are not

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often carried out and these are done as and when the need arises just as in the case of the Bulk Distribution Companies.

5.1.4 Responsiveness of OMCs and BDCs

Responsiveness is important because it is considered as a key driver to organisational performance. This section therefore presents the practices of the Oil Marketing Companies and the Bulk Distribution Companies in ensuring that they are responsive to their customer's demands. Responsiveness is analysed in two items namely responsiveness towards product delivery and response to customer complaints.

5.1.4.1 Product delivery responsiveness

In terms of delivery of the products, the Bulk Distribution and Oil Marketing Companies predominantly make use of vehicular transport in delivering their products to their customers. For most Bulk Distribution Companies, customers provide their own forms of transport. This could be because most of the Oil Marketing Companies were in existence before the Bulk Distribution Companies so they have their own means of transport. These come in the form of tankers in varying sizes, depending on the amount of petroleum product needed. Details of the delivery modes are as given in Table 5.4.

To shorten service time, sequencing of orders is very important to consider in fulfilling orders made by customers. However, none of the companies use the earliest due date, shortest processing time or any of the other sequencing rules apart from the first come, first served rule. We believe that this is the best sequencing rule to use in this circumstance. These hold for both the Bulk Distribution and the Oil Marketing Companies.

However in special cases where there are product shortages and demand urgencies, the first come first served technique is relaxed. When these situations occur, the companies either fulfil

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demands based on the urgency of the demand or would resort to preferential treatment. Under preferential treatment, the companies would prefer to serve their customers that bring them more income than the other customers. In a case in point, a respondent noted:

"Normally it is First-Come-First-Served, but in cases where there is shortage of product, we decide to serve our bigger customers first. Obviously any businessman will see to his bigger customers first."

5.1.4.2 Response to customer complaints

Managers from the Bulk Distribution Companies noted product unavailability or product shortages as the major complaints that are given by their customers. Another likely customer complaint is the occurrence of cross contamination. Cross contamination in fuel products occur when different fuel products of different densities get mixed up. This however occurs in rare cases. For the Oil Marketing Companies, the major source of customer complaints arose from the impolite behaviours that are exhibited by the pump attendants and other workers of the company. Managers from the Oil Marketing Companies also reported that events of cross contamination also occurred in rare situations.

In order to respond to these customer complaints Bulk Distribution Companies noted that the products that get mixed up as a result of cross contamination are sent back to the refinery for re-distillation. In situations of fuel shortages, Bulk Distribution Companies mainly go through a process of reconciliation by analysing the supply chains in order to track the point of shortage. Whilst product recalls occur in rare cases, others respond to complaints on product unavailability by assuring them of their constant communication with other suppliers to curb the fuel shortages. Details of the forms of customer complaints are as given in Table 5.4.

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For the Oil Marketing Companies, responses to product quality complaints are done through careful investigation. Payments for damages are made when the company realises that the poor quality is coming from them. In situations of truck breakdowns, tanker drivers are monitored closely during their delivery to ensure safe delivery. When the rare case of cross contamination occurs during periods of dispensing fuel for the end users, the company addresses the issue by draining the fuel and adding their additive in the fuel tank of the particular vehicle. The additive burns up the contaminated fuel and clears it off. In situations of indecent behaviours, employees are queried and appropriate sanctions are applied.

Table 5. 4: Responsiveness of BDCs and OMCs

	BDCs		OMCs	
Item	**number of respondents**	**percentage of respondents**	**number of respondents**	**percentage of respondents**
modes of delivery				
Road/Vehicular Transport	4	67%	4	100%
Air	1	17%	0	0%
Sea	2	33%	0	0%
Pipelines	1	17%	0	0%
Sequencing Techniques				
First come first served	6	100%	3	75%
Based on urgency of demand	2	33%	2	50%
Preferential Treatment	2	33%	1	25%
Major Customer Complaints				
Cross contamination	2	33%	1	25%
Product Unavailability	6	100%	1	25%
Truck breakdowns	1	17%	2	50%
Product Quality		0%	1	25%
Indecent behaviours of attendants		0%	4	100%

Source: Field Data Analysis, 2015

5.1.5 Cost effectiveness of BDCs and OMCs

Being cost efficient involves strategies that are made to reduce operational costs and wastage in the operations of an organisation. The major source of wastage that was attributed to the Bulk Distribution Companies was demurrage. Demurrage is the penalty that is due to an

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organisation when they keep vessels for longer periods during their product or load discharge operations. The Oil Marketing Companies on the other hand indicated pilfering as their major source of waste. As already seen in the previous section, pilfering comes as part of the indecent behaviour of employees of the organisation. Respondents from both the OMCs and BDCs also made mention of loading smaller orders as another source of waste. Thus the time and resources required to load larger orders is almost equal to that required to load smaller orders.

In a bid to reduce operational costs, managers generally tend to use inventory management techniques. These techniques include setting stock levels to prevent overstocking and understocking. Some also regulate their purchasing procedures in order to control costs incurred as a result of inventory holding. In addition to these inventory management techniques, an Oil Marketing Company stressed on the importance of energy conservation as a way to reduce costs. To this the respondent stated that:

"We make a conscious effort to conserve energy, for instance, we switch off all our electric devices when leaving the office and we do not use the air conditioners often."

Another respondent from an Oil Marketing Company also made mention of the fact that they undergo series of cost benefit analysis in their operations. Thus they weigh alternative methods of carrying out activities in line with their cost involved and the value of output or benefits that will be gained by the organisation. The details of the respondents are as given in Table 5.5.

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Table 5. 5: Cost efficiencies of OMCs and BDCs

	BDCs		OMCs	
item	**number of respondents**	**percentage of respondents**	**number of respondents**	**percentage of respondents**
Sources of wastage				
Loading Small Orders	1	17%	1	25%
Pilfering	2	33%	3	75%
Demurrage	4	67%	2	50%
Reducing operational costs				
Inventory management	5	83%	2	50%
pipeline losses elimination	1	17%	0	0%
Energy conservation			1	25%
Cost benefit analysis			1	25%

Source: Field Data Analysis, 2015

5.2 End user analysis

This section gives a presentation of the findings from the end users. The end users are taken to be the users of the petroleum products. They are mainly vehicle owners who buy petroleum products from the filling stations. In addition, the respondents are also made up of people who use other petroleum product for their factories and liquefied petroleum gas (LPG) for domestic use. Data was collected from the end users using questionnaires. A total of 300 copies of the questionnaires were sent out and 240 copies were retrieved. This gives a response rate of 80%. This sample size was above the minimum required sample size of 227 that was obtained by using the sample size determination formula (see Section 4.4.2)

5.2.1 Demographic characteristics of respondents

This section presents the characteristics of the respondents in terms of the gender of the respondent, their age groupings, and the type of product they use and lastly the purpose of the use of such products. Information provided in Table 5.6 gives details of the characteristics of the respondents. These respondents are end users of the petroleum products.

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The information as given in Table 5.6 indicates that most of the respondents were males as compared to the female respondents. The most predominant age groupings were for those between the ages of 21 to 40 years as they formed over 75% of the total number of respondents. Respondents below 21 years formed the least represented group of respondents.

Petrol emerged as the most predominant petroleum product that is being used by the respondents as over 76% of the respondents were seen to be using this kind of petroleum product. Petrol was basically used on a private basis. Thus respondents mostly use it to fuel their personal vehicles and also for use as source of fuel in their homes. Other forms of petroleum products as identified included the premix fuel, gasoline, and others like “Shell V Power” which is provided by a specific Oil Marketing Company.

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Table 5. 6: Demographic Characteristics of respondents

Item	Number of respondents	Percentage of respondents
Gender		
Male	122	49.2%
Female	118	50.8%
Age grouping		
Below 21 years	5	2.1%
21-30 years	97	40.4%
31-40 years	85	35.4%
41-50 years	39	16.3%
above 50 years	14	5.8%
Type of product used[2]		
Petrol	184	76.7%
Diesel	54	22.5%
Kerosene	26	10.8%
LPG	25	10.4%
Others	8	3.3%
Purpose of usage		
Personal use	189	78.8%
Industrial use	5	2.1%
Company use	15	6.3%
Both personal and company use	31	12.9%

Total sample size: 240
Source: Field Data Analysis, 2015

5.2.2 Measurement model assessments

A confirmatory factor analysis technique was used to analyse the reliability and validity of the research instrument. A partial least squares estimation was used in assessing the reliability of the items. The analysis was done using the SmartPLS software and constructs were measured reflectively. Thus, the indicators are viewed to be influenced by the underlying construct. There were two main validity tests that were conducted for this study – the construct (convergent) validity tests and the discriminant validity tests.

[2] These percentages do not necessarily sum up to 100% as respondents could choose more than one item.

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5.2.2.1 Construct validity

Construct validity ensures that the constructs identified are truly reflected by their indicators using the various loadings. Thus items that described each of quality, flexibility, responsiveness and cost were taken through the construct validity tests. Construct validity was assessed using the composite reliability score and the average variance extracted (AVE) measures. Composite validity is a measure of internal consistency which measures the degree to which the indicators of a construct combine. The rule of thumb for an acceptable internally consistent score is 0.7 (Nunnally, Bernstein & Berge, 1967). Average variance extracted describes the proportion of the variance that is explained by the indicators in relation to a specific construct. The rule of thumb for an acceptable AVE score is 0.5 and above. The various factor loadings are as given in Appendix I.

Quality

In all there were a total of 17 items that were used to describe the concept of quality. The 17 items are further broken down into four sub categories namely management leadership, quality data, employee focus and customer focus. The composite reliability scores and the AVE scores for the quality constructs are as given in Table 5.7. The composite reliability scores for all the constructs are seen to be above the threshold of 0.7. Similarly the AVE scores are also above the 0.5 threshold. This therefore shows that the items are good indicators for quality.

Flexibility

For this study, a total of 11 items were used to describe the concept of flexibility. These 11 items were broken down into three sub groupings namely new product flexibility, volume flexibility and information system flexibility. The composite reliability scores for the items that

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describe flexibility show scores above the 0.7 threshold (see Table 5. 7) indicating that the items described are good indicators for the construct of flexibility.

Responsiveness and cost

Responsiveness was measured using seven items whereas cost was measured using three items. As seen in Table 5.7, the constructs have AVE scores and composite reliability scores greater than the benchmark of 0.5 and 0.7 respectively. These scores give an indication that the items used to describe the constructs of responsiveness and costs are good indicators of the constructs.

Second order constructs

Second order constructs are also latent variables that are formed by another group of latent variables. For instance, in this study, the four latent constructs on management leadership, quality data, customer and employee focus are described by the quality construct. Similarly, product, volume and information system flexibility are also described by the flexibility construct. Similar tests of convergent validity were conducted for these second order constructs and the results indicate internally consistent scores. The values are as given in Table 5.8.

Table 5. 7: Convergent validity tests for the constructs

Latent Variable	AVE	Composite Reliability	Cronbach's Alpha
Quality			
Customer Focus	0.78	0.93	0.90
Employee Focus	0.74	0.94	0.91
Management Leadership	0.68	0.91	0.88
Quality Data	0.74	0.89	0.82
Flexibility			
New Product Flexibility	0.63	0.87	0.81
Volume Flexibility	0.75	0.90	0.83
Information System Flexibility	0.67	0.89	0.83
Responsiveness	0.64	0.93	0.92
Cost	0.73	0.89	0.82

Source: Field Data Analysis, 2015

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Table 5. 8: Convergent validity test for second order constructs

Latent Variable	AVE	Composite Reliability	Cronbach's Alpha
Quality	0.58	0.96	0.95
Flexibility	0.55	0.93	0.92

Source: Field Data Analysis, 2015

5.2.2.2 Discriminant validity measures

Discriminant validity ensures that the items that measure a construct are unique in serving as indicators to the construct. Thus it does not relate more to other constructs than to the construct it is meant to measure. Discriminant validity compares the average variance explained by the indicators in each of the constructs to the squared correlations between the constructs. The rule of thumb for discriminant validity tests ensures that the square root of the average variance extracted for a construct exceeds the correlations it has with other constructs.

Table 5.9 gives the results of the discriminant validity tests. The diagonal elements represent the square root of the AVE of the various latent constructs. The results of the discriminant validity tests indicate that truly the indicators are unique in measuring its construct and hence there are no higher correlations between the constructs.

Table 5. 9: Discriminant Validity Tests

Items	Cost	Flexibility	Quality	Responsiveness
Cost	**0.85**			
Flexibility	0.72	**0.74**		
Quality	0.67	0.64	**0.76**	
Responsiveness	0.691	0.63	0.64	**0.80**

Source: Field Data Analysis, 2015

5.2.3 Importance of the constructs of customer satisfaction

As seen from the previous chapter, respondents were made to rate the importance of the identified constructs of quality, flexibility, responsiveness and cost on a seven point scale from one to seven with 1 indicating an item of no importance and 7 indicating a highly important

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item. This was done in order to meet the second objective and to provide a basis for the third objective of this study. Thus for the purpose of providing a useful model it is necessary that we identify whether differences exist among the four components of customer satisfaction.

5.2.3.1 Quality scores

The average score and its accompanying standard deviation for each item were computed for each of the constructs. On the basis of quality, the three top items with the highest average scores were continuously improving the customer relationship management process (Mean = 5.31, SD = 1.69), management having a focus on customers (Mean = 5.30, SD = 1.77) and top management involvement in quality issues (Mean = 5.28, SD = 1.55).

The three items with the least average scores were data and information accessibility (Mean = 4.96, SD = 1.66), the reliability of data (mean = 4.88, SD = 1.71) and effective employee involvement in quality related issues (mean = 4.84, SD = 1.71).

5.2.3.2 Flexibility scores

On the basis of flexibility, the top three items were the ability to adjust the capacity to meet changes in the requirements of customers (Mean = 5.28, SD = 1.58), ability to meet the information needs of customers (Mean = 5.25, SD = 1.76) and the ability to meet the volume requirements of the customers (Mean = 5.24, SD = 1.62).

Similarly the three items with the least average scores were the ease of modifying existing petroleum products (Mean = 4.74, SD = 1.34), the involvement of customers and suppliers in the development of new products (Mean = 4.64, SD = 1.1.56) and the development of a number of new petroleum products (Mean = 4.60, SD = 1.57). The average scores for the quality and flexibility items are as given in Tables 5.10 and 5.11 respectively.

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5.2.3.3 Scores on responsiveness and cost

For responsiveness, the item with the highest average rating was the ability of the company to respond to demand fluctuations in a timely manner (Mean = 5.51, SD = 1.54). The next highest ranked items were the timely delivery of products and services (Mean = 5.46, SD = 1.54) and shortened lead times (Mean = 5.34, SD = 1.64). The items with the least average score were items related to timely information exchange and making sure that special customer requirements are met on time.

Three items were used to describe the dimension of cost and for this, respondents considered that the price of the products having a good value for money is the most important aspect to consider (Mean = 5.52, SD = 1.73). The average scores for responsiveness and cost are as given in Table 5.12.

5.2.3.4 Components of Customer Satisfaction

The scores on customer satisfaction are as provided in table 5.13. This was for respondents to provide their general level of satisfaction in relation to quality, flexibility, responsiveness and cost. Generally, scores were quite higher however satisfaction with responsiveness (Mean = 4.46, SD = 1.48) and satisfaction with quality standards of OMCs and BDCs were the highest rated items (Mean = 4.45, SD = 1.47).

5.2.3.4 Comparison of the constructs

To ascertain the existence of differences in terms of importance ratings among the four constructs, an Analysis of Variance (ANOVA) test was used. The results of the ANOVA test showed substantial differences between the average scores in relation to the four identified components ($F = 6.64$, $p = 0.00$).

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To find out which components differ significantly, the Tukey's LSD procedure was used. The procedure compares the differences in the scores for a pair of constructs at a time. The tests showed that differences existed at a 5% level of significance, between items that concerned cost and quality ($p < 0.05$), and cost and flexibility ($p < 0.05$). Substantial differences also existed in the scores between responsiveness and quality ($p < 0.05$) as well as responsiveness and flexibility ($p < 0.05$). However, there were no differences between scores on quality and flexibility ($p > 0.05$) as well as responsiveness and cost ($p < 0.05$). The results of the Tukey's LSD procedure are as shown in Table 5.14. The table shows the absolute differences in means between each of the constructs and the values in parenthesis represent the p values. The values in the table indicate that substantial differences exist in the ratings given on the dimension of quality and responsiveness as well as quality and cost. Similarly there are differences in the importance ratings on the dimension of flexibility and responsiveness as well as flexibility and cost.

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Table 5. 10: Importance ratings of quality dimensions

Item	Grouping	Mean	Median score	Standard Deviation
Continuously improving the customer relationship management process	CF	5.31	6	1.69
Management having a focus on customers	CF	5.30	6	1.77
Top management involvement in quality issues	ML	5.29	6	1.61
Management aligning quality management issues in business objectives	ML	5.28	6	1.55
Continually improving the process of refining petroleum products	CF	5.25	6	1.61
Resolving customer complaints	CF	5.23	6	1.83
Top management evaluating and monitoring performance	ML	5.21	6	1.65
Providing reward systems and incentives to employees	EF	5.18	5.5	1.65
Management benchmarking their performance to world class organisations	ML	5.15	6	1.68
Effective employee training	EF	5.15	5	1.69
Providing a conducive work environment for employees	EF	5.14	5	1.74
Managers setting objectives for performance	ML	5.09	5	1.70
Timely review and update of all forms of data	QD	5.03	5	1.60
Ensuring the personal growth of employees	EF	4.97	5	1.66
Data and information accessibility	QD	4.96	5	1.69
Reliability of data	QD	4.88	5	1.71
Effective employee involvement in quality related issues	EF	4.84	5	1.71
Overall average	**5.12**			

Source: Field Data Analysis, 2015

Key: ML – Management Leadership
CF – Customer Focus
EF – Employee Focus
QD – Quality Data

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Table 5. 11: Importance ratings of flexibility dimensions

Item	Grouping	Mean	Median score	Standard Deviation
Ability to adjust capacity to meet changes in customer requirements	VF	5.28	6	1.58
Meeting the information needs of customers	ISF	5.25	6	1.76
Meeting volume requirements of customers	VF	5.24	6	1.62
Installing and maintaining IT applications	ISF	5.19	5	1.66
Speed of information flow throughout all the stages of the supply chain	ISF	5.05	5	1.61
Ability to proportionally adjust volume without compromising on quality	VF	5.00	5	1.71
Ability to customise a petroleum product to meet a specific need	PF	4.94	5	1.74
Getting large range of different petroleum products	PF	4.91	5	1.54
Ease of modifying features of existing petroleum products	PF	4.74	5	1.34
Involving suppliers and customers in the development of new products	PF	4.64	5	1.56
Developing a number of new petroleum products	PF	4.60	5	1.57
overall average			**4.98**	

Source: Field Data Analysis, 2015

Key: PF – Product Flexibility
VF – Volume Flexibility
ISF – Information System Flexibility

Table 5. 12: Importance ratings of responsiveness and cost dimensions

Item	Mean	Median score	Standard Deviation
Responsiveness			
Meeting special customer service requirements on time	5.19	6	1.76
Response to demand fluctuations in a timely manner	5.51	6	1.54
On time delivery of products and services	5.46	6	1.55
Short time interval between order and delivery	5.34	6	1.67
Adequate storage facilities	5.31	6	1.62
Quick response to machine breakdowns	5.24	6	1.58
Timely information exchange	5.19	6	1.59
Making customised products in an acceptable timeframe	5.16	6	1.59
Overall average		**5.30**	
Cost			
Price of products meeting customer expectations	5.45	6	1.68
The price of the products having a good value for money	5.52	6	1.73
Overall average		**5.49**	

Source: Field Data Analysis, 2015

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Table 5. 13: Scores on customer satisfaction

Item	Mean	Std. Deviation
Satisfaction with quality standards	4.45	1.47
Satisfaction with quality of service	4.26	1.49
Satisfaction with flexibility systems	4.14	1.52
Satisfaction with pricing	4.05	1.66
Satisfaction with responsiveness	4.46	1.48
Satisfaction with attitudes of pump attendants	4.20	1.55
Overall level of satisfaction	4.29	1.48

Source: Field Data Analysis, 2015

Table 5. 14: Results of the Tukey's LSD test

	Quality	Flexibility	Responsiveness	Cost
Quality				
Flexibility	0.15 (0.054)			
Responsiveness	0.19 (0.029**)	0.33 (0.001***)		
Cost	0.24 (0.04**)	0.39 (0.002***)	0.06 (0.655)	

** Difference significant at 5% level of significance
*** Difference significant at 1% level of significance

Source: Field Data Analysis, 2015

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CHAPTER SIX

DISCUSSION OF FINDINGS

6.0 Introduction

This chapter gives a detailed discussion of the findings presented in the previous chapter. The chapter is divided into five sections. The first four sections present discussions that are based on the quality management practices, flexibility practices, responsiveness and cost efficiency practices by the Bulk Distribution Companies and the Oil Marketing Companies.

The fifth section presents discussions on the importance of the identified components of customer satisfaction as expressed by end users of the petroleum products. This section also compares the importance of the four components of customer satisfaction as expressed by the end users.

6.1 Quality management practices of OMCs and BDCs

This section gives a discussion on the industry practices based on quality management. The issues that are discussed in this section relate to management leadership, quality data, employee focus and customer focus.

6.1.1 Discussions on management leadership

The findings from the data collected reveal that quality is important to consider in the downstream oil industry. The three major goals set by management are to achieve efficiency, enhance productivity and to reduce customer complaints. Enhancing efficiency became the goal that was affirmed by most of the respondents especially with those from the Bulk Distribution Companies. This is so as management links efficiency to a satisfied customer. Thus if efficiency is ensured, it will lead to higher productivity and eventually a satisfied customer that will lead to reduced customer complaints. The benefits of all these to the BDCs

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is higher profitability. This is also expressed in the findings of Heikkilä (2002) who links efficiency to higher degree of customer satisfaction.

The efforts of quality management are assessed majorly by analysing inventory and other operating costs that are incurred by the organisation. Thus if these costs are minimised in the long run, then the quality management efforts have succeeded. It is the responsibility of management to ensure that efforts in quality management are assessed using the right techniques. In accordance with the study by Sit et al, (2009), management must clearly consider customer feedback in their quality improvement plans. However this study reveals that customer feedback is rarely assessed as only one respondent attested to it as a means of assessing quality management efforts.

Ishikawa (1985) propounded seven basic tools for identifying quality problems and their causes. It is also the responsibility of management to ensure that employees are trained in how these tools are used. Out of the seven basic tools, three were considered widely used in this study. Check sheets were widely used by both Bulk Distribution Companies and Oil Marketing Companies. Scatter plots were also used by some Bulk Distribution Companies and a few Oil Marketing Companies. The reason for the extensive use of the check sheets could be due to its ease of use and interpretation. Similarly the narrow use of process control charts by both Oil Marketing Companies and Bulk Distribution Companies could also be attested to the fact that compared to check sheets, process control charts are difficult to construct and interpret. It is important however for Oil Marketing Companies to utilise process control charts since they also produce new products – fuel additives. These will help them to ensure that their production processes are in control.

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6.1.2 Discussions on quality data

Bulk Distribution Companies and Oil Marketing Companies make information on their product pricing and product availability accessible to their customers. These companies also made efforts on their social responsibilities available for customers and the general public. These are all strategies that are to enhance the image of the organisation in the eyes of the customer. It has been realised that Bulk Distribution Companies keep data on oil marketing companies whilst the Oil marketing Companies also keep data on their customers including the mining and construction companies.

The findings of this study indicated that suppliers or distributors do not generate orders for their customers. Russell and Taylor (2010) note that it is necessary for suppliers to keep data on their customers in order to generate their orders. This relieves the buyer or customer from certain tasks which in turn increases the efficiency of the supply chain. Since most of these communications are done through electronic data interchange, suppliers and customers benefit from the speed of processing information. Distributors on the other hand are able to plan well to keep up with orders from their customers. This is because they manage the orders and the inventories of the customers. This process is known as Vendor Managed Inventory.

On the other hand, respondents also noted that information that are related to their strategies are withheld from the public. This is because these sources of information are basis for competitive advantage on the part of the Bulk Distribution Companies and the Oil Marketing Companies. The study further reveals that conscious efforts are made by management in reviewing information as consistently as possible. This is beneficial as quality data has been seen to help in the prevention of the bullwhip effect along the supply chain (Bayraktar et al , 2008).

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6.1.3 Discussions on customer focus

The primary initiative to maintain customer focus along the oil supply chain is to ensure that the expectations of the customers are duly met. The study found out that both Oil Marketing Companies and Bulk Distribution Companies are customer flexible in their dealings with their respective customers. Thus, they are willing to meet the changing expectations of the customers. Bulk Distribution Companies also ensure customer closeness through their marketing staff who help them in determining product requirements as deemed by the customer.

Thus, out of the forms of customer focus outlined by Jeong and Hong (2007), customer closeness is practiced mainly by the Bulk Distribution Companies whilst customer flexibility is practiced by both Bulk Distribution Companies and Oil Marketing Companies. Customer accessible which is defined as the willingness of the firms in the supply chain to allow customers to access needed information is also seen across both entities.

6.1.4 Discussions on employee focus

As advocated by Satish et al (2001), effective training lies at the heart of any organisation. This was also noted by the respondents within the companies that partook in the study particularly the Bulk Distribution Companies. The respondents emphasised on training as a pillar to employee development. The study also recognised that training does not only take the form of a formal classroom structure but also in informal situations where employees are provided the needed coaching whilst on the job.

With the advent of information communication technologies, training has taken on a different form where employees are made to develop themselves through the use of internet facilities and electronic means of sourcing knowledge. Hence the need for virtual libraries. Aside these training structures is the need for effective reward and remunerations systems for the

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employees. In line with the findings by Yunis et al (2013), this study sees that within both Bulk Distribution and the Oil Marketing Companies, employees are duly compensated and rewarded for their performance.

6.2 Flexibility practices of OMCs and BDCs.

Flexibility practices are done to ensure that the organisation responds to changes that may occur in the internal and external environment the organisation finds itself within. This section discusses issues that are related to new product flexibility, volume flexibility and information system flexibility.

6.2.1 Discussions on new product flexibility

New product flexibility was absent in the Bulk Distribution Companies. This is because fuel types are more standardised and hence the Bulk Distribution Companies sell these standardised fuel types to the Oil Marketing Companies. Secondly, it is seen that because production is not the core competence of a Bulk Distribution Company, new product flexibility is non-existent.

New product flexibility however exists within the Oil Marketing Companies. The study noted that the multinational Oil Marketing Companies produce other special petroleum products that contain special additives to enhance the product's efficiency. For example, Shell Ghana produces the Shell V power that is meant to enhance engine performance. This therefore presupposes that aside the trading and marketing of petroleum products, some Oil Marketing Companies are into production of petroleum products though its scale may be small as compared to the mid-stream refineries and the upstream explorers of crude oil. Since Oil Marketing Companies engage in some form of production, it explains the reason for the companies to conduct efficient research and development into new products as outlined by the respondents from the Oil Marketing Companies.

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6.2.2 Discussions on volume flexibility

In order to meet increasing demands from customers, Bulk Distribution Companies tend to store large volumes of fuel to serve as buffers hedging against possible shortages and high demands. In contrast, Chopra and Sodhi (2004) add that increasing inventory levels increase the possibility of the occurrence of bullwhip effects in the supply chain. Therefore, inasmuch as the Bulk Distribution Companies keep large volumes of petroleum products to meet increasing demands, they are required to manage their inventories well so as to prevent costs that arise from excess inventories. Vendor managed inventory practices is useful in this sense. Oil Marketing Companies also make use of demand forecasting where they would anticipate future demand based on available demand data.

In the rare case of a sudden fall in demand, Bulk Distribution Companies considered that they would sell the products to customers at a cheaper price. However this may not be the case in reality as prices of petroleum products hardly decrease. Strategies made by the Oil Marketing Companies in responding to a fall in demand are seen to be better than that of the Bulk Distribution Companies. Thus, whilst the Bulk Distribution Companies respond to falls in demand by selling off products at cheaper prices, Oil Marketing Companies would consider negotiating with new customers who will be prepared to buy the product at the standard price.

6.2.3 Discussions on information system flexibility

The information needs of customers are catered for majorly through the use of periodic reports that are released by both the Oil Marketing Companies and the Bulk Distribution Companies. These pieces of information are mainly kept on the websites of the companies. All the companies surveyed have websites where they make information available to customers. Noting that these work on electronic gadgets, there is the need for maintenance and a regular update of systems.

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Tipu and Fantazy (2014) note on the ease of changing and maintaining hardware and software components of the computer systems as a major contributor to information system flexibility. However, in our study, the updates of these computer systems are not done as consistently as the update of the details of the information. In all the organisations surveyed, respondents noted that updates and maintenance of computer systems are not done on a regular or periodic basis but as and when the need arises.

6.3 Responsiveness of OMCs and BDCs

This section discusses issues that are related to the industry practices in making them responsive. Two major issues are discussed and these are in terms of product delivery responsiveness and response to customer complaints.

6.3.1 Discussions on product delivery responsiveness

In ensuring that organisations are responsive to their customers, deliveries are done mainly using vehicular transport. Bulk Distribution Companies do not provide transportation to Oil Marketing Companies as the Oil Marketing Companies provide their own forms of transport. This may be due to the fact that Oil Marketing Companies have been in existence for longer periods as compared to the Distribution Companies. Therefore they are already equipped with their needed machinery for their operations.

Sequencing of orders is made on a first come first served bases. This form of sequencing allows customers to be served based on the time their orders were placed. This does not however occur in many instances as it was observed that customers are sometimes served on a preferential basis mostly based on the urgency of demand or the relationship between the customer and the supplier.

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6.3.2 Discussions on response to customer complaints

Customer complaints for the Oil Marketing Companies arose majorly from the impolite behaviours of employees especially pump attendants. These behaviours could largely result from poor working conditions (Wicker, 1997). For instance, in Ghanaian fuel stations, fuel attendants are seen not to be properly remunerated. Based on the "working in Ghana" project organised by the Claremont Graduate University (Wicker, 1997), they noted that pump attendants are not given a good remuneration notwithstanding the fact that they worked mostly seven days in a week. For the Bulk Distribution Companies, respondents noted that the customer complaints arise mainly from product shortages or product unavailability. Product unavailability cuts across both Oil Marketing Companies and Bulk Distribution Companies. However these problems are experienced mostly by the Bulk Distribution Companies than the Oil Marketing Companies. Cross contamination has been seen to occur rarely in their operations. This might also be due to the fact that management, being much aware of the potential dangers of cross contamination, do all they can to prevent its occurrence by making proper checks to prevent the wrong kind of petroleum product to be dispatched into their customer's vehicles.

Companies respond to these complaints in a variety of ways. Reacting to these complaints is mostly based on investigation. For example, complaints on product quality are addressed based on an investigation on the causes of the problems. Payments of damage caused are also made as a response to the customer complaints that occur in the organisation.

6.4 Cost effectiveness of BDCs and OMCs

Demurrage has been the major source of wastage that has been attributed by most of the organisations that partook in the study. This is in line with studies by Brown, Graves, and Ronen (1987), Li et al (2012) and Kolodzeij and Kaufmann (2014) who stressed on demurrage

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as a major source of waste for organisations within the downstream oil industry. Pilfering was also considered as another cause of wastage as reported by the Oil Marketing Companies. This could also be attributed to the employees who work directly with end users at the pumps. In other cases tanker drivers may also siphon petroleum products from the tankers and sell to other smaller retailers of petroleum products. As already indicated in the previous section of this chapter, problems with poor remunerations result in poor work behaviours which pilfering forms a major part.

As outlined in the operations management literature, inventory management is important and beneficial as a cost reduction strategy in many organisations. This is also attested to by the respondents on the importance of managing inventories especially on the part of the Bulk Distribution Companies. Though energy conservation is not in itself a technical approach to cost cutting procedures for organisations, it was noted as an important factor to consider. It is necessary to note that more costs are accrued from consumption of electricity and hence the need to conserve energy in the organisation.

6.5 Perspective of end users

This section provides discussions on the importance of quality, flexibility, responsiveness and cost as seen by the end users. End users were mainly the general public who utilise the petroleum products at their work places, in their vehicles and at the homes. They were made to rate the importance of quality, flexibility, responsiveness and cost when considering petroleum products. Confirmatory factor analysis techniques indicate that all the items measuring the four constructs were valid in measuring the constructs. This goes on to further stress on the multidimensionality of the constructs of quality, cost, responsiveness and flexibility.

The section is grouped into four subsections. The first and second subsections discuss issues of quality and flexibility as seen by the end users. The third section takes a look at the

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dimensions of responsiveness and cost efficiency. The last section compares the importance ratings among the four identified components of customer satisfaction.

6.5.1 Quality on the perspective of end users

Items under customer focus were considered important by the end users. Thus, customers considered management having a focus on customers as well as ensuring a better resolution to their complaints as very important. Items under customer focus ranked first under quality management as compared to the other quality management items. Items under management leadership were considered next as most important indicators for quality management. Customers reflected that management in the oil industry should have an interest in quality issues and should align quality management issues in line with their business objectives.

Top management leadership and customer focus are therefore the two aspects of quality management that are considered important by the end users of the petroleum products. Comparing the importance ratings of the aspects of quality, quality data and employee focus were not ranked as important as compared to customer focus and management leadership. This therefore hinges on the findings of Satish et al. (2001) and Foster (2008) who note that customer focus is key to consider in supply chain quality management. In the case of management leadership, this study also highlights the importance of the involvement of top management in quality related issues as outlined by the earlier proponents of total quality management and in recent studies as well (Deming, 1986; Juran; 1986; Wilson & Collier, 2000; Kaynak & Hartley, 2008; National Institute of Standards and Technology, 2012).

6.5.2 Flexibility on the perspective of end users

On the basis of flexibility, customers considered new product flexibility as the least important aspect to consider. This is even so as it was not considered at all on the part of the Bulk

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Distribution Companies. However, Oil Marketing Companies considered new product flexibility since they are also into manufacturing of certain types of petroleum products. This is due to the standardised nature of the petroleum product. Thus, the customer does not really care about management's decision to customise a product or whatsoever.

Nonetheless, customers are concerned with a focus on the organisation's ability to adjust clearly to meet changes that occur in customer's demand requirements, for example, product volumes. In the case of information systems, customers considered that management should be able to meet their increasing information needs, such as product availability, as and when they are required. Therefore in the oil industry, customers consider volume flexibility and the flexibility of information systems as more important than the ease of developing new products.

6.5.3 Responsiveness and cost on the perspective of end users

Customers rated all the aspects of responsiveness as highly important. However, items on product delivery responsiveness was considered most important of all. End users of petroleum products considered that products must be delivered in a timely manner and there should be a short time interval between order and delivery. Since these products have no substitutes, late delivery will mean that customers' vehicles and machines that use these petroleum products will fail to operate. This notion of shortened lead times is also expressed by Catalan & Kotzab (2003) as an important aspect to consider under responsiveness.

On the basis of cost, the end users of the petroleum products believe that prices must be reasonable and must have a good value for money. In addition, the prices of the products must meet the expectations of the customer. This is because pricing is one of the basic tools used by an organisation in a highly competitive industry. As such in a highly competitive oil industry with many suppliers, those that do not use fair prices do not understand the dynamics of competing in such an environment. This is also espoused by Hassan et al (2013) who note that

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management must provide the best pricing plan that shall meet the expectations of the customers.

6.5.4 Components of customer satisfaction compared

The analysis of variance tests was conducted to compare the important ratings of quality, flexibility, responsiveness and cost among the end users. This is to help provide a useful model for the downstream oil supply chain as noted in Section 5.2.3 of Chapter five. Comparing the average ratings, responsiveness and cost were considered as the most important constructs based on the perspective of the end user. Users of petroleum products would prefer that the pricing of the products are reasonable and will provide the best value for the money they pay. In addition customers would want organisations to be responsive in order to meet the service time requirements made by the customers.

The Tukey's LSD test was conducted to investigate the existence of differences in the ratings by making pairwise comparisons between the constructs. The results of the test indicate that whilst there are no substantial differences in the importance ratings between the constructs of cost and responsiveness, there are differences in the importance ratings between responsiveness and quality as well as responsiveness and flexibility. This indicates that the end users of the petroleum products see responsiveness as more important to consider than flexibility and quality.

Similarly there existed substantial differences in the importance ratings between cost and quality as well as cost and flexibility. On the other hand, no substantial differences existed between the importance ratings on the dimension of quality and flexibility. This is to say that end users of petroleum products would prefer a responsive and a cost efficient oil sector as compared to the basis of quality and flexibility.

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CHAPTER SEVEN

SUPPLY CHAIN MODEL FOR IMPLEMENTATION

7.0 Introduction

The supply chain model for implementation incorporates the Deming's wheel or the Plan-Do-Check-Act Cycle (PDCA cycle). This is done in order to achieve the third objective of this study. The PDCA cycle is a continuous improvement tool that involves four major stages. The concept of PDCA was first introduced by Walter Shewart in 1939 who stressed on the notion that a successful organisation constantly evaluates the practices of management. This was modified by Edward Deming as a way of achieving improvement on a continuous basis. The PDCA cycle is a four stage iterative cycle that involves stages of planning, implementation, assessment and improvement. The cycle is briefly discussed here and an application of it is given in the next section. Fig 7.1 gives an outline of the PDCA cycle.

Plan: The planning stage involves a careful study of the process where problems and goals are identified, goals are set and the plans for improvement are set. The goals set at this stage are measurable and attainable goals that will help solve the problem that is identified. It also involves a series of brainstorming, data collection and analysis and these are done to help solve the goal at hand.

Do: This stage is the implementation stage where the planned solution is implemented. This is the stage of action and the execution of the intended plans that are laid out to help solve the problem at hand.

Check: This stage is an assessment stage. Thus the plan is assessed as to whether the goal has been achieved or not.

Act: This is the stage for improvement and setting standards.

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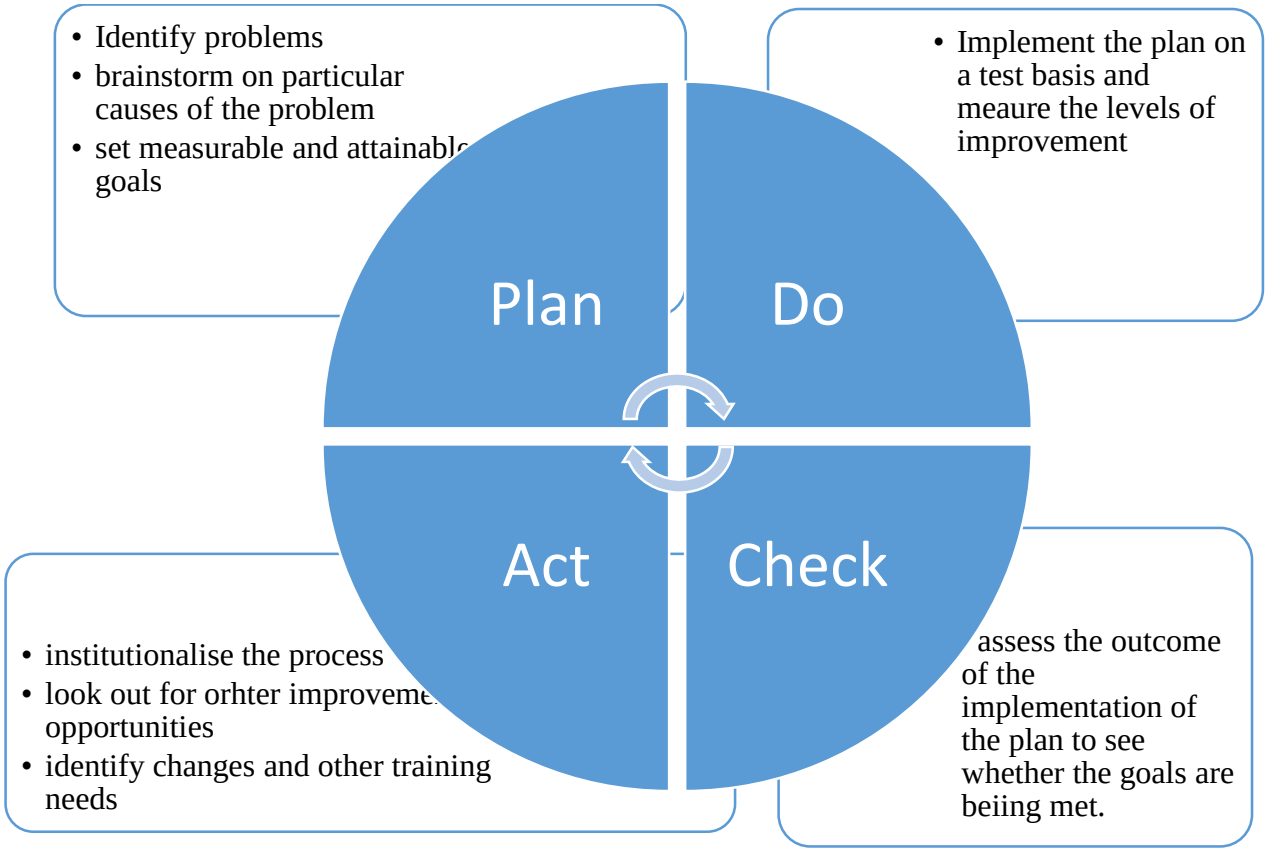
Fig 7. 1: The PDCA cycle



Source: Russell and Taylor (2010)

7.1 PDCA model for a responsive supply chain

The goal of a supply chain is to achieve value throughout each and every aspect of the chain. It has also been identified that the customer is the source of income for all the units within the chain. Customer satisfaction therefore plays a major part in achieving value throughout each unit of the supply chain. Customer satisfaction has been seen to thrive on four components namely quality, flexibility, responsiveness and cost. This model shows ways of attaining the goal of a responsive supply chain. Fig 7.2 shows the PDCA cycle for a responsive supply chain.

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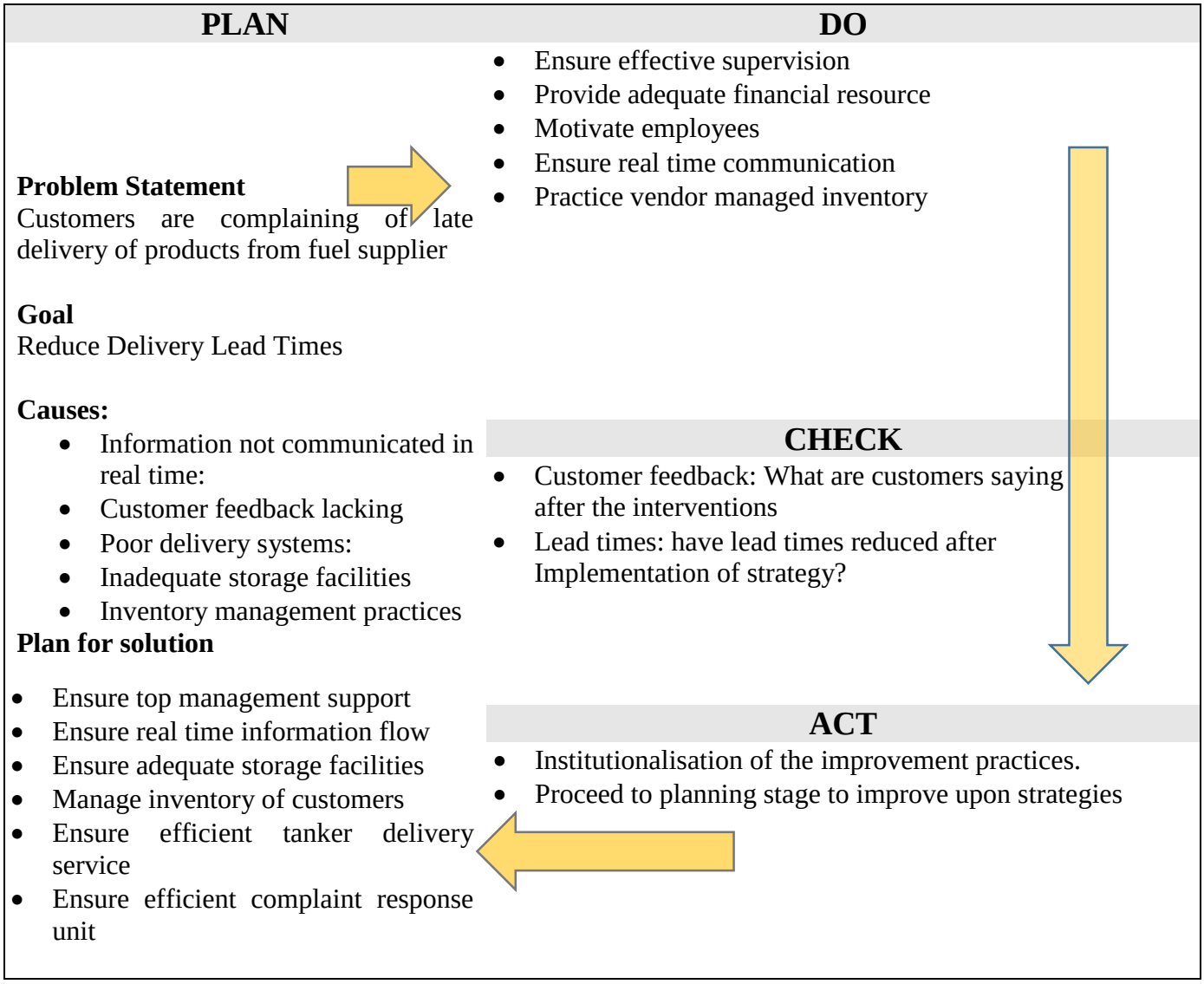
Fig 7. 2: A PDCA cycle for a Bulk Distribution Company



Source: Author's Construct (2015)

7.1.1 Stage one: Plan

In the planning stage, the organisation must identify a problem and proceed to find the potential causes of the problem. For example, management of a Bulk Distribution Company faces a problem of its inability to supply petroleum products to customers (the Oil Marketing Companies) at the right time. This ripples towards the OMCs inability to supply to their customers (industries, manufacturing, construction companies etc.) on time. This consequently causes a delay in the execution of projects outlined by these companies.

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With this problem at hand, management must set a goal towards solving the problem. The ultimate goal for the BDC is to reduce the lead time, thus the time lapse between order and delivery of the product. In order to fully realise this goal, management must set up a team to identify potential causes of the problem.

After a careful investigation on the causes of the problem, the organisation must brainstorm in order to provide a solution to the problem they identified. In this example of the problem of longer lead times, the team must plan to ensure accurate information flow across each member of the supply chain and must also plan to ensure an effective customer feedback system. In addition, the team must plan to institute better inventory management practices and delivery systems. In this example, four causes of the problem of longer lead times have been identified:

Information not communicated in real time: As already noted in previous chapters of this study, accurate and real time information flow are key to every supply chain and also to avoid consequences of the bullwhip effect. Inaccurate information flow results from the inability of the organisations within the supply chain to utilise EDI systems in communicating. Further, it stems from the failure of the organisations to periodically provide maintenance services and updates of their computer systems. These lead to machine break downs and loss of data.

To enhance accurate information flow, the Bulk Distribution Company must make use of enterprise systems. These systems must be integrated among all firms within the supply chain for information to flow smoothly. Secondly, the organisation must maintain and update of computer systems on a regular basis to prevent data loss due to malware attacks and hardware damages.

Customer feedback lacking: When customers are unable to provide feedback to suppliers concerning the product or service provided by the supplier, it is difficult for them to track their performance especially on the perspective of the customers.

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Customers require that most importantly, their issues and complaints must be heard. This means that the organisation must create a platform to provide feedback on the products and the services they pay for. For example, the use of Talk back systems like the Google's Talkbin, where the customer can anonymously text their feedback to a designated phone number. In order to respond to customer complaints, the organisation must ensure an effective customer service management. This must be done through training in customer services relationships in order to serve the customers better. Similarly they must be able to provide first hand and real time information to customers whenever the need arises.

Poor delivery systems: Problems with delivery systems stem from faulty trucks and improper designation of routes. Even though OMCs provide their own form of transport, BDCs could face problems of poor delivery systems when they are receiving from their suppliers.

Customers require that there must be adequate storage facilities in order to prevent shortages. The organisation must utilise vendor managed inventory practices where the suppliers (BDCs) manage the inventories of their customers (OMCs). Similarly, the OMCs must manage the inventories of their customers (industries, mining and construction companies). This is necessary as it helps the suppliers know first-hand when their customers are out of stock.

Inadequate storage facilities and poor inventory management practices: Storage facilities are meant to keep the product whilst anticipating demand. For an organisation with inadequate storage facilities, it implies that the organisation cannot store enough product to meet increasing demand. It was noted from the study that organisations would like to keep large volumes of inventory in order to meet increasing demand. In addition, the study found out that the organisations are seen to keep and manage their own inventory. Thus the Bulk Distribution Companies manage their own inventory and the Oil Marketing Companies manage their own

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inventory. It thus takes some time for orders to be processed as Bulk Distribution Companies would have to be informed of stock outs.

Since timely delivery of products is a basic item to be considered under responsiveness, it is important to highlight on effective transportation services within the organisations in the oil industry. Tankers must be well serviced and quick response to tanker damages or faults is also needed. Preventive maintenance is also necessary. Thus management must ensure that maintenance on the trucks and equipment must be frequently maintained to minimise their chances of failure. This will prevent unexpected machine breakdowns. The project team is also required to set benchmarks to keep them in check. These benchmarks must be measurable and also attainable.

7.1.2 Stage two – Do

After a careful plan, the management must make efforts to implement the plan. Supervision lies at the heart the implementation stage. Without proper supervision, the implementation of the plan shall not produce the needed results. Management must therefore provide the needed supervision within this stage of implementations. They must also ensure that the rules guiding the implementation of the plan are strictly adhered to.

In addition to supervision, management must provide the needed financial resources to help in the smooth implementation of the plans. Relating to the issues of customer relationship management, it would be the duty of top management to ensure that employees are well trained to handle issues that customers may present. Similarly, the employees must be given the needed motivation in order to show positive attitudes towards their work.

7.1.3 Stage three: Check

The checking stage assesses the outcome of the implementation of the plans. At this stage the team must assess the outcome of the implementation. For this particular problem of longer lead

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times, the team must compare the present level of responsiveness as a result of the interventions against the benchmarks they have set.

The team must also assess the performance of these implementations through customer feedback. Customer feedback helps the organisation to get their views of the customer concerning the services provided to them. For example, Bulk Distribution Companies must obtain feedback from the Oil Marketing Companies concerning the quality of the product supplied to them. Similarly, Oil Marketing Companies must receive feedback from their customers from the mining and construction companies on the efficiency of their distribution systems. These must be done through the EDI systems that have been installed and integrated across the supply chain channels. It can also be done through the talkback systems like the Google Talkbin as explained in the preceding section of this chapter.

Employees are motivated in order to unearth the best in them as they perform their tasks. Employees must therefore be appraised periodically to evaluate their performance on the job. Lastly, it is also necessary to check for time lapses between order and delivery. For a responsive supply chain, it is necessary to ensure a short time between order and delivery. Thus in evaluating the strategy for responsiveness, the organisation must assess the extent of the reduction of lead times, the extent of the reduction of periods of shortages and to what extent have customer complaints reduced.

7.1.4 Stage four: Act

This is the stage of adjustment and institutionalisation. Thus if the already identified plan needs to be improved, the cycle is continued with new problems and goals. At this stage, successful plans are also institutionalised and other opportunities for improvement are identified. This is done after the assessment or the checking has been done. Practically, an implementation team is created to ensure successful integration of the improved process

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The successful plans must be maintained and must be used as standards whilst the ones that need improvement must be improved upon. The improvement process also goes through the Plan-Do-Check-Act cycle. Standardised strategies must also go through periodic sessions of evaluation for improvement. This cycle must be endless and continue as long as the supply chain is in existence. Achieving a responsive supply chain is therefore not a one off strategy but a continuous process that will call for changes in strategies at certain times.

7.2 Conclusion

The third objective of this study was to develop a model for an effective supply chain. This was aided by collating the views of the end users with regards to quality, responsiveness, flexibility and cost. The view of the end users were sought as they were made to rate the importance of the four identified components of customer satisfaction. The study realised that responsiveness and cost were the highly important rated dimension followed by quality and flexibility. That is to say, that although quality management is important in the operations of the organisations, it is necessary to also ensure that they are responsive to customers' requests and demands. This model has been applied to responsiveness and can also be used to improve customer satisfaction on the other components namely quality, flexibility and cost.

There are two major items that run through the model that was proposed. These are top management involvement and accurate information flow. These two issues are at the heart of every supply chain and therefore it is not surprising that they also form part of this model. Top management is responsible for adopting strategies for the organisations and hence the failure or success of the supply chain primarily depends on the strategies mapped out by management within the organisations in the supply chain. Accurate information has been espoused into detail and it must thus be noted that without timely and accurate information flow, distortions will abound within the chain.

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CHAPTER EIGHT

SUMMARY, RECOMMENDATIONS AND CONCLUSIONS

8.0 Introduction

The objective of this study was to determine the practices of organisations within the downstream oil supply chain with respect to the dimensions of quality, flexibility, responsiveness and cost. It was also to investigate the level of importance end users of petroleum products attach to each of the four dimensions of customer satisfaction. In addition to this, the study was to propose a model for implementation within the downstream oil supply chain. This chapter presents the summary of the key findings based on the objectives of the study. It also presents certain managerial implications and outlines recommendations for further study.

8.1 Summary of key findings

The study was conducted among three major units of the downstream oil supply chain namely the Bulk Distribution Companies, the Oil Marketing Companies and the end users. There was a total of six respondents from the Bulk Distribution Companies, four respondents from the Oil Marketing Companies and 240 end users of the petroleum products. Response rates for these were 60%, 50% and 80% respectively.

Objective one

The first objective for this study was four fold. This was to investigate practices of firms within the downstream oil industry in terms of quality, flexibility, responsiveness and cost.

Quality Management: The study found that the major reason for ensuring quality standards is to achieve efficiency and these efforts are assessed by analysing certain costs that may be incurred by the organisation. For this objective, the study found out that the both OMCs and BDCs carry out a periodic review of their data and have close interactions with marketing staff. This is to help them ensure that the expectations of customers are duly met. The study also

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found out that research and development mostly done by the OMCs. This is due to the fact that they are into production of certain kinds of petroleum products and therefore more research is needed to develop these new products.

Also the organisations rarely used process control charts in determining whether processes are in control or not. This is particularly so because the organisations within the downstream oil supply chain are mostly not into production or manufacturing. In general data are shared among the units within the chain but certain pieces of information are withheld as these pieces of information are deemed to be sources of competitive advantage. With regard to employee focus it was noted that effective training is enhanced among both Oil Marketing and the Bulk Distribution Companies. Training may take any form from formal classroom training to informal ways like training on the job and coaching.

Flexibility*:* In terms of flexibility, the study found out that new product flexibility was only found existent among the OMCs rather than the BDCs. This is because production is not the core duty of the Bulk Distribution Companies. Secondly the study found out that both OMCs and BDCs do store up large volumes of products to serve as buffers hedging against product shortages and increase in demands. Volume flexibility therefore exists among both the OMCs and the BDCs. Thirdly, the study also noted that strategies to meet the rare case of the sudden fall in demand were different across the OMCs and the BDCs. OMCs consider sending proposals in order to look for more customers. This is seen to be more laudable than the BDCs considering to sell off products at cheaper prices in the sudden case of a fall in demand.

Responsiveness: In terms of responsiveness, the study found that deliveries of petroleum products are generally done on a first come first served basis and transportation is mostly done using vehicular transport. Vehicular transport is thus used from the Bulk Distribution Companies to the Oil Marketing Companies and from the Oil marketing Companies to the final

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end users of the petroleum product. It was also noted that the organisations within the chain also work towards responding to customer complaints as a way of ensuring responsiveness to their customers.

Cost*:* In terms of cost, the study identifies that aside proper inventory management practices, it is necessary to consider energy conservation as an effective cost cutting mechanism for the organisations within the chain.

Objective two

The second objective sought to investigate the importance end users of petroleum products place on each of the four components of customer satisfaction. The study found out that respondents do not place equal importance on the four constructs. Rather, customers place much importance on attributes related to responsiveness and cost than on items related to quality and flexibility. The third objective is as espoused in the model given in chapter seven.

8.2 Managerial implications

The study has identified that top management involvement and accurate real time information exchange is critical to the success of a supply chain. It is thus necessary to ensure that management must map out strategies that are aimed at the success of the supply chain. For instance, particularly with the Oil Marketing Companies, there is the need to stress on process control to identify problems of variability during production of their fuel additives. Information must not be withheld from members within the supply chain.

The organisations must be responsive in their operations. Thus there must be quick response to customers' demands and queries as well as a quick resolution to their complaints. This could be done by ensuring real time information sharing. This is ensured with the use of Electronic Data Interchanges (EDIs) as well as a regular maintenance and updates of computer systems.

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Proper inventory management practices have been noted to reduce high costs of keeping inventory whilst ensuring a responsive supply chain. Vendor managed inventory takes away the pressure of an organisation managing its own inventory and it helps to minimise excess production. It is thus necessary for all organisations within the supply chain to consider vendor managed inventory as a way of reducing costs whilst ensuring responsiveness. Quality and flexibility issues are not left out. These issues are more fixated on customer focus and meeting volume requirements of customers on a regular basis.

8.3 Conclusion and recommendations for future research

This study puts together issues surrounding customer satisfaction with reference to quality, flexibility, responsiveness as well as cost efficiency and places them within a supply chain context. Secondly this study incorporates industry practices, preferences from the end users and findings from the literature in proposing a model for the downstream oil supply chain.

Within the proposed model the study noted that the items under quality, flexibility, responsiveness and cost are multidimensional constructs. The multidimensionality of the constructs asserts that there is not a one size fits all strategy for ensuring customer satisfaction within the oil industry. Secondly these constructs do not exist in isolation as they mostly overlap. For example accurate data is a quality dimension but is also assessed under the dimension of information system flexibility. Adjusting capacities to ensure meeting volume demands is further aided by ensuring adequate storage facilities. Thus volume flexibility dimensions also go with responsiveness. Thus this study blends the concepts of quality, flexibility, responsiveness and cost in a single framework for implementation within a supply chain context.

The drawback to this study is however, it focused on only the downstream supply chain without a consideration to the other aspects of the supply chain from exploration of crude oil through to refining the oil into finished petroleum products. Secondly, all the organisations that were

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considered were found within the nation's capital. This does not give room for comparative studies based on the geographic locations of the organisation. Further research must be carried out in two basic directions. The focus must move from the downstream supply chain to cover the upstream aspects of the supply chain. Secondly, studies of this nature must not be limited to one specific location but to all other geographic locations or regional demarcations within the country.

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APPENDIX I – FACTOR LOADINGS OF INDICATORS FOR THE COMPONENTS OF CUSTOMER SATISFACTION

Indicator/Construct	Loadings
Quality	
Managers setting objectives for performance	0.66
Top management involvement in quality issues	0.73
Management aligning quality management issues in business objectives	0.77
Top management evaluating and monitoring performance	0.67
Reliability of data	0.71
Data and information accessibility	0.70
Timely review and update of all forms of data	0.70
Management benchmarking their performance to world class organisations	0.77
Management having a focus on customers	0.79
Continually improving the process of refining petroleum products	0.77
Continuously improving the customer relationship management process	0.85
Resolving customer complaints	0.81
Effective employee training	0.82
Effective employee involvement in quality related issues	0.81
Ensuring the personal growth of employees	0.80
Providing a conducive work environment for employees	0.79
Providing reward systems and incentives to employees	0.73
Flexibility	
Developing a number of new petroleum products	0.62
Involving suppliers and customers in the development of new products	0.70
Ease of modifying features of existing petroleum products	0.69
Getting large range of different petroleum products	0.66
Ability to customising a petroleum product to meet a specific need	0.72
Meeting volume requirements of customers	0.84
Ability to adjust capacity to meet changes in customer requirements	0.85
Ability to proportionally adjust volume without compromising on quality	0.63
Speed of information flow throughout all the stages of the supply chain	0.78
Meeting the information needs of customers	0.84
Installing and maintaining IT applications	0.74
Responsiveness	
Meeting special customer service requirements on time	0.86
Response to demand fluctuations in a timely manner	0.82
On time delivery of products and services	0.80
Short time interval between order and delivery	0.85

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Adequate storage facilities	0.82
Quick response to machine breakdowns	0.77
Timely information exchange	0.74
Making customised products in an acceptable timeframe	0.74
Cost	
Price of products meeting customer expectations	0.89
The price of the products having a good value for money	0.90

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APPENDIX II - QUESTIOINAIRE FOR BULK DISTRIBUTION COMPANIES

UNIVERSITY OF GHANA BUSINESS SCHOOL

DEPARTMENT OF OPERATIONS AND MANAGEMENT INFORMATION SYSTEMS

An investigation into customer satisfaction along the oil supply chain in Ghana

(BDC Questionnaire)

This research seeks to investigate customer satisfaction along the oil supply chain on the basis of quality management, flexibility, responsiveness and cost. Your participation is voluntary and your responses shall be confidential and shall not be linked to your organisation personally. Thank you for your cooperation.

Researcher: Charles Gyamfi Ofori (coforigyamfi@gmail.com, 0207279230)

Background Information

1. Gender: .a. Male b. Female

2. Age: a. below 21 years b. 21 – 30 years c. 31- 40 years
   d. 41 – 50years e. above 50 years
3. Level of management
   a. Top Level Manager b. Middle Level Manager c. Lower Level Manager

Quality Management Practices

1. Please indicate what you hope to achieve by implementing quality management practices. (You can tick more than one item)
   a. Higher productivity ☐
   b. Efficiency ☐
   c. Lower cost of production ☐

   d. Other (Please specify)……. ……..
   ……. …… ……
   ……. … …… ……..

2. How does top management learn quality related concepts? (You can tick more than one item)
   a. On the job training ☐
   b. Basic training sessions ☐
   c. Visits by inspectors ☐
   d. Virtual libraries (Internet sources, etc.) ☐

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e. Others (please specify) …… …… ……
…… …… …… ……
…… …… …… …… ……..

3. How do you assess the outcome of your quality management programme? (You can tick more than one item)

a. Analysing inventory costs	☐
b. Analysing operating costs	☐
c. Analysing response times	☐
d. Financial gains assessment (NPV etc.)	☐

e. Other (Please specify)…… ……..
…… …… ……
……. … …… ……..

4. Tick as many as possible any of these you use in your quality control efforts

a. Check sheets	☐
b. Pareto charts	☐
c. Cause and effect diagrams	☐
d. Scatter plots	☐
e. Statistical process control charts	☐
f. Process flow charts	☐

g. Other (Please specify)…… ……..
…… …… ……
……. … …… ……..

5. Please list your major (or direct) customers
   a. ……
   b. ……...
   c. ……
   d. ……

6. What kinds of information do you readily allow customers to assess? (You can tick more than one item)

a. Product Availability	☐
b. Product Quantities	☐
c. Quality standards	☐
d. Market Strategies	☐
e. Long term and short term business goals	☐
f. Product pricing	☐

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g. Others (please specify) …… …… ……

…… …… …… ……

7. What measures do you take to ensure that expectations of customers are met? (You can tick more than one item)
   a. Meeting product requirements ☐
   b. Timely delivery ☐
   c. Constant engagement with customers ☐
   d. Interactions with marketing staff ☐

   e. Others (please specify) …… …… ……
   …… …… ……

8. What information is collected by your company for analysis? (You can tick more than one item)
   a. Customer data ☐
   b. Employee data ☐
   c. Product data ☐
   d. Supplier data ☐
   e. Amount owed to suppliers ☐
   f. Amount owed by customers ☐

g. Others (please specify) …… …… ……
…… … ……..

9. How often is the information reviewed and updated?
   a. Daily ☐
   b. Weekly ☐
   c. Monthly ☐
   d. Quarterly ☐
   e. At irregular times ☐
   f. Continuous process ☐
   g. When the need arises ☐

h. Others (please specify) …… …… ……

10. How do you evaluate the performance of employees? (You can tick more than one item)
    a. Appraisal Systems ☐
    b. Analysing performance of employees on the job ☐

c. Others (please specify) …… ……

…… …… …… ……

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11. How often do you conduct training programs for your employees?

a. Daily ☐
b. Weekly ☐
c. Monthly ☐
d. Quarterly ☐
e. At irregular times ☐
f. Continuous process ☐
g. When the need arises ☐

h. Others (please specify) …… …… ……

12. How do you motivate your workforce to ensure better performance? (You can tick more than one item)

a. Training programs ☐
b. Effective Supervision ☐
c. Serene work environment ☐
d. Incentives ☐
e. Monetary Rewards ☐

f. Others (please specify) …… …… ……
…… …… …… ……
…… …… …… …… ……..

Flexibility practices

13. How many storage facilities do you have?

…… …… …… … …… … ……

14. How many of the available storage facilities are always full to capacity?

……

15. How do you meet the varying information needs of customers (You can tick more than one item)

a. Periodic Reports ☐
b. Information on Websites ☐

c. Others (please specify) …… …… …… …
…… … …… …… …… …… ……..
…… …… ……..

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16. How often do you change the IT hardware and software components of your system?

a. Daily ☐
b. Weekly ☐
c. Monthly ☐
d. Quarterly ☐
e. At irregular times ☐
f. Continuous process ☐
g. When the need arises ☐

h. Others (please specify) …… ……

17. What are the modes of delivery available for your customers? (You can tick more than one item)

a. Air ☐
b. Sea ☐
c. Railway ☐
d. Road / vehicular transport ☐

e. Others (please specify) …… ……

18. How do you ensure that demands are met? (You can tick more than one item)

a. Holding large volumes of fuel ☐
b. Sufficient number of workers at all times to fill tankers ☐
c. Sufficient fleet of tankers ☐
d. Regular maintenance of tankers ☐

e. Others (please specify) …… …… ……
…… …… …… ……

19. Do you have special types of vehicles for carrying products of different types to cater for different needs

a. Yes b. No

If yes, what are these special vehicles?

……
……

20. Which of these sequencing techniques do you use to meet your customers due dates (You can tick more than one item)

a. First in first out principle ☐
b. Preferential treatment ☐
c. Based on the urgency of demand ☐

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Others (please specify) …… …… ……
……..

21. What are the major complaints you receive from customers? (You can tick more than one item)
    a. Cross contamination
    b. Truck breakdowns
    c. Fuel shortages

    d. Others (please specify) …… …… ……
    ……..

22. How do you respond to these complaints? (You can tick more than one item)

    a. Products sent back to the refinery
    b. Product recalls

    c. Others (please specify) …… …… ……
    ……..

Responsiveness

23. How do you ensure timely delivery of products?

    a. Use of route maps
    b. Other ways of calculating shortest possible routes
    c. Analysing road networks

    d. Others (please specify) …… …… ……
    ……..

24. How do you respond to demand fluctuations in a timely manner? (You can tick more than one item)
    a. Buy products from elsewhere
    b. Sell leftovers at lower costs (in situations where demand is low)

Cost efficiency

25. How do you reduce operational costs in your operations? (You can tick more than one item)
    a. Inventory Management
    b. Small supplier base
    c. Check behaviours of pump attendants

    d. Others (please specify) …… ……
    ……..

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26. What are some of the sources of wastage in your operations that need to be reduced?

a. Loading small orders ☐
b. Pilfering ☐
c. Operational inefficiency ☐
d. Demurrage ☐

e. Others (please specify) …… ……
……..

27. What are your perceptions about suppliers who do not provide products and services at fair prices?

……
……
……
……
……

Thank you for your participation.

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APPENDIX III – QUESTIONNAIRE FOR OIL MARKETING COMPANIES

UNIVERSITY OF GHANA BUSINESS SCHOOL

DEPARTMENT OF OPERATIONS AND MANAGEMENT INFORMATION SYSTEMS

An investigation into customer satisfaction along the oil supply chain in Ghana

(OMC Questionnaire)

This research seeks to investigate customer satisfaction along the oil supply chain on the basis of quality management, flexibility, responsiveness and cost. Your participation is voluntary and your responses shall be confidential and shall not be linked to your organisation personally. Thank you for your cooperation.

Researcher: Charles Gyamfi Ofori (coforigyamfi@gmail.com, 0207279230)

Background Information

4. Gender: .a. Male b. Female

5. Age: a. below 21 years b. 21 – 30 years c. 31- 40 years
   d. 41 – 50years e. above 50 years
6. Level of management
   b. Top Level Manager b. Middle Level Manager c. Lower Level Manager

Quality Management Practices

28. Please indicate what you hope to achieve by implementing quality management practices. (You can tick more than one item)
    e. Higher productivity ☐
    f. Efficiency ☐
    g. Lower cost of production ☐

    h. Other (Please specify)……. ……..
    ……. ……
    ……. … …… ……..

29. How does top management learn quality related concepts? (You can tick more than one item)
    f. On the job training ☐
    g. Basic training sessions ☐
    h. Visits by inspectors ☐
    i. Virtual libraries (Internet sources, etc.) ☐

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j. Others (please specify) …… …… ……
…… …… …… ……
…… …… …… …… ……..

30. How do you assess the outcome of your quality management programme? (You can tick more than one item)

f. Analysing inventory costs	
g. Analysing operating costs	
h. Analysing response times	
i. Financial gains assessment (NPV etc.)	

j. Other (Please specify)…… ……..
…… …… ……
……. … …… ……..

31. Tick as many as possible any of these you use in your quality control efforts

h. Check sheets	
i. Pareto charts	
j. Cause and effect diagrams	
k. Scatter plots	
l. Statistical process control charts	
m. Process flow charts	

n. Other (Please specify)…… ……..
…… …… ……
……. … …… ……..

32. Please list your major (or direct) customers
e. ……
f. ……...
g. ……

33. What kinds of information do you readily allow customers to assess? (You can tick more than one item)

h. Product Availability	
i. Product Quantities	
j. Quality standards	
k. Market Strategies	
l. Long term and short term business goals	
m. Product pricing	

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n. Others (please specify) …… …… ……

…… …… …… ……

34. What measures do you take to ensure that expectations of customers are met? (You can tick more than one item)

f. Meeting product requirements ☐
g. Timely delivery ☐
h. Constant engagement with customers ☐
i. Interactions with marketing staff ☐

j. Others (please specify) …… …… ……

…… …… ……

35. What information is collected by your company for analysis (You can tick more than one item)

h. Customer data ☐
i. Employee data ☐
j. Product details ☐
k. Supplier data ☐
l. Amount owed to suppliers ☐
m. Amount owed by customers ☐

n. Others (please specify) …… …… ……

…… … ……..

36. How often is the information reviewed and updated?

i. Daily ☐
j. Weekly ☐
k. Monthly ☐
l. Quarterly ☐
m. At irregular times ☐
n. Continuous process ☐
o. When the need arises ☐

p. Others (please specify) …… …… ……

37. How do you evaluate the performance of employees (You can tick more than one item)

d. Appraisal Systems ☐
e. Analysing performance of employees on the job ☐

f. Others (please specify) …… …… ……

……. …… …… ……

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38. How often do you conduct training programs for your employees?

i. Daily ☐
j. Weekly ☐
k. Monthly ☐
l. Quarterly ☐
m. At irregular times ☐
n. Continuous process ☐
o. When the need arises ☐

p. Others (please specify) …… …… ……

39. How do you motivate your workforce to ensure better performance? (You can tick more than one item)

g. Training programs ☐
h. Effective Supervision ☐
i. Serene work environment ☐
j. Incentives ☐
k. Monetary Rewards ☐

l. Others (please specify) …… …… …… …… …… …… …… …… …… …… …… …… …… ……..

Flexibility practices

13. How do you meet the varying information needs of customers (You can tick more than one item)

d. Periodic Reports ☐
e. Information on Websites ☐

f. Others (please specify) …… …… …… … …… … …… …… …… …… …… ……..

14. How often do you change the IT hardware and software components of your system

i. Daily ☐
j. Weekly ☐
k. Monthly ☐
l. Quarterly ☐
m. At irregular times ☐

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n. Continuous process ☐
o. When the need arises ☐

p. Others (please specify) …… ……

15. What are the modes of delivery available for your customers (You can tick more than one item)
    f. Air ☐
    g. Sea ☐
    h. Railway ☐
    i. Road / vehicular transport ☐

    j. Others (please specify) …… ……

16. How do you ensure that demands are met? (You can tick more than one item)
    f. Holding large volumes of fuel ☐
    g. Sufficient number of workers at all times to fill tankers ☐
    h. Sufficient fleet of tankers ☐
    i. Regular maintenance of tankers ☐

j. Others (please specify) …… …… ……
…… …… …… ……

17. Do you have special types of vehicles for carrying products of different types to cater for different needs

    a. Yes b. No

    If yes, what are these special vehicles?
    ……
    ……
    ……

18. Which of these sequencing techniques do you use to meet your customers due dates (You can tick more than one item)

    d. First in first out principle ☐
    e. Preferential treatment ☐
    f. Based on the urgency of demand ☐

    Others (please specify) …… …… ……
    ……..

19. What are the major complaints you receive from customers? (You can tick more than one item)

    a. Cross contamination ☐
    b. Truck breakdowns ☐
    c. Fuel shortages ☐
    d. Indecent behaviours of fuel attendants ☐

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e. Others (please specify) …… …… ……
……..

20. How do you respond to these complaints? (You can tick more than one item)

a. Respond to customers about strong connections with BDCs to help curb fuel shortage
b. Querying employees for indecent behaviour

c. Others (please specify) …… …… ……
……..

Responsiveness

21. How do you ensure of timely delivery of your products?

e. Use of route maps
f. Other ways of calculating shortest possible routes
g. Analysing road networks

h. Others (please specify) …… …… ……
……..

22. How do you respond to demand fluctuations in a timely manner

c. Buy products from elsewhere
d. Sell leftovers at lower costs

Cost efficiency

23. How do you reduce operational costs in your operations

e. Inventory Management
f. Small supplier base
g. Check behaviours of pump attendants

h. Others (please specify) …… ……
……..

24. What are some of the sources of wastage in your operations that need to be reduced

f. Loading small orders
g. Pilfering
h. Operational inefficiency
i. Demurrage

j. Others (please specify) …… ……
……..

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25. What are your perceptions about suppliers who do not provide products and services at fair prices

    ……
    ……
    ……
    ……
    ……

Thank you for your participation.

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APPENDIX IV – QUESTIONNAIRE FOR END USERS

UNIVERSITY OF GHANA BUSINESS SCHOOL

DEPARTMENT OF OPERATIONS AND MANAGEMENT INFORMATION SYSTEMS

An investigation into customer satisfaction along the oil supply chain in Ghana

This research seeks to investigate customer satisfaction along the oil supply chain on the basis of quality, flexibility, responsiveness and cost. Your participation is voluntary and your responses shall be confidential and shall not be linked to you personally. Thank you for your cooperation.

SECTION A: BACKGROUND INFORMATION

7. Gender: .a. Male b. Female

8. Age: a. below 21 years b. 21 – 30 years c. 31- 40 years
   d. 41 – 50years e. above 50 years

9. Type of petroleum product you used (you can tick more than one)
   a. Petrol b. Diesel c. Kerosene d. Premix

   e. Other (Please specify)…….

10. Purpose of usage.
    a. Personal use b. Industrial use c. Company use

    d.. both personal and company use

SECTION B: QUALITY MANAGEMENT PRACTICES

The following questions are related to items under the quality management practices of petroleum companies. As a customer, please indicate how important each of these is to you by ranking each item on a scale of 1 to 7 with 1 indicating low importance and 7 indicating a higher importance.

Item	1	2	3	4	5	6	7
11. Managers setting objectives for performance							
12. Top management involvement in quality issues							
13. Management aligning quality management issues in business objectives							
14. Top management evaluating and monitoring performance							
15. Reliability of data							
16. Data and information accessibility							
17. Timely review and update of all forms of data							
18. Management benchmarking their performance to world class organisations							
19. Management having a focus on customers							
20. Continually improving the process of refining petroleum products							

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21. Continuously improving the customer relationship management process							
22. Resolving customer complaints							
23. Effective employee training							
24. Effective employee involvement in quality related issues							
25. Ensuring the personal growth of employees							
26. Providing a conducive work environment for employees							
27. Providing reward systems and incentives to employees							

SECTION C: FLEXIBILITY

The following statements are related to items under the flexibility (the ability of the organisation respond to changes in demand patterns and product varieties) of the operations of petroleum companies. As a customer, please indicate how important each of these is to you by ranking each item on a scale of 1 to 7 with 1 indicating low importance and 7 indicating a higher importance.

Item	**1**	**2**	**3**	**4**	**5**	**6**	**7**
28. Developing a number of new petroleum products							
29. Involving suppliers and customers in the development of new products							
30. Ease of modifying features of existing petroleum products							
31. Getting large range of different petroleum products							
32. Ability to customising a petroleum product to meet a specific need							
33. Meeting volume requirements of customers							
34. Ability to adjust capacity to meet changes in customer requirements							
35. Ability to proportionally adjust volume without compromising on quality							
36. Speed of information flow throughout all the stages of the supply chain							
37. Meeting the information needs of customers							
38. Installing and maintaining IT applications							

SECTION D: RESPONSIVENESS AND COST

The following statements are related to items under the responsive nature (responding to demands within an acceptable timeframe) of the operations of petroleum companies as well as their pricing strategies. As a customer, please indicate how important each of these is to you by ranking each item on a scale of 1 to 7 with 1 indicating low importance and 7 indicating a higher importance.

Item	**1**	**2**	**3**	**4**	**5**	**6**	**7**
39. Meeting special customer service requirements on time							
40. Response to demand fluctuations in a timely manner							
41. On time delivery of products and services							
42. Short time interval between order and delivery							
43. Adequate storage facilities							
44. Quick response to machine breakdowns							
45. Timely information exchange							
46. Making customised products in an acceptable timeframe							

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47. Price of products meeting customer expectations							
48. The price of the products having a good value for money							

SECTION E: CUSTOMER SATISFACTION

The statements in this section are related to customer satisfaction with the entire operations of the oil industry in Ghana. Please indicate your level of satisfaction for each item by rating them on a scale of 1 to 7, where 1 reflects highly dissatisfied and 7 reflects very satisfied.

Item	**1**	**2**	**3**	**4**	**5**	**6**	**7**
49. What is your level of satisfaction with respect to the quality standards of the petroleum product you buy							
50. What is your level of satisfaction with respect to the quality of service provided by petroleum companies							
51. What is your level of satisfaction with regards to responding to demand changes of the oil companies that serve you							
52. What is your level of satisfaction with regards to the price competitiveness of your petroleum vendor/supplier							
53. What is your level of satisfaction with regards to the delivery times provided by your vendor/supplier (industrial use only)							
54. What is your level of satisfaction regarding the nature and attitudes of the employees or attendants of the oil marketing companies							
55. How satisfied are you with the overall performance of the oil industry							