

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

COLLEGE OF HUMANITIES AND SOCIAL SCIENCES

SCHOOL OF BUSINESS

**ASSESSING THE EFFECT OF WAREHOUSE PRACTICES ON MATERIAL
MANAGEMENT IN THE OIL AND GAS INDUSTRY. THE MODERATING ROLE OF
TRANSPORTATION CAPACITY. A CASE STUDY OF TULLOW GHANA LIMITED**

BY

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**A DISSERTATION SUBMITTED TO THE INSTITUTE OF DISTANCE LEARNING (IDL),
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PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTERS
DEGREE IN LOGISTIC AND SUPPLY CHAIN MANAGEMENT**

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DECLARATION

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma at Kwame Nkrumah University of Science and Technology, Kumasi or any other educational institution, except where due acknowledgment is made in the thesis.

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DEDICATION

This work is dedicated to my beloved family especially my lovely wife, Mrs. Rosina Kassim for they have been there for me and supported me through every aspect of my life.

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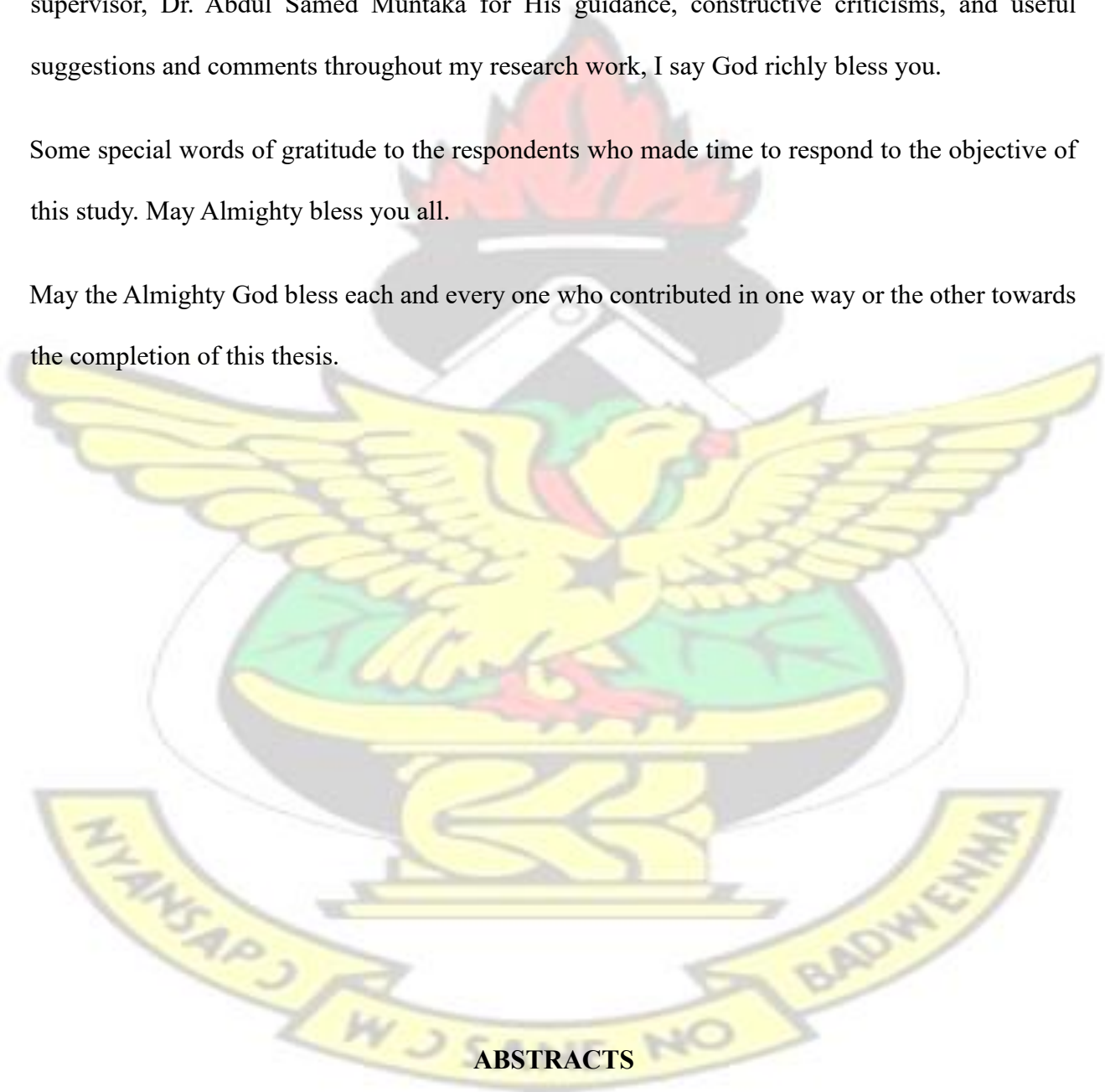
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ABSTRACTS

Many organizations recently face challenges in managing the efficient flow of their materials, both physical supply and physical distribution. Today's business environment requires implementing innovative solutions to effectively manage increasingly complex warehouse management activities while simultaneously reducing operational expenses. This study examined the effect of warehouse practices and transportation capacity on materials management in the oil and gas sector using Tullow Ghana Ltd as a case in the Takoradi Municipal. A sample of 100 management and non-management staffs were selected for the study. Questionnaires were used as the main instrument of data collection. The study revealed an overall mean score of 3.92, which shows that the respondents agreed that Tullow Ghana Ltd address the warehousing practice in material management of the organization such as warehouses are well-organised and the layout supports efficient material handling regular management and inspection of warehouse equipment and infrastructure are conducted, advanced technology is used for tracking and managing inventory within warehouses, effective safety measures and protocols are in place to prevent accidents in the warehouses. Also, with an overall mean score of 3.86, these findings show that the respondents agreed that Tullow Ghana Ltd address the transportation capacity of the organization in material management such as the transportation resources (e.g., vehicles, vessels) are readily available when need. Comparatively, the findings of this study show that warehousing practice (Beta=0.518, p-value=0.000) has the highest effect on the material management of Tullow Ghana Ltd than transportation capacity (Beta= 0.466, p-value= 0.000). Tullow Ghana Ltd should create a standard operating procedure to govern all of the operations inside of its warehouse as the first and most immediate action. The execution of it would require staff training, and it should be strictly enforced.

TABLE OF CONTENTS

| | |
|------------------|---|
| DECLARATION..... | i |
|------------------|---|

| | |
|---|------------|
| DEDICATION..... | ii |
| ACKNOWLEDGEMENT | iii |
| ABSTRACTS..... | iv |
| TABLE OF CONTENTS | v |
| LIST OF TABLES | ix |
| LIST OF FIGURES | x |
| CHAPTER ONE | 1 |
| INTRODUCTION..... | 1 |
| 1.1 Background to the study | 1 |
| 1.2 Problem statement | 4 |
| 1.3 Objectives of the study..... | 5 |
| 1.4 Research Questions | 5 |
| 1.5 Significance of the Study | 5 |
| 1.6 Summary of Methodology | 6 |
| 1.7 Scope of the Study | 6 |
| 1.8 Limitations of the Study..... | 7 |
| 1.9 Organization of the Thesis | 7 |
| CHAPTER TWO | 8 |
| LITERATURE REVIEW | 8 |
| 2.1 Introduction | 8 |
| 2.2 Conceptual Review | 8 |
| 2.2.1 Warehouse management | 8 |
| 2.1.2 Product Intelligence Paradigm | 10 |

| | |
|---|----|
| 2.2.3 Theoretical Inventory Control Model | 11 |
| 2.3 History of Warehousing | 12 |
| 2.3.1 Warehousing | 13 |
| 2.3.2 Classification of Warehouses | 14 |
| 2.2.3 Functions of Warehousing | 14 |
| 2.3.4 Warehouse processes | 15 |
| 2.4 Benefits of Warehouses | 16 |
| 2.5 Type of Warehouses | 18 |
| 2.4.1 The roles of warehouse in material management | 20 |
| 2.5 Factors that impede on Warehousing | 21 |
| 2.6 Materials Management..... | 23 |
| 2.7 Objectives of Materials Management | 25 |
| 2.8 Challenges of Materials Management | 27 |
| 2.9 Quality Assurance | 30 |
| 2.9.1 Standards | 30 |
| 2.10 Role of Materials Management | 31 |
| 2.11 Transportation | 32 |
| 2.11.1 Purpose of Transportation | 33 |
| 2.12 Modes of Transportation | 33 |
| 2.13 Transportation Documentation | 36 |
| 2.14 Other Transportation Documentation | 37 |
| 2.15 The Role of Transportation | 37 |
| 2.15.1 The Role of Transportation in Materials Management | 37 |

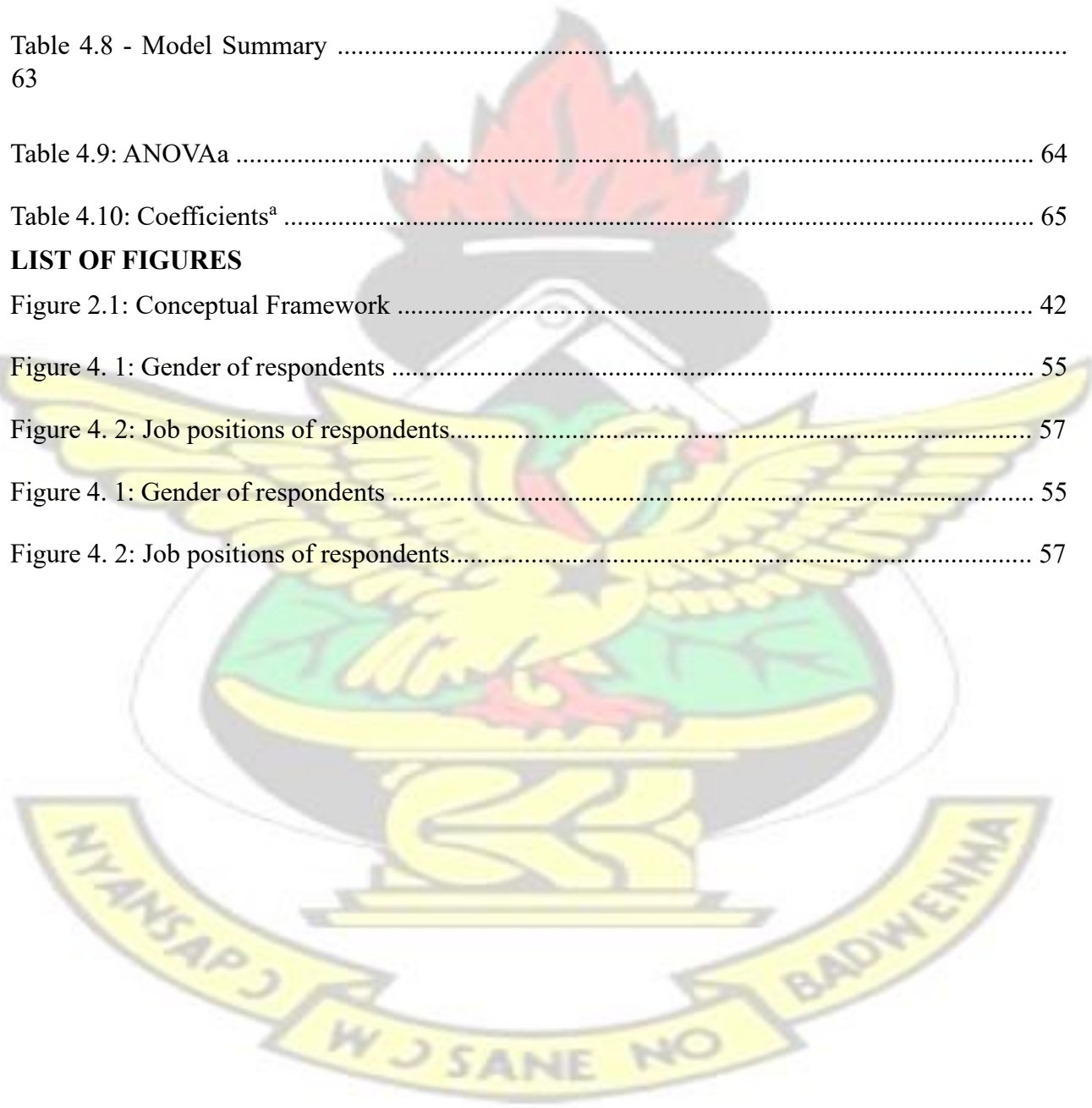
| | |
|--|-----------|
| 2.16 Good Transport System | 38 |
| 2.17 Developing a Transportation Strategy | 39 |
| 2.18 Transport Operations | 39 |
| 2.19 Transport Cost | 40 |
| 2.20 Measuring Transport Operations | 40 |
| 2.21 Modal Complement | 40 |
| 2.22 Factors that impede on transportation | 41 |
| 2.23 Conceptual Framework | 41 |
| CHAPTER THREE | 43 |
| RESEARCH METHODOLOGY AND ORGANISATIONAL PROFILE | 43 |
| 3.1 Introduction | 43 |
| 3.2 Research Design..... | 43 |
| 3.3 Population of the Study | 45 |
| 3.4 Sampling Technique and Sample Size | 45 |
| 3.4.1 Sample Size | 47 |
| 3.5 Data Collection Method | 47 |
| 3.6 Data Analysis | 49 |
| 3.7 Validity and Reliability | 50 |
| 3.8 Ethical Considerations | 51 |
| 3.9 Organisational Profile | |
| 51 CHAPTER FOUR | 53 |
| RESULTS AND DISCUSSION | 53 |
| 4.1 Introduction | 53 |

| | |
|--|-----------|
| 4.2 Demographic Information of Respondents | 53 |
| 4.3 Descriptive Analysis | 57 |
| 4.4 Examining the Nature of Warehousing Practices at Tullow Ghana Ltd | 58 |
| 4.4.1 Materials Management at Tullow Ghana Ltd | 60 |
| 4.6 Transportation Capacity of Tullow Ghana Ltd | 61 |
| 4.7 Effect of warehousing practice and transportation capacity on the material management of Tullow Ghana Ltd | 63 |
| 4.8 Effect of transportation capacity on the material management of Tullow Ghana Ltd | 65 |
| CHAPTER FIVE..... | 67 |
| SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS | 67 |
| 5.1 Introduction | 67 |
| 5.2 Summary of Findings | 67 |
| 5.3 Conclusions | 70 |
| 5.4 Recommendations | 70 |
| 5.5 Suggestion for Further Research | 71 |
| REFERENCES | 72 |
| APPENDIX: QUESTIONNAIRE..... | 78 |
| LIST OF TABLES | |
| Table 2.1 Benefits and challenges of the various modes | 34 |
| Table 2.2 Comparison Matrix of Different Modes | 35 |
| Table 3.1: Total Population Distribution | 45 |
| Table 4. 1: Age Group | 53 |
| Table 4. 2: Educational Qualification | 54 |

| | |
|---|----|
| Table 4. 3: Working Experience | 56 |
| Table 4.4: Guideline for Interpreting Quantitative Data | 58 |
| Table 4.5: Descriptive Analysis Results for Warehouse Practices | 59 |
| Table 4.6: Descriptive Statistics Results for Material Management..... | 61 |
| Table 4.7: Descriptive Statistics Results for Transportation Capacity | 62 |
| Table 4.8 - Model Summary | 63 |
| Table 4.9: ANOVAa | 64 |
| Table 4.10: Coefficients ^a | 65 |

LIST OF FIGURES

| | |
|--|----|
| Figure 2.1: Conceptual Framework | 42 |
| Figure 4. 1: Gender of respondents | 55 |
| Figure 4. 2: Job positions of respondents..... | 57 |
| Figure 4. 1: Gender of respondents | 55 |
| Figure 4. 2: Job positions of respondents..... | 57 |



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CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Warehousing is the method of storing goods in a systematic and organized manner on a large scale and making them readily accessible when needed. In other words, warehousing means holding or preserving goods in huge quantities from the time of their purchase or production till their actual use or sale (Frazelle, 2002). Warehouse: is a place where items are received, stocked, and dispatched (Aronovich et al., 2010).

A warehouse therefore plays an important role in meeting consumer demands in today's business world. It serves as a key source of competition, determined by whom, with better cost efficiency, and versatility, can produce goods faster. In this respect, management must have detailed understanding of warehouse practices and how it impacts the entire supply chain (Richards, 2017). Rappy et al., (2017) have explained that the upgrading of warehouses can be measured by the accuracy and speed of meeting demands, the decrease in non-value-added functions, and effective management. Another concern is the information integration that consists of key functions for inventory updates, order management, and product tracking.

Today's business environment requires implementing innovative solutions to effectively manage increasingly complex warehouse management activities while simultaneously reducing operational expenses (Hackman, 2014). A warehouse is a facility in the supply chain to consolidate products to reduce transportation costs, achieve economies of scale in manufacturing or in purchasing (Bartholdi J, 2006). Or provide value-added processes and shorten response time

Storage has always been an important aspect of economic development. In today's competitive environment, companies must operate at maximum efficiency and provide superior service to ensure profitability (Gong et al., 2008).

The oil and gas industry in Ghana is one of the sectors that provides huge revenue to the nation and is the backbone of the economy of our country. If their warehouse practices are poor, it will be difficult to store materials safely to meet customer demands, and run the country's economy effectively and efficiently. So, the warehouse is the foundation for an organization's ability to satisfy its customers because if there are no products available in the store/warehouse, customers will be dissatisfied, and if the organization fails to meet the customer's needs, it becomes to fail.

Materials management on the other hand is a core supply chain function and includes the process that organizations use to plan, organize, and control the steps they use to manage tangible components within its business processes. Specifically, materials management is the capability firms use to plan total material requirements (Anteneh, 2017). The material requirements are communicated to procurement and other functions for sourcing. Materials management is also responsible for determining the amount of material to be deployed at each stocking location across the supply chain, establishing material replenishment plans, determining inventory levels to hold for each type of inventory (raw material, WIP, finished goods), and communicating information regarding material needs throughout the extended supply chain (Collins, 2006).

According to Belayeneh (2016), typical roles in Materials Management include: Materials Manager, Inventory Control Manager, Inventory Analyst, Material Planner, Expediter and emerging hybrid roles like "buyer planner". The primary business objective of Materials

Management is assured supply of material, optimum inventory levels and minimum deviation between planned and actual results. Transportation therefore tends to play a facilitating role in ensuring that, the goods and services are delivered to the customers at the right time, right place, and right condition.

Transportation plays a very crucial role in the supply chain of all goods and services. It acts as connective tool among several steps that result in the conversion of resources (inputs) into goods (output) in the name of the ultimate consumer. It moves products to markets and provide added value to consumers when the products arrive on time, undamaged and in the require quantities. The purpose of transportation in every organisation is to provide a means through which people and freight can move or be moved from one location to another. With the advent of transportation, many firms have become very effective at maximizing profit per shipment which helps insulate the industry during periods of slow economic growth. As a result, transportation is expected to continue to grow at 2% to 4% annually while firms initiate innovative ways to improve transportation (Tompkins, 2003, & Chen, 2007).

Transportation can hence be defined as the movement or transfer of goods and services from one place to another. With this movement, a whole lot of activities are involved which need to be considered in order to ensure efficient and effective movement of goods and services, so as to facilitate or assist in the achievement of the co-operate objectives of the organization (Aissaoui et al., 2007). The efficiency of the transportation system in an organisation will depend on a robust warehousing infrastructure where goods and raw materials needs to be kept before they are converted into finished product for it to be transported to final consumers. There are different types or modes of transportation. These are road transport, sea transport, air transport, pipelines, telecommunication and rail transport. The role that transportation plays in organization activities

cannot be ruled out. In the sense that it provides better logistics efficiency, reduced operations cost, improves service quality and enables the practice of just-in-time production. The operation of the organization may determine the mode of transport systems to be used (Aissaoui et al., 2007).

1.2 Problem statement

Many organizations recently face challenges in managing the efficient flow of their materials, both physical supply and physical distribution. This results in poor distribution function. The study therefore seeks to assess the role of warehouse practices on materials management in the oil and gas industry (Krumwiede et al,2002).

Since the turnover of inventory is one of the key sources of revenue generation and eventual earnings for most companies, warehousing is one of the most valuable assets they have. Nearly 60% to 70% of total funds working in the oil firms are invested in current assets, with inventory being the most significant portion (Carter, 2002). Moreover, as stated by (Heung, 2006), Warehousing accounts for between 2% and 5% of an organization's cost of sales, and in today's highly competitive global business environment, organizations are focusing on return on assets, so reducing warehousing costs has become a critical business issue. Many companies are automating their basic warehousing functions in order to achieve the higher throughput rates or inventory turns that are required to make their warehousing operations cost-effective. Warehousing is the glue that holds supply chains together, and it has become increasingly critical in the supply chain.

In today's challenging and competitive world, success can hinge on whether your warehouse practices are productive and effective enough to meet your expectations and those of your customers. One way to gauge how effectively your warehouse operations are meeting those

expectations is to determine the effect of warehouse, a systematic review of the warehouse functions looking for possible improvements in efficiency and service.

1.3 Objectives of the study

The broad objective of this study is to assess the effect of warehouse practices and transportation capacity on materials management in the oil and gas sector with a focus on the influence of transport capacity. The study seeks to achieve the following specific objectives:

1. To determine the nature of warehouse practice at Tullow Ghana Ltd.
2. To assess the effect of warehousing practices on material management of Tullow Ghana
3. To determine the moderating effect of transport capacity on the relationship between warehouse practices and material management of Tullow Ghana Ltd.

1.4 Research Questions

1. What type of warehouse practice are adopted at Tullow Ghana Ltd?
2. What is the effect of warehousing practices on the material management of Tullow Ghana Ltd?
3. What is the moderating effect of transport capacity on the relationship between warehouse practices and material management of Tullow Ghana Ltd?

1.5 Significance of the Study

This research is to impact to the reader about the importance of transportation and warehouse practices in materials management and how it helps the establishment and competitive position of the organization on the supply base. For example, it provides the organization with efficient and effective movement of materials into the organization, movement within the organization, as well

as movement of finished goods out from the organization. Also, organisations like Tullow Ghana Ltd, manufacturers, retailers and suppliers may need this study as a reference to help them understand the effect of warehouse practices on material management, the moderating role of transportation capacity.

For academicians or researchers; the study's findings will provide a room to other researchers and may serve as a baseline to conduct further and more detailed research in the area of materials management as the issue will get more attention in the future. It may enable them to see the gaps of what is unknown, what needs further research, elaboration and improvement. It will add value to the body of knowledge in bridging the gap between theories and practical implementation of materials management at Tullow Ghana Ltd.

1.6 Summary of Methodology

The study relies on two main sources of data namely; Primary data and secondary data. The primary data includes interviews, questionnaire, observation, and survey.

The secondary data also include- books written, journals, internet, magazines, and other professional bodies which helps to collect relevant and accurate data for the study.

1.7 Scope of the Study

The study seeks to examine the role of transportation and warehousing in material management in a typical supply chain of a selected company. The study is conducted in the production sector specifically Tullow Ghana Ltd located in Takoradi in the Western Region of Ghana. This is as a result of its proximity, and easy access to information.

1.8 Limitations of the Study

This is to draw the reader's attention to the various problems that the researchers faced in conducting the research study which has affected the quality of the findings in one way or the other. The major limitation to this study is the collection of data. It is limited to the extent that management and employees were not willing and not prepared to disclose essential documents and information which may be relevant as far as the project is concerned.

In addition to the above limitation, is cost of transportation. The organization is far from where the researcher is staying. The movement to and fro the case study also involves money and looking at the financial position of this country, it is very difficult. Notwithstanding these limitations, care was taken to come out with conclusions that are valid.

1.9 Organization of the Thesis

The study is organized into five chapters. Chapter one covers the introduction, background of the study, statement of the problem, aims and objectives of the study, research questions, scope and limitation of the study; methodology, significance of the study and the organization of the study. Chapter two covers the review of related literature on the subject matter. Chapter three covers the various methods used in getting data for the study. Its content includes introduction, research design, population, and sample, sampling techniques, collection instrument, data collection method and analysis of data, background of the organization. Chapter four deals with the presentation, interpretation and analysis of data gathered from the field. Chapter five covers the findings, summary, conclusions and recommendations.

CHAPTER TWO LITERATURE REVIEW

2.1 Introduction

This chapter present the literature review of the study which critically reviews the views, opinion of other authors on the issue under the study. The key concept on which the study is focused on is, warehousing, materials management and transportation within the organisation like Tullow Ghana Ltd.

A safe and convenient transportation, warehouse practices and good materials management system is integral to the health of our economy and quality of life. This chapter will cover the various definitions of warehousing, materials management and transportation, developing transportation strategy, benefit and challenges of the various mode of transportation, layout of warehousing, types of warehousing and functions of warehousing and challenges pertaining to them. The types and purpose of materials management, the 5 R's of materials management, and benefits of materials management. The main focus is based on current knowledge including substantive findings as well as theoretical and methodological contribution to the topic.

2.2 Conceptual Review

2.2.1 Warehouse management

A warehouse is a location used to store the necessary and sufficient materials required by the company, including finished goods for sale, goods in the production process, raw materials, and goods that will be consumed in the process, according to the most widely accepted definition of warehousing management (Teo, 2008).

Since the last decade of the 20th century, the use of traditional warehousing has steadily decreased thanks to the development of Just in Time (JIT) approaches, which are specifically created to increase a business' return on investment (ROI) by reducing in-process inventory. The JIT concept relies on delivering goods directly from the factory to the retail outlet without the use of a

warehouse, but in some situations, such as offshore outsourcing and off shoring, the distance between the manufacturer and the retailer increases significantly in many regions, which creates the need for at least one warehouse per region or per country for a given range of products in any typical supply chain (Tompkins & Smith, 1998).

The emergence of a warehouse designing style, where the same warehouse is utilized for warehousing and retail store, is the result of recent advancements in the marketing area. The inventory items are often stored in the top portions of the tall, heavy-duty industrial racks, while the items that are ready for sale are typically stored in the bottom portions of the racks. Warehouses are being used by exporters and manufacturers as a base for creating retail locations in a certain area or nation. The aforementioned idea lowers the final cost of the good to the buyer, improving the production sale ratio. Manufacturers can reach consumers directly by skipping or omitting importers or other middlemen by employing the warehousing idea (Tompkins & Smith, 1998). The ever-rising customer service standards, inventory optimization, time compression, and cost minimization, which are recent trends and pressures on supply chain/logistics, have unavoidably affected the structure of supply chains and the location and operation of warehouses within the network. Undoubtedly, the traditional idea of warehouses as go downs for the storage of commodities has become obsolete. The main purpose of warehouses, or distribution centers if you prefer is to make it easier to convey materials to the final consumer (Tompkins & Smith, 1998). Distribution centers that do not keep stock, the "stockless depot" such as trans-shipment depots with more cross-docking operations—have also been developed as a result of the concept of throughput rather than storage and the push to optimize inventory with higher customer service levels. This is very helpful for many business groups with the full facilities, but it depends on the objectives of the businesses and the organizational circumstances. For instance, when more goods

are imported into developing nations, doing so is expensive, opens the door to frequent orders, increases the risk of running out of stock, and may even halt production or a mission. For the economics and the accomplishment of the organization's objective, the lack of material on hand or in storage poses a serious threat (Mattsson, 2005).

2.1.2 Product Intelligence Paradigm

It has been proposed that a methodology that can handle various product instances differently based on their unique qualities and needs will bring particular benefits to the manufacturing and supply chain industrial contexts. The effects of such a product intelligence approach, with a focus on supply chain and logistics operations, have lately been taken into account in a number of different domains, including road-based logistics, intermodal transportation, and production logistics.

Orders received by warehouse companies (especially third-party logistics ones) increasingly exhibit special characteristics, such as smaller order sizes, higher product variety, requests for shorter response times, and requests for changes after the order has initially been created and placed, as a result of the rapidly changing preferences of customers. This means that while the traditional performance goals for warehouse services (such higher warehouse utilization and tighter inventory control) still apply, they must now take into account the unique requirements of various customers. This is especially true in third-party logistics facilities that handle a wide range of goods and a sizable number of distinct clients. The operations must adapt in this situation to become more customer-focused and efficient while responding to requests with various characteristics and needs. According to this theory, warehouse management and utilization involve

a wide range of operations. The idea's major aim is a customer-oriented and more responsive approach to warehouse management (Giannikas, 2013).

2.2.3 Theoretical Inventory Control Model

Inventory control is necessary to make sure that the company has the right products on hand to minimize stock-outs, to prevent shrinkage (spoilage/theft), and to offer accurate accounting. Inventory control often accounts for 45% to 90% of all corporate expenses. Many companies have an excessive amount of their scarce resource, money, invested in their main asset, inventory. Even worse, they can be investing their capital in the incorrect kind of merchandise. Inventory issues such as being out of date, worn out, shopworn, the wrong sizes or colors, or a product line imbalance may make the entire business less appealing to customers. Systems for controlling inventory can be perpetual computer-run systems, reserve stock systems, or eyeball systems. Inventory is often valued at the lower of the original cost, market value, or current replacement costs. Because it reduces the likelihood of asset overstatement, this method is employed (Giannikas, 2013). From one market to the next, the ideal inventory and goods turnover will differ. As a benchmark for comparison, average industry data are used. If the turnover is insufficient to justify investment, a big inventory may not be justified. Too little of an inventory, on the other hand, could reduce sales and earnings as customers go somewhere else to get what they want where it is immediately available since there aren't enough products to meet demand. Minimum inventories based on reorder time must become significant factors in purchasing decisions. The costs of material acquisition, transportation, and storage are all high. Stock-outs, however, are often costly. Effective inventory management practices can reduce all of those expenditures (Giannikas, 2013).

2.3 History of Warehousing

According to Koehler (1999), warehousing concept takes us way back to the creation of granaries to store food, which was stored for drought and famine and this food was available for purchase in the conditions of emergency, famine, drought etc. As the European explorers began to discover new shipping trade routes all over the world, the importance of warehouses grew for the storage of products and commodities which were brought from far way places. The ports were the main locations of the warehouses, since majority of the trade between the countries was carried by ships. In early days, man used to store excess food and keeping animals for emergency surplus. As the civilization developed, local warehouses were introduced. Normally merchandise is stored in connection with shipping, trading, and manufacturing activities. The first known major commercial warehouse was built in Venice, a center of major trade routes. In late 1800's in the United States, transportation between port cities and inland cities were effectively provided by railroad. Freight cars were used as warehouses on wheels, and were especially used in grain harvest season. Shortages in freight cars induced the railroad companies to partition the transportation and warehousing functions. During this time period because of monopoly on both warehousing and freight by railroad companies favoured large corporations, giving them free warehousing services with the use of the railroads. The warehousing facility was provided as an additional service to transportation, and the service so provided was part of the clearance terminal.

Warehousing systems have seen a continuous growth throughout the history, they have been moving forward from local storehouses during the middle-ages to multimillion- dollar facilities. The main factor which gave rise to this development was the doubling of the value of business inventories between 1962 and 1972 and the value was tripled between 1972 and 1982. After the

late 1980s the AS/RS systems became obsolete and more emphasis was paid on reducing inventories, small batch production and Just in time delivery (Tompkins, Smith, 1998).

2.3.1 Warehousing

Warehouses are usually large plain buildings used for commercial purposes for storage of goods.

Warehouses are commonly used by exporters, importers, wholesalers, manufacturers etc.

Warehouses are usually equipped with loading docks to load and unload trucks and they have cranes and forklifts for moving goods, and are placed on ISO standard pallets loaded into pallet racks. Chopra, Sunil and Meindl (2007), indicated that some warehouses are fully automated where products are moved from one place to other with a system of automated conveyors and automated storage and retrieval machines which run by programmable logic controllers and also with logistics automation software.

Traditional warehousing continuously is declining since the last decade of the 20th century with the introduction of Just in Time (JIT) techniques which are specially designed to enhance the return on investment (ROI) of a business by mitigating in- process inventory. JIT concept is based on delivering product directly from the factory to the retail outlet without the use of warehouse, but in some cases like offshore outsourcing and off shoring in about the same time period, the distance between manufacturer and the retailer increases considerably in many regions which builds the need of at least one warehouse per region or per country for a given range of products in any typical supply chain (Chopra et al.,2007).

Based on the above, warehousing can be defined by us as an integral part of every logistics system that stores products (raw materials, parts, goods-in-process, finished goods) at and between point of origin and point of consumption, and provides information to management on status, condition

and disposition of items being stored. In other words, warehousing is the performance of administrative and physical functions associated with storage of goods and materials (Chopra et al.,2007).

2.3.2 Classification of Warehouses

The nature of warehouses within the supply chain varies, and can be adopted in various forms of classification, among other things including the following:

By the product type: examples include perishable products, frozen foods, explosive items, small spare parts and security items. By the stage in the supply chain: a warehouse could be meant to carry either material, Work-in-progress or finished goods depending on where it is situated in the supply chain. By geographic location: a warehouse is situated to serve only a certain geographical area like a region, a whole state or even the whole world. By function: that is whether to just hold inventory or for sorting. By company usage: it could be meant for use by just one company, or shared amongst various users in handling the supply chain (Rushton et al.2010).

2.2.3 Functions of Warehousing

Warehouses are designed to meet specific requirements in the supply chain in which they form a part of. Meanwhile, there are some operations which are common amongst them. Simpson (1994) categorizes such operations into the following functions;

Goods in or receiving. This involves the physical activity of unloading incoming transports, checking deliveries against purchase orders and recording. Depending on the agreement of both parties, future checks may include quality control. Some or all of the delivered goods are either rejected or accepted at this stage. Rejected goods are sent back to the supplier. Richards (2011), discusses pre-receipt, suggesting that the warehouse manager should be involved in specifying and

agreeing on the packaging, items per carton as well as any specific labeling required, in addition to the means of transport, so as to ensure that the delivered products are compatible with the storage facility Simpson (1994).

Put away into the storage area. Depending on the state of goods in the above stage, accepted goods are taken into storage. The storage area of the warehouse is often the largest space, with the spaces divided for the different kinds of goods that come in. Order selection and picking or packing. Goods are stored in the warehouse to be used later when needed. The needs for goods are made when orders are placed for them. When orders are placed, the goods are selected and picked according to their identifiable locations. The goods are then made ready for transportation to the point of need. Goods outward or dispatch. The goods are put together at the dispatch area and loaded onto the outbound vehicles, or picked up for use according to their size and place of need. It serves as a buffer that holds inventory for the downstream stages of the supply chain, in order to allow the entire production / distribution network to deal efficiently with the systematic and random variations in the network operation. It serves as value-added processing. Increasingly, warehousing is required to undertake some value-added-processing task like pricing and labelling. It serves as storage of materials. This is the basic function of warehousing. Surplus commodities which are not needed immediately can be stored in warehouses. They can be supplied as and when needed by the customers.

2.3.4 Warehouse processes

The warehouse processes according to Berg (2007) are;

- **Receiving**

This is the process of unloading incoming truck, identifying, registering and sometimes repacking.

- **Put away**

This is when goods are moved from unloading dock to the storage area.

- **Storage - in bulk or pick**

Activities at the warehouse affect goods in storage. For instance, the amount of stocks has to be counted to verify inventory quantities.

- **Replenish**

If inventory levels of the pick storage drop to certain amounts, it is replenished with stocks from the bulk storage.

- **Picking**

Upon order for need of an item in storage, either full pallets are picked from the bulk area of storage, or smaller quantities are picked from the pick area of storage.

- **Shipment**

The picked items are packed, consolidated and staged for shipping.

- **Cross-dock**

Some goods do not make their way into storage. Such goods, upon receipt are transferred to the shipping dock for shipment to point of need.

2.4 Benefits of Warehouses

Rushton, Croucher, Baker, (2006) identifies the benefits of warehouses to include:

- **Regular production**

Raw materials need to be stored to enable mass production to be carried on continuously. Sometimes, goods are stored in anticipation of a rise in prices. Warehouses enable manufacturers to produce goods in anticipation of demand in future.

Time utility: A warehouse creates time utility by bringing the time gap between the production and consumption of goods. It helps in making available the goods whenever required or demanded by the customers. Some goods are produced throughout the year but demanded only during particular seasons, e.g., wool, raincoat, umbrella, heater, etc. on the other hand, some products are demanded throughout the year but they are produced in certain region, e.g., wheat, rice, potatoes, etc. Goods like rice, tobacco, liquor and jaggery become more valuable with the passage of time.

Store of surplus goods: Basically, a warehouse acts as a store of surplus goods which are not needed immediately. Goods are often produced in anticipation of demand and need to be preserved properly until they are demanded by the customers. Goods which are not required immediately can be stored in a warehouse to meet the demand in future.

- **Price stabilization**

Warehouses reduce violent fluctuations in prices by storing goods when their supply exceeds demand and by releasing them when the demand is more than immediate productions. Warehouses ensure a regular supply of goods in the market. This matching of supply with demand helps to stabilize prices.

- **Minimization of risk**

Warehouses provide for the safe custody of goods. Perishable products can be preserved in cold storage. By keeping their goods in warehouses, businessmen can minimize the loss from damage, fire, theft etc. The goods kept in the warehouse are generally insured. In case of loss or damage to the goods, the owner of goods can get full compensation from the insurance company.

- **Packing and grading:**

Certain products have to be conditioned or processed to make them fit for human use, e.g., coffee, tobacco, etc. A modern warehouse provides facilities for processing, packing, blending, grading

etc., of the goods for the purpose of sale. The prospective buyers can inspect the goods kept in a warehouse.

2.5 Type of Warehouses

According to Feare, Tom (2001), there exist several types of warehousing; however, the most common ones are as follows

- **Private Warehouses:**

The private warehouses are owned and operated by big manufacturers and merchants to fulfill their own storage needs. The goods manufactured or purchased by the owner of the warehouses have a limited value or utility as businessmen in general cannot make use of them because of the heavy investment required in the construction of a warehouse, some big business firms which need large storage capacity on a regular basis and who can afford money, construct and maintain their private warehouses. A big manufacturer or wholesaler may have a network of his own warehouses in different parts of the country.

- **Public Warehouses:**

A public warehouse is a specialized business establishment that provides storage facilities to the general public for a certain charge. It may be owned and operated by an individual or a cooperative society. It has to work under a license from the government in accordance with the prescribed rules and regulations. Public warehouses are very important in the marketing of agricultural products and therefore the government is encouraging the establishment of public warehouses in the cooperative sector. A public warehouse is also known as duty-paid warehouse. Public warehouses are very useful to the business community. Most of the business enterprises cannot afford to maintain their own warehouses due to huge capital investment. In many cases the storage facilities required by a business enterprise do not warrant the maintenance of a private warehouse. Such

enterprises can meet their storage needs easily and economically by making use of the public warehouses, without heavy investment.

Public warehouses provide storage facilities to small manufacturers and traders at low cost. These warehouses are well constructed and guarded round the clock to ensure safe custody of goods.

Public warehouses are generally located near the junctions of railways, highways and waterways.

They provide, therefore, excellent facilities for the easy receipt, dispatch, loading and unloading of goods. They also use mechanical devices for the handling of heavy and bulky goods. A public warehouse enables a businessman to serve his customers quickly and economically by carrying regional stocks near the important trading centers or markets of two countries. Public warehouses provide facilities for the inspection of goods by prospective buyers. They also permit packaging, grading and grading of goods. The public warehouses receipts are good collateral securities for borrowings (Feare, Tom 2001)

- **Bonded Warehouses**

Bonded warehouses are licensed by the government to accept imported goods for storage until the payment of custom duty. They are located near the ports. These warehouses are either operated by the government or work under the control of custom authorities. The warehouse is required to give an undertaking or 'Bond' that it will not allow the goods to be removed without the consent of the custom authorities. The goods are held in bond and cannot be withdrawn without paying the custom duty. The goods stored in bonded warehouses cannot be interfered by the owner without the permission of customs authorities. Hence the name bonded warehouse. Bonded warehouses are very helpful to importers and exporters. If an importer is unable or unwilling to pay customs duty immediately after the arrival of goods he can store the goods in a bonded warehouse. He can withdraw the goods in installments by paying the customs duty proportionately. In case he wishes to export the goods, he need not pay customs duty. Moreover, a bonded warehouse provides all

services which are provided by public warehouses. Goods lying in a bonded warehouse can be packaged, graded and branded for the purpose of sale (Feare, Tom 2001).

2.4.1 The roles of warehouse in material management

According to Fear, Tom (2001), warehousing plays an important role in the management of materials in combination with other activities, it provides the firm customers with acceptable service levels and these roles include:

- **Movement**

The movement function has been receiving the most attention in recent times, as organization focus in improving inventory turns and speeding orders from manufacturing to final delivery. The movement role can further be divided into several activities including receiving, transfer, customer order picking / selection, cross docking and shipping.

- **Storage**

The second role of warehousing can be performed on a temporary or a semi-permanent basis. Temporary storage includes only the storage of product necessary basic inventory replenishment. Semi-permanent storage is the storage of inventory in excess of that require for normal replenishment. It can also be referred as buffer or safety stock.

- **Information transfer**

Information transfer is the third major role of warehousing which occurs simultaneously with the movement and storage function. Managers always need timing and accurate information as they attempt to administer to warehousing activity. Information on inventory levels, stock keeping

location, inbound and outbound shipment, customer data, facilities space utilization and personnel is vital to successful operation of warehouse (Feare, Tom 2001).

2.5 Factors that impede on Warehousing

According to Garcia, (2013), five most common warehouse challenges, all of which can easily eliminated through automation.

- **Inventory accuracy**

Without an automated system, companies often don't know what they have in stock, causing inaccuracies. Inadequate visibility can lead to excess/obsolete inventory buildup or unexpected shortages. Excess inventory can decrease cash flow, create warehouse space issues, increase expenses, to house extra materials and ultimately lead to deficient customer service. However, inventory shortage tends to be the greater problem as it can lead to unfulfilled orders and unhappy customers.

- **Inventory location**

Lack of inventory oversight can cause a buildup of inefficiencies within the warehouse that slows operations and increases costs. Without adequate insight into location, pickers take longer to find the items to ship, which slows the loading process and creates a backup in labor allocation and dock-door scheduling.

- **Space utilization/warehouse layout**

If you don't optimize storage systems, racking and pallet patterns, the amount of space necessary to house inventory increases. Inefficient warehouse layouts also cause unnecessary labor. For instance, if you have high-selling inventory in the back of the facility, you'll drive further more often than would be required if the warehouse layout was better optimized.

- **Redundant processes**

It's common for warehouse workers to pass a pick ticket or other documentation through multiple hands. The picker will pass it to the checker, who will pass it to the stager, who will pass it to the loader, and so on. Barcode technology, which is frequently found in today's automated warehouse systems, eliminates multiple touches.

- **Cost optimization**

For warehouses that still have manual processes in place, there tends to be no common route taken to pick items for shipment, which adds unnecessary time to the process. With system-directed pick/put away, the routing is easily automated, reducing wear and tear on both your equipment and your labor force. Today, an agile supply chain is more vital than ever, which is why more warehouses are turning to automation to help smooth operations. It all comes down to efficiency and beating the competition every step of the way, from supply chain to sales and delivery.

- **Globalization**

There are more competitors in your market every single day – people who sell nearly the same products you do, from anywhere in the world. They come from Mexico, China and Eastern Europe.

The quality might not be as good, but the labor is cheap. If you can't compete by keeping overhead down, you lose crucial business to those competitors. Doing less with more is what warehouse technology is all about – automated processes and precise operations save you time and money, and put you ahead of the international competition.

- **Product Diversification**

Take a walk around your warehouse and peak into the little-used bins. You'll see products that you might not even be aware that you had in stock. Why? Your customer is demanding that you stock these items (Garcia, 2013).

2.6 Materials Management

Materials management, is the activity that controls the transmission of physical materials through the value chain, from procurement through production and into distribution. It includes logistics which refers to the procurement and physical transmission of materials through the supply chain, from suppliers to customers. Hill, (2003). He went further to state that the twin objectives of materials managements are to achieve this at the lowest possible cost and in a way that best serves customer's needs, thereby lowering the costs of value creation and helping the firm establish a competitive advantage through superior customer service. According to Rahul (2003), materials management can be seen as the process of strategically managing the procurement, movement and storage of materials, parts and finished inventory (and related information flow) through the organization and its marketing channels in such a way that current and future profitability are maximized through the cost-effective fulfillment of orders.

It refers to the planning; organizing and controlling of a series of activities in the entire supply chain. Materials management exists in both service and manufacturing organization, although the complexity of the chain may vary greatly from industry to industry and from firm to firm. It

provides a major source of competitive and financial advantage, i.e. a position of enduring superiority in terms of customer preference with low cost. He concluded that materials management, works in demand driven situation, encourages flow type production with small batch, reduce idle inventory and idle time in any business by improving overall customer centric approach.

Monczka et.al (2002) defined material management as all activities associated with the flow and transformation of goods from the raw materials stage (extraction), through to end users, as well as the associated information flows. Materials and information flows both up and down in an organization. Materials management includes systems management, operations and assembly, purchasing, production scheduling, order processing, inventory management, transportation and physical distribution, warehousing and customer service. It is essentially a series of activities that links suppliers to customers.

Every organization, big or small, depends on materials and services from other organizations to varying extents. These materials and services are obtained through exchange of money. The various materials used as inputs, such as raw materials, consumables & spares, are required to be purchased & made available to the shops / users as & when needed to ensure uninterrupted production. Therefore, efficient management of input materials is of paramount importance in a business organization for maximizing materials productivity, which ultimately adds to the profitability of the organization. The main concern of any Business management is to maximize the Return on Investment (ROI).

A firm's profit margin reflects management's ability to control costs in relations to revenue. The asset turnover rate reflects management's ability to effectively utilize the firm's productive assets.

Thus, it is the cost control that holds the key. In many production organizations, the cost of materials alone happens to range from 40 % to 60 % of the total expenditure. Obviously, a better management of material is expected to ensure reduction in overall cost of operation and smoothness in supply of inputs. This requires well-coordinated approach towards various issues involving decision making with respect to materials.

All the materials related activities such as material planning & indenting, procedure, variety reduction through standardization & rationalization, reducing uncertainties in demand & supply, handling & transportation, inspection, proper storage & issue of materials to the internal customers, inventory management, vendor management & finally disposal of obsolete, surplus & scrap materials etc. taken together is termed as “Integrated Material Management”. To carry out these functions efficiently, it is essential to have a very good supplier base, order booking process & inventory management system as well as expert Material Management (MM) professional.

2.7 Objectives of Materials Management

Objectives are measure of effectiveness. A good objective must be hierarchical, quantitative, precise and realistic (Onwuchekwa, 2003). Accordingly, objectives are targets, which organizations must achieve if they are to survive. The means through which organization accomplish their objectives is through the formulation of various strategies (Monczka, 2002). They also said that the overall objective of materials management was to solve materials problems from a total system view point rather than the view point of individual functions or activities. In doing this, materials management objectives which are derived from the overall corporate objectives is to reduce cost and maximize efficiency.

Both Onwuchekwa (2000) and Monczka et.al, (2002) concurred that since materials management objectives are derived from the overall corporate objectives, the former must be strategically aligned with the later. This means that materials management activities must be consistent with the nature of business strategy and make a proactive contribution to maximum efficiency, value creation and profitability. Within the broader management objective of an industry or business, effective and efficient materials management contribution towards objectives may be attained under certain subheading like: - Purchasing materials play a vital role in the field of cost control and operating expenditure of any organization, and therefore, have a direct bearing on the costs of a product manufactured or service rendered (Monczka, 2002).

Materials management department can reduce overall materials cost through efficient system of buying which directly contribute its share to the enhancement of profit of organizations. Materials management ensures that the right quality and right quantity of materials is sourced from the right sources (suppliers), at the right price and delivered to the right place at the right time. There are also some other objectives that do not contribute directly but rather help other departments achieve their own objectives but different organizations put different emphasis on these objectives. Such objectives are achieved through value analysis, value engineering and make or buy decision (Monczka, 2002).

According to Baily and farmer (1982), there are benefits an organization will derive if they integrate their materials management effectively and efficiently. Such benefits are as follows:

- **Elimination of buck passing**

This is by defining and centralizing the authority and responsibility of all the materials function under one key individual under the title: purchasing/procurement manager, or rather materials manager or supply chain manager/administrator.

By doing this, a central point of control for materials flow is provided. For instance, when the user departments have problems regarding their materials requirement, they need not to move around but rather go to a central point and ask for the materials.

- **Wise buying**

Wise buying requires accurate information promptly supplied regarding materials need. Therefore, when all materials function, including materials planning and control and inventory control are joined together in an organization, effective communication is greatly required. When there is reduced materials lead-time with long communication channels, substantial amount of time may lapse between the time potential materials user recognizes his need and the time that materials is received by the firm. But, under materials, this reaction time is less and there is greater speed, accuracy and completeness of communication regarding materials requirement and usage rates. It is possible to reduce the total investment in inventory with resultant savings in inventory costs.

According to Bala (2007), if objectives are well articulated, they are likely to enhance indices of high productivity, such indices include: - Market standing, innovation, productivity, physical and financial resources, responsibility, performance and profitability.

In the same vein, the researcher believed that the objectives which materials management aims to achieve, whether in the area of purchasing, distribution and transportation, production scheduling and routing, warehousing (storage) or inventory management etc., are geared towards achieving cost reduction and a way that best serves customer needs, thereby, lowering the cost of value creation and helping the firm establish a competitive advantage through superior customer service.

2.8 Challenges of Materials Management

According to Perdomol (2002), the following are challenges of materials management.

- **Material purchasing**

The purchasing process is dependent on the types of material ordered. In general, materials purchased fall into two categories: miscellaneous material or commodities, and major materials. Although the purchasing process may involve negotiating specifications and prices directly with a manufacturer, procurement department need to purchase materials from a supplier-distributor. The selection of a reputable supplier is critical for ensuring that materials are delivered in the quantities needed and at the dates specified.

Some companies have independent agents, depending on the type of material, for supplier selection and procurement. Suppliers are usually selected based on lowest price; however, contractors may consider suppliers with higher prices that will provide better service or have a record to supply the right material in the quantities needed at the times specified. In some situations, incomplete proposals from suppliers may delay the selection process. For major material, the supplier usually negotiates prices with the manufacturer directly, if the manufacturer is specified in the contract documents. However, the procurement department has to buy the material through the supplierdistributor after a markup has been applied. If the manufacturer is not specified in the contract documents, the contractor requests bids from different manufacturers. Contrary to miscellaneous materials, major materials need to be fabricated and require lead times.

- **Job site storage and handling**

Inventory departments encounter the majority of their material-management problems at the job site, including material tracking, storage issues, material distribution and re-handling. Tracking materials is one of the biggest challenges the inventory department faces. Perdomol (2002),

tracking identifies undelivered material as ordered or delayed. Tracking is also essential in figuring what materials are available to minimize theft or loss, to identify where it is stored on site and to control inventory costs. In some instances, suppliers may deliver the materials that need to be returned.

There is no direct cost to the inventory department in this case; however, indirect costs could be incurred with possible delays to finish affected activities. In other instances, material might be misplaced or relocated by warehouse personnel or not properly identified before storage. In addition, material could be lost, damaged or stolen after it is issued, which represents a major problem for the electrical contractor. An automated system, such as bar codes, could greatly improve tracking and inventory control and minimize loss and material misplacement.

- **Material damage**

Material damage is another challenge faced by the inventory department. Material may get damaged during delivery or while in storage. If the material is damaged prior to delivery and the person receiving it acknowledges the damage, the material is returned at no cost for the inventory department. However, this might cause a delay if the material is needed immediately. If the person receiving the material does not identify any damage, the inventory department may end up responsible for the damaged material, which will result in a loss. Similarly, the inventory department assumes responsibility for damages to material while it is stored prior to arrangement.

- **Material re-handling**

Material re-handling on the job site is another big issue for inventory department. Most of the time, inventory department have trailers for material storage prior to management. The material is moved from these trailers to the storage place as it is needed. This material might be subsequently

moved around the warehouse to create space for other trades before it is arranged. These rehandling increases indirect costs associated with that particular material. Materials management can be broken down into three areas: acquisition, quality control, and standard (Perdomol,2002).

2.9 Quality Assurance

Materials management also ensures that parts and materials used in the supply chain meet minimum requirements by performing Quality Assurance (QA). While most of the writing and discussion about materials management is on acquisition and standards, much of the day-to-day work conducted in materials management deals with QA issues. Parts and material are tested, both before purchase orders are placed and during use, to ensure there are no short- or long-term issues that would disrupt the supply chain. Material management is most important for industrial point of view Quality assurance, or QA for short, refers to planned and systematic production processes that provide confidence in a product's suitability for its intended purpose. It is a set of activities intended to ensure that products (goods and/or services) satisfy customer requirements in a systematic, reliable fashion. Quality Assurance cannot completely guarantee the production of quality products, unfortunately, but makes this more likely. Two key principles characterize QA: "fit for purpose" (the product should be suitable for the intended purpose) and "right first time" (mistakes should be eliminated). QA includes regulation of the quality of raw materials, assemblies, products and components; services related to production; and management, production and inspection processes (Perdomol,2002).

2.9.1 Standards

The final component of materials management is standards compliance. There are standards that are followed in supply chain management that are critical to a supply chain's function. For

example, a supply chain that uses Just In Time or lean replenishment requires complete perfection in the shipping of parts and material from purchasing agent to warehouse to place of destination.

Systems reliant on vendor-managed inventories must have up-to-date computerized inventories and robust ordering systems for outlying vendors to place orders on. Materials management typically insures that the warehousing and shipping of such components follows the standards required to avoid problems. Materials management, therefore, can be defined as a joint action of various materials activities directed towards a common goal and that is to achieve an integrated management approach to planning, acquiring processing and distributing production materials from the raw material state to the finished product state. Materials Management as such is a key business function that is responsible for co-ordination of planning, sourcing, purchasing moving, storing and controlling materials in an optimum manner so as to provide a pre-decided service to the customer at a minimum cost (Perdomol,2002).

2.10 Role of Materials Management

According to Bala (2007), the fundamental objectives of the Materials Management function are acquisition of materials and services, often called the famous 5 Rs of Materials Management:

- Of the right quality
- In the right quantity
- At the right time
- From the right source
- At the right place

From the management point of view, the key objectives of Materials Management are:

- To buy at the lowest price , consistent with desired quality and service

- To maintain a high inventory turnover, by reducing excess storage, carrying costs and inventory losses occurring due to deteriorations, obsolescence and pilferage.
- To maintain continuity of supply, preventing interruption of the flow of materials and services to users.
- To maintain the specified material quality level and a consistency of quality which permits efficient and effective operation.
- To develop reliable alternate sources of supply to promote a competitive atmosphere in performance and pricing.
- To minimize the overall cost of acquisition by improving the efficiency of operations and procedures.
- To hire, develop, motivate and train personnel and to provide a reservoir of talent to develop and maintain good supplier relationships in order to create a supplier attitude and desire furnish the organisation with new ideas, products, and better prices and service.
- To achieve a high degree of cooperation and coordination with user departments.
- To participate in Make or Buy decisions.

2.11 Transportation

According to Arnold (1991) transportation is an essential ingredient in the economic development of any area. It brings together raw materials for production of marketable commodities and distributes the products of industry to the market place. As such, it is a major contributor to the economic and social fabric of a society and aids economic development of regional areas. Another view by Leender (1993) also defines transportation as the transfer of goods and services from one destination to another. This movement of goods and services may be movement from external

sources into the organization, movement within an organization and movement outside the organization. Based on the two definitions above, transportation can be summarised to be a medium used to move an item from one location to another. Common forms of transportation include planes, cars, automobiles, and other two-wheel devices such as bikes or motorcycles.

2.11.1 Purpose of Transportation

According to Hang (1998), the purpose of transportation in every society is to provide a means through which people and freight can move or be moved from one location to another. Even within a factory or warehousing, transportation is needed to move finished goods and materials from production floor or room to the warehouse or vice versa. The purpose is to save time and effort that would have gone into carrying the materials and the goods on the hand.

The role that transportation plays in logistics system is more complex than carrying goods for the proprietors. Its complexity can take effect only through highly quality management. By means of well-handled transport system, goods could be sent to the right place at right time in order to satisfy customers' demands. It brings efficacy, and also it builds a bridge between producers and consumers. Therefore, transportation is the base of efficiency and economy in business logistics and expands other functions of logistics system. In addition, a good transport system performing in logistics activities brings benefits not only to service quality but also to company competitiveness. (Hang, 1998).

2.12 Modes of Transportation

A mode identifies the basic transportation method or form. Each mode has its significance depending upon the geographical location and product to be transported. Monczka et.al (2002), classified transportation into the following:

- Rail transportation
- Road transportation
- Water transportation
- Air transportation and
- Pipeline transportation

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They further averred that the relative importance of each mode can be measured in terms of system mileage, traffic, revenue and nature of composition. **Table 2.1: Benefits and challenges of the various modes**

| MODE | BENEFITS | CHALLENGES |
|--------------|---|---|
| Rail | Full capacity Extensive routes Low cost | Not always complete pick-up Sometimes slow High cost of maintenance |
| Road | Complete pick-up delivery Extensive routes | High cost Size and weight restrictions |
| Air | Fast Low damage | High cost Limited capabilities |
| Pipeline | Low cost Very reliable | Limited routes Slow |
| Water or sea | Low cost Huge capabilities | Slow Limited routes/schedules |

Source: Leender, (1993).

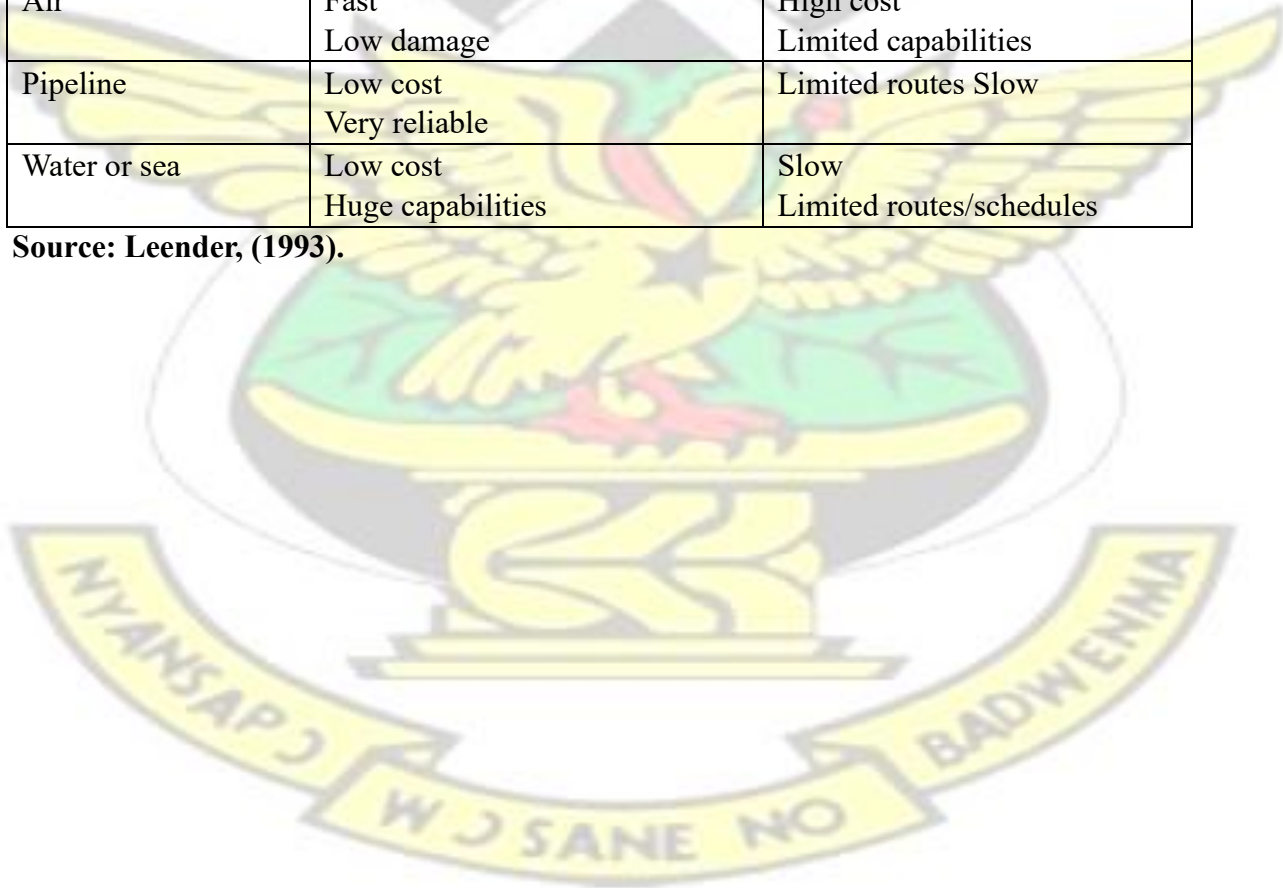


Table 2.2: Comparison Matrix of Different Modes

| Criteria | Road | Rail | Sea | Air |
|-------------------|--|--|--|--|
| Reliability | Moderate | Moderate | Slow | Very high |
| Cost per tonne/km | Good | Good | Limited | Very good |
| Flexibility | Medium | Low/medium | Low/very low | High |
| Challenges | Roads may be dangerous (land mines) or blocked (rainy season) Sometimes drivers nationality or vehicle registration not acceptable | Difficulty finding Freight cars; Delays transshipment, inflexible; tracking. | Slow; transshipment at ports; use as a second means of transport for large volumes; higher theft risk in the port, Not flexible. | Expensive; restricted to journeys between airports; restricted loading capacity (dangerous goods size of shipment, weight, Fuel, Size of packages, etc.) |

Source: Fritz, (2009).

According to Lay (1992), the criteria of speed and reliability must be examined when considering the choice of mode. Different modes have quite different characteristics and will meet the speed/reliability/cost criteria to varying degrees. The appropriate mode must be carefully selected if it is to match all the requirements. Multi-modal solutions may provide the most effective and efficient transport option.

Whilst the physical characteristics of certain goods and supplies may determine a specific mode of transport, most goods will be capable of being moved by a variety of modes. Customer requirement and constraints on the organization providing the transport must be considered. In humanitarian aid situations, it is often environmental factors, such as the destruction of roads and railways that have a significant impact on modes selection.

It is important to fully recognize the operational characteristics of the mode that have been selected.

It is also necessary to consider the type of vehicle or equipment that will be used within that mode. Prior to making a decision on the mode of transport, it would be useful to create a matrix that will help in identifying influential factors when choosing transport modes. Lay (1992).

2.13 Transportation Documentation

There are several types of transport documentation required to perform each transport movement.

According to Rahul (2007), the three primary documents are as follows:

- **Bill of Lading**

This is the basic document for using transport services. It serves as a receipt, and documents the commodities and quantities that are shipped. Accurate description and count are essential. The designated buyer on the bill of lading is the only bonafide receiver of the goods. The bill of lading specifies terms and conditions of carrier liability and documents responsibility for all possible causes of loss or damage.

- **Freight Bill**

This represents a carrier's method of charging for transportation service performed. It is developed using information contained in the bill of lading. It may be either prepaid or collect. A Prepaid bill as the name suggests means the transporter is paid prior to performance. On the other hand a collect bill shifts the responsibility of payment on the consignee.

- **Shipping manifest**

This lists individual consignees when multiple Shipments are placed on a single vehicle. Each shipment requires a bill of lading. The manifest lists the stop, bill of lading, weight and case count for each shipment. One objective of the manifest is to provide a single document that defines the contents of the total load without requiring a review of each individual bill of lading.

2.14 Other Transportation Documentation

According to Cooke (1993) traffic management use several kinds of document when shipping product to customers: bill of lading, freight bill, freight claims and shipping manifest.

2.15 The Role of Transportation

According to Cole (1992), transportation plays a very crucial role in the supply chain of all goods and services. It acts as connective tool among several steps that result in the conversion of resources (input) into useful goods (output) in the name of ultimate consumer. It moves products to the markets and provided added value to consumers when the products arrives on time, undamaged and in the require quantities.

The role that transportation plays in logistics system is more complex than carrying goods for the proprietors. Its complexity can take effect only through highly quality management. By means of well-handled transport system, goods could be sent to the right place at right time in order to satisfy customers' demands on time through lead time reduction. It brings efficacy, and also it builds a bridge between producers and consumers. Also, it reduced the rate of perishability of materials, providing safety of material through proper packaging. Therefore, transportation is the base of efficiency and economy in business logistics and expands other functions of logistics system. In addition, a good transport system performing in logistics activities brings benefits not only to service quality but also to company competitiveness.

2.15.1 The Role of Transportation in Materials Management

According to Cooke (1997), transportation is major contributor to the economy and competitive force to material management. It is the activity that physically connects material to its supply chain

partners such as suppliers and customers and is the major influence on customer satisfaction with the company. Transportation is among the more vital economy activities for material management.

By moving goods from location where they sourced to location where they are demanded.

Transportation provides the essential service of linking a company to its suppliers and customers.

It is an essential activity in logistics function supporting the economy utilities of place and time.

Place utility infers that customers have product available when demanded. Time utility suggests that customers have access to product when they are demanded. By working in close collaboration with inventory planners, transportation professionals seek to ensure that the organization has product available where and when customers seek it. Transportation is sometimes to be blame for a company's inability to properly service customers; late delivery can be the source of service problems and complaints. Products might also incur damage while in transit or warehouse workers might load the wrong items at shipping location. Shipments can frustrate customers too leading to dissatisfaction and the decision to buy from competitors for future purchases. However, when company performs on time with complete and undamaged deliveries constituting this can instill customer confidence and gain business for company. Also, from its service ramifications transportations can represent a substantial cost for the material management. The cost of transportation can sometimes determine whether a customer transactions results in a profit or loss for the materials to be managed depending on the expenses incurred in providing transportation for a customer orders.

2.16 Good Transport System

A good transport system according to Simpson (1994) is supposed to provide:

- Better logistics efficiency
- Reduced operational cost

- Improved service quality
- Enable the practice of just in – time delivery of finished products.

2.17 Developing a Transportation Strategy

According to Bateman (1992), the changes in transportation system and alternatives have been dramatic over the past several years from a rather mundane, routine type of buying it has moved into an era where the same principles of effective purchasing can and should be applied. Development of a transportation strategy should include; Value analysis of alternatives, a service requirement value analysis may turn up totally adequate, lower cost transport arrangements, price analysis, volume discounts may reduce transport cost substantially and consolidated freight where possible. Systems contracts and blankets orders may be advantageous if just in time purchasing is in use or being implemented. Consolidation of several just in time suppliers may be cost effective. According to Bateman (1992), this will enable the buyer to determine the mode that may be suitable for his goods. Load flexibility is the degree to which a transportation mode can provide appropriate equipment and conditions for moving specific kinds of goods and can be adopted for moving other products.

2.18 Transport Operations

According to Simpson (1994), the infrastructure and the vehicles cannot on their own move people and goods from place to place. They have to be operated to be able to do so. Transport operations refer to the decisions about what type of transport mode to use or provide. It deals with the way transport vehicles and transport infrastructures are operated and the procedures set for such purpose including financing, legalities and policies. The operation of transportation determines the efficiency of moving products. In moving raw materials, the delivery, speed, service quality, usage

of facility, energy saving even operating cost is all dependent on how efficient and effective transport operations are.

2.19 Transport Cost

Cole (1992), argue that, transport cost is the biggest of all logistics cost and therefore has a big influence on raw materials price. In general, factors influencing transportation costs can be grouped into two major categories such as product related factors and market related factors.

2.20 Measuring Transport Operations

According to Cole (1992), factors that measure the efficiency and effectiveness of transport operations can also be classified qualitative factors and quantitative factors. Qualitative factors are those factors that can only be felt and cannot be measured. These factors include comfort ability, aesthetic appeals and flexibility. Quantitative factors on the other hand are those factors that can be measured. These include cost, risk, safety, speed, availability and dependability. Choosing mode of transport for transporting goods depends on a number of factors such as transit time, cost, reliability, speed, safety and comfort.

2.21 Modal Complement

According Douglas, Lambert, Lewis, and Stack (1993), modal complement is the use of more than one mode of transportation to move a shipment from its origin, to its final destination. The most common examples are water/rail, water/truck, water/rail/truck, air /rail/truck etc.

2.22 Factors that impede on transportation

According to Coyle and Novack (2006) different modes of transport are affected or impacted by different factors that affect all modes of transport. Among the factors that affect the transportation role in general are:

- Over-reliance on third party carrier within less competitive pricing
- The poor state of the existing transportation system
- High maintenance cost and the bad weather condition.
- Frequent break-downs of trucks
- Transporting less than truck load frequently

2.23 Conceptual Framework

A concept, according to Kombo and Tromp (2009), is an abstract or general idea deduced or formed from particular occurrences. A conceptual framework is a collection of overarching concepts and guiding ideas drawn from pertinent disciplines of study and used to organize a subsequent presentation. A conceptual framework, according to Mugenda and Mugenda (2003), is a model that hypothesizes the model being studied and the link between the dependent and independent variables. According to Kothari (2004), a dependent variable is the variable that the researcher wants to explain, whereas an independent variable, also known as the explanatory variable, is the variable that is thought to be the source of the variations of the dependent variable. The categorization, description, and mapping of relationships between concepts that are important to the investigation are the objectives of the conceptual framework. Such a framework aids in concept definition, conceptual scope mapping, systematizing relationships between concepts, and the identification of literature gaps (Creswell, 2003).

Key themes from the study and the literature review served as the foundation for the conceptual framework of the study. The research's findings were then examined using the conceptual framework. It was based on warehouse practice and transportation capacity techniques that have an impact on the provision of material management. The illustration below illustrates this;

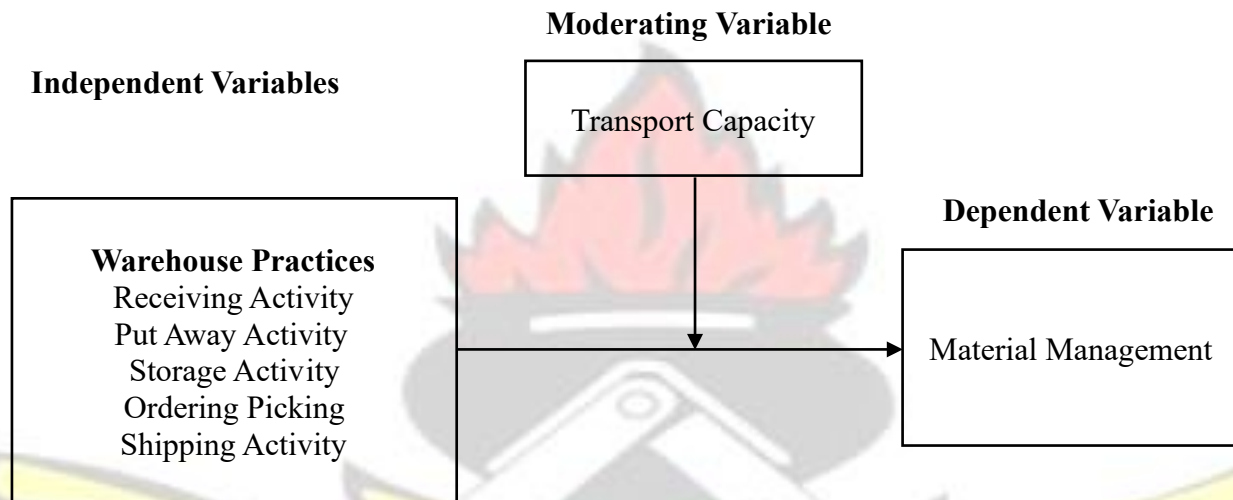


Figure 2.1: Conceptual Framework Source:
 Researcher's Own Construct, 2023

From the conceptual framework, material management is the dependent variable which is been predicted by warehouse practice and transportation capacity. The extent of this relationship is been tested in the research scope and study area

CHAPTER THREE

RESEARCH METHODOLOGY AND ORGANISATIONAL PROFILE

3.1 Introduction

Research methods have evolved over the years and among fields. One concept that has received much attention in methodologies is the research onions. Saunders, Lewis, and Thornhill proposed the use of research onions. Each layer is a crucial stage in the research process, and it majestically

guides the researcher to the centre, which contains the methods for gathering data and analyzing it. The onions are a nested hierarchy that offers a model that aids researchers to establish the main areas that need attention if the final research methodology adopted is to be both justifiable and credible. Other areas in the hierarchy are approaches, strategies, choices and time horizon (Saunders et al., 2009). In this chapter, the research philosophy, design, process and strategy are discussed. The various methodologies adopted are thereafter presented. Additionally, this chapter contains the study populations, sample size and sampling techniques, data collection tools and techniques and data analysis strategy.

3.2 Research Design

The operational framework for conducting research is referred to as research methodology (Govindan et al., 2014). It gives an outline for conducting the research study (Grove, 2003). Also According to Kothari and Garg (2018) research design facilitate the retrieval of relevant evidence or data by the researcher with less effort, time and financial resources. The type of research design adopted for a research work depends largely on the research questions and research strategy adopted for the study. Research strategy informs which research method (case study, survey, experiment, ethnography etc.) to adopt for the research design (Saunders at el., 2019). In this study, a descriptive research design was applied. This is due to the researcher's intention to truthfully and accurately report systematic facts and figures of a certain population or area of interest and seek to identify the links between variables (Dwivedi et al., 2021; Pan et al., 2020). Furthermore, surveys don't regulate or interfere with naturally occurring phenomena. Additionally, the application of this design aided in the measurement of these magnitudes in the general populace by assessing people's knowledge, beliefs, preferences, and satisfaction (van den Berg et al., n.d.).

Research philosophy is an over-arching term which relates to the knowledge and nature of that of that knowledge (Saunders et al., 2019). It depends on the way the researcher views about development of knowledge. According to Easterby-Smith et al. (2012), failure to consider carefully research paradigm or philosophy may affect the quality of research. Research philosophy is critical to research design. There are several research philosophies which includes positivist and social constructionist philosophies. The philosophical stance is influenced by the availability of participants and/or data, as well as by time restrictions.

Ontology is built on how we perceive reality. Relativism, which holds that people's interpretations of reality are what determine its meaning, is one of the two perspectives on reality (Saunders et al., 2016). Each of these various points of view is regarded as correct (Easterby-Smith et al. cited by Pesu, 2019). According to Easterby-Smith et al. (2012), social constructionists argue that reality is not objective and exterior but rather internal and is constructed as well as given meaning by people. Positivism holds the belief that the world exists externally and its elements or properties should be measured objectively. Because the research was applicable to agriculture, positivism as a research philosophy was chosen for this study. Its foundation was an objectivist ontological viewpoint. The researcher created survey questions based on questions from a literature review and sent them to built-environment professionals. The data was then statistically analyzed

3.3 Population of the Study

Population is the aggregate of all elements that show some common set of characteristics and comprise the universe for the purpose of the research. The population parameters are typically numbers (unit) (Chakraponi, 2011). Polit and Beck (2004) added that a population is the entire aggregation of cases that meet a designed set of criteria. Population is the group you want to generalise your findings to (Muijs, 2010). Population can be characterised as the set of individual

persons or objects in which an investigator is primarily interested during a research inquiry. The population in this study comprises of all participants or actors in the Takoradi oil and gas industry supply. The total population comprised of 108 Oil and Gas industry employees in Takoradi branch of Ghana. This population of interest had the potential of providing the relevant information regarding the effects of warehouse practices on materials management in the oil and gas sector.

Table 3.1: Total Population Distribution

| | |
|----------------------|-------|
| Oil and gas Company | Total |
| Management staff | 50 |
| Non-Management staff | 58 |
| Total | 108 |

3.4 Sampling Technique and Sample Size

Sampling is observing a part in order to glean information about the whole which is an instinctive human act (Corbetta, 2003). Sampling technique is a definite schedule for gaining a sample from a given population (William, 2009). Sampling means selecting individuals from the population in a manner that every individual has an equal chance to be taken into the sample (Pandey and Pandey, 2015). Following then, the idea of sampling approaches was introduced. In general, sampling techniques can be divided into probability and non-probability samples, according to Arulmozhi et al. (2012). They went on to say that probability samples are employed when each unit has a known and non-zero chance of being included in the sample, which truly ensures the validity of statistical inferences. Simple random sampling, stratified random sampling, systematic sampling, cluster sampling, and multistage sampling are a few examples of probability samples. The non-probability sample was described by Arulmozhi et al. (2012) as a method of calculating the

likelihood of an element appearing in a sample. In fact, this may lead to inaccuracies and increase bias. According to Arulmozhi et al. (2012), the selection of sampling units from the population is made solely based on individual discretion, experience, convenience, and other factors. Purposive sampling, quota sampling, convenience sampling, and judgemental sampling are a few examples of non-probability samples. According to Creswell (2012), Neuman (2012), Singh and Masuku (2014), the study sampled respondents using a multistage sampling approach. The decision to employ this sample technique was primarily influenced by the research population's large geographic dispersion, which made it challenging to establish a single sampling frame, as well as by the expense of reaching the respondents.

Stratified sampling was used to divide the population into two strata as shown in table 3.1 above. This was done to enable the researcher to draw inferences about both sub groups. This method also leads to more efficient statistical estimates. Both management and non-management staff in the oil and gas industry at Takoradi, the respondents were randomly chosen from different sections. The researcher ensured that all the cadres of employees were represented. This is the process of selecting the number of individuals from the population so that the population contains elements representative of the characteristics found in the entire group (Orodho & Kombo, 2002).

3.4.1 Sample Size

Israel (2012) claims that methods, published tables, copying the sample size of related research, and consensus for small populations can all be used to identify or estimate the sample size for a study. There are several formulas for calculating sample sizes (Singh and Masuku, 2014).

The sample size is a smaller set of the larger population (Cooper and Schindler, 2003). Cooper and Schindler argue that the sample must be carefully selected to be representative of the population

and the need for the researcher to ensure that the subdivisions entailed in the analysis are accurately catered for. However, the study was based on a census. A census is defined as a particular type of survey that counts the total number of populations in an area. For this case, the sample size was based on a census of 108 respondents. The total number of respondents who were sampled with questionnaires was believed to be large enough for the study given the purpose and goals of the research. The representation from each sub group was shown in the table below.

3.5 Data Collection Method

Data collection is the gathering of information needed to address a research problem (Polit and Beck, 2004). According to Pandey and Pandey (2015), there are several ways of collecting data which differ considerably in the context of cost, time and other resources at the disposal of the researcher. Survey data can be collected through a personal interview, telephonic interview, schedules, online survey or mailing questionnaires (ibid). A structured, self-report method allows the respondents to respond directly in writing. It enables the researcher to collate retrospective data about activities or gather projections about behaviour (Polit and Beck, 2004).

Primary and secondary data are the two basic data kinds used in the performance of every research project. Both primary data and secondary data were used in this investigation. According to Greene et al., (2016), primary data consists of items that the researcher has personally collected through careful observation, information from archives, the outcomes of surveys and interviews, and case study compilation. Data collection from a primary source was necessary due to the nature of the research. Questionnaires, interviews, and focus groups were the main methods for acquiring primary data. By giving questionnaires to the many actors who were sampled for the quantitative study, the data were mostly obtained from primary sources. In order to gather more qualitative data for the study, interviews and focus groups with a small number of participants were also held. From

journals, periodicals, and books, secondary data were acquired. The secondary data used in this study was mainly for the review of relevant literature and the construction of the theoretical framework. Arguments from these sources also started to matter in determining how the discussion would proceed.

The data collection techniques that were employed for the research include the use of structured questionnaires. The questionnaires were used for the collection of data from the respondents. The questionnaire embodied both open and closed-ended questions for randomly selected members of the various groups. A survey questionnaire is designed to apply to a heterogeneous sample selected from the large population of respondents. The questionnaire was structured in five broad areas that include general information, a rating on the role of transportation and warehousing in materials management at Tullow Ghana Ltd, examine warehouse and transportation challenges associated with materials management in the oil and gas industry, examine how transportation and warehouse practices provide cost-effectiveness to materials management in the oil and gas industry, provide recommendation and suggestions towards improving Materials management, transportation and warehouse practices at Tullow Ghana Ltd and to investigate the role transportation plays in materials management. The variables on the key objectives of the study were measured in interval scales on a five-point Likert scale (1-representing strongly agree to 4- strongly disagree) to determine respondents' agreement with effects of performance management practices on employee productivity.

The respondents were requested for their time prior to sending the actual questionnaire. A pilot test involving 5 respondents was carried out to evaluate the completeness, precision, accuracy and clarity of the questionnaires. This ensured the reliability of the data collection instruments used.

After the amendment of the final questionnaire, the researcher explained the purpose of the research and sought permission from the company to carry out the actual research. The final questionnaires were distributed to the respondents with the help of research assistants. This enhanced the speed of data collection. Each completed questionnaire was treated, as a unique case and a sequential number given to each. Filling the questionnaire took approximately 10 minutes. The collected data was edited and entered into the Statistical Package for the Social Sciences (SPSS) software to enable the carrying out of the analysis.

3.6 Data Analysis

Data analysis is the process of evaluating the collected data to find solutions (Strydom et al., 2007). According to Burnham et al. (2008), the interpretation refers to the findings, meanings, and explanations of the data. Once the data has been gathered, processing of the data can begin; this comprises coding the data for effective analysis of the results.

All identifiers including names were deleted before the start of data analysis. The questionnaires were pre coded; the coded answers from the questionnaire were entered onto Statistical Package for Social Sciences (SPSS, version 21) which was used for the descriptive and multivariate statistical analysis. Descriptive analysis begins with summaries of continuous variables in form of means for the continuous variables. Tables of frequencies (percentages) were created for the categorical variables and presentation using graphs or charts as appropriate. Regression analysis was done to assess for any linear relationships among the factors, reporting the coefficients and respective P-values.

3.7 Validity and Reliability

Validity is the accuracy and significance of inferences, which are typically based on the results of research (Mugenda and Mugenda, 1999). It also refers to how accurately it measures the things it is intended to measure. The degree to which theory and evidence support the interpretation of test results implied by the usage of the fact is what is meant by "validity." Whether or not the effects seen in a study are the consequence of manipulating the independent variables and no other factors is referred to as validity, according to McLeod (2013). The process of making sure the survey accurately measures what is intended to measure in regards to assess the effect of warehouse practices on materials management in the oil and gas sector is known as ensuring validity of the research instrument. The proper research techniques were used for data collecting and analysis to ensure validity.

Reliability testing makes ensuring the survey tool yields the same result across measures, whether they are conducted on the same population or a similar population. The Cronbach alpha coefficient was used to evaluate or assess the instrument's reliability. Excellent dependability coefficient is approximately 0.9, good is around 0.8, adequate is around 0.7, dubious is around 0.6, poor is around 0.5, and unacceptable is smaller than 0.5, according to George and Mallery (2010).

3.8 Ethical Considerations

This study was guided by the basic principles of ethics in social research (Creswell, 2012; Gyekuni-Bell, 2019). First of all, the study was guided by the University's research ethics through the confidential treatment of identities of research respondents, the use of research data solely for academic purposes and the seeking the consent of respondents before participation. While gathering and analyzing the data, the student made sure to give respondents all guarantees of

privacy, confidentiality, and anonymity. Additionally, it ensured that results were interpreted in a way that was consistent with the data. It also used high methodological standards and strived for accuracy. In addition, the study recognized local protocols during the primary data collection period. The organization heads were consulted, and research objectives were communicated upon which consent was given. Additionally, before beginning to distribute the questionnaires, enumerators obtained the approval of the local authorities in each of the chosen localities.

3.9 Organisational Profile

Ghana is a country located on the Southern coast of West Africa. It is bordered by Cote d'Ivoire to the West, Burkina Faso to the North, Togo to the East and the Gulf of Guinea to the South. It covers an area of 238,539 km², 5% of which is comprised of water bodies. Ghana is divided into

16 administrative regions. The study was carried out in Tullow Ghana Ltd, Takoradi, in Ghana's Western Region. The investigation was conducted primarily at the Oil and Gas industry in Takoradi City. The Takoradi Metropolitan Area have 991,000 people living there by the year 2021.

The majority of businesses are situated in Takoradi, which as of March 2018 covers an area of roughly 191.7 km² (2.53 sq mi). In terms of production, research, extension, internal and external marketing, and quality control, Oil and Gas industry is regarded as the center.

The petroleum sector has experienced significant growth, particularly since the discovery of oil in commercial quantities in the Jubilee fields in 2007. Average crude oil production capacity has been declining slightly over time, with an average 176,000 barrels per day in September 2021. Upstream activities in the Ghanaian petroleum sector include the procurement and refining of crude oil by the nation's only petroleum refinery, Tema Oil Refinery (TOR). Downstream activities include the marketing and distribution of petroleum products by Oil Marketing Companies (OMCs) and the

pre-mixing of petroleum products for other industrial uses. OMCs operating in Ghana are mainly multinationals; however, the last decade has seen an increase in the establishment of several small and medium-sized local OMCs. The Ghana National Petroleum Council (GNPC) which is situated in Takoradi has the mandate to explore for oil within the nation's territory. Ghana's oil and gas prospects are significant. Recent discoveries appear to indicate oil and gas resources stretch across the country's shoreline from Cape Three Points in the west to Keta in the east. The Volta Basin is also believed to hold oil and gas reserves onshore. The Government of Ghana, through GNPC, seeks to maximize the country's prospects in the oil and gas sector and extend the country's continental shelf to increase the sector's scope.

CHAPTER FOUR RESULTS AND DISCUSSION

4.1 Introduction

In order to accomplish the major goal of this study, by concentrating primarily on the specific objectives of the study, this chapter focuses on presenting information about the findings of the primary data that was collected and analysed. The findings are thoroughly addressed in relation to earlier research examined to support the study's main themes. In order to represent the order of the study's objectives, the findings are also organized chronologically. Responses were gathered from staffs of Tullow Ghana Ltd. Hundred (100) responses in all were gathered out of the 108 questionnaires administered. This represented 92.5% response rate.

4.2 Demographic Information of Respondents

This section provides summary of the demographic information of the respondents. The demographics variables of interest were descriptively measured (frequency and percentage) and presented on Tables for easy understanding.

Table 4. 1: Age Group

| Response | Frequency | Percent |
|--------------------|-----------|---------|
| 18 - 25 years | 7 | 7 |
| 26-35 years | 35 | 35 |
| 36-45 years | 43 | 43 |
| 46-55 years | 10 | 10 |
| 56 and above years | 5 | 5 |
| Total | 100 | 100.0 |

Source: Field Data, 2023.

The results from Table 4.1 above shows the age distribution of the respondents. It was found that majority (43%) of the respondents were between 36-45 years. This was followed by (35.0%) of the respondents who were between 26-35 years. Similarly, (10%) of the respondents were between 46-55 years, (5%) of the respondents were age 56 and above years whilst (7%) were 18 -25 years.

Table 4. 2: Educational Qualification

| Response | Frequency | Percent |
|------------------|-----------|---------|
| WASSCE | 7 | 7 |
| Associate Degree | 5 | 5 |
| Degree | 42 | 42 |
| Masters | 36 | 36 |
| PhD | 5 | 5 |
| Others | 5 | 5 |
| Total | 100 | 100.0 |

Source: Field Data, 2023.

The results from Table 4.2 shows the educational qualification of respondents. It was found that majority (42%) of the respondents had undergraduate degree as their educational qualification, (36%) of the respondents had masters whilst (7%) of the respondents had senior high certificates as their educational qualification. Also, 5% of the respondents had associate degree as their educational qualification. With 5% of the respondents had PhD as their educational qualification and (5%) of the respondents had other educational qualification other than the ones mentioned. This means that majority the respondents had relatively better educational level, hence, providing the researcher with accurate information to make informed decisions. Again, this justifies why structure questionnaire was used because the respondents can read and write the English Language proficiently.

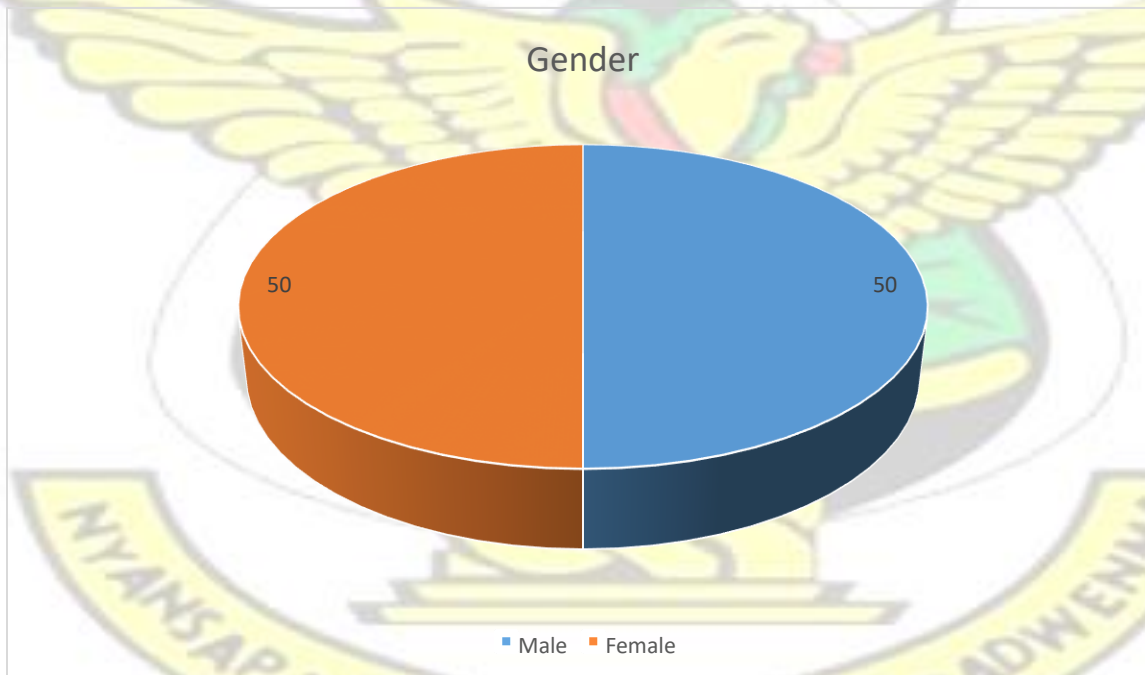


Figure 4. 1: Gender of respondents

Source: Field Data, 2023.

A close observation of figure 4 . 1 reveals that, out of 100 respondents surveyed, 50 were male constituting 50% and the other half were female representing 50%. This partly showed that oil and gas industry in Takoradi Municipal is a gender balance sector. More studies could be conducted to assess why this equal balance of gender into that oil and gas industry in Takoradi Municipal.

Table 4. 3: Working Experience

| Response | Frequency | Percent |
|--------------------|------------|--------------|
| 0-2 years | 37 | 37 |
| 3-5 years | 26 | 26 |
| 6-10 years | 16 | 16 |
| 11-15 years | 14 | 14 |
| 16 years and above | 7 | 7 |
| <u>Total</u> | <u>100</u> | <u>100.0</u> |

Source: Field Data, 2023.

The results from Table 4.3 above shows the number of years respondents have worked in their respective organisations. Table 3 shows that majority (37%) of the respondents have worked for 0-2 years in their organisations, 26% of the respondents have worked in their organisations for 3-5 years, 16% of the respondents have worked in their organisations for 6-10 years, 14% of the respondents have worked in their organisations for 11-15 years and lastly, 7% of the respondents have worked in their organisations for more than 15 years. This implies that majority of the respondents have fair knowledge about their organisations to provide information necessary enough for decision making.

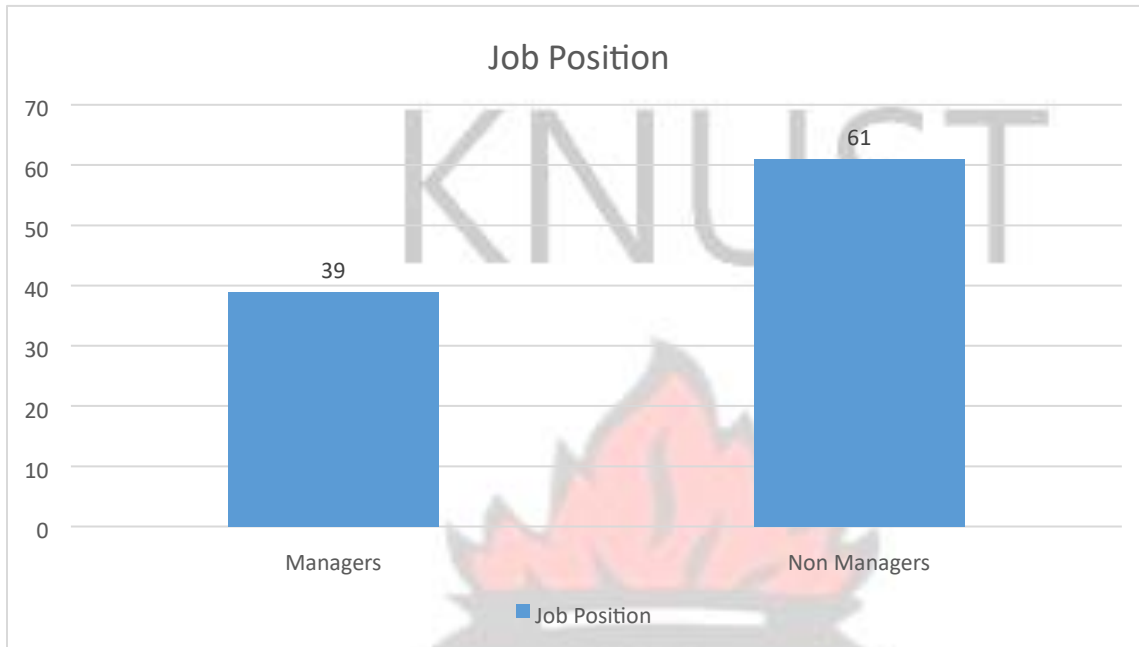


Figure 4. 2: Job positions of respondents Source: Field Data, 2023.

The finding from figure 2 shows the positions held by respondents. It was found that majority (69.0%) of the respondents were non managers and the rest of the respondents were managers (39%).

4.3 Descriptive Analysis

Descriptive statistics was assessed to examine the mean scores and the corresponding standard deviations under the respective scales of each of the measurement items of the dimensions. Hence, this attempt has the importance of addressing some of the research questions based on the perceptions of the respondents on the level of warehousing practice in the oil and gas industry at the Takoradi Municipal. In the descriptive analysis mean and standard deviation were used. Whereas, while making interpretation of the results of mean and standard deviation, the scales were reassigned as follows to make the interpretation easy and clear.

Table 4.4: Guideline for Interpreting Quantitative Data

| Range | Interpretation-1 | Interpretation-2 |
|----------|-------------------|----------------------|
| 1-1.8 | Strongly Disagree | Very dissatisfied |
| 1.81-2.6 | Disagree | Dissatisfied |
| 2.6-3.49 | Neutral | Moderately satisfied |
| 3.5-4.9 | Agree | Satisfied |
| 5-5 | Strongly Agree | Very satisfied |

Source: Field Data, 2023.

4.4 Examining the Nature of Warehousing Practices at Tullow Ghana Ltd

The first objective of the study was to examine warehousing practice at Tullow Ghana Ltd in Takoradi Municipal. It was discovered that the respondents agreed that warehouses are wellorganised and the layout supports efficient material handling (M=3.95, SD=1.12); regular management and inspection of warehouse equipment and infrastructure are conducted (M=3.79, SD=1.16); advanced technology is used for tracking and managing inventory within warehouses (M=3.87, SD=1.09); effective safety measures and protocols are in place to prevent accidents in the warehouses (M=4.11, SD=1.00); efficient material storage systems (e.g., racking, shelving) are utilised in the warehouses (M=3.88, SD=1.14); adequate training is provided to warehouse staff for proper handling and storage of materials (M=3.89, SD=1.14);warehousing processes are aligned with industry best practices and standards. (M=3.87, SD=1.13); inventory control systems are implemented to minimise overstocking and stockouts (M=3.93, SD=1.05); warehouses have designated areas for hazardous materials storage and handling (M=4.02, SD=1.04); warehouse operations are monitored and evaluated for continuous improvement (M=4.01, SD=1.09). With an overall mean score of 3.92, these findings show that the respondents agreed that Tullow Ghana Ltd address the warehousing practice in material management of the organization. This

optimization can lead to reduced carrying costs, minimized storage space requirements, and improved inventory turnover rates. Also, Effective warehousing implies that necessary materials and supplies are readily available when needed, ensuring uninterrupted operations and project timelines. Well-organized warehousing can enhance employee productivity by reducing the time spent searching for materials and streamlining the retrieval process.

Table 4.5: Descriptive Analysis Results for Warehouse Practices

| Statement | Mean | Std. D |
|--|-------------|---------------|
| Warehouses are well-organised and the layout supports efficient material handling. | 3.95 | 1.12 |
| Regular management and inspection of warehouse equipment and infrastructure are conducted. | 3.79 | 1.16 |
| Advanced technology is used for tracking and managing inventory within warehouses. | 3.87 | 1.09 |
| Effective safety measures and protocols are in place to prevent accidents in the warehouses. | 4.11 | 1.00 |
| Efficient material storage systems (e.g., racking, shelving) are utilised in the warehouses. | 3.88 | 1.14 |
| Adequate training is provided to warehouse staff for proper handling and storage of materials. | 3.89 | 1.14 |
| Warehousing processes are aligned with industry best practices and standards. | 3.87 | 1.13 |
| Inventory control systems are implemented to minimise overstocking and stockouts. | 3.93 | 1.05 |
| Warehouses have designated areas for hazardous materials storage and handling. | 4.02 | 1.04 |
| Warehouse operations are monitored and evaluated for continuous improvement. | 4.01 | 1.09 |

Source: Field Data, 2023.

4.4.1 Materials Management at Tullow Ghana Ltd

Again, the study also examines materials management at Tullow Ghana Ltd in Takoradi Municipal. It was discovered that the respondents agreed that material demand and consumption are accurately forecasted before procurement (M=3.71, SD=1.13); regular audits are conducted to ensure the

accuracy of material inventory (M=4.00, SD=1.01); efficient communication between procurement and production teams is maintained (M=3.86, SD=1.09); inventory levels are optimised to prevent overstocking and stockouts (M=3.98, SD=1.04); materials are sourced from reliable suppliers to ensure quality and timeliness (M=3.94, SD=1.03); Just-In-Time (JIT) principles are applied to minimise holding costs (M=3.71, SD=1.08); technological tools are employed to track material movement and usage (M=3.83, SD=1.05); procurement decisions consider factors such as lead times and price trends (M=3.88, SD=1.03); surplus materials are systematically recycled or disposed of (M=3.69, SD=1.14); cross-functional teams collaborate to enhance material management efficiency (M=3.90, SD=1.01). With an overall mean score of 3.85, these findings show that the respondents agreed that Tullow Ghana Ltd address the material management of the organization. This implies that Tullow Ghana Ltd is proficient in managing its materials, which can result in improved operational efficiency. Effective material management can lead to reduced waste, optimized resource utilization, and streamlined processes. Also, Efficient material management can lead to cost savings. If Tullow Ghana Ltd is successful in controlling material costs and minimizing wastage, it can have a positive impact on the company's bottom line.

Table 4.6: Descriptive Statistics Results for Material Management

| Statement | Mean | Std. D |
|---|------|--------|
| Material demand and consumption are accurately forecasted before procurement. | 3.71 | 1.13 |
| Regular audits are conducted to ensure the accuracy of material inventory. | 4.00 | 1.01 |
| Efficient communication between procurement and production teams is maintained. | 3.86 | 1.09 |

| | | |
|---|------|------|
| Inventory levels are optimised to prevent overstocking and stockouts. | 3.98 | 1.04 |
| Materials are sourced from reliable suppliers to ensure quality and timeliness. | 3.94 | 1.03 |
| Just-In-Time (JIT) principles are applied to minimise holding costs. | 3.71 | 1.08 |
| Technological tools are employed to track material movement and usage. | 3.83 | 1.05 |
| Procurement decisions consider factors such as lead times and price trends. | 3.88 | 1.03 |
| Surplus materials are systematically recycled or disposed of. | 3.69 | 1.13 |
| Cross-functional teams collaborate to enhance material management efficiency. | 3.90 | 1.01 |

Source: Field Data, 2023.

4.6 Transportation Capacity of Tullow Ghana Ltd

The third objective of the study was to examine transportation capacity of Tullow Ghana Ltd in Takoradi Municipal. It was discovered that the respondents agreed that transportation resources (e.g., vehicles, vessels) are readily available when needed ($M=3.75$, $SD=1.14$); the transportation network is well-connected and efficient for timely material movement ($M=3.91$, $SD=1.05$); adequate planning and coordination ensure smooth transportation operations ($M=3.87$, $SD=1.06$); modern technology is utilised for tracking and monitoring transportation activities ($M=3.83$, $SD=1.03$); safety measures are strictly enforced during material transportation activities ($M=4.04$, $SD=0.99$); transportation capacity is scaled to meet the demand fluctuations of the industry ($M=3.83$, $SD=1.03$); emergency response plans are in place to address transportation disruptions ($M=3.91$, $SD=0.95$); transportation costs are optimised through efficient route planning and utilization ($M=3.79$, $SD=0.97$); Environmental sustainability is a consideration in transportation practices ($M=3.86$, $SD=1.03$); Continuous improvement efforts are implemented to enhance transportation capacity ($M=3.77$, $SD=1.13$). With an overall mean score of 3.86, these findings show that the respondents agreed that Tullow Ghana Ltd address the transportation capacity of the

organization in material management. This implies that Tullow Ghana Ltd has a well-functioning transportation system, leading to an efficient supply chain. This can result in timely deliveries of materials and reduced lead times. Also, when materials are transported promptly, it can help maintain optimal inventory levels and prevent overstocking or stockouts. This can lead to improved inventory turnover rates. Proper transportation practices can reduce the risk of damage or loss of materials during transit, ensuring that the organization's assets are protected

Table 4.7: Descriptive Statistics Results for Transportation Capacity

| Statement | Mean | Std. D |
|--|------|--------|
| Transportation resources (e.g., vehicles, vessels) are readily available when needed. | 3.75 | 1.14 |
| The transportation network is well-connected and efficient for timely material movement. | 3.91 | 1.05 |
| Adequate planning and coordination ensure smooth transportation operations. | 3.87 | 1.06 |
| Modern technology is utilised for tracking and monitoring transportation activities. | 3.83 | 1.03 |
| Safety measures are strictly enforced during material transportation activities. | 4.04 | 0.99 |
| Transportation capacity is scaled to meet the demand fluctuations of the industry. | 3.83 | 1.03 |
| Emergency response plans are in place to address transportation disruptions. | 3.91 | 0.95 |
| Transportation costs are optimised through efficient route planning and utilisation. | 3.79 | 0.967 |
| Environmental sustainability is a consideration in transportation practices. | 3.86 | 1.03 |
| Continuous improvement efforts are implemented to enhance transportation capacity. | 3.77 | 1.13 |

Source: Field Data, 2023.

4.7 Effect of warehousing practice and transportation capacity on the material management of Tullow Ghana Ltd

The fourth and fifth objective of this study sought to assess the effect of warehousing practice and transportation capacity on material management in the Tullow Ghana Ltd in the Takoradi

Municipal respectively. Data transformation exercise was carried out to transform the constructs (with multiple indicators) into single variables to aid a holistic approach to the analysis of the regression analysis. The first part of the analysis is with respect to the fourth objective. Warehouse practice was measured in terms of the variables to assess warehousing practice. The results were transformed to compute for overall mean. A multiple regression analysis was conducted to that effect. The results are presented in the subsequent tables below.

Table 4.8 - Model Summary

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|-------------------|----------|-------------------|----------------------------|
| 1 | .944 ^a | .882 | .890 | 0.2843 |

a. Predictors: (Constant), warehousing practice, transportation capacity

b. Dependent (material management)

The model summary table assess the overall regression model. The first section, R indicates the correlation that exist between the independents (warehousing practice and transportation capacity) and the dependent variable (material management). The results from table 4.8 above shows that the correlation coefficient between the independent and dependent variables is .944. Cohen (1988) suggests the following guidelines for the interpretation of the magnitude of correlation coefficient; $r = .10$ to $.29$ or $r = -.10$ to $-.29$ small, $r = .30$ to $.49$ or $r = -.30$ to $-.49$ medium, $r = .50$ to 1.0 or $r = -.50$ to -1.0 large. This leads to the conclusion that there is a strong positive relationship between the independents and the dependent variable.

Table 4.8 also presents results on the coefficient of determination (R^2 value) both the R^2 and the Adjusted R^2 play the same role. According to Hair, Ringle, and Sarstedt (2011), the coefficient represents the independent variables' combined effects on the dependent variable. The results show that the warehouse practice and transportation capacity for 88.2% of the variation in the

material management of the Tullow Ghana Ltd in Takoradi. The 11.8% can be attributed to other factors not considered in this study. Table 8 indicates the significance of the entire model. It was found that the model was statistically significant ($p=0.000$; $p<0.05$). The implication is that the model can be relied to make realistic predictions regarding the effect of warehousing practice on material management of Tullow Ghana Ltd because this prediction is attributed to the scientific interaction among the variables in the model and not by chance.

Table 4.9: ANOVA^a

| Model | Sum of Squares | df | Mean Square | F | Sig. |
|--------------|----------------|----|-------------|---------|-------------------|
| 1 Regression | 64.665 | 2 | 32.333 | 399.802 | .000 ^b |
| Residual | 7.845 | 97 | 0.081 | | |
| Total | 72.510 | 99 | | | |

a. Predictors: (Constant), warehousing practice, transportation capacity

b. Dependent (material management)

The contribution of individual constructs to predicting the 88.2% variation in the material management of the Tullow Ghana Ltd. With respect to this objective, discussions will only be restricted to warehousing practice. Table 4.10 indicates that warehousing practice has a beta coefficient of 0.518, and this is significant at $p=0.000$. The findings showed that warehousing practice made the strongest statistically unique positive contribution to predicting the 88.2% positive variance in material management (Beta=0.518; $p=0.000$; $p<0.05$), when the effect of other variables in the model were statistically controlled for.

Table 4.10: Coefficients^a

| Model | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
|--------------|-----------------------------|------------|---------------------------|-------|------|
| | B | Std. Error | Beta | | |
| 1 (Constant) | -.078 | .142 | | -.550 | .583 |

| | | | | | |
|-------------------------|------|------|------|-------|------|
| Warehousing practice | .532 | .063 | .518 | 8.401 | .000 |
| Transportation capacity | .476 | .063 | .466 | 7.561 | .000 |

Dependent variable: Material Management

The findings are supported by the findings of Fear, Tom (2001), where warehousing plays an important role in the management of materials in combination with other activities. It can be concluded that warehousing practice variables increase R-square at a very significant level ($p < .001$) and warehousing practice is significantly and positively related to all material management. In the study of Feare Tom (2001), it was also found that warehousing practice is positively correlated to material management with 73 % variance explained.

4.8 Effect of transportation capacity on the material management of Tullow Ghana Ltd

The fifth objective assessed the effect of transportation capacity on the material management of Tullow Ghana Ltd in Takoradi Municipal. The results for the analysis of this objective are shown in Tables 4.8,4.9 and 4.10. It is worth noting that the overall regression model is significant, indicating that warehousing practice and transportation capacity is statistically significant in predicting material management of Tullow Ghana Ltd. The results from Table 4.10 show that transportation capacity has a positive significant effect on the material management of Tullow Ghana Ltd in Takoradi (Beta= 0.466, p-value= 0.000).

The results indicate that the motivation of Tullow Ghana Ltd to manage transportation capacity with their workers to provide material management activities is very high. This supports the position of Cooke (1997), that transportation brings competitive advantages to firms including able to managed it materials. The findings of this study are supported by the findings of Simpson (1994) who revealed that transportation has significant and positive effects on material

management. According to these results, transportation plays an important role for Tullow Ghana Ltd to achieve high material management.

According to Rahul (2007), transportation is positively associated with operational and firm material management performance. Firms that recognize the strategic importance of managing their transportation capacities can achieve superior operational efficiencies by integrating their operations. Such integration can facilitate the identification of redundant aspects of their interfirm operations. Cole (1992), also reveal out that transportation is positively associated with material management. Comparatively, the findings of this study show that warehousing practice (Beta=0.518, p-value=0.000) has the highest effect on the material management of Tullow Ghana Ltd than transportation capacity (Beta= 0.466, p-value= 0.000). Leading to the conclusion that an orientation of good warehouse practice gives the Tullow Ghana Ltd a higher rate of material management.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter gives a summary of the findings of the study, the conclusions and the recommendations for stakeholders to ensure effective and efficient material management at Tullow Ghana Ltd. These have been discussed in the next sub-sections. The study set out to

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assess the effect of warehouse practices and transportation on materials management in the oil and gas sector (Tullow Ghana Ltd). There were five specific objectives, which the study aimed to achieve and these include to: determine the nature of warehouse practice at Tullow Ghana Ltd; assess the effect of warehousing practices on material management of Tullow Ghana; determine the moderating effect of transport capacity on the relationship between warehouse practices and material management of Tullow Ghana Ltd.

5.2 Summary of Findings

In this study, the approach adopted is the descriptive research design, as it fits the purpose of the study in describing the phenomenon among workers Tullow Ghana Ltd. A quantitative approach was adopted for the study. Quantitative methods are deductive in nature, in the sense that inferences from tests of statistical hypotheses lead to general inferences about characteristics of a population. The study area for the study was the Takoradi Municipal.

The first objective of the study was to examine warehousing practice at Tullow Ghana Ltd in Takoradi Municipal. Findings show that the respondents agreed that Tullow Ghana Ltd address the warehousing practice in material management of the organization with regards to warehouses are well-organised and the layout supports efficient material handling regular management and inspection of warehouse equipment and infrastructure are conducted, advanced technology is used for tracking and managing inventory within warehouses, effective safety measures and protocols are in place to prevent accidents in the warehouses, efficient material storage systems (e.g., racking, shelving) are utilised in the warehouses , adequate training is provided to warehouse staff for proper handling and storage of materials, warehousing processes are aligned with industry best practices and standards, inventory control systems are implemented to minimise overstocking and

stockouts, warehouses have designated areas for hazardous materials storage and handling, and warehouse operations are monitored and evaluated for continuous improvement.

Again, the study also examines materials management at Tullow Ghana Ltd in Takoradi Municipal. It was discovered that the respondents agreed that material demand and consumption are accurately forecasted before; regular audits are conducted to ensure the accuracy of material inventory; efficient communication between procurement and production teams is maintained; inventory levels are optimised to prevent overstocking and stockouts; materials are sourced from reliable suppliers to ensure quality and timeliness; Just-In-Time (JIT) principles are applied to minimise holding costs; technological tools are employed to track material movement and usage; procurement decisions consider factors such as lead times and price trends; surplus materials are systematically recycled or disposed of; cross-functional teams collaborate to enhance material management efficiency. With an overall mean score of 3.85, these findings show that the respondents agreed that Tullow Ghana Ltd address the material management of the organization.

The third objective of the study was to examine transportation capacity of Tullow Ghana Ltd in Takoradi Municipal. It was discovered that the respondents agreed that transportation resources (e.g., vehicles, vessels) are readily available when needed; the transportation network is wellconnected and efficient for timely material movement; adequate planning and coordination ensure smooth transportation operations; modern technology is utilised for tracking and monitoring transportation; safety measures are strictly enforced during material transportation activities; transportation capacity is scaled to meet the demand fluctuations of the industry; emergency response plans are in place to address transportation disruptions; transportation costs are optimised through efficient route planning and utilization; Environmental sustainability is a consideration in transportation practices; Continuous improvement efforts are implemented to

enhance transportation capacity. Findings show that the respondents agreed that Tullow Ghana Ltd address the transportation capacity of the organization in material management.

The fourth and fifth objective of this study sought to assess the effect of warehousing practice and transportation capacity on material management in the Tullow Ghana Ltd in the Takoradi Municipal respectively. The results show that the warehouse practice and transportation capacity for 88.2% of the variation in the material management of the Tullow Ghana Ltd in Takoradi. The 11.8% can be attributed to other factors not considered in this study. It was found that the model was statistically significant. The implication is that the model can be relied to make realistic predictions regarding the effect of warehousing practice and transportation capacity on material management of Tullow Ghana Ltd because this prediction is attributed to the scientific interaction among the variables in the model and not by chance. Comparatively, the findings of this study show that warehousing practice has the highest effect on the material management of Tullow Ghana Ltd than transportation capacity. Leading to the conclusion that an orientation of good warehouse practice gives the Tullow Ghana Ltd a higher rate of material management.

5.3 Conclusions

The effectiveness of a company's entire organizational structure depends on its warehousing procedures. Each warehouse activity is a vital component of an integrated system; thus each must be carried out to the highest standard to allow the preceding practice to be optimized for an overall boost in organizational performance such as material management. Good practice not only lowers a company's operating costs in terms of the value of its stock and the time required to manage that stock, but it also improves customer happiness. Respondents' agreement indicates a willingness to support changes and improvements in the company's material management processes. They may

believe that addressing warehousing practices is a step in the right direction. Respondents likely recognize that transportation is a critical component of effective material management. They understand that efficient transportation can impact the flow of materials, delivery times, and overall operational effectiveness.

5.4 Recommendations

Based on the finding and discussion presented above, the following recommendations are outlined for consideration in a bid to propel sustainable growth and development with the material management of the Tullow Ghana Ltd in Takoradi Municipal.

Tullow Ghana Ltd should create a standard operating procedure to govern all of the operations inside of its warehouse as the first and most immediate action. The execution of it would require staff training, and it should be strictly enforced.

For its employees, Tullow Ghana Ltd must provide warehouse practice training. Additionally, they must hire the appropriate personnel for each position. Employing a focal person to oversee the material management system should be prioritized. Tullow Ghana should maintain a wellmaintained and modern fleet of vehicles that are appropriate for the transportation of various materials. Regularly service and replace vehicles as needed to minimize breakdowns and delays. Tullow Ghana Ltd should consolidate multiple shipments when possible to maximize the use of transportation capacity and reduce the number of trips required. Tullow Ghana optimize the layout of the warehouse for efficient material handling. Store frequently accessed items closer to the loading area, while less frequently used items can be placed in deeper storage.

5.5 Suggestion for Further Research

The study assesses the effect of warehouse practices and transportation on materials management in the oil and gas sector (Tullow Ghana Ltd). Future studies should focus on the effect of warehousing practice on organizational performance and also the current study should be conducted in other organization to ascertain the findings.

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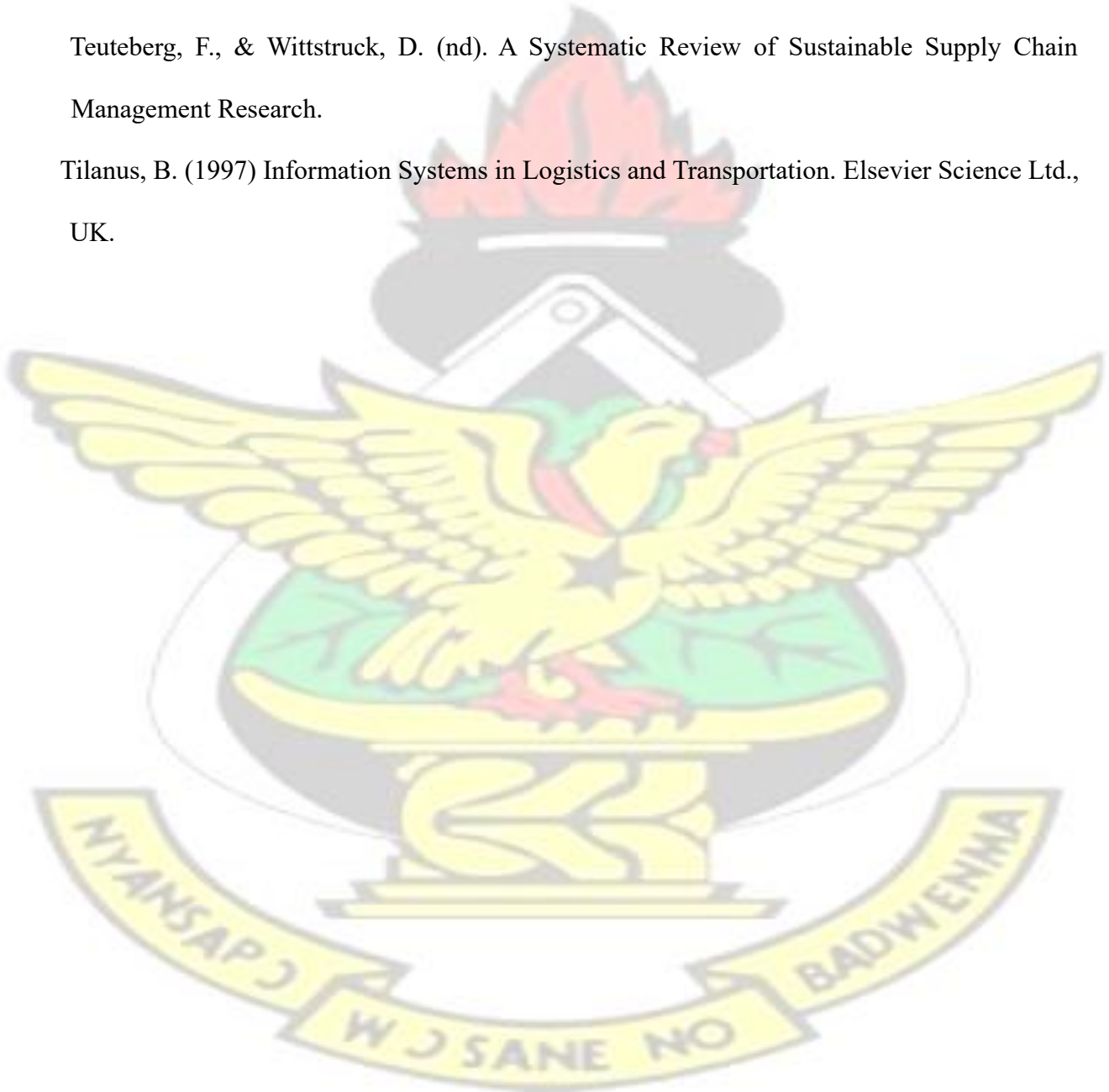
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APPENDIX: QUESTIONNAIRE

ASSESSING THE EFFECT OF WAREHOUSE PRACTICES ON MATERIALS MANAGEMENT IN THE OIL AND GAS INDUSTRY. THE MODERATING ROLE OF TRANSPORTATION CAPACITY

Introduction

Dear Participant,

Thank you for participating in this research to investigate the effect of warehouse practices on materials management in the oil and gas sector: the moderating role of transportation capacity at Tullow Ghana Ltd. Your participation is crucial to the study. Please take a few minutes to complete this questionnaire. Your responses will contribute to our understanding of this important topic.

SECTION 1: DEMOGRAPHIC INFORMATION

Please provide us with some information about yourself.

1. Age: Under 18 18-25 26-35 36-45 46-55
56 and above
2. Gender: Male , Female
3. Educational Background: High School Associate's Degree Bachelor's
Degree Master's Degree Doctorate Other (please specify):

4. Job Position: Management , Non-Management

5. Years of Experience in the Oil and Gas Industry: 0-2 years [] 3-5 years [] 6-10 years [], 11-15 years [], 16 years and above []

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SECTION 2: WAREHOUSE PRACTICES

Please indicate your level of agreement with the following statements about the warehouse practices at Tullow Ghana Ltd. Please rate the following statements using a 5-point Likert scale, where 1 represents "Strongly Disagree" and 5 represents "Strongly Agree."

| STATEMENT | 1 | 2 | 3 | 4 | 5 |
|--|---|---|---|---|---|
| Warehouses are well-organised and the layout supports efficient material handling. | | | | | |
| Regular maintenance and inspection of warehouse equipment and infrastructure are conducted. | | | | | |
| Advanced technology is used for tracking and managing inventory within warehouses. | | | | | |
| Effective safety measures and protocols are in place to prevent accidents in the warehouses. | | | | | |
| Efficient material storage systems (e.g., racking, shelving) are utilised in the warehouses. | | | | | |
| Adequate training is provided to warehouse staff for proper handling and storage of materials. | | | | | |
| Warehousing processes are aligned with industry best practices and standards. | | | | | |
| Inventory control systems are implemented to minimise overstocking and stockouts. | | | | | |
| Warehouses have designated areas for hazardous materials storage and handling. | | | | | |

| | | | | | |
|--|--|--|--|--|--|
| Warehouse operations are monitored and evaluated for continuous improvement. | | | | | |
|--|--|--|--|--|--|

SECTION 3: MATERIAL MANAGEMENT

Please indicate your level of agreement with the following statements about material management practices at Tullow Ghana Ltd. Please rate the following statements using a 5-point Likert scale, where 1 represents "Strongly Disagree" and 5 represents "Strongly Agree."

| STATEMENT | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Material demand and consumption are accurately forecasted before procurement. | | | | | |
| Regular audits are conducted to ensure the accuracy of material inventory. | | | | | |
| Efficient communication between procurement and production teams is maintained. | | | | | |
| Inventory levels are optimised to prevent overstocking and stockouts. | | | | | |
| Materials are sourced from reliable suppliers to ensure quality and timeliness. | | | | | |
| Just-In-Time (JIT) principles are applied to minimise holding costs. | | | | | |
| Technological tools are employed to track material movement and usage. | | | | | |
| Procurement decisions consider factors such as lead times and price trends. | | | | | |
| Surplus materials are systematically recycled or disposed of. | | | | | |
| Cross-functional teams collaborate to enhance material management efficiency. | | | | | |

SECTION 4: TRANSPORTATION CAPACITY

Please indicate your level of agreement with the following statements using a 5-point Likert scale, where 1 represents "Strongly Disagree" and 5 represents "Strongly Agree."

| STATEMENT | 1 | 2 | 3 | 4 | 5 |
|--|---|---|---|---|---|
| Transportation resources (e.g., vehicles, vessels) are readily available when needed. | | | | | |
| The transportation network is well-connected and efficient for timely material movement. | | | | | |
| Adequate planning and coordination ensure smooth transportation operations. | | | | | |
| Modern technology is utilised for tracking and monitoring transportation activities. | | | | | |
| Safety measures are strictly enforced during material transportation activities. | | | | | |
| Transportation capacity is scaled to meet the demand fluctuations of the industry. | | | | | |
| Emergency response plans are in place to address transportation disruptions. | | | | | |
| Transportation costs are optimised through efficient route planning and utilisation. | | | | | |
| Environmental sustainability is a consideration in transportation practices. | | | | | |
| Continuous improvement efforts are implemented to enhance transportation capacity. | | | | | |