KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

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THE EFFECT OF INVENTORY MANAGEMENT PRACTICES ON OPERATIONAL PERFORMANCE OF HEALTHCARE COMMODITIES.: THE MODERATING ROLE OF DEMAND UNCERTAINTY. A CASE STUDY OF WESTERN REGIONAL MEDICAL STORES.

BY:

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DECLARATION

I declare that this thesis is the result of my original work towards the MSc in Procurement and Supply Chain Management, and that to the best of my knowledge, it neither contains material published by another person nor materials which have been accepted for the award of any other degree of the University, except where due acknowledgements have been made in the text.

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DEDICATION

I dedicate this work to my mother, Mrs. Millicent A. Ayomu, my father, Mr. Michael Akwada, and my lovely wife, Mrs. Maud Akwada, for their emotional, financial, and spiritual support during my graduate studies.

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ABSTRACT

Previous research in the body of literature pertaining to the health supply chain has concentrated on the effect that inventory management procedures have on health commodities from the point of view of health facilities. While such studies have yielded valuable insight, they did not consider the perspective of distributor agencies such as regional medical stores that are responsible for distributing health commodities. Moreover, the role of demand uncertainty in the relationship between inventory management practices and operational performance has not been thoroughly investigated using cross-sectional data by the prior researchers. This study attempted to fill these gaps by examining the moderating role of demand uncertainty in the relationship between inventory management and operational performance in a developing country context. The study employed a case study design with a quantitative approach, and a questionnaire instrument was used to collect data from 100 staff members of western regional medical stores. Multiple linear regression was employed to analyze the data. The result showed that western regional medical stores highly prioritize the just-in-time technique (1st rank), followed by economic order quantity (2nd rank), vendor-managed inventory (3rd rank), and activity-based costing (4th rank). In addition, inventory management has a positive and significant effect on operational performance. Lastly, demand uncertainty does not moderate the relationship between inventory management and operational performance. The study recommended that management should invest more resources towards improving inventory management practices, strengthen intra-organizational relationships by prioritizing the sharing of information, delegating responsibilities to capable employees, appraising and rewarding employees for their good performance, and institutionalizing a framework for improving poor performance. The study concluded that future research should collect data from more than one regional medical store to enhance generalization.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

USAID	United States Agency for International Development
WHO	World Health Organization
NGO	Non-Governmental Organization
RMS	Regional Medical Stores
CMS	Central Medical Stores
WRMS	Western Regional Medical Stores
MOH	Ministry of Health
DDIC	Direct Distribution and Information Capture
DTTU	Delivery Team Topping Up
DLS	Dedicated Logistics System
ABC	Activity-Based Costing
JIT	Just-In-Time
EOQ	Economic Order Quantity
RBV	Resource-Based View
DU	Demand Uncertainty
CT	Cost
QU	Quality
DD	Delivery Dependability
FL	Flexibility
SP	Speed

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Controlling the materials and products that need to be stored away for later use in production by the manufacturing industry or consumption by the service sector is an essential part of a successful and efficient organization, and inventory management plays a crucial role in this control (Muchaendepi et al., 2019). A substantial impact on the sustainability of a business may be attributed to efficient management and effective control of inventories because these factors contribute to the achievement of better operating performance and a reduction in expenditures on capital investment (Lwiki et al., 2013; Oluwaseyi et al., 2017). Planning and controlling the consumption of the necessary materials are components of effective inventory management (Koumanakos, 2008). The inventory planning component requires looking forward to estimate the quantity and period to order for the preservation of the total stock, whiles the practice of maintaining a firm's inventory levels, whether such levels are located in the company's own warehouse or are dispersed over multiple different sites, is referred to as inventory control (Koumanakos, 2008; Aro-Gordon and Gupte, 2016).

The term “inventory management of health commodities” refers to the process of managing the supply chain of acquiring, storing, hauling, and delivering commodities, as well as preserving commodity accounts and documents (Hani et al., 2013). According to Gulma et al. (2015) health commodity management refers to a collection of operations and processes that are designed to guarantee the availability, accessibility, and high quality of health commodities. USAID (2011)

define health commodities management as the tasks that healthcare workers are required to perform in order to get adequate levels of health commodities—of high quality, at a reasonable rate, and in compliance with all relevant laws—to the patients who require them in a dependable and timely manner. Example of health commodities are contraceptives, analgesics, antipyretics, and drugs used in gout, anti-allergic drugs, anti-infective drugs, anticonvulsants, cardiovascular drugs and other medical supplies. It is well known that the availability of goods and services is a key factor in how successful holistic health programs and services can be (Meeme et al., 2015).

Previous studies have documented the importance of inventory management of health commodities. The primary goal of inventory management is to strike a balance between competing economic considerations in order to avoid overstocking or understocking, to protect against rising inventory holding costs such as storage, spoilage, pilferage, obsolescence, and stock out, and to ensure that items or goods are available in the required quality, quantity, time, and location (Jonsson and Mattsson, 2008; Coelho et al., 2014). The importance of commodity management can be attributed to a number of factors, including the following: the demand for health care services; the quality of patient care; the cost; the ability to stop waste; the capabilities to ensure continuity of supply; and the tendency to eliminate irrational or inaccurate use (Boru-Godana and Karanja-Ngugi, 2014; Berhanemeskel et al., 2016). The increased availability of pharmaceuticals and other health-related commodities drives up the demand for medical treatment (Chandani et al., 2012). Hence, if the necessary supplies were not readily and easily accessible at all times, a healthcare facility would not be in a position to provide the necessary care and treatment to its patients (Jepkosgei, 2018). In addition, the availability of commodities boosts the staff's motivation to perform the requested services. When essential supplies are in short supply, members

of the staff can become disheartened because they are unable to provide adequate care for patients (Damtie et al., 2020).

The majority of developing countries are estimated to spend between 60 and 80 percent of their national budgets on health commodities for their populations (WHO, 2018). Most hospitals' budgets (about 20-30 percent) are allocated to the purchase of healthcare supplies and commodities, making this category the second greatest expense in the healthcare industry behind human resources (USAID, 2014). The availability of supply chain partners that are well-motivated, knowledgeable, and well-resourced is essential to the accomplishment of intelligent healthcare commodity management (Tiye and Gudeta, 2018). In the context of healthcare supply chains, the term “supply chain partners” refers to the manufacturers, who are typically pharmaceutical companies that supply the products, as well as the procurement agents, who may include ministries of health, agencies of the United Nations, and other organizations. Transporters, Central, Regional, and District Medical Stores make up the distributors. Government, donors and funding agencies (such as NGOs) are both examples of financiers. Service providers include health centers, pharmacies, and hospitals. These partners in the supply chain play an important part in the synchronization of the many stages of inventory planning and control, ensuring efficiency in operations.

In an open system, organizations cannot just sit still and hope for the best. A firm might incur significant losses by making poor decisions in response to the external environment (Dubey et al., 2020). The level of uncertainty is one of the most influential aspects of the decision-making process (Liu et al., 2020). Demand uncertainty is the ratio of external factors (such as customers,

government, employee unions, and competitors) that is likely to change in the future (Habib et al., 2011). Uncertainty reduces competitive pressure, customer demand variation, and the need for disruptive technology development (Kim et al., 2018; Xin et al., 2020). However, if uncertainty is high, unstable situations, including fluctuating customer needs, rapid technology shifts, and intense competition, are likely to emerge (Roy et al., 2018). Since these changes are unpredictable, they put pressure on organizations. Available literature suggests that a company's ability to respond to and adapt to new market information has a direct and positive impact on its performance in uncertain markets (Chen et al., 2018; Akhtari et al., 2019; Xie et al., 2021).

The Central Medical Store (CMS) and a network of Regional Medical Stores (RMSs) are what make up the health commodities supply chain in the public health sector of Ghana. There are sixteen administrative regions across the country, so there is a total of sixteen RMSs. This supply chain is responsible for managing the distribution of medications and supplies to health facilities located all throughout the country. The receipt, storage, and distribution of all medical supplies are the responsibilities of the CMS. These goods are acquired by the Ministry of Health (MOH). The CMS is the primary provider of medical supplies for the lower tier levels. When it comes to medical supplies, health care facilities are supposed to get them from the RMSs that are most appropriate for their geographic area. A chain of temperature-controlled warehouses and refrigerated facilities are spread around the country to ensure that vaccines are kept at the appropriate temperature at all times. The majority of these establishments can be found in the same locations as the RMSs. The appropriate Regional Health Administration is in charge of managing each RMSs, and these stores each offer a supply service to the many medical facilities located within the region. After receiving authorization from the MOH, the teaching hospitals and regional

hospitals may, on occasion, purchase their supplies directly from the vendors. This is only done in extreme circumstances. In light of this background, this study is conducted to examine demand uncertainty as a contingency underlying the relationship between inventory management practices and operational performance using western regional medical stores (WRMS) as a case study.

1.2 Problem Statement

When it comes to providing adequate medication and medical supplies to healthcare facilities, developing countries like Ghana face a number of challenges. It is common practice for the Ministry of Health (MOH) to establish semi-independent entities, such as a Central Medical Store (CMS), which is responsible for the acquisition, storage, and distribution of medicines and medical supplies to health centers located all over the nation, including general hospitals and dispensaries. Inadequate forecasts, insufficient financing, delays in funding disbursements, and lengthy lead times are some of the typical problems that occur within national health systems and have an effect on the supply chains of health commodities (Annan et al., 2009). These factors have adverse effects, such as high rates of mortality and inadequate service provision in the health sector. Nevertheless, it is every nation's objective to accomplish the Millennium Development Goals (MDGs) 4, 5, and 6, which respectively seek to reduce the death rate of children, enhance the health of mothers, and fight HIV/AIDS, malaria, and other diseases. These are the primary challenges facing nations, both developed and developing countries alike. In order to accomplish these objectives, there needs to be an appropriate supply of health commodities, which are essential for the delivery of services that are both efficient and effective. The reason for this is that effective health commodity management may close both the time and geographical gaps that exist in public health (Gallien et al., 2017; Boche et al., 2020).

In recent years, inventory management of health commodities has received an increasing amount of attention as both a priority and a challenge for many countries. This is because governments are finding themselves overwhelmed with an expanding number of products, programs, and patients to manage, and inventory management of health commodities has become a key focus and a challenge for many countries (Kritchanchai et al., 2018). It is possible that supply chain managers of health commodities will be responsible for a greater number and volume of products as a result of significant increases in funding and donor support for a variety of health programs. However, they may have constrained extra resources to develop their capability to manage, store, and distribute these products as a result of these developments. When this happens, extra pressure is put on staff members who are already engaged in this area to create internal resources to fulfill the service delivery requirements. Because of this, it is necessary to have a proper and effective inventory management system for health commodities. This may be accomplished by maintaining strict supervision of vital pharmaceuticals, preventing theft, and determining priorities for the procurement and distribution of health commodities (Kritchanchai et al., 2018).

An evaluation of the supply chain management system of the Ghana Health Service (GHS) showed supply chain vulnerabilities in the health commodities (Manso et al., 2013). These supply chain weaknesses have impacted both the network connectivity of health commodities and the consistent delivery of services (Atinga et al., 2020). In a setting where resources are already in short supply, these possibly redundant operations throughout the supply chains will result in inefficiencies. Also, it is hard to track performance indicators like the availability of health commodities (Kamau & Assumpta, 2015). Because of this, it is often hard to figure out where the health supply chain is lacking and where it could be improved (Ibegbunam and McGill, 2012).

According to Bray and Awuah (2019) one of the major challenges of national medicine policies is the best way to make sure that their implementation plans include the undisrupted supply of essential health commodities that are safe and effective. Unfortunately, the medical supply systems in some countries, particularly those in Sub-Saharan Africa, are sometimes unstable, and as a result, they do not ensure a continuous supply of the needed drugs (Schöpperle, 2017). This calls for more context-based evidence in order to comprehend the complex dynamics that underlie the capability to perform inventory management activities and to ascertain the operational performance of health commodity distributors in order to serve as a guideline for policy and institutional strengthening strategies. This study is conducted in response to this practical-knowledge gap.

Previous research in the body of literature pertaining to the health supply chain has concentrated on the effect that inventory management procedures have on the health commodities from the point of view of health facilities (e.g., Annan et al., 2009; Jepkosgei, 2018; Kefale and Shebo, 2019; Befekadu et al., 2020). While these studies have yielded valuable insight, they did not consider the perspective of distributor agencies such as the regional medical stores that are responsible for distributing health commodities. This knowledge gap served as the impetus for the current study, which studies inventory management of health commodities from the perspective of regional medical stores (WRMS in particular). In addition, the aforementioned studies investigated "service delivery" as an outcome variable, whereas the present study investigates "operational performance" from the viewpoint of the WRMS.

The high levels of uncertainty in demand in today's volatile global marketplace require the promotion of a fully connected supply chain (Prakash et al., 2020), including the pursuit of diverse inventory management strategies (Li et al., 2021). Although the impact of demand uncertainty on the supply chain performance has been extensively studied in the supply chain management literature (e.g., Chen et al., 2018; Melolidakis et al., 2018; Azaron et al., 2020; Liu et al., 2020; Shokouhifar et al., 2021), these studies were interested in mathematical modelling and simulation using real world data. However, the role of demand uncertainty in the relationship between inventory management practices and operational performance has not been thoroughly investigated using cross-sectional data. This study seeks to fill this methodological gap. Furthermore, available literature suggests that demand uncertainty is an exogenous issue that modern supply chains must contend with (Akbarpour et al., 2020; Sazvar et al., 2021). When demand is unpredictable, a company might enhance its bottom line by entering new areas or adjusting its existing offerings (Azaron et al., 2020). For the purpose of this study, the primary function of inventory management is not to decrease demand uncertainties but rather to mitigate their negative impact on operational performance. Thus, this study contends that organizations that are able to effectively manage inventory in the face of volatile market conditions will fare better than their competitors.

1.3 Research Objectives

The overall aim of this study is to examine demand uncertainty as a contingency underlying the association between inventory management practices and operational performance of health commodities. The specific objectives are:

1. To examine the scope of inventory management practices within western regional medical stores.
2. To determine the relationship between inventory management practices and operational performance of western regional medical stores.
3. To evaluate the moderating role of demand uncertainty in the relationship between inventory management practices and operational performance of western regional medical stores.

1.4 Research Questions

1. What is the score of inventory management practices within western regional medical stores?
2. What is the relationship between inventory management practices and operational performance of western regional medical stores?
3. To what extent does demand uncertainty moderate the relationship between inventory management practices and operational performance of western regional medical stores?

1.5 Significance of the Study

The current study makes a significant contribution toward the development of Ghana's health supply chain, in particular in the areas of health commodity security and availability, which addresses important gaps in the health care systems of Sub-Saharan African countries, including Ghana in particular. For instance, inventory management of health commodities has been researched pretty successfully in countries such as the USA, European countries, and Asian countries. However, the same cannot be said about countries in sub-Saharan Africa. It has not been investigated as a potential method for the provision of high-quality health care to the people of

Ghana, which is to their advantage. As a result, the findings of the current study contribute to the design of policy, the execution of policy, and the reform of policy with regard to the management of health commodity inventories in the GHS. In particular, the management of WRMS would benefit from the study by using the findings to improve inventory management practices in the organization through workshop and capacity-building programs.

In addition, the purpose of the current research is to broaden and deepen the understanding of inventory management of health commodities or the health supply chain by offering some experimentally tested insights from the point of view of a developing country. The findings of the study might provide decision makers with improved information on the fundamental benefits, innovative techniques, and resolving stock-out obstacles. The necessity of this study becomes more apparent due to the frequent efforts of policymakers to establish specific constraints and circumstances for multiple delivery possibilities by the MOH and GHS. The current study also makes a significant contribution to future research projects by laying the groundwork for more research on inventory management of health commodities in a developing country.

1.6 Overview of Methodology

Given our limited knowledge of the phenomena, the study used an explanatory research methodology in order to carry out the task of determining how the various inventory management practices impact the operational performance of the WRMS. In the course of this research, a case study methodology was utilized in order to record and comprehend the actions taken by WRMS staff members with reference to inventory management practices. Consequently, the population of the study consisted of WRMS employees. In order to carry out the study, the quantitative research approach was utilized, and employees of WRMS were given survey questionnaires to fill out and

return. The data collected was subjected to a quantitative analysis with the aid of the SPSS software, version 25, using the mean score, standard deviation, relative importance index (RII) scores, and ordinary least regression analysis for examining the relationship between inventory management and operational performance as well as the moderating role of demand uncertainty.

1.7 Scope of the Study

The conceptual and contextual paradigm are the two primary pillars on which the scope of the study is founded. On the one hand, the conceptual paradigm of the study is centered on the topic of inventory management, specifically, health commodities and operational performance arising from the management of health commodities under demand uncertainties. Inventory management is a field in operations management. In addition to that, operational performance is the primary focus of this study. Because of this, the study does not consider other performance measures such as financial performance, market performance, environmental performance, and so on. On the other hand, the contextual paradigm of the study is concentrated on the public sector, which is represented by the western regional medical stores (WRMS). As a result, there is no attempt made to include any kind of private organization, regardless of its nature, in this study.

1.8 Limitations of the Study

In the course of carrying out this research, there were a few shortcomings that should be mentioned. To begin with, this research project is a case study that focuses on WRMS. Because of this, it is extremely crucial to stress that the findings of this study are only applicable to WRMS and not to the entirety of the RMSs in Ghana, despite the fact that certain conclusions could be drawn from them. It is also important to note that the data cannot be used to draw conclusions about the inventory management practices used by firms in the private sector because of differences in

inventory management practices. Therefore, when evaluating the results, readers should approach the information with caution. Secondly, the researcher chose to conduct a quantitative survey, and because of this, the findings are restricted in terms of the respondents' ability to provide in-depth information, which is something that a qualitative study could have accomplished. Last but not least, the findings of this research cannot be generalized to the public sector in other developing nations due to the disparate approaches taken in other nations to the inventory management of health commodities.

1.9 Organization of the Study

This study is divided into five Chapters. Chapter one provides insight into the background of the study, problem statement, research objectives, research questions, significance of the study, overview of methodology, scope of the study, and limitations of the study. Chapter two is devoted to a review of the literature, concentrating on its conceptual, theoretical, empirical, and conceptual framework reviews. In Chapter three, the researcher's methodology for conducting the study is presented. The research design, study population, sample size and sampling method, data collection method, data analysis, and ethical issues are the main topics of this chapter. The analysis and findings from the data gathering are presented and discussed in Chapter four. The study is concluded in Chapter five, which focuses on the summary of results, conclusion, and recommendation.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The objective of this chapter is to review the literature on the topic under study. Specifically, the chapter is divided into four major sections. The first section is the conceptual review, which reviews literature on the key concepts ingrained in the topic. The main subjects of discussion under this section are the definition of inventory, components of inventory, types of inventory, definition of inventory management, health commodities inventory management, the health commodities distribution network, health commodities distribution approaches, the logistics system of Ghana's health service, inventory management practices, demand uncertainty, and operational performance. The second section is the theoretical review, which explains the theoretical underpinnings of the study. The theory chosen for the study is the resource-based view and the contingency theory. The third section is the empirical review, which reviews existing empirical works conducted on the topic in different geographical contexts. The last section is the conceptual framework, which shows the research model and the development of hypotheses.

2.2 Conceptual Review

2.2.1 Defining Inventory

A definition of inventory might be goods held on hand with the express aim of satisfying customer demand (Stock and Lambert, 2001). Stock, or inventory, is defined as the stockpiling accumulation of material resources in a system of transformation (Slack and Brandon-Jones, 2019). Materials, customers, and data/information are all examples of inventory. Therefore, a manufacturer will have

materials on hand, a tax office will keep records of tax payers (information or data), and a theme park will keep visitors (customers) on hand. In this study, "inventory" is defined as the stored accumulation of health commodities (materials or physical inventory). According to Slack and Brandon-Jones (2019), inventory builds up when there is a mismatch between production (supply) and consumption (demand) (see Figure 2.1). Inventories grow when the supply rate is higher than the demand rate, and they shrink when the demand rate is higher (Slack and Brandon-Jones, 2019). Because of the complexity of the forces that influence it, the demand for most products is difficult to anticipate (Stock and Lambert, 2001). This means that businesses must maintain a constant stock level adequate to meet current demand. Koumanakos (2008) states that businesses need to gain a better understanding of customer behavior in order to make the necessary adjustments to their operations and output.

Inventories are a type of asset called current assets (because they are easily convertible into cash) (Slack and Brandon-Jones, 2019), and assets are typically thought of as having monetary value and bringing in revenue for businesses. However, according to Krajewski and Ritzman (2001), businesses that keep too much stock run the risk of seeing their resources squandered, which results in an additional, hidden cost. The idea here is that carrying an excessive amount of inventory can cause problems for a company, forcing management to make decision after decision in an effort to find the perfect balance. Capkun et al. (2009) also emphasized that maintaining insufficient stock levels can hinder a company's ability to reach its production targets. Because of this, it is indisputable that inventory represents the single largest investment in assets for the vast majority of manufacturers, wholesalers, and retailers (Stock and Lambert, 2001).

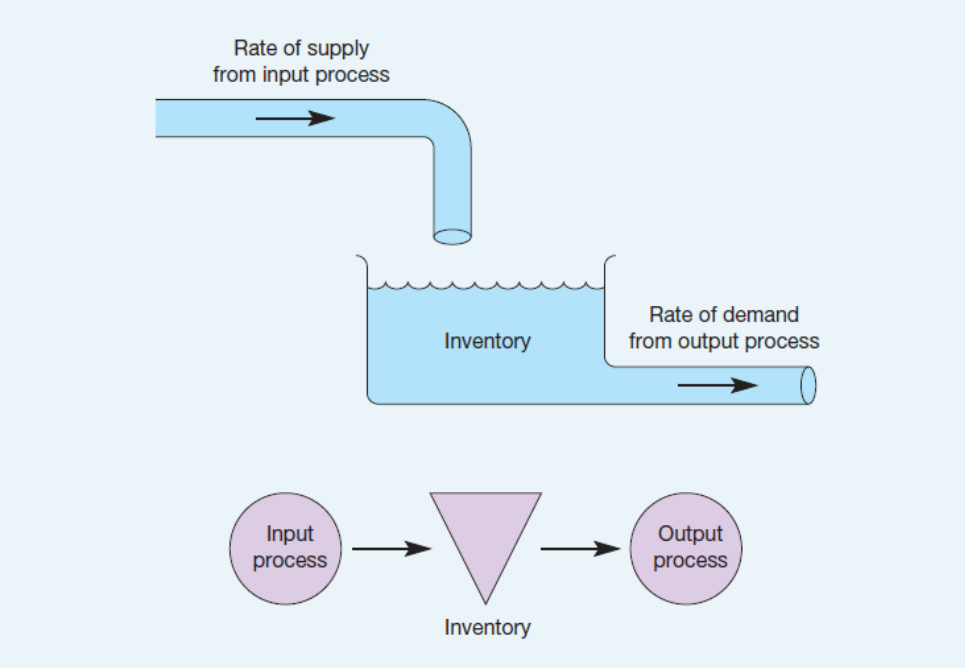

Figure 2. 1 Inventory process

Source: Slack and Brandon-Jones (2019)

2.2.2 Components of Inventory

To recap, inventory consists of items that can be bought, sold, or transformed into something else. Consequently, there are three parts to inventory: raw material inventory, work-in-progress inventory, and finished goods inventory.

2.2.2.1 Raw Material Inventory

Slack and Brandon-Jones (2019) defined "raw materials" are any materials that can be used to make another product. Keeping an accurate inventory of raw materials is essential for any company serious about planning its production activities. Since raw materials are the primary requirement in the production cycle, no manufacturing company can function without them. According to Stock

and Lambert (2001), a company's raw material needs are rooted in the total number of products that will be manufactured.

2.2.2.2 Work-In-Progress Inventory

After determining the quantity of goods to be manufactured, the next step is to feed raw materials into the manufacturing plant. The term "work-in-progress" is used to describe the state of raw materials as they are being processed into completed goods (Slack and Brandon-Jones, 2019). Typically, work-in-progress, or semi-finished products, are not suitable for consumption or other uses. Rahman et al. (2010) reaffirmed in their study findings that manufacturers with work-in-progress should make an effort to inspect the product for flaws before it is fully processed into a whole product destined for consumer use. Others studies note that work-in-progress is crucial to a company's ability to turn out a quality product (Chen et al., 2005; Rushton et al., 2011).

2.2.2.3 Finished Goods Inventory

According to Slack and Brandon-Jones (2019), finished goods are those that have undergone no more processing and are ready for sale to the general public. Most factories put their finished products through a series of tests and a conformity assessment to make sure they are up to par with international norms before they are released to the public. According to Stock and Lambert (2001), finished goods bring in more money than raw materials and work in progress combined. This is mostly because it adds value to the raw materials, making them more "marketable" and less risky for human use. Also, apart from the effect on their health, consumers care about how a product makes them feel after they use it (Mwangi and Nyambura, 2015).

2.2.3 Types of Inventory/Stock

Five distinct types of stocks were identified by Stock and Lambert (2001), with each type falling into one of three broad categories: transactional, safety/precautionary, or speculative motives. Since most business activities take place at irregular intervals, the transaction motive is necessary to explain their occurrence (Stock and Lambert, 2001). Secondly, every producer is aware of the potential consumer health risk if they do not take precautions to ensure their products are up to national and international safety standards; therefore, a safety (precautionary) motive is essential (Stock and Lambert, 2001). Lastly, the unpredictability of pricing changes, inflation, consumer tastes, and other macroeconomic factors that could have an impact on the firm's products necessitates the inclusion of the speculative motive as well (Stock and Lambert, 2001). The five types of stock are explained in the following sections.

2.2.3.1 Cycle Stock

Stock and Lambert (2001) believe that technological limitations and the resulting economies of scale in procuring and transporting products are the core causes of cycle stock. The manufacturer-distributor supply chain provides a lens through which to analyze cycle stock. The manufacturer sends the goods on to the distributor, who, once their first supply has been depleted, contacts the manufacturer again to place an order for more goods (Slack and Brandon-Jones, 2019). This procedure is performed countless times until the needs of the customer are satisfied. If the business is not completely adaptable, it will need to have some inventory on hand to keep the supply going even when it is busy with other tasks, such as satisfying customers who have a wide range of options to choose from (Stock and Lambert, 2001). Take a baker who produces three different breads. The mixing and baking procedures only allow for one type of bread to be made at a time.

The baker needs to make enough loaves of each sort of bread to meet the demand between the times when those loaves are ready for sale. Therefore, there will always be some stock to compensate for the sporadic supply of each sort of bread, even when demand is consistent and predictable.

2.2.3.2 Pipeline Stock

Raw materials in transit from one manufacturing stage to another or finished items undergoing various processing steps before being shipped are examples of pipeline stock, also known as process inventory (Stock and Lambert, 2001). The pipeline stock system is characterized by continuous processing cycles that do not overlap (Slack and Brandon-Jones, 2019). By way of illustration, when a retail business places an order, the supplier will "allocate" the stock to the retail store in its own warehouse before packing it, loading it onto its truck, transporting it, unloading it, and incorporating it into the retail store's inventory. Thus, pipeline inventory is the stock that is assigned (and consequently unavailable to any other customer) before it is delivered to the retail outlet. When dealing with supply chains that span multiple locations, pipeline stockpiles can become rather large (Slack and Brandon-Jones, 2019).

2.2.3.3 Safety Stock

A company uses safety stock to achieve the goal of reducing the risk of uncertainty in the firm's operational and business success (Stock and Lambert, 2001). The obvious objective of safety stock is to aid in mitigating the possibility of demand, lead time, and other drivers of production efficiency fluctuating unexpectedly (Slack and Brandon-Jones, 2019). Safety stock acts as a “buffer stock”, or an excess of stock that is held solely to prevent disruptions to the producer-

supplier-customer connection from occurring in the future (Stock and Lambert, 2001). For example, a retail store will never be able to predict demand accurately over the long term. To prepare for the possibility that demand will be higher than expected throughout the time it takes to deliver the items, it will order goods from its suppliers with a minimum level of inventory in place. The term “buffer” refers to this stockpile of extra supplies. In the same way, some hospitals never run out of blood, stitches, or bandages in their output inventories, allowing them to quickly respond to patients in need in the event of an emergency. So, this excess stockpile is employed as a sort of "insurance" against the unforeseeable.

2.2.3.4 Speculative Stock

This type of stock is utilized most frequently in situations in which demand changes are significant but reasonably foreseeable (Stock and Lambert, 2001). For example, in order to hedge against a potential increase in costs, a company may decide to purchase an inventory of raw materials in advance of the day that production is scheduled to begin. In the event that such a transaction takes place within the company, it will lead to an increase in the firm's excess marginal cost, which is the cost of producing one more additional unit of a good. This will cause the company to be forced to adjust its price, which will typically result in an increase in the price of its products in order to achieve demand-supply equilibrium (Stock and Lambert, 2001). As a direct consequence of this, the company will not incur any overhead costs. This inventory could be used by medium-term capacity management as a tool for coping with demand and capacity (Slack and Brandon-Jones, 2019). Instead of trying to create a product only when there is a need for it, it is more efficient to produce it throughout the year in advance of the demand and store it in inventory until it is required (Slack and Brandon-Jones, 2019).

2.2.3.5 Seasonal Stock

In order to avoid having an impact on productivity, a manufacturing company will often make the bulk of its purchases of raw materials for stock just before the conclusion of a given season (Stock and Lambert, 2001). By purchasing the stock as soon as it is available, the company is able to maintain continuous production, avoiding the costs associated with having the factory and its workforce idle (Stock and Lambert, 2001). This is due to the fact that a facility and its workers that are not being utilized are known to depreciate in value, which will result in the production of items that are not up to par. Even though there is no immediate need for an item, it may be necessary to build up inventory on occasion since possibilities may arise that require this (Slack and Brandon-Jones, 2019). For instance, a supplier may provide a particularly attractive price reduction on selected items for a limited amount of time, possibly because they wish to minimize the quantity of finished goods they have in stock. This promotion may only last for a specific amount of time. Under these conditions, a purchasing department can seize the opportunity to make the most of the short-term discount.

2.2.4 Defining Inventory Management

Inventory management is the practice of planning, organizing, and controlling accumulations of transformed resources as they travel through supply networks, activities, and processes (Slack and Brandon-Jones, 2019). According to Coyle et al. (2003), inventory management is defined as the coordinated effort by management to ensure the efficient and effective utilization of available resources in order to achieve productivity goals, such as lowering costs, satisfying current and projected customer demand, and increasing the company's return on invested capital. When done properly, inventory management may help businesses save money and provide better service to their customers, two things that are crucial to maintaining a successful business model (Cannon,

2008; Lwiki et al., 2013). Specifically, the objectives of inventory control are as follows: to offer an appropriate supply of products to customers and prevent shortages as much as possible; to guarantee that the financial investment in inventories is kept to a minimum; to ensure that materials are purchased, stored, consumed, and accounted for in an efficient manner; to maintain a current record of inventories of all the items, and to ensure that acceptable levels of those stocks are maintained (Slack and Brandon-Jones, 2019). Companies rely on effective inventory management to deal with the resulting supply and demand imbalances (Heizer and Render, 2008).

All businesses keep some form of inventory, but it is especially crucial to keep track of expensive or strategically vital stock (Munyao et al., 2015). However, managing stock is a complex endeavor that calls for on-going research into and review of purchasing and supply policies, workforce competences, and skill dynamics in order to ensure the success of the business (Stock and Lambert, 2001). Achieving a common ground between satisfying customers and keeping costs down depends on how well stocks are managed (Nawanir et al., 2013). For example, a manager who is well-versed in information management is better equipped to make choices about what data to collect, what product to purchase, and keep, as well as what information technology to invest in. Ineffective utilization of information renders inventory management useless (Toomey, 2000). As an added example, a tracking system allows an inventory manager to monitor the status of individual orders. Nothing about the information or the technology used to get it is useful if it is not put to use in improving replenishment decisions. According to Koumanakos (2008), the costs and advantages of maintaining inventory must be balanced in order to achieve optimal inventory management. Thus, the objective of effective inventory management is to maximize the inventory's net benefit, or benefits minus costs (Slack and Brandon-Jones, 2019).

2.2.5 Health Commodities Inventory Management

In the context of this research, the term "health commodity" refers to the availability of life-saving drugs that can be administered to patients in a healthcare setting for the treatment of illness or disease (Chandani et al. 2014). Some examples of health commodities are anesthetics, analgesics, antipyretics, nonsteroidal anti-inflammatory drugs (NSAIDs), drugs used to treat gout, anti-allergic drugs, anti-infective drugs, anticonvulsants, and cardiovascular drugs, among others. Indicators for the management of health commodity inventories must be reviewed and monitored frequently to ensure a steady supply of medications (Kritchanchai et al., 2018). Despite increased focus on these problems and various reform attempts and initiatives, certain public health facilities in developing countries continue to lack crucial health commodities (WHO, 2018). For example, the low supply of health commodities in Tanzania is just one indicator that hospitals' reliance on the Medical Stores Department' ordering and inventory management skills are inadequate (WHO, 2018). Inventory shortages in Lesotho have also been linked to sloppy recordkeeping and a slow purchasing system (WHO, 2018). These situations are no different from Ghana (see Manso et al., 2013; Annan et al., 2019; Bray and Awuah, 2019; Atinga et al., 2020).

Managers in charge of health commodities often lack advice for dealing with shortages and lack the expertise for safe medicine administration, exacerbating an already bad situation (OECD, 2014). This has resulted in shortage of pharmacists and pharmacy technicians in public hospitals in several developing countries, making it difficult to provide adequate oversight of basic healthcare institutions (Schöpperle, 2017). Thus, problems with inventory management are caused, on the one hand, by limitations with human resources and, on the other, by a lack of clearly defined procedures and systematic stock monitoring (Ibegbunam and McGill, 2012; Mahoro, 2013).

Disruption or delay in a course of treatment, which may aggravate a patient's health or even lead to death if a lifesaving medicine is out of stock, is one of the catastrophic consequences of failing to monitor stock levels periodically (WHO, 2013). A problem for emerging logistic systems is the lack of a standardized inventory control system with procedures for monitoring and managing stock levels of health commodities; this is especially true in low and middle-income countries, where stock levels are not monitored, leading to over- and under-stocking of certain medicines (Chandani et al., 2012; Yadav, 2015; Agrawal et al., 2016).

A reliable supply of health commodities is essential for people to keep faith in the healthcare system. The stock on hand, monthly consumption data, and fluctuations in demand can all be used to calculate an accurate estimate of the quantity of medicines that will be required (Babatunde et al., 2020). Ordering processes suffer from the lack of such information. For example, health facility failures in Sierra Leone have been blamed on a lack of usage statistics, which has led to a high number of emergency orders (Boche et al., 2020). Inadequate stock card documentation of health commodity quantities was also a factor in Walawi's critical pharmaceutical shortage (WHO, 2014).

2.2.6 Health Commodities Distribution Network

In the context of the supply chain, the term "distribution" refers to the processes that are carried out in order to transport and store a product as it makes its way from the supplier stage to the customer stage (Bray and Awuah, 2019). Distribution network, on the other hand, is defined as a company's method of transporting goods from the factory or warehouse where they are produced to retail outlets (Slack and Brandon-Jones, 2019). Because customers need to be able to acquire the goods and services they purchase when they want them, a distribution network that is both

quick and dependable is absolutely necessary for a successful business (Slack and Brandon-Jones, 2019). As shown in Figure 2.2, there is a significant amount of variability in the modern health commodities distribution network systems in developing countries. This variability reflects the complicated client needs and weaknesses that exist in the distribution network.

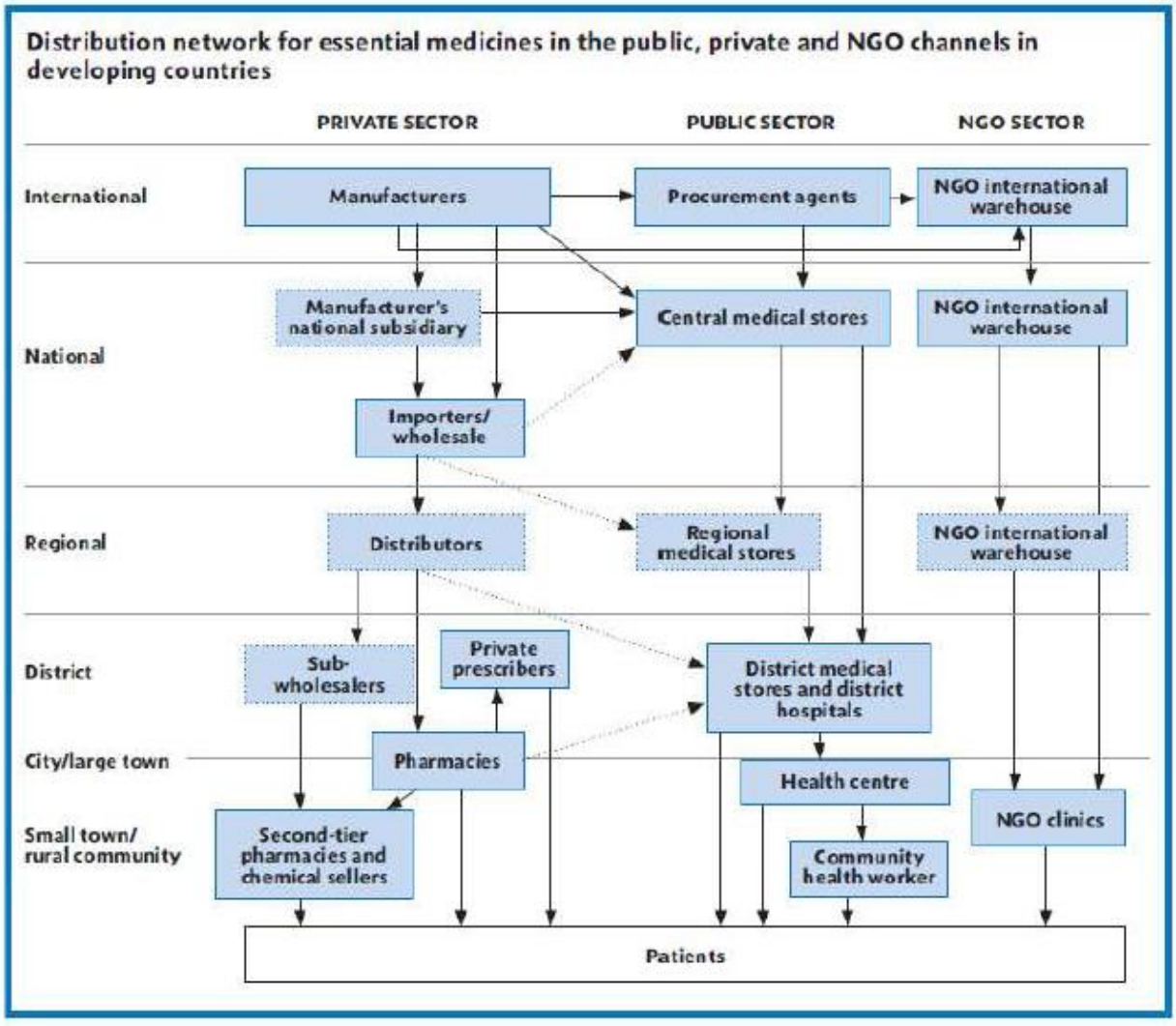

Figure 2. 2 Health Commodities Distribution Network

Source: Yadav et al. (2011)

2.2.7 Health Commodities Distribution Approaches/Models

Improving the distribution of health commodities can been accomplished through the application of a variety of strategies and models. Bray and Awuah (2019) identified four approaches/models: informed push model, direct distribution and information capture, delivery team topping up, and dedicated logistics system.

2.2.7.1 Informed Push Model

The informed push model (IPM) is a method of distributing goods that applies business distribution strategies to the public health domain (Bray and Awuah, 2019). Transport, quantification, data availability, and cash flows are only some of the issues that the IPM attempts to solve throughout the supply chain. The IPM takes a business-like approach by employing teams of skilled drivers and staff to keep tabs on stock levels of medical supplies at clinics and hospitals in low- and middle-income countries (Bray and Awuah, 2019). With an informed push, a small but skilled supply management team can see consumption patterns more clearly, which improves upstream supply decisions. Data collection at the facility level and the consequent reduction of stockouts for various products have both been shown to be successful applications of informed push models in a number of different countries. The countries of Senegal, the Philippines, and Uruguay have all found success with this paradigm (Bray and Awuah, 2019). It also frees up the time of the medical staff to concentrate on patient treatment. For example, the model for distributing contraceptives in Senegal is called "pousse pousse" (informed push), and it entails a driver with a truck full of supplies making scheduled visits to each point of sale to replenish stock and record sales (Bray and Awuah, 2019). The information the driver gathers is used to keep the warehouse and each

location stocked, identify the most popular items and locations, and get the factories ready to keep up with demand (Bray and Awuah, 2019).

2.2.7.2 Direct Distribution and Information Capture

Another distribution model is direct distribution and information capture (DDIC). When this strategy is used, trucks delivering health commodities arrive with quantities that have been determined in advance based on the facilities' historical consumption statistics (Bray and Awuah, 2019). The DDIC model was especially popular in Nigeria. DDIC assures that there will be truck drivers and team leaders available to deliver commodities to health facilities in accordance with a predetermined delivery schedule by making investments in dependable modes of transportation (Bray and Awuah, 2019). A team leader who is going with the truck conducts an inspection of the facilities' storage space, counts the stock-on-hand for the various health commodities, and then enters this inventory data into a database created specifically for the management of inventory (Bray and Awuah, 2019).

2.2.7.3 Delivery Team Topping Up

The implementation of delivery team topping up (DTTU) took place in Zimbabwe (Bray and Awuah, 2019). DTTU trucks have started rolling out to make supplies for the country's more than 1,300 public-sector health facilities, with the goal of maintaining strong delivery coverage and low stockout rates (Bray and Awuah, 2019). DTTU regularly supplies all public sector health facilities with health commodities using the principles of VMI, which is a concept that is extensively utilized in the commercial sector. This is accomplished by sending delivery trucks straight to facilities in order to "top up" supplies and capture stock data (Bray and Awuah, 2019).

2.2.7.4 Dedicated Logistics System

The implementation of a dedicated logistics system (DLS) took place in Mozambique (Bray and Awuah, 2019). Instead of relying on traditional hierarchies, this system's two delivery zones are overseen by a single point person with a car for each zone (Bray and Awuah, 2019). The field coordinator is responsible for ensuring that vaccines are delivered to each health center on a monthly basis, collecting statistics on vaccine utilization and confirming its quality, ensuring that the vaccine refrigerator is in working order, and supervising health personnel (Bray and Awuah, 2019). Decision-makers will have better access to crucial data regarding system performance thanks to the new information management system into which the data is being entered.

2.2.8 Logistics System of Ghana Health Service

The Central Medical Store (CMS) and its network of Regional Medical Stores (RMS) across Ghana's sixteen regions make up the public sector's health commodity supply chain (Manso et al., 2013). This system coordinates the distribution of drugs and medical supplies to clinics and hospitals around the country. The CMS is in charge of receiving, storing, and dispensing all medical supplies ordered by the Ministry of Health. Supplies for the lowest tiers are distributed by the CMS. Depending on where they are located, hospitals and clinics must obtain their medical supplies from one of several regional medical stores. Vaccines are handled slightly differently, with a system of cold storage warehouses and chilled facilities spread around the country (Manso et al., 2013). Typically, these can be found in the same area as the RMS. The Regional Health Administration (RHA) is in charge of each region's medical store, which serves local hospitals. The teaching hospitals and the regional hospitals may, with Ministry of Health approval, make

some purchases directly from RMS. In addition, they source their materials from the CMS. The Ghana Health Service supply chain is depicted in Fig. 2.3.

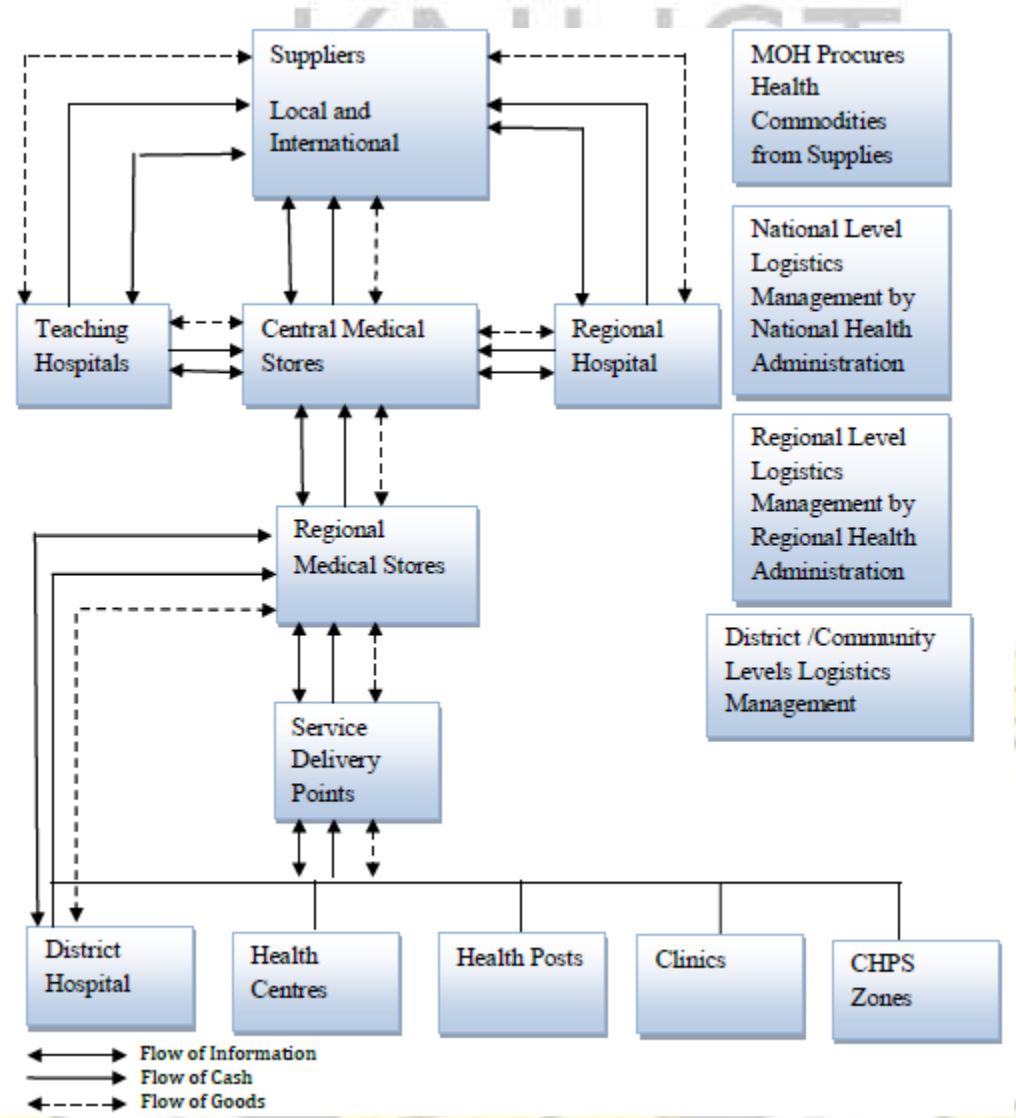

Figure 2. 3 Ghana Health Service Logistics System

Source: Manso et al., (2013)

2.2.9 Inventory Management Practices

Staff knowledge and competencies are crucial for inventory management practices, which are essential for the success and reduction of the firm's expenses (Slack and Brandon-Jones, 2019).

Managers and procurement professionals need to have a firm grasp of these practices so that they can implement them to maximum effect for the business (Naliaka and Namusonge, 2015). In order to keep stock levels under control, many techniques have been developed. Activity-based costing (ABC) analysis, just-in-time (JIT), economic order quantity (EOQ), and vendor-managed inventory (VMI) are just a few examples that are the focus of this study.

2.2.9.1 Activity Based Costing Analysis

Coyle et al. (2003) defined activity-based costing (ABC) analysis as a product categorization method that takes into account the monetary and/or functional significance of the items in question. There are three distinct categories in this set of rules: A, B, and C. It is considered that Group A has the greatest monetary value and influence, that Group B has a moderate monetary value and impact, and that Group C has the least monetary value and impact (Coyle et al., 2003). The ABC analysis's categorization is not based on luck or randomness, but on how frequently an item is used and how much it is worth (expressed in units of measurement) (Onyango, 2016). Generally speaking, greater focus is put on more valuable products than on less valuable goods that can be easily replaced. On the flip side, goods with a moderate impact (Group B) need to have their mechanisms tweaked so that they can compete with Group A. (Coyle et al., 2003). By using the ABC analysis techniques of inventory control, businesses can confidently estimate how well each product will sell as well as the return on investment for each product category (A, B, and C) (Onyango, 2016). The advantages of using the ABC analysis is that it improves resource utilization, lowers costs, and increases supplier dependability (Lysons and Gillingham, 2003).

2.2.9.2 Just-In-Time

Coyle et al. (2003) defined "just in time" (JIT) as a stock control method that schedules market activity such that ordered items arrive in time for use. According to Musau et al. (2017), JIT inventory control is defined as producing what the customer wants and making it available at the right time. In an ideal world, companies would receive their orders exactly when they are needed, without penalty for early or late deliveries. Japanese automakers pioneered JIT, and their manufacturing counterparts have greatly benefited from it ever since (Nawanir et al., 2012). Inventory control systems that employ fewer resources to create items to meet exact demand are often referred to interchangeably by the terms "just-in-time" (JIT) and "lean manufacturing" (LM) (Heizer and Render, 2008; Nawanir et al., 2012). According to Adamu (2016), JIT is a vital part of lean manufacturing since it ensures that orders are fulfilled in a timely manner and according to the customer's specifications.

The primary objective of JIT as an inventory control system is to produce the exact amount of an item that is needed at any given time (replenishment lead time is constant) in order to meet demand (Onyango, 2016). According to Schonberger (2007), manufacturing firms have adopted JIT because of its cost-cutting, quality-improving, feasible productivity (producing solely to satisfy demand), and need-adjusting perks. Additionally, JIT is a tried and true method of inventory management that boosts company efficiency by focusing on maximizing profits (Ganiyu et al., 2019; Bashar and Hasin, 2019; Khalfallah and Lakhal, 2021) and expanding market share (Phan et al., 2019; Suleiman et al., 2021; Nugroho et al., 2022). These researchers pointed out that JIT is a widely used, credible, and time-tested approach and that it has been shown to increase performance in different manufacturing companies, leading to growth in sales and higher profits

for those companies. This makes JIT an appropriate and interesting dimension of inventory management for this study.

2.2.9.3 Economic Order Quantity

Bachetti et al. (2010) suggest that in order for an organization to know when to order and how much to order, inventory management must be arranged in a logical fashion. Only by calculating an economic order quantity (EOQ) can this be possible. Incorporating an EOQ model into a company's purchasing practices enables more regular inventory replenishment cycles, such as quarterly, monthly, semiannually, and annually (Onyango, 2016). Since newly received stock is promptly dispatched, this practice allows businesses to incur little or no warehouse holding costs (Slack and Brandon-Jones, 2019). In order to prevent stock-outs, businesses are constantly looking for ways to better manage their inventories, and the EOQ can be a useful tool (Riza et al., 2018). In response to the negative impact of stock outs on customer satisfaction, companies are adopting a new strategy, using the EOQ to ensure that their clients are satisfied (Rukiya and Kibet, 2019; Kehinde-Busola et al., 2020).

The EOQ is a mathematical model used to order at the optimum stock level, thereby minimizing costs. The model assumes several things about supply and demand, such as that demand is known and constant, lead time is known and constant, only one item is considered, the planning horizon is infinite (the model is time invariant), the lead time to replenish is zero, replenishment is instantaneous (the entire order quantity is delivered at once), and shortages are never tolerated (Slack and Brandon-Jones, 2019). It is rational and mathematically advantageous to use the same order quantity each time a replenishment is made because the model's parameters are supposed to remain constant throughout time (Simchi-Levi et al., 2004).

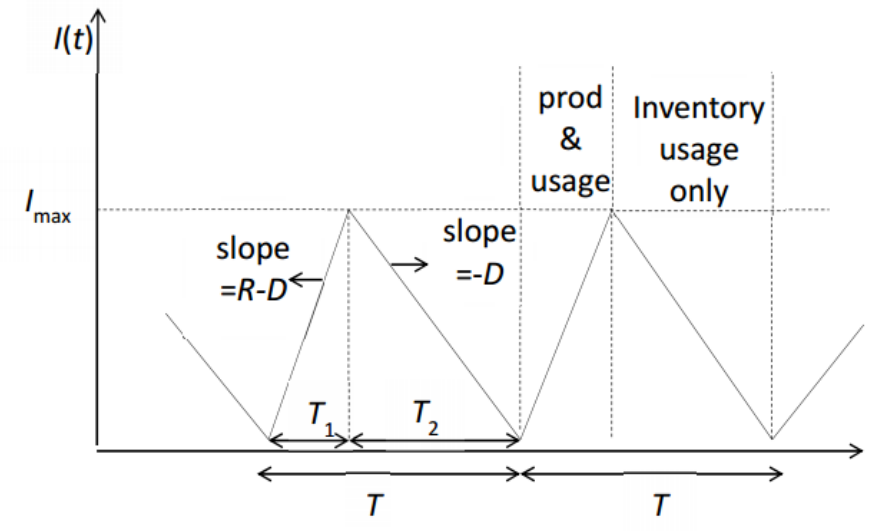

Figure 2. 4 An illustration of the EOQ

Source: Simchi-Levi et al., (2004)

The inventory profile is depicted in Figure 2.4 for the case where the production rate is finite. The diagram, in essence, backs off the guarantee of a prompt delivery of the full quantity that was ordered. It takes time profile is depicted in Figure 2.4 for the case where the production rate is finite. The diagram, in essence, backs off the guarantee of a prompt delivery of the full quantity that was ordered. It takes time (denoted by T) for the ordered quantity to be manufactured or delivered. Moreover, given that demand is fixed, the replenishment lead time is zero, and shortages are not permitted (the assumption is fixed), each replenishment will occur when the inventory level goes to zero. In addition, restocking will generally occur at regular T-minute intervals. I_{max} denote the maximum number of products that should be kept in inventory.

2.2.9.4 Vendor Managed Inventory

How well a firm manages its inventory will affect how well it can compete in the marketplace. Some companies use vendor managed inventory (VMI) systems, which allow vendors to keep tabs

on how much stock their clients are actually using (Taleizadeh et al., 2020). Customers will not experience shortages thanks to this VMI technique because suppliers will have already restocked (Sumrit, 2020). Communication between the client and the supplier is crucial and should be well planned from the outset of the business relationship (Guggenberger et al., 2020). With VMI, a company can save a ton of money and time because the vendor is responsible for keeping track of its customers' stock and making sure it is always restocked (Beheshti et al., 2020). Hence, to avoid stock outs, it is critical that the communication channel between the client and the supplier be clear and quick. If a buyer expects an unusually high volume of orders, they should let the manufacturer know in advance so that they can prepare for the surge.

2.2.10 Demand Uncertainty

Davis (1993) identifies three categories of uncertainty: supply uncertainty, process uncertainty, and demand uncertainty. The most prevalent and consequential among these is demand uncertainty (Davis, 1993; McCutcheon et al., 1994). Accordingly, this research will focus on demand uncertainty. Demand uncertainty is defined as the fluctuating market conditions that result from shifts in customer preferences and the sheer volume of customers that have an impact on product development, strategy, and planning (Boon-itt and Wong, 2010). Demand uncertainty is associated with the product market's change ratio and the buyers' market position's change ratio (Tung-Jung et al., 2010). Customers are demanding new products and services at an unprecedented rate, challenging the status quo of conventional advertising and promotion strategies. As a result, firms are unable to reliably predict demand in terms of its size, location, or timing (Alawneh and Zhang, 2018). Demand uncertainty can cause adjustments to be made to production schedules, marketing initiatives, and other business initiatives on a regular basis (Riccardo, 2012). Organizations may

be prompted to work more closely with and integrate their suppliers as a result of the high rate of change (Liu et al., 2020).

According to Prater et al. (2001), supply chain sensitivity to changes in demand is referred to as the "bullwhip effect" or external vulnerability. This means the supply chain must be adaptable in order to meet the ever-changing demands of the marketplace. Modak and Kelle (2019) recommended that in order to deal with uncertain demand under control mechanisms, supply chain management at the implementation phase should have the competence of sourcing, product development, new product development, and delivery. Furthermore, Rajendran and Srinivas (2020) discovered that product flexibility helps attenuate demand uncertainty for specific items, which in turn better manages uncertainty in aggregate demand. Therefore, having agile, adaptive, and coordinated operational strategies is a viable choice for organizations to react to uncertain demand (Roy et al., 2018).

2.2.11 Operational Performance

Operations management has several potential benefits for a company. As a first priority, operations management focuses on enhancing performance in key areas such as quality, service, responsiveness, reliability, flexibility, cost, and the return on investment in physical plant (Slack and Brandon-Jones, 2019). Second, operations management can have a major strategic influence by developing "difficult to mimic" competencies via ongoing learning and improvement (Slack and Brandon-Jones, 2019). However, a more narrowly focused set of goals is needed to manage operations on a day-to-day basis. The term "operations performance objectives" describes these targets. Quality, speed, dependability, flexibility, and cost are the operations performance

objectives (Slack and Brandon-Jones, 2019). Thus, at the operational level, operations management is measured as quality, speed, dependability, flexibility, and cost. They are often used interchangeably with "competitive advantage" when discussing the measures used to determine performance in a given industry (see Li et al., 2006). The five dimensions of operational performance are explained in the following sections.

2.2.11.1 Quality

Quality is the constant meeting of customer requirements, or "doing things properly," although the specific "things" that need to be done right will change depending on the nature of the operation (Slack and Brandon-Jones, 2019). Quality is a primary focus in any endeavor. It is also something a customer may quickly evaluate to get an opinion about the business (Li et al., 2006). This makes quality an undeniably important factor in determining whether or not a consumer is satisfied. The likelihood of a consumer returning increases when they have a positive experience with the company's products or services (Afthanorhan et al., 2019).

2.2.11.2 Speed

The term "speed" refers to the amount of time that has passed since a consumer placed an order for a product or service before they actually received it (Slack and Brandon-Jones, 2019). The primary advantage that prompt delivery of goods and services brings to the operation's (external) customers is that the quicker they can have the product or service in their possession, the higher the likelihood that they will purchase it, the higher the price that they will pay for it, and the greater the benefit that they will receive from it (Li et al., 2006). The longer it takes for goods to move through a process, the longer they will have to wait, which will result in a higher inventory level

(Agrawal et al., 2016). The ability to move quickly can result in cost reductions as well as a shortened amount of time needed to deliver goods and services (Slack and Brandon-Jones, 2019).

2.2.11.3 Dependability

Dependability refers to the ability to complete tasks on time so that consumers can receive the goods or services they have ordered precisely when they are required or, at the very least, when they were promised they would (Slack and Brandon-Jones, 2019). Customers may not form an opinion regarding the reliability of a business until after they have received the goods or services in question. Because these customers have already "consumed" the service, it is possible that this will initially have no impact on the likelihood that they will choose to utilize it (Slack and Brandon-Jones, 2019). However, dependability might eventually supersede all other requirements if given enough time. Dependability can open the door to the possibility of a more reliable supply of services and products, as well as cost savings (Slack and Brandon-Jones, 2019).

2.2.11.4 Flexibility

The ability to make adjustments to the firm's operations is what flexibility is about (Slack and Brandon-Jones, 2019). This could necessitate modifying the operation's objectives, workflow, or timing. Slack and Brandon-Jones (2019) state that customers will want adjustments to the business model so that it can meet four distinct needs:

Product or service flexibility: the ability to adapt by releasing updated or new versions of existing products or services;

Mix flexibility: the ability to produce a wide variety of goods and services;

Volume flexibility: the ability to adjust production levels to meet fluctuating demand for a given product or service;

Delivery flexibility: Being able to change how a service is delivered lets a company meet customer requests for different delivery times.

Thus, flexibility can allow for the creation of new, broader varieties, different volumes, and different delivery dates of services and products and can lead to cost savings.

2.2.11.5 Cost

Companies that compete solely on pricing will naturally prioritize minimizing costs (Slack and Brandon-Jones, 2019). If the cost of producing goods and services is reduced, a company can offer lower prices to their customers. Companies of all types, including those that do not compete primarily on price, still want to keep costs as low as possible (Li et al., 2006). Evidently, minimizing costs is something that appeals to firms everywhere. Where costs are incurred in an operation has a significant impact on how much influence management of those costs has (Slack and Brandon-Jones, 2019). For example, money will be spent on personnel (paying workers), infrastructure (purchasing, maintaining, running, and replacing the business's "hardware"), and inputs (things that are brought into the business and used or changed there). Therefore, even if a firm does not compete primarily on price, cost reduction remains an essential goal for operations management (Slack and Brandon-Jones, 2019).

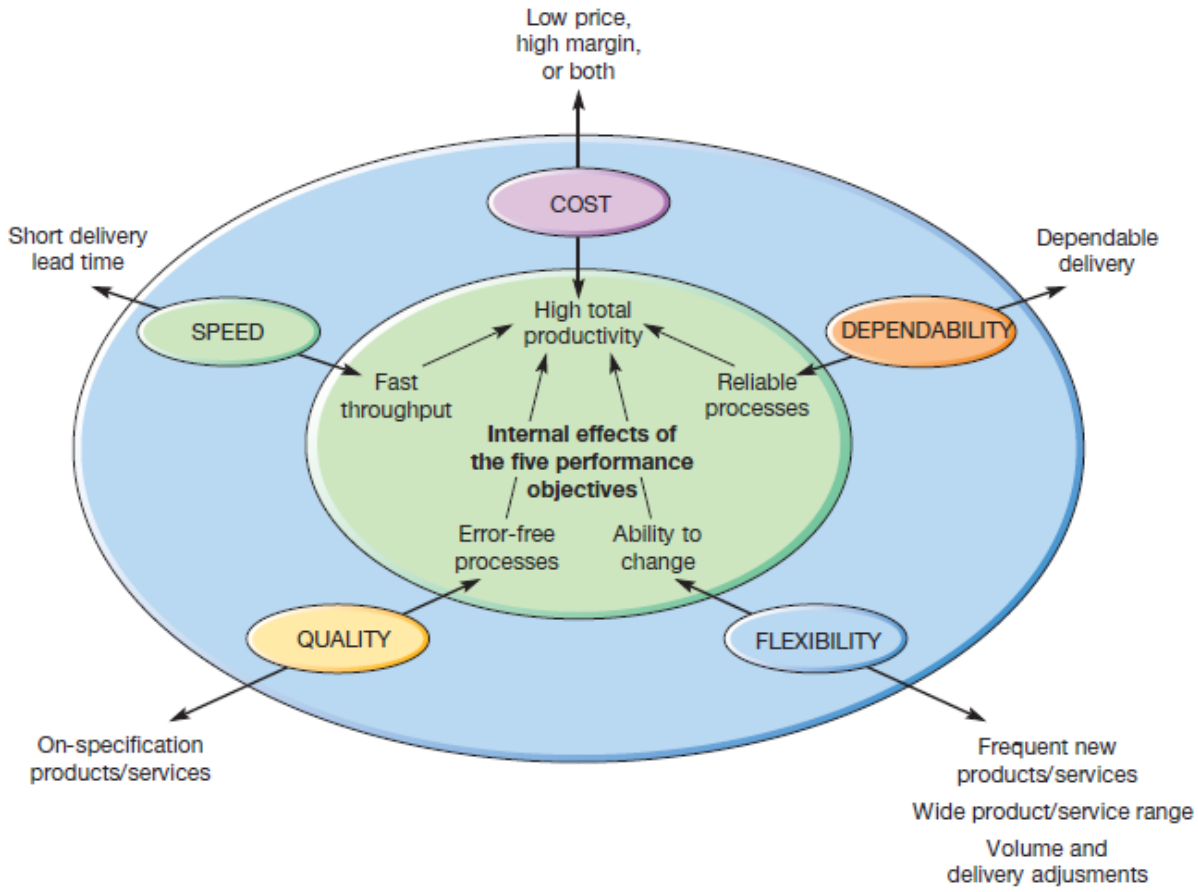

Figure 2. 5 Five dimensions of operational performance

Source: Slack and Brandon-Jones (2019).

2.3 Theoretical Review

To obtain a better understanding of inventory management practices and their effect on operational performance, the resource-based view theory and the contingency theory have been chosen as the study's theoretical underpinnings.

2.3.1 Resource-Based View

The resource-based view (RBV) was developed from a small set of core ideas; as a result, it places emphasis on an individual company and advocates for the strategic advantage that may be achieved

through the smart application of internal resources rather than external resources (Barney, 1991). RBV posits that various forms of heterogeneous and immovable tangible and intangible resources are essential to the success of businesses (Wernerfelt, 1984; Barney, 1991). That is, firms need to have resources that are valuable, rare, imperfectly imitable, unique, and non-substitutable (Dierickx and Cool, 1989; Barney, 1991; Peteraf, 1993) in order to reap the benefit of competitive advantage. Because of the importance of inventory management to operational performance and the need for a cautious approach to inventory management, the RBV theory was selected for this study.

Material goods, or health commodities (as used in this study), are examples of tangible resources because they can be physically handled. The supply chain structure may include a logistics network or a fleet of trucks to transport these commodities. Although this characteristic may be advantageous strategically, they are only so for the time being, as actual resources may be obtained just as easily in the free market. In contrast, resources like knowledge and expertise in operations are intangible and cannot be touched or seen (Khan et al., 2019). Note that unlike physical goods, intangibles cannot be quickly purchased on the open market. For example, the activity of distributing health commodities to health facilities scattered across the region required specialized skills on the part of WRMS staff. The knowledge and expertise of the WRMS staff in dealing with health commodities is, in this sense, a valuable intangible resource that is difficult for competitors to imitate. These kinds of intellectual capabilities are the primary basis for competitive advantage (Teece and Pisano, 1994). In addition, if resources are assumed to be heterogeneous in the sense of being both dispersed and immobile (Wernerfelt, 1984; Barney, 1991), then we can expect such resources to vary depending on the industry. This suggests that firms subject to the same external

influences will, owing to differences in their internal resources, produce different results. Because of their inability to quickly adapt, competitors are unable to easily copy their strategies and advantages.

According to the RBV, organization's resources need to meet certain criteria in order to be successful. In addition to being valuable, rare, and imperfectly imitable, resources must be unique. In health logistics, the value of tools or models lies in their ability to assist health facilities save costs, boost competitiveness, and improve customer satisfaction (Riza et al., 2018). Therefore, from an inventory management standpoint, any strategic tools that incorporate time, location, shape, or possession in a less expensive or faster way are unique. One such tool for keeping orders in stock is the EOQ model. Previous studies have shown that complex health commodity distribution networks are difficult to imitate since competitors typically lack first-hand knowledge of each individual stage, or else they are not sure if even those steps exist (Onyango, 2016; Oluwaseyi et al., 2017; Messele, 2020).

The final requirement is that products and services are non-substitutable, meaning that they cannot be complemented by other resources that are easily accessible, or at the very least, the discovery of an alternative resource would be costly for a rival. When a company uses a method of creating value that its competitors do not, it gains a competitive edge (Peteraf, 1993). The secret to WRMS' performance, then, lies in harnessing their potential as a competitive resource given the market disadvantage they currently face in the management of health commodities. On top of that, these health commodity bundles should serve as the focal point for decision-making over which

resources to outsource (for example, from WRMS to district medical stores as vendors) and which to keep in-house.

2.3.2 Contingency Theory

Early works on organizational theory and management (Lawrence and Lorsch, 1967; Galbraith, 1977) might be seen as the foundation upon which contingency theory was built. According to this theory, the organizational structure of a company as a whole can have an impact on its overall success (McAdam et al., 2019). Therefore, when dealing with particular elements of context, certain organizational structures inside a business unit will produce better performance outcomes; this is known as a "good fit" (Romero-Silva, 2018; McAdam et al., 2019).

The concept of fit is central to the study of contingency theory, which contends that some organizational structures and practices, like business processes and policies, are better suited to particular organizational contexts than others (Burton and Obel, 2018). As a result, organizations work to improve their performance by adapting to a variety of uncertainties and a dynamic external environment (Romero-Silva et al., 2018). The importance of this ongoing process of fit cannot be overstated, especially in fast-paced firms like those in the manufacturing and supply industries (McAdam et al., 2019).

Several studies examined environmental uncertainties in the context of supply chain operations, and their findings provided support for the contingency theory (e.g., Boon-itt and Wong, 2010; Lusiantoro et al., 2018; Perdana et al., 2019; Safari and Saleh, 2020). Accordingly, the contingency theory is applicable to this investigation because it sheds light on how demand uncertainty may

impact the association between inventory management and operational performance. Therefore, the purpose of this research is to investigate the concept of fit in relation to how WRMS handles demand uncertainty to achieve predetermined operational performance goals.

2.4 Empirical Review

Koumanakos (2008) investigated the claim that effective (lean) inventory control enhances a company's financial performance. The study used a quantitative methodology. The ICAP database, which provides financial data on all medium- to large-sized Greek businesses, provided the data for the analysis. The sample time frame covered the years 2000 to 2002. The data were analyzed using the ordinary least squares regression method. The findings showed that a firm's rate of return decreased with increasing levels of inventory kept (as opposed to lean operations).

With a focus on Kenya's Safaricom Ltd., Kamau and Kagiri (2015) evaluated the impact of inventory management on organizational competitiveness. The quantitative method was used, and the sample size was 80 respondents. The data were analyzed using descriptive and inferential statistics. The findings demonstrated that inventory turnover, investment, and shrinkage all had a positive effect on Safaricom Ltd.'s ability to compete.

In Kenya, Onyango (2016) looked into how inventory management techniques affected the provision of healthcare services. The study employed a descriptive design and a quantitative approach. There were 30 respondents in the sample. Multiple linear regression and descriptive statistical analysis were used to analyze the data, and the findings demonstrated that inventory

management techniques had a positive effect on how well humanitarian health organizations delivered their services.

Mbonyinshuti (2017) evaluated the role that health commodity inventory management plays in the provision of healthcare in Rwanda's Kirehe district public health facilities. A quantitative approach and a descriptive research design were used in the study. There were 77 respondents in the sample. The analytic methods used were descriptive statistical analysis and linear regression. The outcomes demonstrated how important health commodity inventory management is to the provision of healthcare. The study concluded that managing the inventory of health commodities positively impacted the provision of healthcare.

Jepkosgei (2018) investigated how logistics management techniques affected lead times in Kenya's public healthcare system. The study focused especially on warehouse practices, transportation management practices, inventory management practices, and transportation management. The research design was descriptive. Data was collected from 451 employees from all roles in the procurement, storage, transport, and logistics departments, which made up the study's target population. The data was analyzed using a multiple regression model. The findings demonstrated a negative and significant relationship between lead time and the public health sector in Kenya's warehouse management practices, inventory management practices, order management practices, and transportation management practices.

Abu-Nimeh et al. (2018) looked into how Jordanian manufacturing companies' supply chains and markets performed after implementing lean inventory practices. With a sample size of 308

businesses, they used the quantitative approach. To examine the data, they employed a structural equation modeling technique. The just-in-time system, information flow, and customer relationship were found to have positive and significant effects on market performance. Additionally, the performance of the supply chain was positively and significantly impacted by all lean inventory techniques.

Muchaendepi et al. (2019) investigated the effectiveness of inventory management practices employed by manufacturing SMEs in Zimbabwe and their effect on firm performance. They used a sample size of 244 respondents using the quantitative approach. The data were analyzed using the descriptive statistical method. According to the findings, the majority of SMEs used the JIT method of inventory management and were unaware of other computerized systems and methods. They added that SMEs encounter difficulties in the supply chain since they must always ensure that they are in contact with their suppliers and shorten the time it takes for them to get the materials. Furthermore, they found that inventory management practices positively affect firm performance.

Khan (2020) assessed how business strategies, such as differentiation and cost leadership, mediated aspects of inventory capability, such as cost-related factors of inventory and techniques of inventory, and firm performance, such as return on asset (ROA) and improved productivity (IMP), of the Bangladeshi garment industry. Data was collected from 385 senior managers in Bangladesh's ready-made garment industry. To analyze the data, structural equation modeling was used. The results showed that inventory management practices do indeed have a positive effect on

firm performance. Additionally, business strategies mediate the effect of inventory material capabilities on firm performance.

Opoku et al. (2021) investigated the impact of various inventory management techniques on the operational effectiveness of Ghanaian manufacturing companies. They used a descriptive design and a quantitative approach. 152 managers of operations and procurement made up the sample. They used multiple linear regression as well as descriptive statistics to analyze the data. According to the findings, strategic supplier partnerships and activity-based costing are highly preferred by Ghanaian manufacturing companies, but just-in-time manufacturing is the least preferred. Additionally, just-in-time delivery, economic order quantity, material resource planning, vendor-managed inventory, activity-based costing, and strategic supplier partnerships were significant and positively correlated with operational performance.

The relationship between inventory management techniques and service delivery in the Philippines was examined by Parilla et al. (2022). 80 patients and the 16 hospitals in Ilocos Norte participated in the study. The research measured the strength of the link between the independent and dependent variables using a quantitative research design and a casual research approach. Five inventory management practices were identified based on the study's findings: pharmacy facilities and storage, drug information, safety and security, personnel and stock control, and monitoring. Hospitals, on the other hand, fall into four groups in terms of service quality. These include hospital discharges, care and treatment, environment and facilities, and hospital admissions. In addition, service quality was strongly associated with personnel, stock, and inventory control and monitoring.

2.5 Conceptual Framework

This section presents the research model, which illustrates the link between the independent, dependent, and moderator variables. The independent variable is inventory management practices. Four subconstructs have been used to measure inventory management practices. These are activity-based costing analysis, just-in-time, economic order quantity, and vendor managed inventory. On the other hand, the dependent variable is operational performance. Five subconstructs have been used to measure operational performance. These are quality, speed, dependability, flexibility, and cost. Lastly, demand uncertainty is the moderator. The study aims to test whether inventory management practices, at aggregate level, has an influence on each of the operational performance measures under the theoretical lens of the RBV. The study also examines the moderating role of demand uncertainty in this relationship under the theoretical lens of the contingency theory.

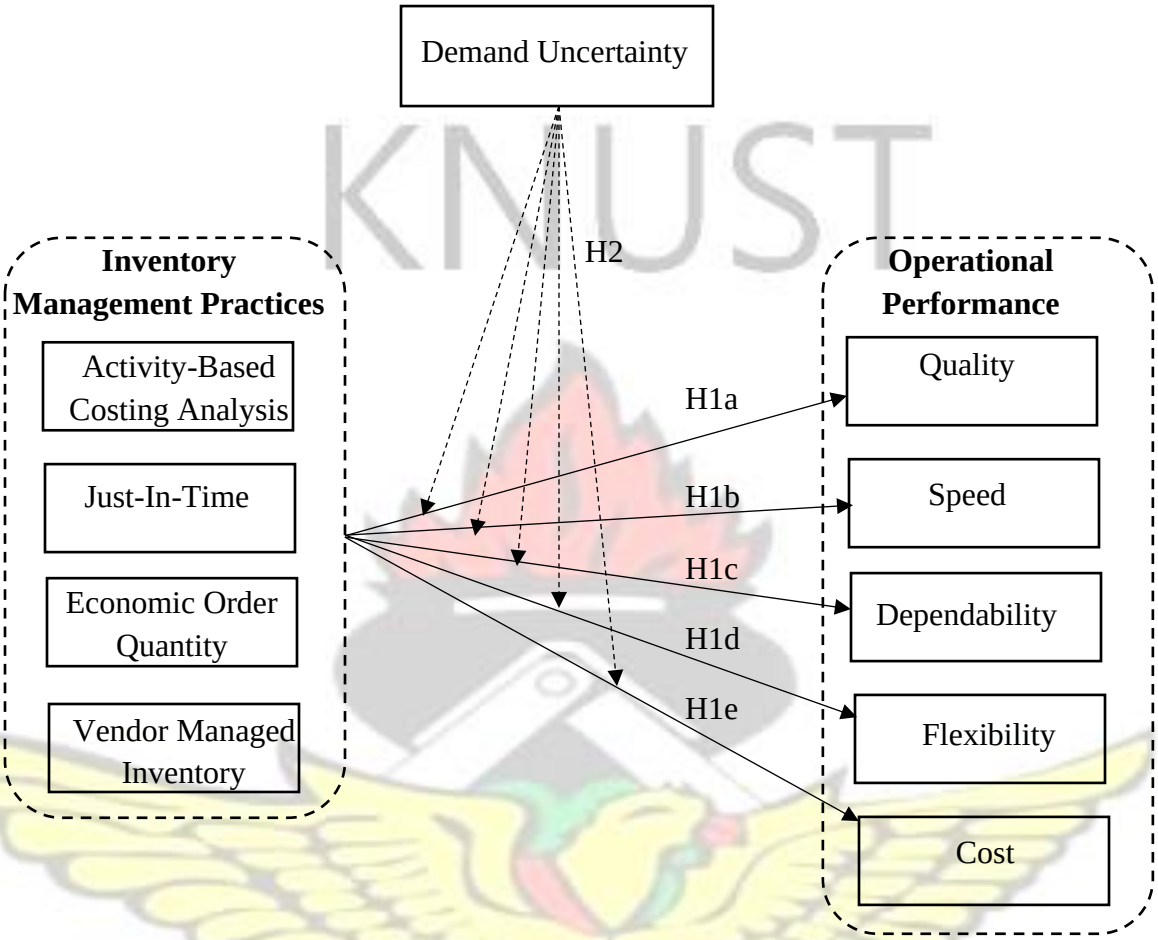

Figure 2. 6 Research Model

Source: Author's own design

2.5.1 Inventory Management Practices and Operational Performance

The RBV theory discussion allows us to conclude that inventory management practices can result in improved performance for firms. This is because these practices involve in-house resources and/or expertise employed in value creation in the form of competitive advantage (Barney, 1991). A company's resources are ineffective without some sort of organizational competency or set of core competencies to guide their use (Teece and Pisano, 1994). Consequently, the competitive differences between companies could be attributed to the way in which their resources or

competences are managed. Using the RBV theory, WRMS may learn what makes it special and capitalize on those factors. In this sense, the skills and competencies (intangible resources) of WRMS personnel in handling health commodities (tangible resources) could be regarded as a strategic resource that competitors would find difficult to imitate. This should lead to improvement in the operational performance of the firm.

Patients' well-being is the first priority in healthcare, and managers of health commodities play a crucial role in realizing this objective. The primary responsibility of stock managers is to secure the delivery of high-quality supplies for medical use (Berhanemeskel et al., 2016). Although price is a crucial factor in evaluating products, clinical efficacy and safety must also be considered (Annan et al., 2009; Pinna et al., 2014). When the efficacy and safety of health commodities is assured coupled with its availability in large quantities, delivery of quality care is guaranteed (Larson et al., 2014; Ooms et al., 2020). Research shows that by producing only what is required at the right time, supply chain wastes can be reduced and quality performance can be improved (Muchaendepi et al., 2019). When it comes to the three most important aspects of medical supplies used in healthcare—quality, accessibility, and security—stock management plays a crucial role in providing professional patient services (Pisa and McCurdy, 2019). Therefore, organizations that implement effective health commodity inventory management practices tend to have better results in terms of quality performance indicators (Daff et al., 2014; Agrawal et al., 2016; Messele, 2020). Evidence also suggest that there is positive significant relationship between supply chain practices and quality-related performance (Li et al., 2006; Gandhi et al., 2017). Therefore, this study hypothesizes that:

H1a: Inventory management practices have a positive and significant influence on quality performance.

The most important factor in the delivery of healthcare is time. Some delays, even if only a few seconds long, can be fatal (Kishore et al., 2016). It is therefore the primary duty of the inventory manager to guarantee the punctual supply of all necessary health commodities (Boche et al., 2020). Managers of health commodities should have a strategy in place to speed up distribution in points of emergency because of the unpredictability of the projected number of patients (Babatunde et al., 2020). Research shows that if administrators of health facilities work together with their suppliers in ways that facilitate the just-in-time (JIT) system, production lead times could be cut in half, and they could better meet the unpredictable needs of their customers (Jepkosgei, 2018). Thus, improving health commodity inventory management typically results in better, more patient-centric service delivery (Befekadu et al., 2020; Kefale and Shebo, 2019). In addition, having stock on hand in the company's warehouse ensures prompt service and prevents frustrating instances of out-of-stock conditions (Aro-Gordon and Gupte, 2016). Moreover, previous studies have found that there is a positive and significant relationship between supply chain practices and timely delivery (Li et al., 2006; Koh et al., 2007; Gandhi et al., 2017). Therefore, this study hypothesizes that:

H1b: Inventory management practices have a positive and significant influence on speed performance.

For the healthcare industry to thrive, dependable commodity supplies are essential because of its impact on service availability, pricing, and quality (Chandani et al., 2014). Research shows that having a reliable commodity management system in place is important for facilitating easy access

and efficient utilization of these resources during service delivery and in the form of referrals (Lydon et al., 2017). Thus, to guarantee dependable healthcare delivery, commodity management in the health sector should adhere to established principles but also take into account the wide range of settings and services on offer (Atinga et al., 2020). Lack of proper commodities management leads to several issues, including a lack of logistical infrastructure to store health commodities, a failure to properly monitor drug expiration dates, bad procurement practices, distribution issues, and usage issues (Ibegbunam and McGill, 2012; Bray and Awuah, 2019). These will negatively impact operational performance, and more specifically dependable delivery. Effective health commodity inventory management is achieved when firms share information that improves their ability to make consistent deliveries (Pastakia et al., 2018). Moreover, according to Li et al. (2006), there is a positive and significant relationship between supply chain practices and delivery dependability. Therefore, this study hypothesizes that:

H1c: Inventory management practices have a positive and significant influence on dependability performance.

Customers are ultimately responsible for the demand for change, as they want more options, better quality, cheaper costs, and quicker lead times (Sinishaw et al., 2015). To maintain their competitive edge, firms have had to speed up the rate at which they implement design changes and react to client feedback (Gligor et al., 2020). That is why it is crucial for businesses to be adaptable, as customer preferences are always changing (Gandhi et al., 2017). Improved demand forecasting and, by extension, greater resource planning and efficiency are common outcomes of strong customer relationships, which include activities like complaint handling and customer satisfaction

(Li et al., 2006; Madhani, 2019). Additionally, JIT improves a company's competitiveness and the satisfaction of its customers by efficiently and effectively satisfying their various needs (Sulistyowati et al., 2020; Opoku et al., 2021). Furthermore, a company's market share and revenue can increase if it can modify existing products to suit customer tastes and preferences (Saragih et al., 2020). Enhanced flexibility will arise from enhanced material flow, decreased prices, and enhanced quality (Ding et al., 2019), allowing businesses to rapidly introduce new products to the market quickly (Rasib et al., 2020). Moreover, previous studies have found a positive and significant relationship between supply chain practices and flexibility performance (Li et al., 2006; Koh et al., 2007; Gandhi et al., 2017). Therefore, this study hypothesizes that:

H1d: Inventory management practices have a positive and significant influence on flexibility performance.

Managers of health commodities are under a lot of pressure to initiate cost-cutting measures. As the price of health commodities continues to skyrocket, an increasingly large number of customers are also demanding better service from their health insurance providers (Walter et al., 2012). Given that the cost of health commodities constitutes a sizable proportion of healthcare expenditures in developing countries (WHO, 2018), it is imperative that health commodity inventory managers consistently guarantee they receive better deals (Macha et al., 2012). Every day, new and innovative services and products enter the health commodities market. Hence, inventory managers should always be on the lookout for competitive products or processes that produce superior results (Kibira et al., 2017). Even if quality is a critical factor, the cost of the product should be the primary concern to ensure that patient care is not compromised (Kritchanchai et al., 2018). For example, JIT boosts efficiency by minimizing stock on hand and operating expenses and enhancing quick

responses to customer needs (Alkhaldi and Abdallah, 2019). The elimination of corruption, bias in the procurement process, and the purchase of low-quality goods that end up costing a lot of money are all benefits of a more open approach to inventory management (Githui, 2012; Rosen et al., 2013). Moreover, previous studies found that there is a positive and significant relationship between supply chain practices and cost performance (Li et al., 2006; Koh et al., 2007; Gandhi et al., 2017). As a result, effective health commodity inventory management practices should lead to noticeable decrease in the cost incurred by the firm. Therefore, the last hypothesis is that:

H1e: Inventory management practices have a positive and significant influence on cost performance.

2.5.2 The Moderating Effect of Demand Uncertainty

Research suggests that customers routinely place orders that are twice as large as their average order, leading to poor delivery performance (Modak and Kelle, 2019). This is at least in part because demand uncertainty frequently leads to skewed demand data (Alawneh and Zhang, 2018). As a result, a firm's supply-chain planning, manufacturing plans, and marketing strategies will need to be modified when demand changes. When information is shared and collaboration is promoted across departments, a firm can better adapt its operational strategy to meet changing customer demands (Lusiantoro et al., 2018). It has been demonstrated that a networked supply chain with better information sharing, objective alignment, and cooperation will be able to maintain on-time customer delivery even when demand uncertainty is high (Duran and Arkci, 2015; Prakash et al., 2020). Thus, in order to improve operational performance, firms must rethink their approaches to inventory management practices (Rajendran and Srinivas, 2020) and

reconfigure their internal structures, processes, and procedures in the context of health commodity supply chains (Sazvar et al., 2021).

Furthermore, it is becoming more challenging to anticipate customers wants in terms of location, volume, and variety of products (Kim et al., 2018). With access to real-time data and the ability to collaborate, firms in a networked supply chain may better plan production and allocate inventory in an environment with lower demand uncertainty (Xin et al., 2020; Xie et al., 2021). As Melolidakis et al. (2018) point out, delivery lead-time, technological advancements, and price structures all contribute to the wide range of customer expectations. Available literature (Gruler et al., 2018; Akhtari et al., 2019) demonstrates that growing misalignment between supply and demand drives rising supply chain costs. Furthermore, the contingency theory suggests that there is no optimal organizational structure (Burton and Obel, 2018; McAdam et al., 2019), suggesting that the optimal structure is contextual in nature. It follows that with the right kind of management methods, a company can improve its operational performance. Therefore, this study proposes that:

H2: Demand uncertainty has a negative effect in the relationship between inventory management practices and operational performance.

CHAPTER THREE

METHODOLOGY AND PROFILE OF STUDY ORGANIZATION

3.1 Introduction

This chapter of the study focuses on the definition, explanation, and justification of the strategy and methods that were employed to carry out the research. This chapter focuses on a number of different aspects of research, including the research design, the population of the study, the sampling strategy and size of the sample, the method of data collection, the analysis of the data, and ethical considerations.

3.2 Research Design

Research designs are the overarching strategies employed by researchers to ensure that their studies effectively address their research questions (Kumar, 2019). A researcher will utilize a research design, which is essentially a comprehensive strategy, to bring the various aspects of a study together in a manner that is coherent and logical. This ensures that the study will successfully solve the research problem (Kumar, 2019). The three types of study designs are known as explanatory, descriptive, and exploratory designs, respectively (Saunders et al., 2012). Explanatory research seeks to explain the causes and implications of a well-defined problem, while exploratory research seeks to investigate the primary facets of a topic that has received relatively little previous attention (Saunders et al., 2012). While studying a population or phenomenon, descriptive research is conducted to describe the features of the subject of the study. For the purpose of this study, an explanatory research design was selected. Testing the associations between the variables is a key component of an explanatory research design (Kumar, 2019), as this helps answer questions such as "how" or "what" an issue arises (Saunders et al., 2012). The

selection of an explanatory design for this research makes it possible to examine the hypothesized link between inventory management practices, demand uncertainty, and operational performance.

This study made use of a case study methodology. An organization's culture and decision-making processes can be better understood through a case study, which is an in-depth analysis of a recent occurrence (Yin, 2014). In this study, the case organization is the Western Regional Medical Stores (WRMS), and the theme is inventory management practices. Thus, the case study helps us gain insight into WRMS's inventory management practices and their effects on operational performance as well as the moderating effect of demand uncertainty. The case study approach was chosen because it allows for a more in-depth exploration of the phenomena through the collection of data from a wider range of people inside the unit or organization (Yin, 2014). O'Gorman and Macintosh (2014) highlight another advantage of case study research: its ability to identify issue areas inside an organization, allowing for more targeted management and resource allocation to address them.

3.3 Research Approach

The study adopted a quantitative and deductive research approach. Whereas the deductive method is concerned with putting hypotheses to the test (Saunders et al., 2012), the goal of quantitative research is to establish a numerical value for the elements that influence a variable of interest (Creswell, 2018). This study used a quantitative and deductive method because its objective was to determine if there was a connection between inventory management and operational performance. The correlation between two or more variables can only be calculated numerically (Creswell, 2018). Due to this, it was decided that the quantitative and deductive approaches were the best approaches to use in order to achieve the objectives of the study. The quantitative method also has the advantage of factual data and being easy to replicate (Kumar, 2019).

3.4 Population of the Study

The term “study population” refers to the individuals, events, or records that hold the necessary information and are able to provide responses to the research questions (Kumar, 2019). WRMS was the organization where this study was carried out. All of WRMS's personnel were considered part of the study's intended sample set. These include the supply or procurement officers, warehouse officers, administrators, drivers, account officers or finance managers, pharmacists, CEO, labeler/packers/labourers, and security personnel. The population size summed up to 100.

3.5 Sampling Technique and Sample Size

A sample size is the amount of a population that is chosen at random to serve as a sample for statistical analysis (Kumar, 2019). This is very important because it lets the researcher save time and money by focusing on just a small part of the population instead of the whole population. According to Cooper and Schindler (2014), in order to perform a study that is both valid and trustworthy, the sample size should not be less than thirty percent of the population being studied. In this study, the population size was small. Due to the fact that the study population was very small, the sample size for this study comprised 100 percent of the target population (100).

3.6 Data Collection Method

The questionnaire was the primary method of data collection in this study. As part of the research endeavour, questionnaires were handed out face-to-face to participants. The response rates to these surveys are far higher than those to online surveys and are widely recognized as valid by academics (Kumar, 2019). The researcher's affiliation with WRMS also contributed to the success of the in-person questionnaire administration. Data collection techniques that rely on the internet or postal

mail have a hard time being put into practice in Ghana because of the country's inadequate addressing system and low levels of internet connectivity or penetration. This made these approaches cumbersome and time-consuming to implement. No late responses were accepted after the three weeks deadline passed.

3.6.1 Data Collection Instrument

This study mostly used a questionnaire as its means of data collection. The questionnaire is the most reliable method for gathering numerical data (Creswell, 2018). In particular, a closed-ended questionnaire was used to collect the data. Closed-ended questions ask respondents to choose just one answer from a small set of predetermined possibilities (Kumar, 2019). Respondents' time is most efficiently used when they select an answer from a predetermined set of possibilities provided in a closed-ended questionnaire. The questionnaire consisted of two main sections. The first section contained the demographic profile of respondents, while the second section contained the measurement items for inventory management, demand uncertainty, and operational performance. The measurement items for inventory management, demand uncertainty, and operational performance were adapted from previous studies. Table 3.1 provides a summary of the constructs and their source.

Table 3. 1 Constructs and Source

Category	Construct	Measure	No. of Items	Source
Independent	Inventory Management Practices	Economic Order Quantity	5	Onyango (2016)
		Activity-Based Costing	3	Onyango (2016)
		Just-in-Time	5	Onyango (2016)
		Vendor Managed Inventory	5	Onyango (2016)
Dependent	Operational Performance	Quality	4	Li et al. (2006)
		Speed	4	Li et al. (2006)
		Dependability	3	Li et al. (2006)
		Flexibility	3	Li et al. (2006)
		Cost	2	Li et al. (2006)
Moderator	Demand Uncertainty		3	Hosseini and Sheikni (2012)

3.5 Data Analysis

The study adopted a quantitative approach and therefore a quantitative analysis of the data in order to ascertain whether or not the study's objectives had been successfully accomplished. In this particular instance, both descriptive and inferential statistics were utilized. The means and standard deviations of the study variables were computed by the application of descriptive statistics. This was done in order to accomplish the first objective. To determine the nature of the link that exists between the independent and dependent variables, an ordinary least squares (OLS) regression analysis with inferential statistics was carried out. This allowed for the accomplishment of objective two. In order to carry out the data analysis, the SPSS software was utilized.

3.7.1 Model Specification

In this study, the ordinary least squares (OLS) regression, in particular, the simple linear regression was used to examine the nature of the relationship that exist between the independent, dependent and moderator variables. The OLS regression formula is given by:

$$Y = \beta_0 + \beta_1 X_i + \ldots + \beta_n X_n + \varepsilon \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where,

Y = the dependent variable

$X_i \ldots X_n$ = independent variables

$\beta_1 \ldots \beta_n$ = coefficients of the independent variables

ε = error term

Substituting the study's variables into equation (1), gives five different models as follows:

Quality = β (Inventory Management Practices) + ε ……model (1)

Speed = β (Inventory Management Practices) + ε ……model (2)

Dependability = β (Inventory Management Practices) + ε …….model (3)

Flexibility = β (Inventory Management Practices) + ε ……model (4)

Cost = β (Inventory Management Practices) + ε ……model (5)

The moderating effect of demand uncertainty in the relationship between inventory management practices and operational performance was modeled using the formula below:

$$OP = \beta_0 + \beta_1 IVM + \beta_2 DU + \beta_3 (IVM * DU) + \varepsilon \quad \ldots\ldots\ldots\ldots (6)$$

Where,

OP = Operational Performance

IVM = Inventory Management

DU = Demand Uncertainty

IVM*DU = Interaction of IMP and DU

$\beta_1, \beta_2, \beta_3$ = The coefficients of IVM, DU, and IVM*DU respectively

3.7.2 Reliability and Validity

The term "reliability" refers to how consistent a measurement is (whether the same results can be obtained in the same way) (Hair et al., 2010). The Cronbach Alpha statistic is used to examine the reliability of the scale within itself. A rule of thumb is that if the Cronbach Alpha score is 0.70 or greater (Nunnally, 1978), then the reliability requirements have been met. On the other hand, validity refers to the degree to which a measure is accurate (whether the results really do represent what they are supposed to measure) (Hair et al., 2010). Validity was determined for this study utilizing a method known as nomological validity. Nomological validity provides estimates of how well the proposed model fits the observations (e.g., direct effects, mediated effects, and moderated effects) (Hagger et al., 2017). This is accomplished by first determining the extent to which the model fits the data as a whole and then evaluating the model's individual hypotheses one at a time. If the researchers can demonstrate that the model fits the data well and, more significantly, that all of the hypotheses in the theoretical model stand up under inspection, they will have a solid case for the model's nomological validity (Hagger et al., 2017).

3.8 Ethical Consideration

Researchers' morals and ethics are put to the test in the field in ways that can greatly affect the reliability of their findings (Saunders et al., 2012). The researcher gave a lot of thought to a variety of ethical considerations before, during, and after the study's execution. Firstly, research was able

to begin after approval from the researcher's supervisor. Secondly, before any data was collected from the survey, participants gave their verbal consent. In addition to obtaining informed consent, participants were also made aware that they could withdraw from the study at any time before data analysis began. Additionally, participants were guaranteed that their confidential survey responses would be kept secret. Finally, the researcher did not provide any sort of inducement, financial or otherwise, to participants prior to or after the data collection exercise.

3.9 Profile of Western Regional Medical Store

3.9.1 Introduction

The Western Regional Medical Stores was established in the early 1950 to cater for the supply of health commodities to the entire Gold Coast. Initially, it served as the Central Medical Stores and also Western Regional Medical Stores.

As the Central Medical Stores, it distributes commodities to the other Regional Medical Stores in the country. This functional unit was moved to Tema after the Tema Habour was built. The facility then became the Western Regional Medical Stores serving only health facilities in 1972. Since then the Western Regional Medical Stores is concerned with the conventional supply system in which logistics are requested and delivered to health facilities.

The Western Regional Medical is part of the ten Regional Medical Stores covering all of Ghana's ten regions. It has a warehouse capacity of 3,793 $2m^2$ and has ten store rooms and three sheds presently. The Western Regional Medical Stores carries its mandate through the medicines section which has five (5) store rooms and non –medicines consumables section which also has five (5) store rooms.

Western Regional Medical Stores stocks a wide range of pharmaceuticals, dressing and surgical products, stationery (medical forms and literature), and medical equipment. Some of the pharmaceuticals are psychotropic medicines, antiretroviral medicines, antituberculosis medicines, routine medicines. Aside this, some of the recommended equipment used at the Western Regional Medical Stores are pallets, shelves, assembly trolleys, stepladders.

Vision: To have a healthy population for National Development

Mission: To be an established leader in the distribution of quality health commodities in the Western Region, infusion of professionalism into our services tour clients, providing cost effective scheduled delivery system and ultimately serving as a centre of excellence for logistics management.

3.9.2 Activities and Tasks for Managing Health Commodities

Order: Determine supply needs, write requisition to appropriate authority and liaise with procurement unit to place an order.

Receive: Ensure the correctness and timely receipt of ordered commodities.

Store: Store commodities properly and maintain serviceability, safety and security of stock. It is also responsible for accounting for the quantities and value of the stock on hand at the risk of expiry, spoilage, and theft.

Issue: Delivering medicines and non – medicines to health facilities at lower levels. Example, hospitals.

Inventory Control: Distribute and maintain adequate supplies.

Reporting: Record and report accurate and timely information about supplies and their consumption.

Quality assurance: Ensuring that the quality of commodities is maintained.

Monitoring: Monitor logistics activities and supervise the personnel who carry them out.

Training: Ensuring that students, national service personnel and other logistics management staff in the region are effectively trained.

3.9.5 Health Facilities

The breakdown of health facilities being served in the region is Regional Hospital, District Hospitals, Health Centres and CHPS Facilities.

The Western Regional Medical Stores is concerned with the conventional supply system in which logistics are prepared and distributed through the scheduled delivery system to about 609 health facilities in the region.

Table 3. 2 Health Facilities being Served by WRMS

NO	DIISTRICTS	TOTAL NO. OF FACILITIES	HOSPITALS	HEALTH CENTRES	CHPS ZONE	DHAS	PRIVATE
1	AHANTA WEST	24	1	6	13	1	3
2	AOWIN	37	1	6	27	1	2
3	BIA EAST	14	0	1	12	1	0
4	BIA WEST	19	1	3	12	1	2
5	BIBIANI ANH. BEKWAI	30	1	9	18	1	1
6	BODI	16	0	5	9	1	1

7	ELLEMBELLE	32	0	7	22	1	2
8	JOMORO	28	1	7	17	1	2
9	JUABOSO	27	1	1	23	1	1
10	MPOHOR	12	0	5	5	1	1
11	NZEMA EAST	21	1	2	17	1	0
12	PRESTEA HUNI VALLEY	30	1	6	21	1	1
13	SEFWI AKONTOMBRA	22	0	5	16	1	0
14	SEFWI WIAWSO	27	1	3	21	1	1
15	STMA	55	4	7	24	1	19
16	SHAMA	14	0	2	9	1	2
17	SUAMAN	11	0	1	9	1	0
18	TARKWA NSUAEM	29	2	10	11	1	5
19	WASSA AMENFI CENTRAL	26	0	5	20	1	0
20	WASSA AMENFI EAST	50	1	5	43	1	0
21	WASSA AMENFI WEST	59	0	3	53	1	2
22	WASSA EAST	26	0	6	17	1	2
	TOTAL	609	16	105	419	22	47

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 Introduction

The data analysis technique discussed in Chapter 3 is utilized throughout this chapter. In order to examine the data in a way that is useful for decision-making, the study makes use of both descriptive and inferential statistical techniques. In the beginning of the chapter, there is an analysis of the response rate, then there is a descriptive statistic of the data, then there are inferential statistics, and finally there is a discussion of the results.

4.2 Response Rate of the Study

Utilizing the case study method, the study indicated that a sample size of 100 was adequate for OLS regression. Therefore, the researcher administered a total of 100 questionnaires to the employees at Western Regional Medical Stores. Three weeks after administering the questionnaire, the researcher went back to collect the completed questionnaires, receiving a total of 100 questionnaires. After a critical evaluation and assessment of each questionnaire, it was discovered that all 100 questionnaires were completely filled out and found to be usable. Since the sample size was 100 percent of the population size, this gives a response rate of 100 percent.

4.3 Descriptive Statistics

Before moving on to the in-depth analysis of the data itself, the objective is to first present a clear and succinct summary of the data. The primary foci of this section are the demographic profiles of the participants in the study as well as a descriptive examination of the variables under study.

4.3.1 Demographic Characteristics of Respondents

This part looks at the basic information about the respondents, such as their gender, age, level of education, respondent's position, and years of experience. Table 4.1 demonstrates that 69 percent of respondents are males, while 31 percent are females. Out of these, the majority fall within the 26–36 year bracket (57%), followed by 37–47 years (31%), 48–58 years (7%), and 59–69 years (5%) in descending order of magnitude. In terms of education level, the majority have been educated up to the first-degree level (35%), followed by Masters (33%), Diploma/HND (22%), PhD (6%), and SSCE/WASSCE (4%) in descending order of magnitude. In terms of respondents' job titles, the majority were medical doctors (17%) and pharmacists (17%), followed by administrative officers (14%), store officers (13%), head of procurement (9%), accountants (7%), head of stores (7%), nurses (6%), procurement officers (6%), physician assistants (2%), supply managers (1%), and human resource managers (1%) in descending order of magnitude. When asked how long the respondent has worked in the organization, the majority (60%) have less than 5 years working experience, followed by 5 to 15 years' experience (30%), and 15 to 30 years' experience (10%) in descending order of magnitude.

Table 4. 1 Demographic characteristics of respondents

Variable	Frequency	Percent (%)
Gender		
Male	69	69
Female	31	31
Age		
26-36years	57	57
37-47years	31	31
48-58years	7	7
59-69years	5	5
Education		
SSCE/WASSCE	4	4
Diploma/HND	22	22
First Degree	35	35

Masters	33	33
PhD	6	6
Position		
Accountant	7	7
Administrative Officer	14	14
Head of Procurement	9	9
Head of Stores	7	7
HR Manager	1	1
Medical Doctor	17	17
Nurse	6	6
Pharmacist	17	17
Physician Assistant	2	2
Procurement Officer	6	6
Stores Officer	13	13
Supply Manager	1	1
Years of Experience		
Below 5years	60	60
5-15years	30	30
15-30years	10	10
Total	**100**	**100**

Source: Field Research Data (2023)

4.3.2 Descriptive Statistics of Study Variables

The study variables are inventory management, demand uncertainty, and operational performance. Thus, the mean and standard deviation of the items corresponding to the individual items of each construct are presented and explained. The researcher adopted a standard rule of thumb as follows: if the mean score of an item is less than 4, it is considered “disagreement”; equal to 4 but less than 5 is considered “neutral”; greater than or equal to 5 is considered “agreement”.

4.3.2.1 Inventory Management

Inventory management consists of four subconstructs: economic order quantity (5 items), activity-based costing (3 items), just-in-time (5 items), and vendor managed inventory (5 items). In total, inventory management consists of 18 items, which were measured on a scale of 1 representing

strongly disagree to 7 representing strongly agree. The minimum, maximum, mean, and standard deviation are shown in Table 4.2.

Table 4.2 shows that mean scores corresponding to economic order quantity (EOQ) are greater than 5, indicating that they fall within the "agree" threshold. By interpretation, respondents agree with the statements. The composite mean is also greater than 5, which further indicates that EOQ is highly practiced within the organization.

For activity-based costing (ABC), the mean scores for item 1 fall within the “neutral” threshold, indicating that respondents neither agree nor disagree with the statement. However, the remaining two items have mean scores greater than 5, indicating respondents “agree” with the statements. The composite mean is less than 5, indicating that ABC is least practiced within the organization.

For just-in-time (JIT), the mean scores for all the items fall within the “agree” threshold since they are greater than 5, indicating that respondents agree with the statements. The composite mean is also greater than 5, indicating that JIT is highly practiced within the organization.

For vendor managed inventory (VMI), items 2, 3, and 4 fall within the “neutral" threshold since they are less than 5, indicating that respondents neither agree nor disagree with the statements. However, items 1 and 5 have mean scores greater than 5, indicating that respondents “agree” with the statements. The composite mean is less than 5, indicating that VMI is less practiced within the organization.

Ranking the constructs in their order of importance, JIT is ranked first (5.774), EOQ is ranked second (5.664), VMI is ranked third (4.984), and ABC is ranked fourth (4.887). This means western regional medical stores highly prioritize JIT and least prioritize VMI. The overall composite mean is greater than 5, indicating that respondents generally view inventory management of health commodities as an important practice within the organization.

Table 4. 2 Descriptive statistics for inventory management

Construct	Min	Max.	Mean	Std. Dev	Ranking
Economic Order Quantity					
"The firm plans their inventory replenishment on a timely basis" (EOQ1).	2	7	5.95	1.067	
"The firm knows when to order and when not to order" (EOQ2).	1	7	5.63	1.186	
"The firm clearly forecasts hence making inventory available by use of EOQ technique" (EOQ3).	1	7	5.49	1.202	
"The firm inventory management is organized in a logical way through the use of EOQ technique" (EOQ4).	2	7	5.59	1.045	
"The firm ensures that inventory supply does not hit stock outs" (EOQ4).	2	7	5.66	1.165	
Composite Mean			**5.664**	**1.133**	**2nd**
Activity-Based Costing					
"The firm allocates time and money in inventory by use of ABC technique" (ABC1).	1	7	4.05	1.822	
"The firm determines the importance of items by use of ABC technique" (ABC2).	1	7	5.30	1.446	
"The firm determines the control level placed on the items by use of ABC technique" (ABC3).	1	7	5.31	1.269	
Composite Mean			**4.887**	**1.512**	**4th**
Just-In-Time					
"The firm items desired arrives just in time for Use" (JIT1).	1	7	5.94	1.293	
"The firm does not have tolerance for late or early deliveries" (JIT2).	1	7	5.63	1.353	
"The firm coordinates movement of Inventory by use of JIT technique" (JIT3).	1	7	5.27	1.325	
"The firm matches demand and supply by use of JIT technique" (JIT4).	1	7	5.81	1.178	

"The firm maintains first enough material in just the right time just the right place to make just the right number of products" (JIT5).	3	7	6.22	0.836	
Composite Mean			**5.774**	**1.197**	**1st**
Vendor Managed Inventory					
"The firm avoids stock outs by use of VMI (VMI1).	3	7	5.40	1.214	
The firm inventory delivered on time by use of VMI" (VMI2).	2	7	4.85	1.184	
"The firm saves on finance and time by use of VMI' (VMI3).	1	7	4.84	1.195	
"The firm coordinates movement of inventory by use of VMI" (VMI4).	3	7	4.77	1.136	
"The firm achieves high inventory utilization by use of VMI" (VMI5).	2	7	5.06	1.144	
Composite Mean			**4.984**	**1.175**	**3rd**
Overall Composite Mean			**5.327**	**1.254**	

Scale: (1= strongly disagree, 2= disagree, 3= somewhat disagree, 4=neutral, 5=Somewhat agree, 6= Agree, 7= Strongly agree)
Source: Field Research Data (2023)

4.3.2.2 Demand Uncertainty

Demand uncertainty consists of three items that were measured on a scale of 1 representing "almost never predictable" to 7 representing "almost always predictable". The minimum, maximum, mean, and standard deviation are shown in Table 4.3. Table 4.3 shows that all the items as well as the composite mean fall within the "occasionally predictable" threshold since they are less than 5, indicating that respondents are able to predict demand uncertainties occasionally.

Table 4. 3 Descriptive statistics for demand uncertainty

Items	Min	Max.	Mean	Std. Dev
"Variation of sales channels" (DU1)	1	7	4.60	1.729
"Number of sales channels" (DU2)	1	7	4.76	1.634
"Frequency of sales channels changes" (DU3)	1	7	4.54	1.690
Composite Mean			**4.633**	**1.684**

Scale: (1= almost never predictable; 2= usually not predictable; 3= rarely predictable; 4= occasionally predictable; 5= often predictable; 6= usually predictable; 7= almost always predictable)

Source: Field Research Data (2023)

4.3.2.3 Operational Performance

Operational performance consists of five subconstructs: cost (2 items), quality (4 items), delivery dependability (3 items), flexibility (3 items), and speed (4 items). These items were measured on a scale of 1 (strongly disagree) to 7 (strongly agree). The minimum, maximum, mean, and standard deviation are shown in Table 4.4.

Table 4.4 shows that mean score corresponding to cost (CT) are greater than 5, indicating that they fall within the "agree" threshold. By interpretation, respondents agree with the statements. The composite mean is also greater than 5, which further indicates that western regional medical stores performed very well in terms of cost.

For quality (QU), the mean for item 1 and 2 fall within the "neutral" threshold, indicating that respondents neither agree nor disagree with the statement. However, the remaining two items have mean scores greater than 5, indicating respondents agree with the statements. The composite mean is greater than 5, indicating that western regional medical stores performed very well in terms of quality.

For delivery dependability (DD), the mean score for all the items fall within the "neutral" threshold since they are less than 5, indicating that respondents neither agree nor disagree with the statements. The composite mean is also less than 5, indicating that western regional medical stores did not perform well in terms of delivery dependability.

For flexibility (FL), the mean score for all the items fall within the "neutral" threshold since they are less than 5, indicating that respondents neither agree nor disagree with the statements. The composite mean is also less than 5, indicating that western regional medical stores did not perform well in terms of flexibility.

For speed (SP), the mean score for all the items fall within the "neutral" threshold since they are less than 5, indicating that respondents neither agree nor disagree with the statements. The composite mean is also less than 5, indicating that western regional medical stores did not perform well in terms of speed.

Table 4. 4 Descriptive statistics for operational performance

Construct	Min	Max.	Mean	Std. Dev
Cost				
"We offer competitive prices" (CT1).	1	7	5.21	1.513
"We are able to offer prices as low or lower than our competitors" (CT2).	1	7	5.32	1.487
Composite Mean			**5.265**	**1.5**
Quality				
"We are able to compete based on quality" (QU1).	1	7	4.97	1.201
"We offer products that are highly reliable" (QU2).	2	7	4.91	1.045
"We offer products that are very durable" (QU3).	1	7	5.11	1.063
"We offer high quality products to our customer" (QU4).	1	7	5.41	1.303
Composite Mean			**5.1**	**1.153**
Delivery Dependability				
"We deliver the kind of products needed" (DD1).	2	7	4.78	1.315
"We deliver customer order on time" (DD2).	1	7	4.53	1.337
"We provide dependable delivery" (DD3).	1	7	4.61	1.385
Composite Mean			**4.64**	**1.346**
Flexibility				
"We provide customized products" (FL1).	1	7	4.71	1.678
"We alter our product offerings to meet client needs" (FL2).	1	7	4.26	1.857
"We respond well to customer demand for "new" features" (FL3).	1	7	4.10	1.692
Composite Mean			**4.357**	**1.748**
Speed				
"We deliver product to market quickly" (SP1).	1	7	4.85	1.395

"We are first in the market in introducing new products" (SP2).	1	7	4.21	1.565
"We have time-to-market lower than industry Average" (SP3).	1	7	4.75	1.114
"We have fast product development" (SP4).	1	7	4.63	1.089
Composite Mean			**4.61**	**1.408**
Overall Composite Mean			**4.785**	**1.254**

Scale: (1= strongly disagree, 2= disagree, 3= somewhat disagree, 4=neutral, 5=Somewhat agree, 6= Agree, 7= Strongly agree)
Source: Field Research Data (2023)

4.4 Inferential Statistics

In this section, the most important findings from the data are presented, with a particular emphasis on exploratory factor analysis, correlation analysis, and multiple linear regression analysis.

4.4.1 Exploratory Factor Analysis

Exploratory factor analysis (EFA) is performed for inventory management, demand uncertainty, and operational performance using the SPSS software.

4.4.1.1 Inventory Management

In performing the EFA, the researcher specified the following: significance, KMO, and Bartlett's test of sphericity (under descriptive); principal component and four fixed numbers of factors to extract (under extraction); varimax (under rotation); and suppress small coefficients with absolute values below 0.50 (under options), following Field's (2018) recommendations. The first output from the EFA resulted in JIT5 being removed because it loaded onto another component other than itself. The final result is shown in Table 4.5.

Table 4.5 shows that the factor loadings range from 0.589 to 0.832 with a KMO of 0.770, a chi-square of 904.596, and a significant Bartlett's test ($p < 0.05$). The four factors accounted for

67.34% of the total variance. The Cronbach alpha for each component (with the exception of component 4) is greater than the 0.70 threshold (Nunnally, 1978), indicating the internal consistency and reliability of the items. According to Field (2018), when scale items are meant to test understanding or knowledge of a subject (as is the case in this study), which is discrete in nature, it should not always be expected that Cronbach alpha will exceed 0.70. Hence, the 0.592 value obtained for component 4 is accepted.

Table 4. 5 EFA on inventory management

	Components			
Items	1	2	3	4
EOQ1	0.749			
EOQ2	0.827			
EOQ3	0.782			
EOQ4	0.774			
EOQ5	0.741			
ABC1				0.589
ABC2				0.778
ABC3				0.819
JIT1			0.684	
JIT2			0.789	
JIT3			0.796	
JIT4			0.656	
VMI1		0.806		
VMI2		0.794		
VMI3		0.762		
VMI4		0.787		
VMI5		0.832		
Cronbach alpha	0.875	0.862	0.802	0.592

KMO = .770; χ^2 = 904.596; df = 136; p = 0.000; percent of variance explained = 67.34%

Notes: Component 1= Economic Order Quantity; Component 2= Activity-Based Costing; Component 3=Just-In-Time; Component 4= Vendor Managed Inventory

4.4.1.2 Demand Uncertainty

In performing the EFA, the researcher specified the following: significance, KMO, and Bartlett's test of sphericity (under descriptive); principal component and 1 fixed number of factors to extract (under extraction); varimax (under rotation); and suppress small coefficient with absolute values below 0.50 (under options), following Field's (2018) recommendations. No item was deleted during this analysis.

Table 4.6 shows that the factor loadings range from 0.897 to 0.938 with a KMO of 0.742, a chi-square of 202.252, and a significant Bartlett's test ($p < 0.05$). This factor accounted for 84.72% of the total variance. The Cronbach alpha for this factor is greater than the 0.70 threshold (Nunnally, 1978), indicating the internal consistency and reliability of the items.

Table 4. 6 EFA on demand uncertainty

	Components
Items	1
DU1	0.897
DU2	0.938
DU3	0.925
Cronbach alpha	0.909
KMO = .742; χ^2 = 202.252; df = 3; p = 0.000; percent of variance explained = 84.72%	

4.4.1.3 Operational Performance

In performing the EFA, the researcher specified the following: significance, KMO, and Bartlett's test of sphericity (under descriptive); principal component and 5 fixed number of factors to extract (under extraction); varimax (under rotation); and suppress small coefficient with absolute values

below 0.50 (under options), following Field's (2018) recommendations. No item was deleted during this analysis.

Table 4.7 shows that the factor loadings range from 0.734 to 0.916 with a KMO of 0.759, a chi-square of 821.736, and a significant Bartlett's test ($p < 0.05$). These five factors accounted for 76.17% of the total variance. The Cronbach alpha for each component is greater than the 0.70 threshold (Nunnally, 1978), indicating the internal consistency and reliability of the items.

Table 4. 7 EFA on operational performance

	Components				
Items	1	2	3	4	5
CT1					0.906
CT2					0.847
QU1	0.790				
QU2	0.840				
QU3	0.856				
QU4	0.796				
DD1				0.806	
DD2				0.859	
DD3				0.860	
FL1		0.873			
FL2		0.916			
FL3		0.889			
SP1			0.834		
SP2			0.785		
SP3			0.768		
SP4			0.734		
Cronbach alpha	0.846	0.917	0.809	0.847	0.803

KMO = .759; χ^2 = 821.736; df = 120; p = 0.000; percent of variance explained = 76.17%

Notes: Component 1= Quality; Component 2= Flexibility; Component 3= Speed; Component 4=Delivery Dependability; Component 5 = Cost.

4.4.2 Assumption Tests

The study performs three assumption tests that are common in multiple linear regression analysis: normality, linearity, and homoscedasticity.

4.4.2.1 Normality Test

After performing the EFA, the items corresponding to each construct in the EFA tables were averaged to get an index value for each variable. The resulting mean, standard deviation, skewness, and kurtosis of the variables are shown in Table 4.8. According to Hair et al. (2010), data is considered "normal" if skewness is between -2 and +2 and kurtosis is between -7 and +7. The column containing the skewness and kurtosis shows that the values meet the required threshold, confirming the normality of the data.

Table 4. 8 Summary descriptive statistics

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
IVM	100	5.3265	.64304	-.781	.241	.692	.478
DU	100	4.6333	1.54941	-.410	.241	-1.088	.478
CT	100	5.2650	1.37520	-1.020	.241	.250	.478
QU	100	5.1000	.95809	-.587	.241	1.448	.478
DD	100	4.6400	1.17749	-.637	.241	.004	.478
FL	100	4.3551	1.61433	-.530	.241	-1.078	.478
SP	100	4.6100	1.04163	-.232	.241	-.471	.478

4.4.2.2 Linearity Test

A linearity test is performed to check whether the independent variable has a straight-line relationship with the dependent variable (Field, 2018). To do this, the study examines the normal P-P plot of the residuals. As shown in Figure 4.1, there is no drastic deviation of the little circles

from the diagonal line. In other words, the little circles follow the normality line, confirming that there is a linear relationship between the independent and dependent variables.

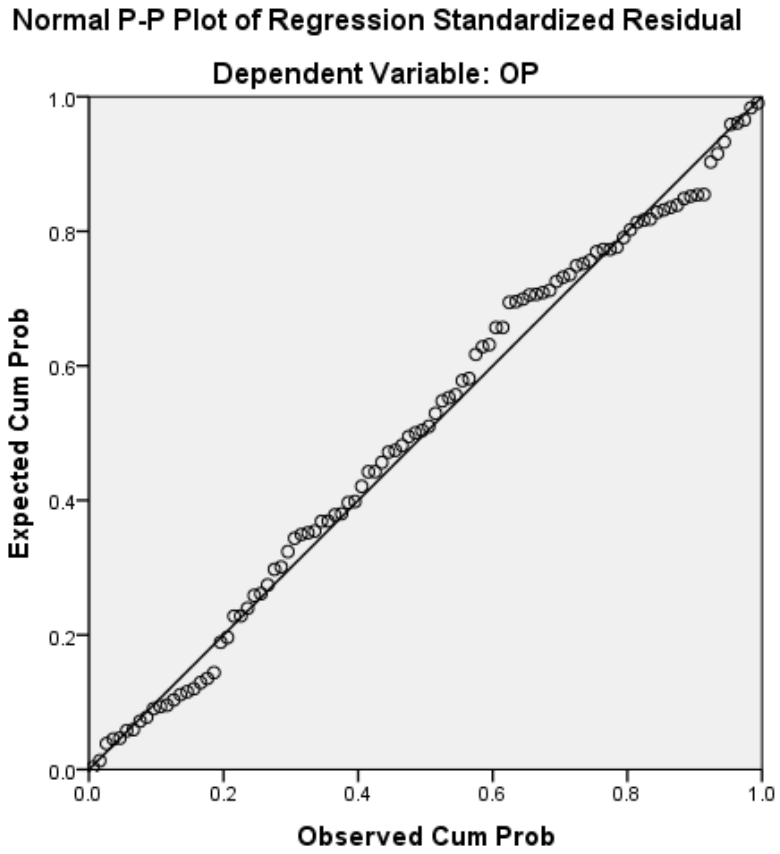

Figure 4. 1 Normal P-P plot of residuals.

4.4.2.3 Homoscedasticity

When the error term in the regression equation is constant for all values of the independent variables, we say that the data is homoscedastic (Field, 2018). To check whether the data is homoscedastic, the study examines the scatter plot of the residuals as shown in Figure 4.2. There is no discernible trend in the data, as seen in Figure 4.2. That is to say, there are equal number of points to the left and right of zero on the Y-axis and above and below zero on the X-axis. This confirms the data is homoscedastic.

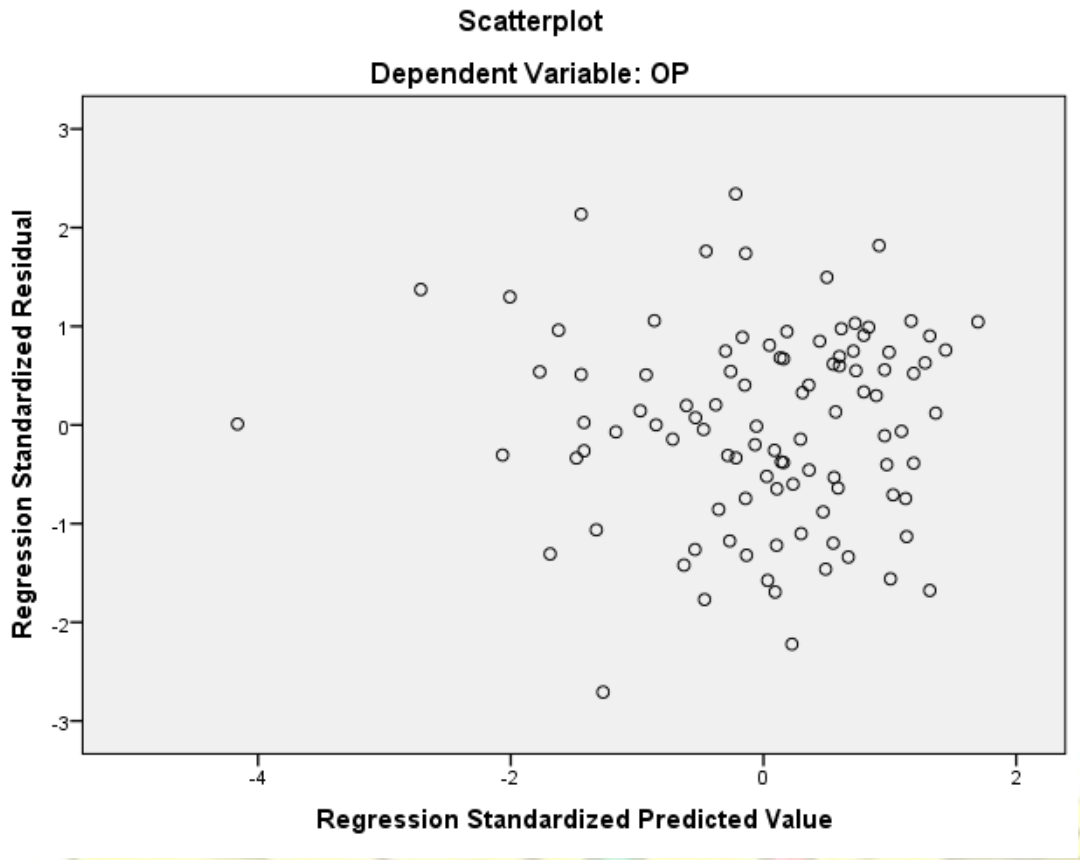

Figure 4. 2 Scatter plot of residuals

4.4.3 Correlation Analysis

Correlation analysis examines the degree of association between the constructs. As shown in Table 4.9, demand uncertainty is positively correlated with inventory management at the 0.05 level. Cost has a positive correlation with inventory management and demand uncertainty at the 0.01 level. Similarly, quality is positively correlated with inventory management, demand uncertainty, and cost at the 0.01 level. Furthermore, flexibility is positively correlated with delivery dependability at the 0.01 level. Last but not least, speed is positively correlated with delivery dependability and flexibility at the 0.01 level. Aside from the significant correlations between the constructs, it can

be observed that none of the correlation coefficients is greater than 0.80 (Field, 2018), indicating that multicollinearity is not present in the variables.

Table 4. 9 Correlation matrix

	1	2	3	4	5	6	7
1. Inventory management	1						
2. Demand uncertainty	0.289*	1					
3. Cost	0.383**	0.301**	1				
4. Quality	0.346**	0.314**	0.408**	1			
5. Delivery dependability	0.112	-0.040	-0.054	0.055	1		
6. Flexibility	0.148	0.078	0.024	0.020	0.401**	1	
7. Speed	0.059	-0.023	0.031	-0.033	0.311**	0.331**	1

**Significant at the 0.01 level (2-tailed)
*Significant at the 0.05 level (2-tailed)

4.4.4 Regression Analysis

To test the hypotheses, the study employs the multiple linear regression technique explained in the data analysis section of the methodology chapter. Prior to running the regression analysis, the researcher performed a mean centering on the independent variable and the moderator as suggested by Aguinis et al. (2017) in order to get better coefficients. In the data analysis section of the methodology chapter, six equations were formulated. Accordingly, Table 4.10 shows the result for each equation.

Table 4.10 shows that model 1 is significant, as indicated by the Sig F. In this model, inventory management has a positive and significant relationship with quality performance ($\beta = 0.515$, $p < 0.05$), which lends support to H1a. About 12 percent of the variance in quality performance is explained by inventory management, as indicated by the R-square value. The variance inflation factor (VIF) value is less than 10 (Field, 2018), indicating the absence of multicollinearity in the predictor variable.

Similarly, model 2 is not significant because the Sig F is greater than 0.05. In this model, inventory management has a positive but insignificant relationship with speed performance ($\beta = 0.095$, $p > 0.05$), which fails to support H1b. This means that inventory management has no relationship speed performance.

Model 3 is not significant since the Sig F is greater than 0.05. In this model, inventory management has a positive but insignificant relationship with delivery dependability performance ($\beta = 0.205$, $p > 0.05$), which fails to support H1c. This means that inventory management has no relationship with delivery dependability performance.

Model 4 is not significant since the Sig F is greater than 0.05. In this model, inventory management has a positive but insignificant relationship with flexibility performance ($\beta = 0.372$, $p > 0.05$), which fails to support H1d. This means that inventory management has no relationship with flexibility performance.

Model 5 is significant since the Sig F is less than 0.05. In this model, inventory management has a positive and significant relationship with cost performance ($\beta = 0.819$, $p < 0.05$), which lends support to H1e. About 14.7 percent of the variation in cost performance is explained by inventory management, as indicated by the R-square value. The VIF value is less than 10 (Field, 2018), indicating the absence of multicollinearity in the predictor variable.

Model 6 is significant since the Sig F is less than 0.05. The VIF value is also less than 10, indicating that multicollinearity is not present in the predictor variables. In this model, inventory

management has a positive and significant relationship with operational performance (β = 0.319, p < 0.05). About 12.8 percent of the variation in operational performance is explained by inventory management, as indicated by the R-square value. However, when demand uncertainty interacted with inventory management (IVM*DU), the result showed a negative and insignificant relationship with operational performance (β = -0.038, p > 0.05). This means that demand uncertainty does not moderate the relationship between inventory management and operational performance, which fails to support H2.

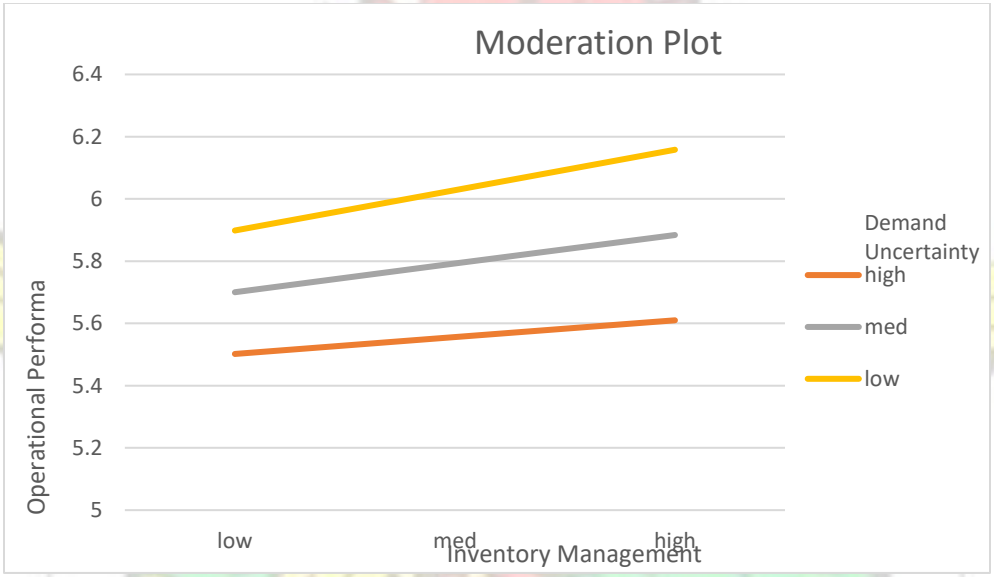

Figure 4. 3 Moderation plot for the interaction between IVM and DU.

Figure 4.3 shows that the absolute magnitude of the effect of DU on the IVM-OP slope is greater at low DU (there are positive slopes for IVM and DU individually), but the sign of the interaction coefficient is negative, so that the IVM-OP slope increases at high DU.

Table 4. 10 Regression analysis result

	Dependent Variables						
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	
	Quality	Speed	Delivery Dependability	Flexibility	Cost	Operational Performance	VIF
Constant	5.126	4.615	4.650	4.373	5.306	4.799	
Inventory Management (IVM)_centered	0.515 (0.000)*	0.095 (0.562)	0.205 (0.267)	0.372 (0.142)	0.819 (0.000)*	0.319 (0.004)*	1.122
Demand Uncertainty (DU)_centered	-	-	-	-	-	0.050 (0.261)	1.099
IVM*DU	-	-	-	-	-	-0.038 (0.566)	1.029
Sig F	0.000	0.562	0.267	0.142	0.000	0.004	
R-square	0.120	0.003	0.013	0.022	0.147	0.128	

p-values are in the parenthesis
****Significant at the 0.05 level***

Table 4. 11 Summary of hypothesis result

	Hypothesis	Result
H1a	*Inventory management practices have a positive and significant influence on quality performance*	Supported
H1b	*Inventory management practices have a positive and significant influence on speed performance.*	Not Supported
H1c	*Inventory management practices have a positive and significant influence on dependability performance.*	Not Supported
H1d	*Inventory management practices have a positive and significant influence on flexibility performance*	Not Supported
H1e	*Inventory management practices have a positive and significant influence on cost performance.*	Supported
H2	*Demand uncertainty has a negative effect in the relationship between inventory management practices and operational performance.*	Not Supported

4.5 Discussion of Result

4.5.1 Inventory Management and Operational Performance

The regression analysis shows that inventory management has a positive and significant effect on operational performance (aggregate). This finding is consistent with several prior studies that found similar results (e.g., Onyango, 2016; Mbonyinshuti, 2017; Muchaendepi et al., 2019; Khan, 2020; Opoku et al., 2021; Parilla et al., 2022). This study finding posits that inventory management should be seen as a proven operations management tactic requiring commitment from employees and managers as well as organization-wide resources for a positive outcome. From the perspective of the RBV theory, firms need to have resources that are valuable, rare, imperfectly imitable, and non-substitutable in order to reap the benefits of competitive advantage (Dierickx and Cool, 1989; Barney, 1991; Peteraf, 1993). In the context of this study, the activity of distributing health commodities to health facilities scattered across the region required specialized skills on the part of WRMS staff. The knowledge and expertise of the WRMS staff (an intangible resource) in

dealing with health commodities (a tangible resource) is, in this sense, a valuable resource that should lead to organizational competitiveness. These kinds of intellectual capabilities are the primary basis for competitive advantage (Teece and Pisano, 1994). From an inventory management standpoint, practices such as EOQ, JIT, ABC, and VMI are unique to WRMS and should lead to better operational performance. It is interesting to note that when inventory management is regressed on each of the five dimensions of operational performance (quality, speed, delivery dependability, flexibility, and cost), the results appear different.

First, the study finds that inventory management has a positive and significant effect on the quality dimension of operational performance, providing support for H1a. From the firm's perspective, inventory management of health commodities is a multi-tasking activity that requires the active participation of all departments within the firm to ensure the availability and security of health commodities. When the efficacy and safety of health commodities are assured, coupled with their availability in large quantities, the delivery of quality care is guaranteed (Larson et al., 2014; Ooms et al., 2020). Inventory management practices like economic order quantity ensure the right amount of health commodities is procured and delivered just in time. In this way, supply chain waste can be reduced and quality performance can be improved (Li et al., 2006; Daff et al., 2014; Agrawal et al., 2016; Gandhi et al., 2017; Muchaendepi et al., 2019; Messele, 2020).

Second, the study finds that inventory management has no relationship with the speed dimension of operational performance, failing to support H1b. This finding contrasts with the positive and significant relationship reported in the existing literature (Li et al., 2006; Koh et al., 2007; Gandhi et al., 2017). This difference could be attributed to the nature of the data employed. For instance,

the prior studies employed a survey design, while this study employs a case study design focusing on a single organization. From an inventory management perspective, the ability of WRMS to respond quickly to demand for health commodities depends on a number of factors, including the road infrastructure network, availability of vehicles, drones, and financial resources, availability of the health commodity, and communication network efficiency, which pose a significant challenge, especially in a developing country context. This supply chain weakness could cancel out the positive effort of WRMS staff and render the organization incapable of meeting the delivery deadlines. Thus, inventory management of health commodities is not a predictor of timely delivery. This finding contrasts with the claim that improving health commodity inventory management typically results in better, more patient-centric service delivery (Befekadu et al., 2020; Kefale and Shebo, 2019).

Third, the study finds that inventory management has no relationship with the delivery dependability dimension of operational performance, failing to support H1c. In the existing literature, this finding contrasts with the positive and significant relationship reported by Li et al. (2006). This difference could be attributed to the data employed. According to Hair et al. (2010), the larger the sample, the better the result. While Li et al. (2006) surveyed a large number of firms, the current study focused on a single organization, employing a smaller sample size. From the firm's perspective, lack of proper commodity management leads to several issues, including a lack of logistical infrastructure to store health commodities, a failure to properly monitor drug expiration dates, bad procurement practices, distribution issues, and usage issues (Ibegbunam and McGill, 2012; Bray and Awuah, 2019). These problems could create an imbalance between WRMS inventory management efforts and health facilities reliance on WRMS for consistent

supplies. In view of these problems, inventory management of health commodities does not lead to delivery dependability.

Fourth, the study finds that inventory management has no relationship with the flexibility dimension of operational performance, failing to support H1d. This finding is in contrast to the positive and significant relationship reported by previous researchers (Li et al., 2006; Koh et al., 2007; Gandhi et al., 2017). As explained earlier, the difference could be attributed to the data employed. From the firm's perspective, flexibility refers to a firm's capacity to adapt to changing needs and expectations of customers. However, the managerial approach to inventory management differs in every organization. That is, not all organizations will respond in the same way to the changing needs and expectations of customers. Due to the inherent problems in the management of health commodities, it would take time for WRMS to adapt to their customers (health facilities) needs and expectations, and so the positive outcomes of inventory management cannot be realized in the short term. Although customers want more options, better quality, cheaper costs, and quicker lead times (Sinishaw et al., 2015), implementing such changes does not always lead to enhanced flexibility. Enhanced flexibility will arise from enhanced material flow, decreased prices, and enhanced quality (Ding et al., 2019). Without enhancing these factors, flexibility performance cannot be guaranteed.

Lastly, the study finds that inventory management has a positive and significant relationship with the cost dimension of operational performance, providing support for H1e. This is consistent with the findings of previous studies (Li et al., 2006; Koh et al., 2007; Gandhi et al., 2017). From the firm's perspective, involving key employees in various departments in the management of health

commodities is a cost-effective way to minimize waste resources. For example, inventory management practices like JIT boost efficiency by minimizing stock on hand and operating expenses and enhancing quick responses to customer needs (Alkhaldi and Abdallah, 2019). Specifically, in the public health sector, inventory management improves cost performance through the elimination of corruption, bias in the procurement process, and the purchase of low-quality goods that end up costing a lot of money (Githui, 2012; Rosen et al., 2013). Therefore, inventory management is a predictor of cost performance, and so the cost of the product should be the primary concern to ensure that patient care is not compromised (Kritchanchai et al., 2018).

4.5.2 The Moderating Effect of Demand Uncertainty

The study finds that the interaction between inventory management and demand uncertainty is negative and insignificant, which fails to support H2. Prior to this interaction, the coefficient of inventory management was positive and significant; however, after the interaction, the result became negative and insignificant. Thus, demand uncertainty does not moderate the relationship between inventory management and operational performance. In theory, this means moderation does not hold in specific conditions when tested on employees in a single organization (western regional medical stores). This is at least in part because demand uncertainty frequently leads to skewed demand data (Alawneh and Zhang, 2018) in the sense that the focal firm cannot accurately predict the variation in demand.

In reference to the moderation plot, the absolute magnitude of the effect of DU on the IVM-OP slope is greater at low DU, but the sign of the interaction coefficient is negative, so that the IVM-OP slope increases at high DU. Based on this, when demand uncertainty is high, the focal firm would need to prioritize better information sharing, objective alignment, and cooperation to

maintain on-time customer delivery (Duran and Arkci, 2015; Prakash et al., 2020). Conversely, when demand uncertainty is low, the focal firm would prioritize better production planning and allocation of inventory (Xin et al., 2020; Xie et al., 2021). This misalignment between supply and demand increases supply chain costs (Gruler et al., 2018; Akhtari et al., 2019), putting the focal firm in a tight position to meet customer demand. The contingency theory can also provide support for this study's findings. From the contingency theory perspective, there is no optimal organizational structure (Burton and Obel, 2018; McAdam et al., 2019), suggesting that the optimal structure is contextual in nature. Following this line of reasoning, it could be argued that demand uncertainty cannot be a good "fit" when looking for ways to better improve the IVM-OP relationship within western regional medical stores. Thus, in order to improve operational performance, the focal firm must rethink their approaches to inventory management practices (Rajendran and Srinivas, 2020) and reconfigure their internal structures, processes, and procedures in the context of health commodity supply chains (Sazvar et al., 2021).

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

In the previous chapter, the study empirically tested and validated the hypotheses. The purpose of this chapter is to present a summary of the findings, the conclusion, and recommendations for management of western regional medical stores. The study also presents some suggestions for future research.

5.2 Summary of Findings

5.2.1 Scope of Inventory Management Practices

To achieve this objective, the study examines the mean and standard deviation corresponding to inventory management constructs. Ranking the constructs in their order of importance, the study finds that just-in-time is ranked first (5.774), economic order quantity is ranked second (5.664), vendor managed inventory is ranked third (4.984), and activity-based costing is ranked fourth (4.887). This means western regional medical stores highly prioritize just-in-time and least prioritize vendor managed inventory.

5.2.2 Inventory Management Practices and Operational Performance

To achieve this objective, the study performs a multiple linear regression analysis. The result shows that inventory management has a positive and significant relationship with operational performance ($\beta = 0.319$, $p < 0.05$). When the dimensions of operational performance are analyzed individually, inventory management has a positive and significant effect on quality ($\beta = 0.515$, p

< 0.05) and cost (β = 0.819, p < 0.05). This supports H1a and H1e. On the contrary, inventory management has no relationship with speed (β = 0.095, p > 0.05), delivery dependability (β = 0.205, p > 0.05), or flexibility (β = 0.372, p > 0.05). This fails to support H1b, H1c, and H1d.

5.2.3 Moderating Effect of Demand Uncertainty

To achieve this objective, the study performs a moderated regression analysis. The result shows that demand uncertainty does not moderate the relationship between inventory management and operational performance (β = -0.038, p > 0.05). This fails to support H2.

5.3 Conclusion

Previous research in the body of literature pertaining to the health supply chain has concentrated on the effect that inventory management procedures have on health commodities from the point of view of health facilities. While such studies have yielded valuable insight, they did not consider the perspective of distributor agencies such as regional medical stores that are responsible for distributing health commodities. Moreover, the role of demand uncertainty in the relationship between inventory management practices and operational performance has not been thoroughly investigated using cross-sectional data by the prior researchers. This study attempted to fill these gaps by examining the moderating role of demand uncertainty in the relationship between inventory management and operational performance in a developing country context. The study employed a case study design with a quantitative approach, and a questionnaire instrument was used to collect data from 100 staff members of western regional medical stores. Multiple linear regression was employed to analyze the data. The result showed that western regional medical stores highly prioritize the just-in-time technique (1st rank), followed by economic order quantity

(2nd rank), vendor-managed inventory (3rd rank), and activity-based costing (4th rank). In addition, inventory management has a positive and significant effect on operational performance. Lastly, demand uncertainty does not moderate the relationship between inventory management and operational performance.

5.4 Recommendations

First, the study found that inventory management has a positive and significant effect on operational performance. In practice, this means more attention and commitment from management towards inventory management of health commodities is required. Particular attention should be paid to the practice of economic order quantity, just-in-time, vendor-managed inventory, and activity-based costing in descending order of magnitude. Thus, to achieve operational excellence, management should invest more resources in improving the aforementioned inventory management techniques. Management should frequently organize workshops and seminars on the latest trends in health commodities management so that employees can gain new skills and technical know-how to effectively manage health commodities. Furthermore, management should strengthen intra-organizational relationships by prioritizing the sharing of information, delegating responsibilities to capable employees, appraising and rewarding employees for their good performance, and institutionalizing a framework for improving poor performance. When there is a culture of organizational cohesiveness, employees would be able to work together towards achieving organizational goals.

Second, the study found that demand uncertainty does not moderate the relationship between inventory management and operational performance. In practice, this means that demand uncertainty cannot qualify as a contingency fit in the context of the management of health

commodities from the perspective of western regional medical stores. In other words, if management desires to improve operational performance, their focus should be on other factors other than demand uncertainty. Management has no cause to worry since the negative hypothesized effect of demand uncertainty is not present.

5.5 Suggestions for Future Research

The study has some methodological limitations. First, the study is limited to a single organization. As such, the sample size is considered small for a moderation analysis, which could explain why the interaction between inventory management and operational performance appears insignificant. Future research should increase the sample size and the survey to include more than one organization for a better result. It is also noteworthy that the finding is applicable to only western regional medical stores. To enhance generalization across the country, future research should collect data from more than one regional medical store. Second, the study used aggregate inventory management. Future research could adopt a different approach by examining each dimension of inventory management in the theoretical model of operational performance to generate new insight. Moreover, future researchers could employ the structural equation modeling technique in place of multiple linear regression to achieve better construct validity and reliability. Lastly, the study should be replicated in other developing countries, especially in Africa, in order to compare and contrast the results.

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APPENDIX – QUESTIONNAIRE

Thank you for your consideration to participate in this study. I am a postgraduate student at KNUST pursing an MSc. in Logistics and Supply Chain Management. The aim of this study is to **assess the effect of inventory management practices on operational performance of healthcare commodities: the moderating role of demand uncertainty. A case study of western regional medical stores.** This questionnaire is for academic purpose only and any information gathered will remain confidential. Where alternatives have been provided in this questionnaire, please tick the appropriate response. For any other question write your answer in the space provided. You are kindly reminded to provide answers to what currently happens in your organization and not what you expect to happen. Please note that there are no right and wrong answers.

This questionnaire will take 30 minutes maximum to complete. Your participation and cooperation in this study is highly appreciated and valued.

Section A: Respondent's Profile (*Only tick one option under each question)*

1. Indicate your gender:
   Male [ ] Female [ ]

2. Indicate your Age
   18-25years [ ] 26-36years [ ] 37-47years [ ] 48-58years [ ] 59-69 years [ ]
   70years and above [ ]

3. Indicate Qualification:
   SSSCE/WASSCE [ ] Diploma (HND) [ ] First Degree [ ] Masters [ ]
   PhD [ ] MBChB [ ]
   Others (please specify)……..

4. Indicate your position:
   Medical Doctor [ ] Nurse [ ] Head of Stores [ ] Procurement Officer [ ] Head of Procurement [ ] Accountant [ ] Stores Officer [ ] Pharmacist [ ]
   Administrator [ ], Warehouse officer [ ] HR Manager [ ] Employee [ ]
   Others (please specify) ……..

5. How long have you worked in this organization?
   Below 5years [ ] 5–15years [ ] 15–30years 30–45 years [ ] Above 45years [ ]

Section B: Inventory Management Practices

The items presented here deal with inventory management practices in your organization. Deploying a 7-point Likert scale provided in the agreement legend, kindly evaluate the following statements. Where 7- imply that you very strongly support the statement as valid and true whiles 1- imply that you strongly disapprove the statement.

Scale: (1= strongly disagree, 2= disagree, 3=somewhat disagree, 4=neither agree nor disagree, 5=Somewhat agree, 6= Agree, 7= Strongly agree)

Economic Order Quantity		**1**	**2**	**3**	**4**	**5**	**6**	**7**
EOQ1	The firm plans their inventory replenishment on a timely basis.							
EOQ2	The firm knows when to order and when not to order.							
EOQ3	The firm clearly forecasts hence making inventory available by use of EOQ technique.							
EOQ4	The firm inventory management is organized in a logical way through the use of EOQ technique.							
EOQ5	The firm ensures that inventory supply does not hit stock outs.							
	Activity-Based Costing	**1**	**2**	**3**	**4**	**5**	**6**	**7**
ABC1	The firm allocates time and money in inventory by use of ABC technique.							
ABC2	The firm determines the importance of items by use of ABC technique.							
ABC3	The firm determines the control level placed on the items by use of ABC technique.							
	Just-in-Time	**1**	**2**	**3**	**4**	**5**	**6**	**7**
JIT1	The firm items desired arrives just in time for use.							
JIT2	The firm does not have tolerance for late or early deliveries.							
JIT3	The firm coordinates movement of Inventory by use of JIT technique.							
JIT4	The firm matches demand and supply by use of JIT technique.							
JIT5	The firm maintains first enough material in just the right time just the right place to make just the right number of products.							
	Vendor Managed Inventory	**1**	**2**	**3**	**4**	**5**	**6**	**7**
VMI1	The firm avoids stock outs by use of VMI.							
VMI2	The firm inventory delivered on time by use of VMI.							
VMI3	The firm saves on finance and time by use of VMI.							

VMI4	The firm coordinates movement of inventory by use of VMI.							
VMI5	The firm achieves high inventory utilization by use of VMI.							

Source: Onyango (2016)

Section C: Demand Uncertainty

The items presented here deal with demand uncertainty in respect of inventory management of health commodities. Deploying a 7-point Likert scale provided in the agreement legend, kindly evaluate the following statements.

Scale: (1= almost never predictable; 2= usually not predictable; 3= rarely predictable; 4= occasionally predictable; 5= often predictable; 6= usually predictable; 7= almost always predictable)

	Items	**1**	**2**	**3**	**4**	**5**	**6**	**7**
DU1	Variation of sales channels							
DU2	Number of sales channels							
DU3	Frequency of sales channels changes							

Source: Hosseini & Sheikhi (2012)

Section D: Operational Performance

The items presented here deal with operational performance in your organization. Deploying a 7-point Likert scale provided in the agreement legend, kindly evaluate the following statements. Where 7- imply that you very strongly support the statement as valid and true whiles 1- imply that you strongly disapprove the statement.

Scale: (1= strongly disagree, 2= disagree, somewhat disagree, 4=neither agree nor disagree, 5=Somewhat agree, 6= Agree, 7= Strongly agree)

	Cost	**1**	**2**	**3**	**4**	**5**	**6**	**7**
CT1	We offer competitive prices.							
CT2	We are able to offer prices as low or lower than our competitors.							
	Quality	**1**	**2**	**3**	**4**	**5**	**6**	**7**
QU1	We are able to compete based on quality.							
QU2	We offer products that are highly reliable.							
QU3	We offer products that are very durable.							
QU4	We offer high quality products to our customer.							
	Delivery Dependability	**1**	**2**	**3**	**4**	**5**	**6**	**7**
DD1	We deliver the kind of products needed.							
DD2	We deliver customer order on time.							
DD3	We provide dependable delivery.							
	Flexibility	**1**	**2**	**3**	**4**	**5**	**6**	**7**
FL1	We provide customized products.							
FL2	We alter our product offerings to meet client needs.							
FL3	We respond well to customer demand for "new" features.							
	Speed	**1**	**2**	**3**	**4**	**5**	**6**	**7**
SP1	We deliver product to market quickly.							
SP2	We are first in the market in introducing new products.							
SP3	We have time-to-market lower than industry average.							
SP4	We have fast product development.							

Source: Li et al. (2006)

THANK YOU!