THE ROLE OF LOGISTICS NETWORK DESIGN ON SERVICE DELIVERY IN PUBLIC HEALTH CARE SYSTEMS : A CASE OF NATIONAL MEDICAL STORES

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A DISSERTATION SUBMITTED TO THE SCHOOL OF BUSINESS IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF A DEGREE OF BACHELOR OF PROCUREMENT AND LOGISTICS MANAGEMENT OF UGANDA CHRISTIAN UNIVERSITY

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UGANDA CHRISTIAN UNIVERSITY

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DECLARATION

I, **NAMUKWAYA REBECCA** hereby declare that this research presented herein is entirely original, conducted in accordance with the required standards. The information in this report has not been presented to any educational institution or for any academic recognition.

Signed: ..... **Date:** 11th September, 2024.

NAMUKWAYA REBECCA.

APPROVAL

This report titled the role of Logistics Network Design in Public Health Care System, the case of National Medical Stores Entebbe, Kajjansi has been submitted by **NAMUKWAYA REBECCA** for examination with my approval as the University supervisor, and it's now ready for presentation for the award of a Bachelor's Degree of Procurement and Logistics Management of Uganda Christian University.

Signed: ..... **Date:** 11/09/2024

MR. TUMUHAMYE DUNCAN.

DEDICATION

I dedicate this research report to my family and friends for their financial, physical and moral support given to me towards my education and to the completion of research work in general.

ACKNOWLEDGEMENT.

Above anyone, I want to thank the Almighty for how far He has brought me and for guiding me throughout the process of creating this report, all glory and honor goes back Him.

I extend my sincere gratitude to a number of people who unreservedly contributed towards the accomplishment of this Dissertation and research work. I would also like to acknowledge the assistance and role played by the following personalities to the successful completion of this study. I cannot say exactly how grateful I am to my supervisor, MR. TUMUHAMYE DUNCAN, for his guidance in this study was beyond measure. Thank you for providing me with professional advice, encouragement and your time that has spurred to my success.

In the same way, I would like to thank all the staff members at National Medical stores for the time they offered me. They honestly filled the questionnaires, surely without their input, this study would not have come to fruition. I cannot forget the efforts of the staff of Uganda Christian University especially the lecturers at the Faculty of Business and Administration for their input, and effort that enabled me acquire the invaluable knowledge I currently possess, their contribution can never be qualified but will always be reminiscent whenever I look through this book.

Lastly, I thank my family for sacrificing the little they had in thick and thin and invested in my education. This sacrifice that you made failed in other people's homes. Thank you for looking after me and enabling me to acquire a lifelong investment.

May the Almighty God reward them all immensely.

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ABSTRACT

The study investigated the role of logistics network design on service delivery in public health systems. The objectives that guided the study include; to examine the role of decentralized warehousing, to examine the role of centralized warehousing and to identify the inventory management practices used at National Medical Stores. The study employed a cross-sectional research design that was descriptive in nature with qualitative and quantitative data. Quantitative Data was analyzed using the statistical package for social sciences (SPSS) computer system program to come up with the findings. The primary data sources were National Medical Stores along with retrospective data from archives, conducted as a cross-sectional study.

The study involved 40 stakeholders, with a sample size of 36 determined using Krejcie and Morgan's method. Stratified and purposive sampling methods were used, and data was collected through questionnaires. The study findings were presented using tables. The study findings stressed that National Medical stores have effective inventory management practices but needs improvement in technology integration and optimized distribution channels.

In investigating the role of Logistics Network Design on service delivery in public health care systems, several key findings emerged. National Medical stores implemented a robust centralized warehousing System and inventory management practices with clear records of stock inflows and outflows for efficient inventory management and service delivery. However, gaps existed in the implementation of a decentralized warehousing system emphasizing the need for emergency response. In conclusion, this research highlights the greater role of logistics network design on service delivery and offers recommendations to NMS towards the gaps to enhance its logistics network designs and improve service delivery in health care systems.

CHAPTER ONE

1.0 Introduction

This chapter presents the background of the study, the statement of the problem, the purpose of the study, specific objectives, research questions, the scope of the study, the significance of the study, and lastly the conceptual framework

1.1 Background of the Study.

In today's competitive landscape, efficient and timely deliveries are paramount for businesses. Customers expect fast and reliable service; failing to meet these expectations can result in lost sales and brand damage. Logistics network design plays a critical role in achieving these delivery performance goals.

Efficient healthcare delivery relies heavily on a well-designed logistics network. This network manages everything from life-saving medications and equipment to skilled personnel, ensuring they reach healthcare facilities and, ultimately, patients, on time. A robust logistics system is the backbone of quality healthcare service delivery.

Logistics Network Design is one of the multicommodity network design models' most important application areas. Logistics networks connect suppliers, manufacturing plants, warehouses, distribution centers, and customers to coordinate the acquisition of raw materials and components, their transformation into finished products, and the delivery of these products to the customers. Over the last 40 years, the realism of logistics network design models has greatly improved, and efficient solution methods have been developed to solve these models. (Jean Francois cordeau, 2021).

A logistics network is the infrastructure that facilitates the flow of goods from suppliers to customers. It comprises facilities (warehouses, distribution centers), transportation modes (trucks, planes), inventory management systems, and information technology. The design of this network determines how efficiently products move through the supply chain, impacting delivery speed and cost (Chopra. S, 2019) (Mentzer et al., 2018).

In centralized warehousing, products are stored in a single large warehouse near the production facility. This approach offers economies of scale in terms of storage costs and inventory management (Chopra. S, 2019) while decentralized warehousing, products are distributed across multiple smaller warehouses closer to customer demand centers. This strategy aims to reduce transportation lead times and improve on-time delivery rates.

On-time delivery rate, studies have shown that decentralized warehousing can positively impact on-time delivery rates. By placing inventory closer to customers, businesses can reduce the time it takes for products to reach them, leading to higher fulfillment rates within promised delivery windows (Seyed-Hosseini, 2018). For instance, a study by Akyol et al. (Akyol, 2020) found that a decentralized network design with strategically located warehouses significantly improved on-time delivery performance for a retail company.

Order fulfillment lead time, decentralized networks can also decrease order fulfillment lead times. With products readily available in regional warehouses, order processing and shipping can occur faster compared to a centralized model where goods might need to travel long distances (Lang, 2018) .

Logistics chains are constantly changing to facilitate increasingly global movements in qualitative terms, long-term trends in logistics services indicate a growing degree of product customization and increased responsiveness in-order delivery. (LA Tavasszy, 2003).

Logistics in Africa is an overlying issue despite other factors. The reasons are rooted in the deficits in the infrastructural, physical, organizational, and information-related dimensions of Logistics technologies in the wider sense as well as the actual transport, handling, storage, order picking, and information technologies as concepts and methods of their application and incorporation into logistics networks can be used to improve the population's access to important basic goods. For this, planning tools used in industrialized nations for commercial logistics are applied and adapted to the preconditions of sub-Saharan Africa which are relevant logistics. (Kessler, 2013).

A study carried out by Hilda,2015 in Baylor Uganda shows that there's an improvement in the ARV logistics management at the health centers including timely submission of order forms and an increased number of HIV-positive pregnant women and exposed infants started on antiretroviral treatment (Nakalema, 2015).

Over the years the Mandate, and volume of Essential Medicines and Health Supplies, Handled by National Medical Stores have increased. This has resulted from the incremental budgetary provisions by the government of Uganda and support from its development partners. Against this background, the Ministry of Health and the National Medical stores expanded storage capacity at the central level to manage the growing supply chain demands, hence the construction of this new Warehouse. The new warehouse project in Kajjansi will improve the

storage capacity with an additional 30,000 pallet warehouse locations, almost four times the current capacity of their Headquarters in Entebbe.

According to James Odongo (Odongo, 2021), NMS also designed the Last Mile Delivery in 2012. This was intended to ensure that medicines were delivered directly to the health centres after it observed that the system of providing medicines to the District Health Officer's Office which was then responsible for delivery at health centres had inefficiencies such as delays; forcing. NMS also designed the Delivery Schedule which is a contract between NMS and all health facilities in the country. This was meant to help health facilities understand when to expect medical supplies after making an order. The schedule is also designed with telephone numbers and toll-free lines in case of any challenges and delays in receiving supplies. NMS can share the delivery schedule in all health facilities in the country. NMS also developed the SmartCare App, enabling everybody involved in the delivery chain to give it feedback in time.

1.2 Statement of the Problem

Uganda, like many African countries, struggles with inefficient healthcare logistics networks. Specific challenges impacting Uganda, in a more recent article published by The Observer Uganda on August 6, 2021, it was reported that there were still frequent stockouts of essential medicines in public health facilities, despite efforts by NMS to maintain adequate stocks. The article suggests that inadequate planning, budgeting, and coordination efforts by NMS have contributed to the persistent issue of stockouts in public health facilities. A 2022 study published in the "Journal of Public Health Policy and Practice" assessed the Ugandan health supply chain system. It found that nearly 84% of health facilities reported stockouts of essential medicines and health supplies in the past six months. The primary reasons cited included delayed deliveries and discrepancies between orders and deliveries. This suggests potential inefficiencies in the NMS logistics network, leading to stockouts and impacting service delivery

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past six months. The primary reasons cited included delayed deliveries and discrepancies between orders and deliveries. This suggests potential inefficiencies in the NMS logistics network, leading to stockouts and impacting service delivery.

According to the Journal of Pharmaceutical Policy and Practice "Health supply chain system in Uganda; current issues, structure, performance, and implications for systems strengthening" it showed that in 2018, more than 80% of Health Centers and Referral Hospitals were stocked out of essential medicines due to several supply chain bottlenecks including poor inventory management, ineffective supervision and oversight, expiries of commodities, poor storage and management of commodities, and inadequate skilled supply chain system staff, this happens at NMS and the health facilities that is, the Health care centers at all levels and national referral hospitals.

It is concerning that logistics management practices at NMS have failed to address the stockouts in public health facilities, which has hurt healthcare service delivery in the country.

Therefore, it is necessary to explore the effects of logistics management on service delivery in the public sector, identify challenges, and propose effective solutions to improve healthcare service delivery in public health facilities in Uganda.

1.3 Objective of the study

1.3.1 General Objective

The study's general objective was to examine the role of Logistics Network Design on Service Delivery in the Public Healthcare System- a case study of National Medical stores, in Entebbe Wakiso District.

1.3.2 Specific Objectives of the Study.

1. To examine the role of Decentralized warehousing in Public Health Systems.
2. To examine the role of Centralized Warehousing in Public Health Systems
3. To identify the inventory management practices used in Public Health Systems.

1.4 Research Questions.

1. What is the role of Decentralized Warehousing in logistics management?
2. What is the role of Centralized Warehousing in Public Health Systems?

3. What are the inventory management practices used in Public Health Stores?

1.5 Scope of the Study.

1.5.1 Content Scope.

The study included a comprehensive examination of National Medical Stores' logistics network design, including procurement, inventory management, and distribution of medical supplies to health facilities. The study also examined how logistics network designs impacted the availability, accessibility, and quality of healthcare services provided by the public health sector.

1.5.2 Geographical Scope.

The research was carried out at National Medical Stores, located on plots 4-12 in Nsamizi Entebbe, Wakiso District, and Lugosi Health Centre III.

1.5.3 Time Scope.

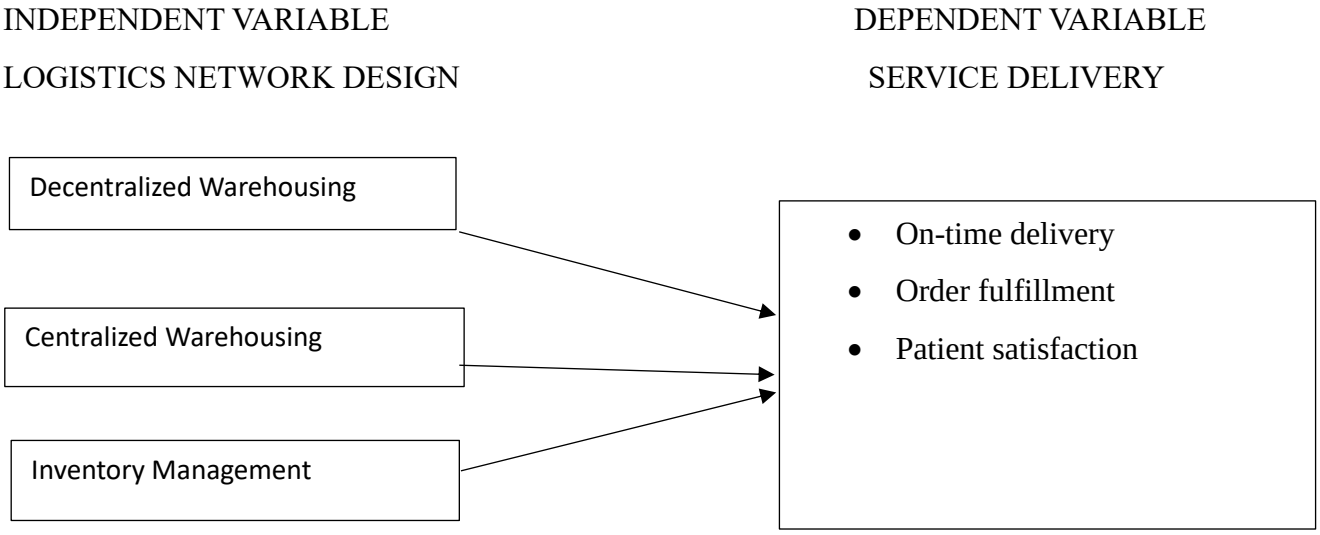
The research looked at approximately 5 (2019 – 2023) years back and how NMS has been conducting its logistics regarding service delivery.

1.6 Significance of the Study.

The study provided insights into the impact of Logistics Network Design on Service Delivery in the Public Healthcare System, which could help policymakers identify areas where improvements were needed. The study also increased the literature, knowledge, and understanding of how logistics network designs affected service delivery in the public health sector. The study identified areas of self-improvement in the logistics network designs of the organization to enhance service delivery.

1.7 Conceptual framework

Figure 1.



Source; Self Developed.

CHAPTER TWO.
LITERATURE REVIEW

2.0 Introduction

This chapter presents existing literature on the subject of Logistics Network Design. Information and Data Logistics Network Design is extracted from dissertations, journals, textbooks, and online sources. All information is related to the proposed study to understand the relationship between logistics network designs and service Delivery, Decentralized and centralized warehousing, and inventory management practices.

2.1 Logistics Network Design

Logistics network design is the strategic configuration of a supply chain network, including the location and capacity of warehouses, distribution centres, and transportation routes, to optimize the flow of goods and services (Christopher.M, 2016). Logistics Network Designs connect suppliers, manufacturing plants, warehouses, distribution centres, and customers to coordinate acquiring raw materials and components, transforming them into finished products, and the delivery of these products to customers. (Francois, 2012). It aims to enhance supply chain operations' efficiency and effectiveness, reduce costs, and improve service delivery (E, 2018). Key components of logistics network design include centralized and decentralized warehousing, transportation management, and inventory control (Simchi-Levi, 2019).

2.2 Service Delivery

Service delivery provides healthcare services to the public, ensuring they are accessible, efficient, and high-quality. It involves the management of healthcare resources, such as medical supplies, personnel, and facilities, to meet the community's health needs (WHO, 2020). Key performance indicators of service delivery include accessibility, timeliness, quality, and patient satisfaction (Donabedian, 1988). According to James Odongo (Odongo, 2021), NMS also designed the Last Mile Delivery in 2012.

2.3 The role of Decentralized Warehousing in Public Health Systems

Decentralized warehousing is the distribution of multiple warehouse facilities in various locations instead of storing all inventory in a large warehouse. This approach is designed to optimize logistics and supply chain management by placing inventory closer to key market points, thereby reducing transportation costs and times, improving delivery times, and enhancing overall customer service. This enables organizations to be more responsive to demand volatility, market changes and trends, as well as customer needs, as they dispatch goods from the nearest locations, reducing lead times and increasing customer satisfaction (Hopstack, 2022).

According to Kang (2020), the logistics industry has prioritized throughput, moving large volumes of products through the supply chain as quickly, cheaply, and reliably as possible. Warehousing and distribution centres have been decentralized to the urban areas. This change in location patterns has been driven by the demand to build more modernized and larger facilities to accommodate an ever-increasing volume of inventory. Accessibility to medical supplies is critical in public health systems, particularly in remote or underserved areas. Decentralized warehousing ensures that healthcare facilities are closer to stocked inventories, reducing the time and cost of transporting supplies from centralized locations (McLaren et al., 2012). This enhances the accessibility of medical supplies, allowing healthcare providers to respond swiftly to patient needs, emergencies, and disease outbreaks.

Research by Smith and Brown (2015) highlighted that decentralized warehousing significantly reduced the distance travelled for medical supplies, which benefited areas with poor infrastructure or challenging geographical terrain. By positioning warehouses closer to healthcare facilities, this strategy mitigates logistical barriers and improves the timely availability of medicines and equipment, thereby enhancing overall healthcare delivery effectiveness.

Cost efficiency is another advantage of decentralized warehousing in public health systems. By distributing inventory across multiple locations, healthcare organizations can optimize transportation costs and minimize the need for emergency deliveries (Govindan, 2020). This distribution strategy reduces the risk of stockouts and overstocking, which can lead to financial waste and inefficiencies in resource allocation (panneerselvam, 2019). By consolidating inventory in one location, businesses can benefit from economies of scale (Couriers and Freight, 2023).

Moreover, decentralized warehousing supports resource optimization by allowing healthcare facilities to tailor their inventory levels based on local demand patterns and population needs (Simcha-Levi, 2019). This flexibility in inventory management ensures that supplies are neither underutilized nor excessively stocked, thereby improving cost-effectiveness and operational efficiency within the supply chain.

Resilience in supply chain management is critical for public health systems, especially in the face of emergencies or natural disasters. Decentralized warehousing enhances resilience by decentralizing risk across multiple warehouses, thereby reducing the impact of disruptions on supply continuity (M Christopher, 2004). This decentralized approach ensures that even if one

warehouse experiences logistical challenges or supply chain disruptions, other locations can continue to meet healthcare demands without significant interruption (Tang, 2006).

Research by (Kumar et al.,2018) underscored the importance of decentralized warehousing in mitigating risks associated with sudden increases in demand or unforeseen supply chain disturbances, such as pandemics. By maintaining distributed inventories, public health systems can improve their ability to respond swiftly to crises and maintain essential healthcare services, safeguarding public health outcomes and minimizing adverse impacts on patient care.

A significant advantage of decentralized warehouses is the increased flexibility to respond swiftly to high demand in specific regions or markets. With Inventory strategically distributed across multiple locations, businesses can adapt more efficiently to spikes in demand. This allows for the quicker allocation of resources, faster order processing and the ability to meet customer needs promptly. the decentralized model enables a more agile response to varying demand patterns, reducing stockout risk and enhancing overall customer satisfaction. (Team Hopstack, 2024).

2.4 The role of Centralized warehousing in public systems

Centralized warehousing refers to storing all inventory in a single, central location. This serves as the primary distribution centre for processing orders and managing stock and all inventory. The main aim behind this is to consolidate operations to achieve economies of scale and optimize resources. Centralized warehousing often leads to cost savings because businesses benefit from economies of scale, and simplified inventory management because it makes it easier to manage and track inventory and better control of stock outs. This has enabled NMS to provide and deliver better services to its customers (Mckinsey, 2023).

Centralized warehousing is one interesting option for Health care systems facing an increasing need to improve responsiveness and service quality while reducing costs**.** (Anna Corinna, 2016)**.** Recent changes to management of inventory and warehousing methods have created significant changes in in business processes. These changes have produced economic savings to firms from reduced handling of supplies. The system wide impacts of this shift in methods on overall cost and the environment are still unclear, however. Reductions in inventories can provide significant environmental savings (Mathews). Having a single warehouse makes it easier to manage and track inventory. Centralized systems allow for better control over stock levels, reducing the risk of overstocking or stock outs. This simplicity in inventory management can enhance accuracy and responsiveness. It promotes streamlined operations by consolidating

tasks such as order fulfilment, packing, and shipping. This enables businesses to standardize processes, leading to increased operational efficiency (Mckinsey, 2023).

National medical stores expanded its storage capacity to manage the growing supply chain demand in 2022.It undertook a construction of works of a modern pharmaceutical warehouse and office complex at Kajjansi site. The warehouse was to improve the storage capacity with additional 30,000 pallet locations of warehouse space. The was to enhance efficiency and improve Government's performance in terms of availability of quality essential medicines and health supplies and increase responsiveness to the identified health needs of Ugandans. (stores, 2022)

2.5 The role of Inventory Management Practices in Public Health Systems

Public health systems utilize inventory control techniques to optimize stock levels and minimize inventory holding costs. NMS adapted the use of the Economic Order Quantity (EOQ) model, the EOQ is widely used in inventory management. According to (Nahnias, 2015), the economic order quantity is a classical deterministic inventory model that seeks to determine the order quantity that minimizes the sum of holding and ordering costs. NMS uses this model to calculate the optimal order quantity for each item to ensure it maintains adequate inventory levels without incurring unnecessary costs. According to Govindan et al. (2016), techniques such as ABC analysis, EOQ (Economic Order Quantity), and JIT (Just-in-Time) inventory management are commonly employed. According to James Odongo, NMS also designed the Last Mile Delivery in 2012. This was intended to ensure medicines are delivered directly to the health centre. The private contractors with whom NMS engages directly provide the medication to the doorsteps of individual government health facilities. NMS designed the Last Mile since it had observed that the system of delivering medicines to the District Health Officer's Office which was then responsible for delivery at health centres had inefficiencies such as delays; forcing patients to receive drugs late or resorting to buying from private clinics (nms.go.ug).

The Last Mile innovation was fundamental since it became an experiment for other African countries. NMS also designed the Delivery Schedule, a contract between NMS and all health facilities in the country. ABC analysis categorizes items based on their importance/value and usage frequency, allowing healthcare facilities to prioritize management resources and focus on managing critical supplies effectively (Smith & Brown, 2017). This is done based on the Pareto principle, also known as the 80/20 rule which states that a small percentage of items account for a large percentage of the item's total value or usage (Gupta, 2017).ABC analysis

Helps Health institutions prioritize their inventory management activities by allocating resources and attention based on the value and significance of each item. It enables better control over high-level items while optimizing inventory levels for low-value items, resulting in improved efficiency and cost-effectiveness in inventory management.

Research underscores the importance of adopting these techniques in public health systems to streamline inventory replenishment processes, improve demand forecasting accuracy, and enhance overall supply chain efficiency (Kumar, 2015). By implementing robust inventory control strategies, healthcare organizations can achieve cost savings, reduce wastage, and maintain consistent availability of medical supplies, thus enhancing patient care outcomes.

CHAPTER THREE
RESEARCH METHODOLOGY

3.0 Introduction

This chapter presents the research design, study population, sample size, selection techniques and procedures, data collection methods, data collection instruments, measurement of variables, and validity and ethical considerations employed in the study.

3.1 Research Design

The study adopted a cross-sectional research design. The researcher collected data from different individuals simultaneously (Thomas 2023). The design enabled the researcher to use qualitative and quantitative (to a lesser extent) techniques to collect data and analyse data. The main data source was National Medical stores as a reference. The study was conducted by interviewing National medical stores and Katabi Health Centre III staff members to the survey, it also considered data retrieved from the archives.

3.2 Study Population

The study targeted a total population of 40 respondents comprising doctors, warehouse managers, procurement personnels among other employees from National medical stores. (ZoomInfo 2023)

3.3 Sample Size.

The sample size was determined based on the total number of staff within the organisation. Using the Krejcie and morgan (1970) table of determining sample size, a sample of 36 respondents was selected to provide a representative and manageable group of for data collection.

3.4 Sampling Methods.

The study used simple random sampling technique and stratified sampling method since it consists of different subgroups or strata such as other departments and service levels. This ensured representation from each stratum allowing room for comparisons and analysis across different areas.

Purposive sampling procedures was also be used in this study because they were found in any research paradigm and help ensure that the quality samples are located without biases to increase reliability and trustworthiness (Leah,2024)

3:5 Data Collection Methods or Sources.

3.5.1 Primary Data Collection

This was collected through conducting surveys and administering questionnaires among health workers and professionals, logistics personnel, warehouse managers, and stakeholders involved in logistics network design and service delivery in the public health sector. Interviews were conducted by key collaborators and staff involved in delivering health care services. Observational data was collected by observing different ways in which activities were carried out by various individuals or departments for example in warehouses, transporters among others, analysing relevant documents such as delivery notes, guidelines, reports, and records from NMS.

3.5.2 Secondary Data Sources.

Health secondary Data was obtained from different sources, including reviewing and analysing published research academic journals, articles, and dissertations related to logistics network designs in the public health sectors. It was obtained from assessing government reports and publications and nongovernment organizations (NGOs) working in the public sector.

3.6 Data Collection Methods.

Data was collected through questionnaires to collect quantitative data on logistics network designs and perceptions of healthcare personnel and other stakeholders.

3.7 Research Instruments.

An interview guide was developed to facilitate semi-structured interviews with key informants. It included open-guided questions to explore the in-depth perspectives of people on logistics network designs.

Research questionnaires were administered with different structured questions because of the ability to obtain important information about the population and were said to reach several people. (rodeo,2004).

Validity and Reliability of the Research Instrument**.**

Testing and pretesting were conducted before all instructions are administered to ensure reliability and validity. A content validity index (CVI) was performed to ensure the validity of the questionnaire. This was done by aligning the questions with the study objectives and research questions.

The reliability of questionnaires was improved through pre-testing the pilot samples from staff in the organization. The scores obtained from the pre-test were then correlated using Cronbach's coefficient alpha since multiple response items are involved.

3.8 Data Processing and Analysis

The data was collected and analyzed using qualitative and quantitative methods. Qualitative analysis involved the use of both descriptive and inferential analysis. In this case, descriptive analysis included the use of frequencies and percentages to present qualitative data in the form of tables, and after that data from questionnaires was coded and logged into the computer using SPSS which was used to analyze the relationship between the variables using regression, and correlation coefficients.

3.9 Ethical Consideration

Ethical issues were addressed by obtaining informed consent from respondents, ensuring confidentiality, and using all the data collected for academic purposes. Participants were informed about the study's objective and their voluntary participation.

3.10. Limitations of the study.

The researcher experienced time constraints in data collection, analysing of data and in final presentation f the report. The Researcher however overcame this by ensuring that the time element was put into consideration and that all appointments agreed upon with respondents was fully met.

The Researcher failed to probe deeper into the study because some respondents were arrogant and non cooperative and some hid information because it was regarded confidential.

CHAPTER FOUR.
DATA ANALYSIS, REPRESENTATION AND INTERPRETATION OF FINDINGS

4.0 Introduction.

This chapter presents the findings of the study which are interpreted and analyzed using frequency tables. The findings have been analyzed and interpreted with a view of achieving the objectives and answering the questions of the study.

4.1 Background Information.

The study acquired a response rate of 100%. That is to say; all the 36 respondents were able to provide information and feedback.

4.1.1 Gender of Respondents.

Table 1.

Gender	**Frequency**	**Percentage**
Male	24	66%
Female	12	34%
Total	**36**	**100%**

In the survey of 36 respondents, 24(66%) were male, and 12(34%) were female. This indicated that the male respondents constituted a higher percentage of the sample compared to the female respondents.

4.1.2 Education Levels.

Table 2.

Level of Education	**Frequency**	**Percentage**
Certificate	7	19%
Diploma	5	13.8%
Bachelor's Degree	15	41.6%
Masters	9	25%
Others	0	0%
Total	**36**	**100%**

According to the table above, majority (41.6%) of the respondents had attained a bachelor's Degree,25% had a Master's Degree,19% were Diploma holders,13.8% had attained a

certificate level of Education, while none had attained other levels of Education. This implied that the majority of the respondents were learned which assured the researcher that that the respondents could easily interpret the questionnaire and raise relevant information to the study under investigation.

4.1.3 Age Group.

Table 3.

Age Group	**Frequency**	**Percentage**
18-23Years	6	16.6%
24-29Years	10	27.7%
30-35Years	13	36%
36-41years	4	11%
42-47years	3	8%
48years-above	0	0%
Total	**36**	**100%**

The data illustrated that the highest percentage of respondents fell into the age group of 30 to 35years, making up 36% of the sample. The age group of 24 to 29 years followed with a rate of 27.7%, the age group of 18 to 23 years with a percentage of 16.6, 36-41 years with a percentage of 11%, 42 to 47 years with 8%, and the researcher found no respondent of 48years and above.

4.1.4 Working Experience.

Table 4.

Working Experience	**Frequency**	**Percentage**
1Day-3years	22	61%
4-6Years	12	33%
7-10years	2	5.5%
10years-above	0	0%
Total	**36**	**100%**

According to the table above, it is evident that there was a diverse range of experience levels among the respondents. The largest group consists of individuals with less than 3 years of

working experience, comprising 61% of the total. Almost equally substantial, at 33%, are those with 4 to 6 years of experience, suggesting a sizable mid-level cohort. In contrast, the group with 7 to 10 years of experience constitutes 5.5% of the respondents, representing a smaller segment. Lastly, the researcher found no respondent with 10 years above experience. This distribution of experience levels provides a nuanced view of the respondents' backgrounds, which can be valuable for understanding their perspectives on logistics Network Designs in the public health sector.

4.2 Inventory Management Practices used at National Medical Stores.

No	Inventory Management Practices.	SA		A		N		SD		D	
		F	%	F	%	F	%	F	%	F	%
1.	The National Medical stores (NMS) have well-defined procedures for inventory management.	24	67	9	25	3	8	0	0	0	0
2.	NMS regularly conducts inventory audits to ensure accurate stock levels.	28	78	8	22	0	0	0	0	0	0
3.	NMS utilizes inventory tracking systems or software to monitor stock movements.	34	94	2	6	0	0	0	0	0	0
4.	NMS established performance metrics or key performance indicators (KPIs) to evaluate the effectiveness of logistics management practices in service delivery	23	64	7	19	6	17	0	0	0	0
5.	NMS maintains clear records of stock inflow and outflow for efficient inventory management.	29	81	7	19	0	0	0	0	0	0
6.	NMS has mechanisms in place to address stockouts and ensure continuous availability of essential medical supplies.	24	67	8	22	4	11	0	0	0	0
7.	NMS implements effective stock replenishment strategies based on demand and consumption patterns.	22	61	9	25	3	8	0	0	2	6
8.	NMS employs appropriate storage methods to preserve the quality and shelf-life of medical supplies.	23	64	6	17	7	19	0	0	0	0
9.	NMS has mechanisms in place to address stockouts and ensure continuous availability of essential medical supplies.	22	61	11	31	3	8	0	0	0	0
10.	NMS collaborates with healthcare facilities to forecast demand and plan stock procurement accordingly.	20	55	6	17	5	14	3	8	2	6

The results of the findings presented a substantial portion of the respondents had appositive perception regarding the well-defined procedures for inventory management at National Medical stores. Majority of the respondents (92%) acknowledged the existence of these procedure. This witnessed that majority of the recognize NMS' efforts in establishing clear guidelines and procedures for inventory management practices. However, a number of respondents (8%) were unsure about the existence of these guidelines.

Furthermore, the results demonstrated a positive trend in NMS's approach to inventory management. A significant of the respondents 100% (strongly agree and agree combined) acknowledge that NMS regularly conducts inventory audits. The results continued to reveal a strong positive perception among respondents regarding NMS's use of inventory tracking systems or software to monitor stock movements. An overwhelming majority of 100% (combined strongly agree and agree) recognized and acknowledged this practice. This proved that NMS is effectively leveraging technology to enhance its inventory management and monitoring processes.

More to that, the study findings stressed that majority of respondents (83%combined from strongly agree and agree) acknowledged that NMS established performance metrics or key performance indicators (KPIs) to evaluate the effectiveness of logistics management practice in service delivery, and the rest of the respondents(17%) were unsure about the same.

Additionally, the study findings also stressed that a greater percentage (100%) strongly agree and agree combined) of the respondents believed that National Medical stores maintain clear records of stock inflow and outflow for efficient inventory management which is clear proof that NMS manages its inventory efficiently.

A greater number or respondents (89%) strongly agree and agree combined) believe that National Medical stores have mechanisms in place to address stock outs and ensure continuous availability of essential medical supplies which proves that National medical stores has enhanced customer satisfaction and improved service delivery. However, a slight number of respondents (11%) wasn't sure about the same which demands NMS to effectively communicate with its employees and other stake holders.

Furthermore, the study findings stressed that majority of the respondents (86%) have a positive perception about the implementation of effective stock replenishment strategies based on demand and consumption patterns by National Medical Stores despite a few respondents (8%) who were unsure, 6% of them who disagreed with the same.

National Medical stores employ appropriate storage methods to preserve the quality and shelf-life of medical supplies as majority of the respondents perceived it (81%) strongly agree and agree combined). However,19% of the respondents were unsure about the same which is a gap NMS must fill through awareness, effective communication and collaboration.

The study findings also stressed that National medical stores have mechanisms in place to address stockouts and ensure continues availability of essential medical suppliers as provided by majority of the respondents (92%) strongly agree and agree combined) where as 8% of the respondents were unsure about the same.

Lastly, the study findings presented that majority of the respondents (72%) were positive about National Medical stores' collaboration with healthcare facilities to forecast demand and plan stock procurement according. This enables NMS to avoid over and under stocking, reduce lead times and improve its delivery services. However, some respondents (14%) were unsure about the same, and 14% of the respondents were not in agreement with the same which is a gap NMS has to fill.

4.3 Centralized Warehousing at National Medical Stores

No	Centralized Warehousing	SA		A		N		SD		D	
		F	%	F	%	F	%	F	%	F	%
1.	Centralized warehousing has improved our inventory management significantly	34	94	2	6	0	0	0	0	0	0
2.	NMS has experienced significant cost savings since the implementation of centralized warehousing.	29	80	5	14	2	6	0	0	0	0
3.	Centralized warehousing has had a significant impact on NMS order fulfillment rates.	34	94	2	6	0	0	0	0	0	0
4.	Centralized warehousing has improved NMS supply chain visibility significantly.	23	64	7	19	6	17	0	0	0	0
5.	NMS is satisfied with the decision of implementing centralized warehousing.	20	55	5	14	5	14	2	6	4	11
6.	NMS has faced significant challenges while implementing centralized warehousing.	24	67	9	25	3	8	0	0	0	0
7.	NMS has taken significant action to address issues of limited warehouse space.	20	55	9	25	4	11	1	3	2	6
8.	NMS is very satisfied with the ability to address challenges of	27	75	6	17	3	8	0	0	0	0

	implementing centralized warehousing.										
9.	NMS has taken significant action to manage the complexity of centralized warehousing.	22	61	11	31	2	6	0	0	1	3
10.	NMS has taken significant action to address issues of higher operational costs.	26	72	7	17	2	6	0	0	1	3

According to the information in the table above, the study findings stressed that majority (94%) of the respondents strongly agreed that Centralized warehousing has improved NMS inventory management significantly, 6% of then agreed with the above.

In line with the study findings, majority of the respondents (80%) of the respondents strongly agreed that National Medical stores has experienced significant cost savings since the implementation of centralized warehousing,14% agreed and 6% were neutral about the same.

The study findings also stressed that, the majority of the respondents (100%) strongly agreed that centralized warehousing has had a significant impact on National Medical stores' order fulfillment rates.

According to the table above, a greater percentage of respondents (64%) strongly agreed that centralized warehousing has improved National Medical Stores' supply chain visibility significantly, 19 of them agreed with the same, whereas 17% of the respondents were neutral.

Furthermore, the findings of the study stressed that 55% of the respondents strongly agreed that national Medical Stores is satisfied with its decision of implementing centralized warehousing, 14% of them agreed and another 14% were neutral, 7% disagreed whereas 11% of the respondents strongly disagreed with the same issue.

An average percentage of the respondents (67%) strongly agreed that NMS has faced significant challenges while implementing centralized warehousing, 25% of them agreed with the same, whereas 8% of the respondents were neutral.

The study fundings stressed that 55% of the respondents strongly agreed that NMS has taken significant action to address the issues of limited warehouse, 25% of them agreed with the same,11% of them were neutral,3% strongly disagreed and 6% disagreed with the same.

More to this, the study finding stressed that majority (75%) of the respondents strongly agreed that NMS is very satisfied with the ability in addressing challenges of implementing centralized warehousing, 17% of them agreed with the same whereas 8% of the respondents were neutral.

Additionally, the study findings stressed that 61% of the respondents strongly agreed that National Medical stores has taken a significant action to address the complexity of centralized warehousing, 31% agreed with the same whereas 6% of the respondents were neutral.

Lastly, the study findings stressed that majority (72%) of the respondents strongly agreed that NMS has taken a significant action to address the issue of higher operational cost,17% of them agreed, 6% of them were neutral whereas 3.7% of them disagreed with the same.

4.4 Decentralized Warehousing at National Medical Stores

No	Decentralized Warehousing	SA		A		N		SD		D	
		F	%	F	%	F	%	F	%	F	%
1.	Decentralized warehousing has improved our response times to customer orders significantly.	2	6	0	0	0	0	29	80	5	14
2.	Decentralized warehousing has a significant impact on our inventory turnover rates.	0	0	5	14	7	19	18	50	6	17
3.	Decentralized warehousing has improved our ability to manage multiple products significantly.	5	14	2	6	2	6	24	67	3	8
4.	Decentralized warehousing has a significant impact on our supply chain agility.	10	28	3	8	4	11	14	39	5	14
5.	Decentralized warehousing has had a significant impact on our overall supply chain responsiveness.	20	55	5	14	5	14	2	6	4	11
6.	NMS is satisfied with its decision of implementing decentralized warehousing.	5	14	2	6	4	11	22	61	3	8
7.	NMS has taken significant action to manage difficulties in managing multiple warehouses.	20	55	9	25	4	11	1	3	2	6
8.	NMS has taken significant action to manage the complexity of Decentralized warehousing.	27	75	6	17	3	8	0	0	0	0
9.	NMS is very satisfied with its ability to address challenges of Decentralized warehousing.	18	50	1	3	7	19	8	22	2	6
10.	NMS has taken significant action to address issues of higher operational costs.	6	17	26	72	0	0	3	8	1	3

According to the above table, majority (80%) of the respondents strongly disagreed that Decentralization has improved the response times to customer orders at National medical stores. A close number to those disagreed (14%) about the same,6% strongly agreed and the other areas didn't have any respondents.

An average percentage of respondents (50%) negatively criticized the significance of Decentralized warehousing on NMS inventory turnover while none of them agreed to the same.

In line with the study findings, Decentralized warehousing has not improved the ability of NMS to manage multiple products significantly and has no impact NMS supply chain responsiveness as witnessed by the percentages and frequencies from the feedback received from the respondents.

The study findings have also stressed that the majority (61%) of the respondents strongly disagreed that NMS is satisfied with the decision of implementing decentralized warehousing,14% respondents strongly agree,11% were neutral, 8% disagrees and 6% respondents agree. NMS has one Centralized warehouse and has not decided to implement decentralized warehousing in the organization.

Furthermore, the findings of the study stressed that majority (55%) of the respondents strongly agreed that NMS has taken significant action to manage difficulties in managing difficult warehouses, 25% agreed with the same,11% were neutral about it,6% of them disagreed and 3% strongly disagreed. NMS has managed difficulties in managing multiple warehouses by expanding their warehouse in Kajjansi with support from the Government and other funding bodies.

In relation to the study findings, majority (50%) of the respondents strongly agreed that National Medical stores is satisfied with the ability to address challenges of Decentralized warehousing, 22% of the respondents strongly disagreed, 19% were neutral, 6% disagreed and 3% agreed.

Lastly, the findings of the study stressed that majority (72%) of the respondents agreed that National Medical stores has taken a significant action in addressing the issue of higher operational cost, 17% strongly agreed,8% strongly disagreed, 3% disagreed and none was neutral according to the table above.

CHAPTER FIVE
SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction.

This chapter presents a summary of findings observed and inferred from the presented in chapter four. The summary of findings is based on the literature available in chapter Two. This chapter also provides, the conclusions, recommendations and suggested areas for further study.

5.1 Summary of Findings.

From the study finding, it was highlighted that majority of the respondents expressed agreement or strong agreement (100%) that National Medical Stores had well-defined practices for managing inventory. Similarly, a significant number (100%) acknowledged that NMS conducted routine inventory audits to ensure accurate stock levels. Furthermore, an overwhelming number of respondents (100%) recognized the practice of maintaining records of stock inflow and outflow to optimize inventory management. These results collectively reflected a positive image of NMS's dedication to effective inventory management and that service delivery can be enhanced.

Regarding the role of Centralized warehousing, a substantial portion (95%) indicated that the implementation of a single warehouse has improved inventory management at NMS significantly, cost reduction and efficiency, enhanced supply chain visibility significantly and that NMS is satisfied with the decision of implementing Centralized warehousing in their organization to improve their service delivery. Furthermore, it was highlighted that majority of the respondents expressed their agreement that NMS has the ability to address the challenges that arise during the implementation of Centralized warehousing and that it has taken significant action to manage the complexity of centralized warehousing and to address the issues of limited warehouse space.

However, certain apprehensions emerged. Notably, more than half (75%) of the respondents stressed that NMS lacked a Decentralized warehousing system. The results highlighted that Decentralized warehousing has not improved the response of NMS customer orders significantly, has no significant impact on inventory turnover rates, has a significant impact on NMS' supply chain agility and that NMS is not satisfied with the decision of implementing Decentralized warehousing system in their organization. More to that, the results stressed that despite NMS failing to implement decentralized warehousing, it has taken significant action to manage difficulties in handling multiple warehouses, the complexity of decentralized

warehousing by expanding their warehouse and it satisfied with the ability to address challenges of decentralized warehousing and issues of higher operational costs.

5.2 Discussions of The Findings.

With the objective of identifying the inventory management practices used at National Medical Stores (NMS). The survey results revealed that 66% of respondents strongly agreed that NMS employs appropriate storage methods to preserve the quality and shelf life of medical supplies. This high level of agreement aligns with the literature on best inventory management practices, which emphasizes the importance of proper storage techniques to ensure the integrity of medical supplies (Forouzani et al., 2019). Effective storage methods are crucial for maintaining product quality and reducing waste, both of which contribute to improved service delivery (Zhou et al., 2015).

With the objective of centralized warehousing, majority of the respondents stressed that centralized warehousing has improved inventory management and reduced costs which aligns with the literature on the role of centralized warehousing which emphasizes that centralized warehousing is one interesting option for health care systems facing an increasing need to improve responsiveness and service quality while reducing costs. (Anna corinna,2016). And that having a single warehouse makes it easier to manage and track inventory (Mckinsey,2023). More to that, a greater percentage of respondents also submitted that NMS has a significant ability to address issues of limited warehouse space and complexity of centralized warehousing which aligns with literature emphasizing that NMS expanded its warehouse (storage capacity) to manage the growing supply chain demand in 2022 by undertaking a construction of works of a modern pharmaceutical warehouse and office complex at Kajjansi (NMS,2022).

When it comes to Decentralized warehousing, the study also found that 75% of respondents strongly disagreed that the implementation decentralized warehousing in improving service delivery has a significant impact on inventory turnover rates, supply chain agility and improved response rates for customer orders significantly which shows a very huge gap and calls for further investigations and attention by NMS and their alignment with service delivery goals.

In summary, the study's findings align with much of the existing literature on the role of logistics network designs on service delivery in the public healthcare systems. However, they

also highlight areas where there may be gaps or challenges, emphasizing the need for continued research and improvements in healthcare logistics network designs.

5.3 Conclusions

In conclusion, the research provided valuable insights into the role of Logistics Network Designs on Service Delivery in the Public Healthcare Systems, particularly in the context of the National Medical Stores (NMS). The findings collectively underscore the complex interplay between various logistics Network Designs and their impact on the effectiveness of service delivery in healthcare.

It is evident from the study findings that National Medical Stores has made significant milestones in its inventory management practices. The majority of respondents acknowledged NMS's well-defined practices for managing inventory, conducting routine audits, and maintaining accurate records of stock movements. These practices are indicative of NMS's commitment to ensuring the availability and accuracy of medical supplies within its inventory.

However, the study findings have highlighted certain gaps and challenges that NMS has failed to implement Decentralized warehousing systems in their organization an area that needs serious attention. The absence of multiple warehouses questions the ability of NMS to ensure improved inventory management and service delivery to its customers.

The implementation of centralized warehousing is acknowledged as having positive implications. Respondents largely agreed that implementation of centralized warehousing improves NMS's responsiveness to supply chain visibility, inventory management, cost effectiveness and improve on order fulfillment rates.

The research findings underline the pivotal role of logistics Network Designs on improving service delivery within the public healthcare systems. As the healthcare sector continues to evolve, a dynamic

and adaptive approach to logistics Network Designs is essential for ensuring the efficient and improved delivery of medical supplies and services to all corners of the nation.

5.4 Recommendations.

Based on the results of the study findings, National Medical Stores (NMS) has a greater task of implementing Decentralized warehousing in the organization in order to manage their inventory efficiently to prevent cases of variations in stock such as over and under stocking of inventory, to reduce lead times, operational costs and the likelihood of risks that may occur

such as fire break outs that might affect a single warehouse leading great loss and damages. This is to enable the organization to improve on its delivery services and efficiency.

Another area of concern is the initiative of training NMS' staff members the different logistics Network Designs adopted in the organization to create awareness because according to the study findings, a number of the respondents were unsure about the logistics Network Designs implemented by NMS to improve on their service delivery for example the inventory management practices put in place, the implementation of centralized and decentralized warehousing. There is also need of designing effective communication channels to effectively communicate and collaborate with employees and customers on the improvements that are in place. By doing this, NMS is (Mckinsey, Centralized vs decentralized Warehousing, 2023) likely to get constructive feedback and opinions from employees and customers which might be of great impact during decision making.

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APPENDICES

APPENDIX 1.Questionnaire

UGANDA CHRISTIAN UNIVERSITY

SCHOOL BUSINESS OF DEPARTMENT

OF UNDERGRADUATE

A QUESTIONNAIRE FOR THE STAFF OF MEDICAL STORES ON THE ROLE OF LOGISTICS NETWORK DESIGN IN PUBLIC HEALTH SYSTEMS.

Dear respondent,

I am Namukwaya Rebecca, a third-year student of Uganda Christian University conducting a study on "The role of logistics network design in public health systems". This study is a partial fulfillment of the requirements for the award of a Bachelor's in Procurement and Logistics Management. Your participation in this study out of this questionnaire is highly appreciated. Your responses will be kept confidential and used solely for the purposes of this study.

Please be assured that your responses will be kept confidential and will be used for academic purposes. The data collected will be used solely for research purposes and will not be shared by any third parties.

PART 2: Bio Data.

Please TICK the most appropriate response.

1. Gender.

A. Male ☐ B. Female ☐

2. Age group.

18 years – 23 years ☐ 24 years – 29 years ☐

30 years – 35 years ☐ 36 years – 41 years ☐

42 years – 47 years ☐ 48 years – Above ☐

3. Education Level.

A. Certificate level ☐ B. Diploma Level ☐ C. Bachelor's Degree ☐

D. Masters ☐ E. Others. ☐

4. Working Experience.

A. 1day – 3years ☐ B. 4years – 6years ☐ C. 7years – 10years ☐

D. 10years and Above ☐

Section A (Inventory Management Practices)

(Please TICK your level of Agreement with the statements below).

National Medical Stores employs the following Inventory Management Practices.

Inventory tracking systems or Software ☐

Stock Replenishment Strategies, such as ☐

EOQ Continuous Review System ☐

A ☐

B ☐

C

If there are any other inventory management practices being used at NMS, please specify.

……

…

No.		SA	A	NS	SD	D
1.	The National Medical stores (NMS) have well-defined procedures for inventory management.					
2.	NMS regularly conducts inventory audits to ensure accurate stock levels.					
3.	NMS utilizes inventory tracking systems or software to monitor stock movements.					
4.	NMS established performance metrics or key performance indicators (KPIs) to evaluate the effectiveness of logistics management practices in service delivery					
5.	NMS maintains clear records of stock inflow and outflow for efficient inventory management.					
6.	NMS has mechanisms in place to address stockouts and ensure continuous availability of essential medical supplies.					
7.	NMS implements effective stock replenishment strategies based on demand and consumption patterns.					
8.	NMS employs appropriate storage methods to preserve the quality and shelf-life of medical supplies.					
9.	NMS has mechanisms in place to address stockouts and ensure continuous availability of essential medical supplies.					
10.	NMS collaborates with healthcare facilities to forecast demand and plan stock procurement accordingly.					

Section B

Implementation of Centralized Warehousing

No.		SA	A	NS	SD	D
1.	Centralized warehousing has improved our inventory management significantly					
2.	NMS has experienced significant cost savings since the implementation of centralized warehousing.					

3.	Centralized warehousing has had a significant impact on NMS order fulfillment rates.					
4.	Centralized warehousing has improved NMS supply chain visibility significantly.					
5.	NMS is satisfied with the decision of implementing centralized warehousing.					
6.	NMS has faced significant challenges while implementing centralized warehousing.					
7.	NMS has taken significant action to address issues of limited warehouse space.					
8.	NMS is very satisfied with the ability to address challenges of implementing centralized warehousing.					
9.	NMS has taken significant action to manage the complexity of centralized warehousing.					
10.	NMS has taken significant action to address issues of higher operational costs.					

SECTION C

Implementation of Decentralized Warehousing

No.		**SA**	**A**	**NS**	**SD**	**D**
1.	Decentralized warehousing has improved our response times to customer orders significantly.					
2.	Decentralized warehousing has a significant impact on our inventory turnover rates.					
3.	Decentralized warehousing has improved our ability to manage multiple products significantly.					

4.	Decentralized warehousing has a significant impact on our supply chain agility.					
5.	Decentralized warehousing has had a significant impact on our overall supply chain responsiveness.					
6.	NMS is satisfied with its decision of implementing decentralized warehousing.					
7.	NMS has taken significant action to manage difficulties in managing multiple warehouses.					
8.	NMS has taken significant action to manage the complexity of Decentralized warehousing.					
9.	NMS is very satisfied with its ability to address challenges of Decentralized warehousing.					
10.	NMS has taken significant action to address issues of higher operational costs.					

Thank you for your cooperation and feedback.

APPENDIX 2: INTRODUCTORY LETTER

UGANDA CHRISTIAN UNIVERSITY
A Centre of Excellence in the Heart of Africa

SCHOOL OF BUSINESS

19th Aug, 2024

TO WHOM IT MAY CONCERN

Name: **NAMUKWAYA REBECCA** Reg. No J22B12/115

A bachelor's student who is seeking permission from your office to collect data for her dissertation titled

The Role Of Logistics Network Design In Public Health Care Systems. A Case Study Of National Medical Stores Entebbe

We shall be grateful if you could render assistance to her in collecting the necessary data for her dissertation

The Uganda Christian University School of Business thanks you in advance

.....

Mukisa Simon Peter
Research coordinator