

DECLARATION

I, **Izidoro Sunday**, hereby declare that the work contained in this dissertation is my original piece of work and has never been submitted to any university or institute for the award of any degree. Where segments of previous work have been included appropriate references have been cited.

Signature

Date

APPROVAL

This dissertation entitled, **Information and supply chain performance in Uganda: a case study of National Medical Stores**, has been done under our supervision and has been submitted to the school of Management Science for examination with our approval as supervisors.

Signature Date.....

MR. BENEDICT MUGERWA

Signature Date.....

Dr. STELLA B. KYOHAIRWE (PhD)

DEDICATION

I dedicate this book to my late sister **Ms. Euzobia Gashemeire**, who willfully and worked tirelessly towards paying my fees at primary and secondary level.

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LIST OF ACRONYMS

3PLP	Third party Logistics Providers
AHSPR	Annual Health Sector Performance Report
CDC	Centres for Disease Control and Prevention
CMS	Central Medical Store
DHIS2	District Health Information System Version 2
GoU	Government of Uganda
HC	Health Centre
JMS	Joint Medical Store
KEMSA	Kenya Medical Supplies Agency
MAUL	Medical Access Uganda Limited
MIS	Management Information Systems
NIST	National Institute of Standards and Technology
NMS	National Medical Stores
PNFPs	Private Not- For-Profit Facilities
SCM	Supply Chain Management
UMI	Uganda Management Institute
USAID	United States Agency for International Development
VHTs	Village Health Teams

ABSTRACT

The study examined the relationship between information and supply chain performance at National Medical Stores (NMS) in Uganda. This study was based on the model of “Contextual and Performance Factors of the foundations of supply chain integration” (Vanpoucke et al 2009). It was intended to achieve three specific objectives. The first objective was to assess the relationship between information sharing and supply chain performance at NMS. The second objective was to assess the relationship between information quality and supply chain performance at NMS and the last objective was to assess the relationship between information system applications and supply chain performance at NMS. The study was a cross sectional design intended to assess how information relates to performance at NMS. A total of 119 respondents, all NMS staff of different cadres participated in the study. The study findings show a significant relationship between information and supply chain performance at NMS. The correlation results revealed a positive significant relationship between information sharing, information quality, information system application and supply chain performance at NMS. The study revealed that the order fulfilment rate was 70.73%, which is the key performance indicator of NMS. The study concluded that the current information sharing channels available at NMS had gaps which need to be reinforced through the public relations office and the nine regional NMS liaison offices. The study observed data quality gaps and recommended that the NMS regional officers in collaboration with health development partners strengthen the health facility staff in making accurate and complete orders. The study revealed MIS user knowledge gaps and recommended extensive and routine training of MIS users. The study observed MIS applications functional inabilities and therefore recommended an upgrade to new ERP system that has features to cover the current functionality gaps, which include, web based ordering and fleet monitoring among others. Future studies to explore contract execution and information flow efficiency.

CHAPTER ONE

INTRODUCTION

1.1 Introduction

Information is arguably the most important factor in modern business environment. Supply chain management requires continuous decision-making in five distinct areas: production, inventory, location, transportation and information by each of the supply chain members individually and collectively (Weiss et al, 2013). National Medical Stores (NMS) is mandated to procure, store and distribute medicines and medical supplies to public health facilities in Uganda (NMS Act 1993). The continuous flow of medicines and medical supplies to health facilities is supported by information. This study was set out to determine the relationship between information and performance of National Medical Stores (NMS). This chapter includes background of the study, statement of the problem, study objectives, research questions, hypothesis, conceptual framework, justification, significance, scope and operational definitions of key terms and concepts.

1.2 Background to the study

In Uganda, there are three National medical supply chain warehouses. These include National Medical Stores (NMS), Joint Medical Store (JMS) and Medical Access Uganda Ltd (MAUL). They are mandated to procure, store, distribute and track medicines and medical supplies to beneficiary health facilities. The beneficiary facilities are public and Private Not-For-Profit Health facilities (PNFPs). NMS beneficiary facilities are all the public health facilities. Public Health facilities are government owned facilities spread out countrywide that offer health services at different levels i.e. National Hospitals, Regional Hospitals, District Hospitals, HCIV,

HCIII, HCII and VHTs. Customer orders are received from these facilities processed at the NMS warehouse and supplies are delivered directly to facilities on bimonthly basis according to the published delivery schedule. The order processing procedure begins with the acceptance of an order from the customer, and is not considered complete until the customer has received the products and determined that order has been delivered accurately and completely(Tatum,2014). The orders are received sorted and encoded in the sales department of NMS. They are released to stores and operations for picking with eventual dispatch of consignments to the user health facilities.

Prior to April 2011, NMS distributed medical supplies to districts and these would thereafter be delivered to facilities by the district health teams. Since April 2011 the medical supplies are distributed to health facilities by 'last mile' through the ordering system for HCIV and above and predetermined kits for HCIII and HCII, arrived at through procurement planning. Despite these interventions, information setbacks still weigh down effectiveness of order fulfilment leading to stock outs especially of tracer medicines. The ordering system is primarily paper based and there is limited access to DHIS2, a data collection tool for the MoH from which consumption data would be readily accessed. This section lays out the historical, theoretical, conceptual and contextual back ground of the report.

1.2.1 Historical Background.

The history of supply chains begins in the 18th and 19th century where it was invisible and taken for granted. A theoretically attractive new relationship was devised between big customers and smaller suppliers – long-term contracts, close supervision by the customer of the suppliers' production line, system integration, joint working to improve the product and the way it was made – creating mutual benefits, not just an annual wrangle over the prices and quality, (Mukid et al, 2010).Traditionally, the segments of the supply chain have operated independently with minimal vertical integration and the lack of information-sharing, trust, and supply chain

coordination has often resulted in product inconsistencies and opportunistic behaviour amongst chain members (Madeleine E. Pullman and Jesse Dillard, 2010).

Interest in supply chain management (SCM) has steadily increased since the 1980s when firms saw the benefits of collaborative relationships within and beyond their own organization. Firms found out that they could no longer compete effectively in isolation of their suppliers or other entities in the supply chain. This included sourcing and procurement, production scheduling, order processing, inventory management, transportation, warehousing, and customer service. Importantly, SCM embodies the information systems so necessary to monitor all of those activities. In that period SCM was initially applied in distribution of textiles, computers and food products in the United States of America (USA) (Lummus et al 1999).

Within the medical products industry, three firms engaged in supply chain relationships in the early 1990s. West supplies rubber stoppers to Becton Dickinson who supplied medical products to Baxter. Becton Dickinson implemented the program by assigning a senior-level executive officer with the responsibility to monitor supply chain execution. Working together at all management levels the three companies made improvements in quality and service while at the same time reducing cycle times and costs (Lummus et al 1999). On the African continent the engagement of supply chain management has also taken pace and more so in the medical industry. In 2000 Kenya Medical Supplies Agency (KEMSA) was established as a state-owned corporate organisation through a legal notice No 17 of 2000, Cap 466 of the Laws of Kenya. The purpose was to procure, warehouse and distribute medical supplies for prescribed public health programs, the national strategic stock reserve, prescribed essential health packages and national referral hospitals (KEMSA, 2013). In Uganda, National Medical Stores (NMS) is mandated to procure, store and distribute medicines and medical supplies to public health facilities in Uganda (NMS Act 1993). The establishment of NMS as a corporate organization was a transition from

the former Central Medical Stores (CMS). The main offices and the warehouse are located in Entebbe Town, Wakiso District with the nine satellite liaison offices spread countrywide. The NMS warehouse currently supports 3,000 beneficiary health facilities for medicines and medical supplies across the Uganda.

NMS co-exists with other two warehouses that have a national character, which distribute medical supplies to PNFPs. These are Joint Medical Store (JMS) and Medical Access Uganda Limited (MAUL). These were not part of this study and where information intercepted with their operations, appropriate references were made.

1.2.2 Theoretical Background

This study was based on the model of “Contextual and Performance Factors of the foundations of supply chain integration” (Vanpoucke et al 2009). The authors describe information as the foundation for integration in the strategic alliance between organisations. They describe this information by three characteristics: (1) level of Information sharing; (2) information quality; and (3) IT supply chain applications. Information sharing among supply chain partners creates information flow within supply chain management and this enables supply chain partners to make effective decisions. The authors further argue that supply chain management involves the entire flow of information, materials and services from raw material suppliers through factories and ware houses to end users. They further state that supply chain management incorporates both upstream and downstream relationships along the chain.

Under this theory Tibin et al (2012), agrees that Information flow plays a key role in the function coordination of supply chains. The study emphasises that optimising supply chains quantitatively and searching for key segments of information flow value-increment are very significant for enhancing the core competitive ability of enterprises of supply chains. Under the competitive

circumstance based on time, information is a key to create value of enterprises of supply chain, and improve their core competitive ability.

1.2.3 Conceptual Background

Information sharing in complex linkages is vital to the functioning of the supply chain and would be impossible without efficient information flows. Information sharing is actually required to occur on a real-time basis, to decrease uncertainty between the members of the supply chain and leading to a smoother and more efficient functioning and integration of the supply chain. The flow of information in business organisations and particularly in supply chains affects productivity and innovation because it determines the speed by which individuals can act and plan future activities (Weiss et al, 2013).

The aspects of interest for this study were information sharing, information quality and information system applications. Information sharing was considered as the sharing of knowledge and data between NMS, health facilities and stakeholders, downstream and upstream for effective and efficient customer service. Information quality was handled in the aspects of data accuracy, completeness and frequency of exchange Information system applications were considered by what software systems are available and their capabilities at NMS. These include data capture, processing, study extraction and modes of information dissemination channels to stake holders in the medical supply chain. There were also MIS capabilities that limit the desired operations of staff during information processing. These capabilities are very restrictive resulting into lengthy processing of customer orders which affects customer service.

The study assessed information by three characteristics: (1) level of Information sharing; (2) information quality; and (3) IT supply chain applications. Supply chain performance measurement of NMS was limited to customer response time, customer order fill rate, customer complaint resolution time and shipping errors.

1.2.4 Contextual Background

In recent years, the competitive business environment, marked by the acceleration of globalisation and increasing customer demand for an ever higher level of service, has forced companies to reduce costs while still providing high quality products and services. As late as 1969, logistics, the predecessor of supply chain technology, was still in infancy as a modern management science. Since then, enterprises have made increasing efforts to adjust internal functions, reorganize business units, and implement enterprise software in order to optimize their operations (Liu and Kumar, 2003). The direct consequences are increased inventories and the distortion of demand forecasts. Moreover, the distortion propagates through the supply chain and is amplified at each stage, the well-known bullwhip effect. The bullwhip effect has been identified as one of the biggest causes of inefficiencies in a supply chain. Information sharing is viewed as an effective way to reduce uncertainties and counter this effect. Through information sharing, the demand information flows upstream from the point of sales, while product availability information flows downstream in a systematic manner. Moreover, information sharing ensures that the right information is available for the right trading partner in the right place and at the right time—supplies chain visibility (Liu and Kumar, 2003). This also applies to medical supply chain mechanisms for the procurement for health products by donor agencies for different health programs as implemented by Partnership for Supply Chain Management Systems (PFSCMS) under the coordination Pooled Procurement Mechanism (PPM). Uganda being one of the beneficiary countries, the consignments are shipped from international suppliers to NMS as consignee warehouse. This arrangement is facilitated by flow of information through correspondences on email, phone and internet. The medicines programs funded by Government of Uganda are procured locally, guided by PPDA regulations 2014, and delivered to NMS. The bulk of the supplies is stored and distributed to health facilities by NMS.

Guided by the published annual delivery schedule, beneficiary health facilities submit orders for medicines and medical supplies that they will require for a period of two months. The orders are supposed to indicate product description, unit of measure and the required quantity for the two months period. In some instances the details above have not been accurately filled resulting into oversupply and/or undersupply. Some orders are not complete as some of the fields of the order form are not filled. The timelines for submission have to some extent not been met with some facilities not submitting orders at all. According to Rushton et al (2010) order receipt and entry affect order cycle time which determines order fulfilment. The quality and the time the order has been submitted affect all the subsequent processes. Inappropriate submission of orders leads to under supply, oversupply and non-supply of commodities.

At NMS, order processing is segmented into order receipt, sorting, encoding, picking, packing and dispatch for delivery to beneficiary health facilities. Order processing is a key element of order fulfilment. Accurate order processing leads to ‘the perfect order’. According to (Rushton et al , 2010), a perfect order is a measure that attempts to take into account the entire main attributes that go towards the completion of an order that absolutely satisfies customer requirements. The key components of this include; delivered complete to the quantities ordered, delivered exactly to the customer’s requested date and time, no delivery problems (damage, shortage, and rejection), accurate and complete delivery documentation.

1.3 Statement of the Problem.

Over years NMS has sourced for medicines and medical supplies through contracts with suppliers, both local and international. The warehouse inventory is managed using the MACS software system. The medicines and medical supplies are dispatched and delivered to health facilities against the facility generated orders on a bimonthly basis against a published annual delivery schedule. In some cases it has been observed that submission of orders from the

beneficiary public facilities, who are customers to NMS, has been inappropriate in terms of submission time and quality of orders received, with some orders not submitted at all, (NMS order tracking tool 2014). The late orders, back orders and a section of emergency orders are not processed in the same ordering period. There is no quick feedback mechanism to the customers regarding the non-supply of the orders. This has been exacerbated by the lengthy warehouse operations under limited information system applications that are incapable of performing some activities essential to order fulfilment. Efforts have been made by NMS and different stake holders to support facilities make accurate and timely orders. NMS has instituted seven regional customer care liaison offices country wide in 2011 and addition of two in 2014. Routine updates on the MIS system have also been done to facilitate order processing coupled with capacity building for staff. The fleet has been expanded to facilitate transportation of commodities. This coupled with the contracting of third party transport providers was intended to shorten the order cycle time. All these interventions have left the stock availability of the six tracer essential medical supplies at 49% (AHSPR 2013/14) leaving a stock out rate at 51%.

Amidst all the interventions customer needs have not been fully met characterised by stock outs, resulting into interruption in health service delivery. Quite often larger swings in inventory in response to changes in customer demands have been observed resulting into bullwhip effect. The beneficiaries of NMS have perceived the low performance of the corporation particularly attributed to information flow. This study was purposed to establish the relationship between information flow and supply chain performance at National Medical stores.

1.4 General Objective

To establish the relationship between information and supply chain performance at National Medical Stores (NMS).

1.5 Specific objective

- i. To assess the relationship between information sharing and supply chain performance at NMS
- ii. To assess the relationship between information quality and supply chain performance at NMS
- iii. To assess the relationship between information system applications and supply chain performance at NMS.

1.6 Research question

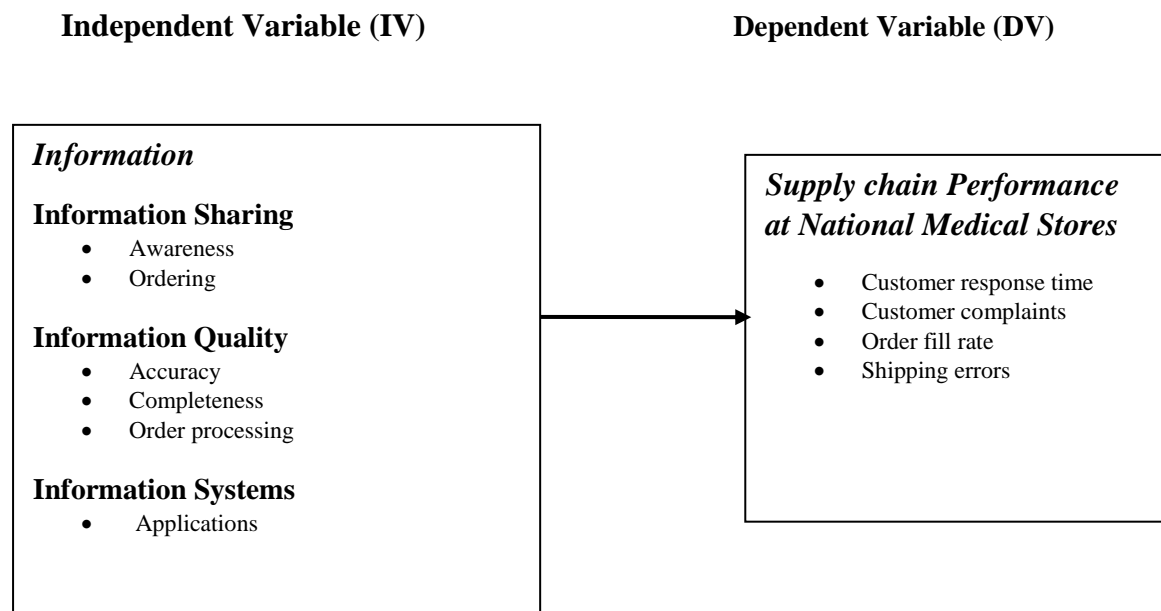
- i. How does information sharing with stakeholders associate with supply chain performance at NMS?
- ii. How does information quality associate with supply chain performance at NMS?
- iii. How do information system applications relate to supply chain performance at NMS?

1.7 Hypotheses of the study

- i. There is a relationship between information sharing and supply chain performance.
- ii. There is a relationship between information quality and supply chain performance.
- iii. There is a relationship between information system applications and supply chain performance.

1.8 Conceptual framework

Figure 1; Conceptual framework showing information and supply chain performance



Adopted and modified from Vanpoucke, Boyer and Vereecke (2009)

Information was considered in the aspects of information sharing, information quality and information system applications and how they affect supply chain performance at NMS. The indicator for supply chain performance at NMS was limited to the aspects of customer response time, customer complaints, order fill rate and shipping errors. In order to achieve reasonable supply chain performance, information is of great value. Information exchange empowers customers to know the inventory list of what is in stock. Customer accurate orders should be submitted to the warehouse in time guided by a schedule. The sorting, encoding, picking and packing must be done timely and accurately. The dispatch of the consignments need to be timely and to the right destination. All these transactions are supported by information system applications which are effective, efficient to permit unrestricted information exchange along the supply chain. Information sharing is required to occur in a real-time basis, to decrease uncertainty between the members of the supply chain and leading to a smoother, effective and efficient functioning of supply chain.

1.9 Significance of the study

The wide search of literature made revealed that no such study has been done about National Medical Stores (NMS). Since this study is the first of its kind, it will make a contribution to the body of knowledge for use by researchers and scholars, on the relationship between Information flow and supply chain performance. The findings will also guide medical supply chain stakeholders in policy reviews regarding information flow along the medical supply chain. The report coupled with the extensive literature review may guide NMS on the best functionalities of IT supply chain software to deploy. The study recommendations indicate the grey areas where further research can be done to improve supply chain systems.

1.10 Justification of the study

While NMS has been changing its positioning to offer a better service to beneficiary facilities several measures have been put in place to facilitate success initiatives. These include but are not limited to establishment of a supportive legal framework i.e. the shift from Central Medical Stores to National Medical Stores in 1993, change of MIS system 2009, and introduction of 9 regional offices country wide. Besides, the medical supplies are delivered directly to health facilities through the '*last mile*' arrangement. Despite all the interventions above, the performance has remained wanting characterised by stock outs and extreme swings of demand for stock (Bullwhip effect). There has never been any assessment of the association between information and performance of NMS to its beneficiary health facilities. This study was prompted by this existing gap that needed to be addressed, as the corporation refocuses to make the service to its beneficiary facilities better. Successful implementation of recommendations will improve supply chain performance at NMS.

1.11 Scope of the study

This study on information and supply chain performance of National Medical Stores operations in Uganda was conducted at National Medical Stores; Plot 4-12 Nsamizi Road, located in Entebbe, Wakiso District, in central Uganda. The study covered information under the aspects of information sharing, information quality and information system applications in relation to supply chain performance. The respondents of the study were NMS staff of different cadres both from management and operations. This was done in order to have balanced opinions across management and operational staff. The study also undertook a document review of NMS deliveries done to beneficiary health facilities in the period of January 2014 to December 2014. This was done to assess the orders fulfilment levels during the recent complete period prior to the report. The study was conducted from August 2015 to December 2015.

1.12 Operational definitions

Effectiveness: The rate of fulfilment of customer needs at NMS

Information flow: Information flow is defined as the graphic representation of data collection, data processing, and report distribution throughout an organization (McGraw-Hill, 2003). For this study, it will be defined as provision and receipt of information relating to any orders or delivery commodity movement between NMS, beneficiary facilities and stakeholders to and from beneficiary facilities to National Medical stores.

Information Quality; is defined as accuracy, timeliness, precision, reliability, correctness and completeness of information. (Vanpoucke et al 2009). For this study this definition will remain the same.

Information sharing; Information sharing in the supply chain is defined as the sharing of knowledge among partners to serve downstream customers effectively and efficiently, (National

Institute of Standards and Technology [NIST] 2002). This knowledge includes information on the production status and the planning process, but also on changes in the business environment and the goals of the companies. For this study information sharing will be limited to supply chain data and correspondences between NMS health facilities and stakeholders.

Information systems; It is defined as a discrete set of information resources organized for the collection, processing, maintenance, use, sharing, dissemination, or disposition of information (National Institute of Standards and Technology [NIST] 2002). For this study the meaning will remain the same.

Information; information is defined as ‘any communication or representation of knowledge such as facts or data, in any medium or form, including textual, numerical, graphical, cartographic, narrative or audio-visual forms’,(National Institute of Standards and Technology [NIST] 2002). For this study it will carry the same meaning.

Last mile: This is the delivery of medical supplies door to door to beneficiary health facilities.

MACS: MACS (Model-based Analysis of ChIP-Seq) is an analysis tool for NGS ChIP-Seq data. MACS empirically models the length of the sequenced ChIP fragments and uses it to improve the spatial resolution of predicted binding sites (<https://research.csc.fi/-/macs>..... Accessed on 26/10/2016

Medical supplies: Items used to perform clinical diagnostic procedures and treatment on patients.

Order: Order is the a commercial document by a buyer to a seller, indicating types, quantities, and agreed prices for products or services the seller will provide to the buyer (www.supplymanagement.ubc.ca/purchasi.). In this study an order will be defined as the document sent by a health facility indicating the needs for medicines and medical supplies from NMS.

Ordered fulfilment: Defined as the way firms respond to customer orders, and the process they take to move products from those orders, to the customer (www.fulfillmentwarehouse.biz/what-is-fulfillment.asp.....). In this study Order fulfilment will be defined as the complete process from point of sales inquiry to delivery of medicines and medical supplies to the customer.

Performance: Fulfilment of customer orders at National Medical Stores.

Pull system; A type of supply system where quantities to be issued by the central warehouse determined by the personnel who receive the supplies at the health facility.

Push system: A type of supply system where quantities to be issued to the facility are determined by the personnel who issue the supplies at the central warehouse.

Supply chain; A supply chain refers to the flow of materials, information, payments, and services, from raw material suppliers, through factories and warehouses, to end customers. A supply chain also includes the organizations and processes that create and deliver products, information, and services to the end customers. It includes many tasks such as purchasing, payment flow, materials handling, production planning and control, logistics and warehousing inventory control, and distribution and delivery. (www.dell.com) visited on 19/06/2015. For this study supply chain will refer to planning, forecasting procurement storage and distribution of medicines and medical supplies to public health facilities in Uganda.

Tracer medicines: Tracer medicines are a list of representative medicines used to generate routine quantitative information on the performance or desired outcomes of the pharmaceutical sector.

SAGE: British multinational enterprise **software** used for accounting at NMS

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter lays out the review of literature related to the study. Particularly this covers the theoretical review; themes and subthemes in line with the study objectives, experiences and research gaps identified in the literature reviewed. This systematically reflects the course and trend of what areas of supply chain that will be investigated and what has prompted this study to take place.

2.2 Theoretical review

This study was based on the model of “Contextual and Performance Factors of the foundations of supply chain integration” (Vanpoucke et al 2009). The authors describe the information flow as the foundation for integration in the strategic alliance between organisations. They describe this information flow by three characteristics: (1) level of Information sharing; (2) information quality; and (3) IT supply chain applications.

A supply chain can be treated as a societal-techno interactive system constituted by interactive triplex network (that is, physical network, participant network and information network) with entities involved in moving products or services from suppliers to customers. It consists of a supplier, manufacturer, distributor, retailer and consumer. Information is the key to successful supply-chain management because “no product flows until information flows” (Vanpoucke et al, 2009).

Accurate and timely information allows a firm to minimize inventories, improve routing and scheduling of transportation vehicles, and improve customer service levels. Different types of data are often used to control operations in an individual firm and are also used for negotiation

among chain members that form a virtual organization to provide products and services to customers. Irregular flow of information and materials has been observed to lead to distortion which propagates through the supply chain and is amplified at each stage, a situation well known as bullwhip effect. The bullwhip effect has been identified as one of the biggest causes of inefficiencies in a supply chain. Information sharing is viewed as an effective way to reduce uncertainties and counter this effect. Through information sharing, the demand information flows upstream from the point of sales, while product availability information flows downstream in a systematic manner. Moreover, information sharing ensures that the right information is available for the right trading partner in the right place and at the right time—supply chain visibility, (Liu & Kumar 2003)

2.3 Conceptual Review

The conceptual framework is adopted and modified from “Contextual and Performance Factors of the foundations of supply chain integration” model (Vanpoucke et al, 2009). The authors describe information as the foundation for integration in the strategic alliance between organisations. They describe this information by three characteristics: (1) level of Information sharing; (2) information quality; and (3) IT supply chain applications. In this section the three characteristics are conceptualised against supply chain performance at NMS in view of previous related studies.

2. 3.1Information Sharing and supply chain performance at NMS

The orders generated from beneficiary health facilities are submitted to NMS on a bimonthly basis. This creates an information flow channel that facilitates flow of medical supplies to beneficiary facilities (NMS stores and operations manual, 2014). According to Leng & Zailani, (2012), information flow involves transmitting orders and updating the status of delivery. They further describe how information flow is a key component of today’s supply chain; it is the

mechanism that brings trading partners together. This activity includes monitoring data capturing, processing, and dissemination of customer data, end-to-end inventory status and locations, order status, costs-related data, and performance status. Prem (2000) argues that information flow is a critical component for the efficient performance of the supply chain.

Information sharing significantly reduces supply chain costs, improves communication with partners, increases the flow of materials, enhances delivery and order fulfilment. Information sharing ultimately improves customer satisfaction, coordination and facilitates access to the competitive position as supported by (Moshkdanian & Molahosseini 2013). At NMS, health facility information is received but there no standard mechanism in place for acknowledging the orders. In case items are not in stock the health facilities and other stakeholders do not receive timely feedback. According to (Vanpoucke et al 2009) Information sharing is an important issue in supply chain management, particularly as a component of supply chain practices that have recently become popular, such as vendor managed inventories (VMI) and collaborative planning, forecasting and replenishment (CPFR). Upstream partners may share information with their downstream partners about production plans and future deliveries.

2.3.1.1 NMS confirmation of receipt health facility order submission

NMS receives orders from beneficiary facilities on a bimonthly basis. The facilities get feedback about the order submission, mostly those who submit through mail. Given the limited internet access in the country, telephone is the most preferred channel of communicate used by NMS (83%). The orders are fed into the order tracking tool which rates the submission by zones in relative percentages. The remote and hard to reach areas of the country that are underserved with facilities like internet and phone networks may not receive the feedback at all.

2.3.1.2 Distribution of Medical Supplies to health facilities by NMS

Distribution of medical supplies at National Medical stores is through the ‘last mile’ an initiative that enables commodities to be delivered directly to beneficiary health facilities. According to USAID | DELIVER PROJECT, Task Order 4. 2011, the ‘last mile’ is not simply about the physical delivery of commodities but also reduces delivery lead times and improves accountability for supplies along the supply chain. At the same time that products flow toward the end user, logistics data need to flow in the reverse direction. This flow of logistics information is crucial to supporting product availability for the patient user. While there are existing electronic logistics management information systems where the health facility utilisation is electronically relayed to the central ware house, the logistics information flow along the supply chain at NMS is largely paper based ,like in the Kano State, Nigeria, (USAID | DELIVER PROJECT, Task Order 4. 2011). If a flexible material flow is supported by inadequate information, waste may be produced in the material flow, in the form of excess inventories or capacity, (Kaipia, 2009). This has been argued to be suitable logistics method at NMS since most health facilities in Uganda have limited or no access to electronic systems.

2.3.2 Information quality and supply chain performance at NMS,

The data contained in the information needs to be of quality. The quality of shared information has a clear impact on the planning outcome and is critical to the effectiveness of decision making. Information quality includes such aspects as accuracy, timeliness, adequacy, completeness, credibility, ease of access, and compatibility across users. Flexible material flow needs frequent updates of the plan based on accurate information, (Kaipia & Hartiala, 2006). According to (Vanpoucke et al, 2009) the major problem in information processing in organizations is not the lack of data, but the lack of clarity of the data. In an earlier study, Jacobson (2007), findings agree that accuracy and speed of information flow in the supply chain is a major element in preventing amplification in the order information as it passes upstream in

the supply chain (the so called 'bullwhip effect'). This was further supported by (Omar1 et al, 2010), in their study about information sharing, information quality and usage of information technology (IT) tools in Malaysian organizations.

According to (Monczka et al, 2002) two of the major internal functions of an organisation are order processing and production scheduling. Order processing involves extensive customer interaction – starting from taking the order to after-market service while production scheduling involves actual plans and schedules. The upstream suppliers manage the flow of the right materials, at the right time to the right internal users. Weiss et al, (2009) argue that, efficient information flow, accuracy, reliability and comprehensiveness are directly associated with effective interoperability between various supply chain partners handling and using this information. Achieving interoperability means faster information flow, and an effective decision-making process. The inability of transferring information correctly, to where and when it is required, will have an impact on the decision making in the four key areas and therefore on the performance of the entire supply chain.

The biggest form of information that flows from health facilities to NMS are facility orders. These are converted into facility needs in form of medical supplies through order processing, where entries are manual into the MIS system, with high chances of transcription errors. This coupled with incomplete and inaccurate orders from health facilities weighs down information quality.

2.3.3 Information system applications and supply chain performance at NMS

Effective information management is crucial to organisations in the efforts to improve customer service, businesses face order management challenges in the areas of visibility, productivity, accuracy, cost control and implementation. The largest obstacle to overcoming all these challenges is paper based systems. Effective order management demands that organisations may

have to quit paper, improve responsiveness, access order information instantly and monitor order management performance to enhance customer service, (G. Prem Premkumar, 2000).

Information flow and the control thereof involves many heterogeneous technologies, including but not limited to computers, printers, digital image archiving systems, electronic records, paper-based records and human speech (Weiss et al, 2009).The authors further argue that in many cases companies employ information systems applicable to supply chains in order to improve information flow to its members. Information systems for supply chain management must address the fundamental supply chain process consisting of the activities: buy, make, move, store and sell (operational level in the SCOR model).

According to (Cuenca, 2004) systems that achieve the afore-mentioned tasks have been developed since the realisation of the first computer. Individual material requirement planning (MRP) systems were soon developed into enterprise resource planning (ERP) systems, which are installed throughout the entire organisation and include all the fundamental activities as detailed above.

According to (Swink et al,2011) the Internet and other emerging technologies have improved communications, data management, visibility and coordination across global supply chain networks. For example, as sales are made in retail stores, the sales and inventory information is automatically captured by point-of-sale (POS) bar codes and radio frequency identification (RFID) scanners and conveyed through the Internet or other exchanges to a control point. An enterprise resource planning (ERP) or other system then shares this information with suppliers' systems so that inventory records could be updated and replenishment orders may be generated. Fast moving consumer goods supply chains are usually managed through efficient consumer response through ERP systems (ERP), for example in the grocery industry, and quick response (QR) in the apparel industry.

At NMS the customer orders are prompted the annual delivery schedules for distribution of medicines and medical supplies to beneficiary facilities on a bi-monthly basis. The distribution network is segmented into five zones, with due-dates for order submission and delivery deadlines. The picking and packing of orders is done in sequence according the published delivery schedule (Stores & Operations manual 2014).

Earlier studies focused on the benefits of electronic data interchange (EDI) and showed that it provides benefits to companies by providing speed of information flow and fostering value-added partnerships between supply chain organizations. While traditional information sharing methods involve the use of written documentation and face-to-face contact, advanced information sharing methods refer to computer-to-computer links, EDI and enterprise resource planning (ERP).

NMS uses the MACS system in the warehouse for inventory management and order processing. This system has RFID capability that enables the use the hand held devices for stock movements and other operational activities in the warehouse. In concurrence with Park et al, 2010), the automatic identification technology that is readily available offers the potential to achieve inventory accuracy. They explained the potential benefits of RFID in manufacturing, including improved knowledge about demand, better forecasting of changes in supply and demand, and more optimal steering of the production.

2.3.3.1 Integrated Management Information Systems and supply chain performance at NMS

According to (Forsslund, 2010), ERP is a business management system made up from a collection of applications or modules that integrates company functions such as marketing, finance, manufacturing and logistics. ERP uses database technology to control and integrate

information related to a company's business including data related to customers, suppliers, employees and finance. Ideally, all business transactions, such as inventory management, customer order management, production planning and distribution are entered; recorded, processed, monitored and reported. The author further explains core capabilities of the ERP system would be to record measurement data in its database and to process measurement data. The author concludes that these capabilities of ERP systems are from here named data capturing, recording/processing and reporting.

NMS uses MACS warehouse management software for warehousing distribution and reporting, SAGE for finance and accounting. The two software systems do not adequately update each other in real time. The system does not have a provision for human resource management module. There needs to be a better integrated system that synchronises corporate information in real time in form of Enterprise Resource Planning (ERP).

2.3.4 Supply Chain Performance at NMS

In this section, the literature on performance measurements and metrics in Supply Chain Management will feature. The total order cycle time, also known as the order to delivery cycle time, refers to the time elapsed in between the receipt of customer order until the delivery of finished goods to the customer. The reduction in order cycle time leads to reduction in supply chain response time, and as such is an important performance measure and source of competitive advantage (Christopher, 1992)—it directly interacts with customer service in determining competitiveness. Processes must consider the value added of developing and maintaining an open, ongoing relationship between the customer and supplier that could potentially yield better outcomes with reduced costs (Kellerman and Kirk, 2010).

Gunasekaran et al,(2004), argues that performance evaluation of buyers or suppliers is simply not enough but also their relationships must be evaluated too. The parameters that need to be

considered in the evaluation of partnerships are the ones that promote and strengthen them. For example, the level of assistance in mutual problem solving is indicative of the strength of supplier partnerships. This rhymes with NMS periodic stake holder engagements, annual procurement planning workshops, annual health facility Board of Directors (BoD) visits and customer satisfaction surveys.

It has been clearly observed that lack of real-time information can have a major impact on supply chain performance. Supply chain information which has been derived only from the supply chain entity immediately ahead (a direct customer) of a supply chain member, may lead to the bullwhip-effect. It is a direct consequence of a lack of real-time information sharing and efficient information flow through the entire supply chain. In some supply chain systems the bullwhip-effect can rise up to 13% – 25% of operating costs, (Weiss et al, 2013)

In modern society a supply chain system analogous to the Triple-A is desired. Lee (2004) described Triple-A supply chains as those exhibiting agility, adaptability, and alignment. The most successful companies work within supply chains that rapidly respond to short-term changes in immediate and ultimate customer' demands (agility), adjust to long-term changes in economies and markets by restructuring the supply chain (adaptability), and integrating and coordinating business processes resulting in an equitable sharing of risks, costs, and benefits with all participating partners (alignment). Organizational success depends on supply chain success which depends on the abilities of a supply chain partnering organizations to build a supply chain that simultaneously exhibits agility, adaptability, and alignment. Lee's qualitatively developed strategy is, therefore, bolstered through an empirical investigation of the strategy's efficacy (Lee & Kwon, 2007).

NMS supplies medicines and medical supplies to beneficiary health facilities on a bimonthly basis guided by the published annual delivery schedule. The beneficiary health facilities are

clustered in five zones based on districts. The annual delivery schedule is characterised by order and delivery deadlines. The medicines are delivered to health facilities the 'last mile' model. Apart from the delivery deadlines, the channels of communication to update the health facilities about the deliveries are limited, an issue that creates delay in offloading and verification periods.

2.3.5 Customer Order fulfilment

Customer order fulfilment is a compound phenomenon of having the customer expectations fully met. Customers' expectations are not perceived by customers as being fulfilled, customers' expectations are over-targeted by suppliers, but suppliers' internal performance decreases performance. Finally, suppliers overestimate their performance compared with the ratings of customers. (Forslund, 2006). This mismatch is quite often perceived as non-fulfilment on the side of the customer.

The existence of logistics performance gaps requires that logistics quality related issues be communicated between customers and suppliers in greater depth. This leads to increase in the effectiveness with which the firm is able to use external supply chain functionality (Biehl, 2005). This is in agreement with (Lee & Kwon, 2007), who envisaged customer linkage to be concerned with planning, implementing, and evaluating successful relationships between providers and recipients either upstream or downstream of supply chain. The authors further explain customer linkage to mainly sharing product information with customers, accepting customer orders, interacting with customers to manage demand, having an order placing system, sharing order status with customers during order scheduling, and product delivery phase.

NMS has nine regional customer care liaison offices across the country through which it interacts with the beneficiary facilities. These act as firm links between NMS and its beneficiary facilities. The customer care officers move through these facilities for support supervision as per policy (NMS sales manual, 2014). These officers support facilities in procurement planning,

ordering and address frequent issues in the medical supply chain. They also update the health facility staff and other health development partners about new developments at NMS.

2.5 Literature review summary

Supply chain management has become an excellent strategy to effectively link all the trading partners and ensuring cost effective and timely movement of materials from the raw material supplier to the final end-consumer of the finished product. Inter-organizational systems or extranets provide the technology infrastructure to facilitate the flow of information along the chain and thereby ensures the smooth flow of goods. The basic premise in both these initiatives is that organizations are willing to share information with their business partners on their internal operations including orders, inventory, shipments and customer satisfaction. However, reality may be the opposite. During the literature review three major observations were made. The literature reviewed did not assess the relationship between information and supply chain performance in organisations that have been studied. Secondly all the literature reviewed did not address the medical supply chain and particularly central warehouses and their beneficiary health facilities. Thirdly supply chain activities can only be effectively and efficiently coordinated with the use of information system applications that manage inventory, facilitate communication, track distribution and delivery of goods and services to the beneficiaries.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter describes research design that was used during the study. It also indicates the study population from which the relevant samples have been selected, sampling methods, data collection procedures, data collection tools, data quality control, data analysis interpretation of results and ethical considerations.

3.2 Research Design

This was a cross sectional study, with a retrospective component. This design was preferred because the information gathered represented what was going on at NMS during the period of the study (Olsen & George, 2004). The study was conducted using qualitative and to a lesser extent quantitative approaches. The main source of data was National Medical Stores as a reference. The study was conducted by interviewing National Medical Stores staff. The study also considered retrospective data which was retrieved from the archives. The quantities on orders submitted were compared with fulfilment levels. Record reviews were done to give more information to the report. The study aimed to determine the relationship between information sharing, information quality and information system applications and supply chain performance of NMS. This approach was preferred because it is a single entity where the parameters of information were investigated to a greater depth.

3.3 Study Population

The study was conducted among the National Medical Stores employees. NMS had a total of 201 staff members in the period of the report. The members of staff selected were those in operations and their supervisors. The members of the middle management staff were selected as

key informants. This was because they have operational and strategic insights of the corporation. The management information systems section staffs were left out to rule out bias.

3.4 Determination of the sample size and sampling techniques

The sample was determined using the Morgan and Krejcie, 1970 table as per (Appendix II). Out of the 201 NMS staff 135 staff members were selected. The staffs were randomised using random numbers. Every third number was picked in order of the random numbers table. This technique was preferred because all the eligible NMS staff had equal and independent chances of participation. Three key informants were selected from middle management who have a blend strategic and operational information.

Table 1; Table showing population and sampling techniques used

Population Category	Population Size	Samples Size	Sampling Technique
NMS Staff	201	132	Simple Random sampling
Key Informants	3	3	Purposive
TOTAL	204	135	N/A

Source: NMS staff list as at 31st December, 2015.

3.5 Data Collection Methods

3.5.1 Questionnaire Survey

Qualitative data was collected using questionnaires. Questionnaires were administered to selected staff members. Key informants were interviewed using an interview guide for expert supply chain information (Appendix III). The questions had predetermined responses based on Likert scale to increase the accuracy of the information. The interactions with the key informants were in-depth face to face interviews. Key informants were selected basing on level of insight in

and the positions of responsibility held in supply chain. This ensured that the respondents gave complete and accurate answers. It further guaranteed full exploration of expert opinion.

A range of records was selected to be reviewed from the health facility orders for selected tracer medicines, submitted in the period of January 2014 to December 2014. The orders processed in this period are estimated at 92,154 and a sample was taken from these.

3.5.2 Document Review

The quantitative data was collected from medicines distribution record at NMS by extraction reports from the archived information. The delivery documents were retrieved from archives and were reviewed to establish the order fill rate. The customer complaint records for the period under consideration were also reviewed and the response resolutions categorised. Because of the wide range of medical supplies on the NMS stock list, the study only considered delivery documents for the 10 tracer items as these were manageable, and because of the National Health Policy, their insufficient supply has serious impact on the performance of the health sector. The orders received and served in the months of January 2014 to December 2014 were randomised using random numbers. The number of orders selected was 381 and would be representative, (Morgan and Krejcie, 1970).

3.6 Data Collection Instruments

3.6.1 A Questionnaire and Key Informant Interview Guide

Qualitative data was collected using questionnaires with closed end questions. Questionnaires were used, since the qualitative component of the study considered variables that could not be directly observed such as views, opinions, perceptions and feelings of respondents (Appendix I). These were filled by selected NMS staff as per the selection criterion in section 3.4 above. The key informant guide was administered to the selected staff to obtain in-depth expert information about the operations of NMS, (Appendix III).

3.6.2 Document Review tools

The order data was collected from existing MIS records using the application's report extraction tools and exported to Microsoft excel. Three hundred eighty one (381) orders for the 10 tracer items were selected for the period of January 2014 December 2014. Clients' complaints records of the same period were also extracted and analysed for nature of complaints and resolution times. The combined instruments captured adequate information that defined the conceptualised aspects of the study and provided reliable data quality checks.

3.7 Validity and Reliability tests

The questionnaire was tested for validity and reliability. The latter was tested using Cronbach's alpha while the former by expert judges. The two aspects of validity and reliability control the quality and relevancy of the data that will be collected.

3.7.1 Validity

Validity is the extent to which research results can be accurately interpreted and generalised to other populations. It is the extent to which research instruments measure what they are intended. To establish validity, the instrument was given to two expert judges to evaluate the relevance of each item in the instrument to the objectives. The items were rated as relevant (4), quite relevant (3), somewhat relevant (2) and not relevant (1). The items that were rated as relevant (4) and quite relevant (3) were divided by the total number of the items in the questionnaire to determine the Content Validity Index (C.V.I) (Oso &Onen, 2009).

CVI = Number of items declared valid by judges

Total number of items on the instrument

Judge 1:

CVI = 40/44 = 0.91

Judge 2:

$$CVI = \frac{37}{44} = 0.84$$

Therefore the Average of Content validity index was:

$$C.V.I = \frac{0.91+0.84}{2} = 0.875$$

The overall C.V.I for the tool was 0.875 which means that the items on the tool were relevant and above the acceptable minimum of ≥ 0.70 (Oso & Onen, 2009).

3.7.2 Reliability

This method splits the questions in the questionnaire and in every possible way and computes correlation values for them all. The desirable Cronbach's alpha value generated should always be one closer to one (Birafaijo, et al, 2010).

Table 2; Table Showing Reliability Coefficients

Variable	Cronbach's Alpha Coefficients
Information Sharing	0.705
Information Quality	0.765
Information System Application	0.754

Source: Primary data

The Cronbach's Alpha reliability coefficients for the items on the questionnaires were above 0.70 which is acceptable (Oso & Onen, 2009). The items on the questionnaire would yield responses consistent to the objectives.

3.8 Research Procedure

The research proposal was presented to the UMI Masters Defence committee and approved. Permission was sought and granted from National Medical Stores to proceed with the report. Data collection proceeded after the permission was granted by NMS. Qualitative data was collected using self – administered questionnaires and in depth key informant interviews. The quantitative data was collected through document reviews contained in the archived data to ascertain the order fill rate and shipment errors. The customer complaint record was extracted and analysed to assess the customer response time. The qualitative data obtained through the questionnaires was entered into the computer software and analysed using Statistical Package for the Social Sciences (SPSS) version 19. The key informant interview data collected provided in-depth knowledge of NMS as a supply chain organisation and was used make inferences. Quantitative data was analysed in Microsoft excel version 2013.

3.9 Data Management and Analysis

Data analysis was done using Statistical Package for the Social Sciences (SPSS) version 19 and Microsoft excel version 2013. For qualitative variables, analysis included exploring one variable at a time, followed by bivariate analysis using cross tabulation tables. Statistical significance of categorical variables was determined using the Chi-Square test. The strength and direction of associations were determined using correlation. For continuous variables, both descriptive and inferential statistics were employed. Contextual information was analysed qualitatively using content analysis approaches. Interpretation of results, discussions, conclusions and recommendations were made.

3.10 Assumptions and Limitations

It was assumed that all the health facility orders received in the period of January 2014 to December 2014 were given same procedural handling through the supply chain process. It was also assumed that all the NMS staff involved in the study had full knowledge of the corporation

operations. The study involved retrospective extraction of records from archives and some records were not readily available but the study maximized whatever data was accessed.

3.11 Ethical Issues

Before proceeding with the report, the researcher obtained an introductory letter from the School of Management Science of Uganda Management Institute. Permission was sought and granted by National Medical Stores management to proceed with the report. All the participants in the study filled the responses in the questionnaire anonymously. The respondents were assured beforehand that the information they provided would be kept private and confidential. Dissemination and future publication of the findings would be done with approval from NMS irrespective of the findings.

CHAPTER FOUR

PRESENTATION, ANALYSIS AND INTERPRETATION OF FINDINGS

4.1 Introduction

This study intended to establish the relationship between information and supply chain performance at National Medical Stores (NMS). The study had three specific objectives. First objective was to assess the relationship between information sharing and supply chain performance at NMS, the second was to assess the relationship between information quality and supply chain performance at NMS and the third was to assess the relationship between information system applications and supply chain performance at NMS. This chapter presents data analysis and interpretation of findings. The presentation is guided by objectives of the report, research questions and hypotheses. This chapter of the report is segmented into background information of respondents, descriptive statistics for the study variables, descriptive and inferential statistical findings under the three specific study objectives.

Table 3; Table showing response rate

Category	Target Sample Size	Actual Response	Response Rate
NMS Staff	132	116	87.87%
Key Informants	3	3	100%
Total	135	119	88.15%

Source: Primary data

The sample was drawn from a total of 201 NMS staff members who constituted 151 males and 50 females with education qualifications ranging from advanced level to masters degrees. These belonged to the departments of sales & marketing, stores & operations, procurement & disposal unit, finance & accounts, audit and human resource & support services. Table 3 indicates that 119 individuals took part in the study representing a response rate of 88.15%. This response was

considered adequate based on Mugenda & Mugenda (2003) who noted that a response rate of 50% is adequate, the one of 60% is good and a response rate of 70% and above is very good for analysis and reporting.

4.2 Objective One: Relationship between information sharing and supply chain performance at NMS

Objective one was aimed at assessing the significance of information sharing and supply chain performance of National Medical stores. Analysis of qualitative responses is shown in Table 4 below;

Table 4; Information sharing and supply chain performance at NMS

Statement	SD (%)	D (%)	N (%)	A (%)	SA (%)
All the beneficiary facilities are aware of the role of NMS	2.5	7.5	15.0	35.0	40.0
NMS communicates the delivery schedules to beneficiary facilities and stakeholders two months before the next financial year	2.5	5.0	0.0	35.0	57.5
Health facilities and stakeholders are aware of the range of stock available at NMS whenever they need.	5.6	16.7	38.9	33.3	5.6
Health facilities regularly receive stock lists updates from NMS	2.5	7.5	42.5	25.0	22.5
The frequency of information sharing between NMS and stakeholders is adequate	2.5	7.5	17.5	55.0	17.5
Facilities share future demand forecasting information with NMS annually	5.0	2.5	27.5	35.0	30.0
All the ordering facilities submit their orders to the NMS ware	5.0	15.0	12.5	40.0	27.5

Statement	SD	D	N	A	SA
	(%)	(%)	(%)	(%)	(%)
house on bimonthly cycle in time					
Facilities share performance evaluation information with NMS annually	2.5	12.5	45.0	30.0	10.0
NMS has very frequent face-to-face planning and communication with health facilities	5.0	2.5	27.5	45	20
The means of order submission available are appropriate	5.0	5.0	10.0	52.5	27.5
There are appropriate channels for NMS stakeholders to submit their feedback to NMS	5.0	2.5	5.0	40.0	47.5
Response to customer complaints is immediate.	0.0	1.0	7.0	42.0	50.0
NMS has a protocol for resolving customer complaints well laid down	0.0	3.0	10.0	30.0	57.0
Health facilities have overall satisfaction with organisation customer service.	1.0	40	39.0	10	10

Source: Primary data

4.2.1 Descriptive Statistics for information sharing and supply chain performance at NMS

While 40% of the NMS staff agreed that all beneficiary facilities are aware of the role of NMS, 57 % of them strongly agreed that NMS effectively communicates the delivery schedules to beneficiary facilities and stockholders two months before the next financial year. All the three key informant sources confirmed that NMS share delivery information to the beneficiary facilities.

In the course of the study 55% of the health facilities and stake holders are aware of the range of stock available at NMS whenever they need it. In the same aspect 22.5% of the respondents strongly agreed that health facilities regularly receive stock lists updates from NMS .As

information sharing is the leading factor in supply chain 17% of the respondents strongly agreed that NMS frequently and adequately shares information between its stakeholders.

A section up to 30% of the respondent agreed that beneficiary health facilities share future demand forecasting information with NMS annually. In the same respect 45% of the respondents agree that NMS has very frequent face to face planning and communication with health facilities. This forms a basis for the bimonthly cycle orders. In the aspects ordering for Medicines and medical supplies, 52% of the respondents agree that the means of order submission available are appropriate. One of the key informants said;

The orders are received on published delivery schedules, non-supply, emergency requirements, disease outbreaks and National public health programs like immunisation. We are however challenged by, incorrect data, incomplete data, wrong units of measure, wishful orders that do not match procurement plans, late and non-submissions of orders.

Supply chain evaluations forms part of feedback NMS gives to health facilities annually. However 45% of the respondents were neutral about NMS performing or even sharing this performance evaluation information. This phenomenon could be attributed to knowledge gap of NMS staff about its internal processes.

Regarding the communication channels to beneficiary facilities and stakeholders 47.5% of the respondents strongly agreed that there are appropriate channels for NMS stakeholders to submit their feedback to NMS. While 92% of the respondents agreed that the customer complaints are resolved in time 87% at the same agreed that there is a protocol laid down for complaint handling. A documentary review revealed that;

The customer complaints are forwarded formally to NMS in writing the discrepancy form. Besides there are quicker means of raising concerns like using electronic social

media platforms NMS Smartcare, WhatsApp and telephone voice calls. Some concerns are contextually sorted immediately. According to the record review analysis, the lowest time of record is 0.00days with highest being 324.80 days. The average resolution time is 78.75 days. Of the 1,942 customer concerns raised in the period 1,468(75.59%) were discrepancies. The highest number of complaints come from lower level facilities particularly HCIII at 45.62%. (Appendices V&VI). This is so because facilities at this level get predetermined kits for essential medicines and also draw orders for laboratory supplies and HIV care commodities.

A section of respondents up to 40% disagreed on the overall customer satisfaction while 39% were neutral. While interacting with one of the key informants, he stated that;

Customers always respond to inadequacies with gut feelings and do not take into account the positive aspects of delivery system. He graded the general customer satisfaction levels to be about 80%.

4.2.2 Hypothesis one: There is a relationship between information sharing and supply chain performance

All the above responses in 4.2.1 were subjected to statistical analysis using Chi-Square and Pearson r correlation. The results are in the tables below.

Table 5; Chi-Square test for information sharing and supply chain performance

		Agree	Not agree	Total	chi-square	p-value	r	p-value
information sharing	Agree	77.5%	33.3%	63.8%	10.484	.001	.425	.001 ^c
	Not agree	22.5%	66.7%	36.2%				
	Total	100.0%	100.0%	100.0%				

The compound bivariate analysis indicates that 77.5% of the respondents agreed that NMS shares information frequently, appropriately and effectively. The Chi-square value of 10.484 indicates there was a significant relationship between information sharing and supply chain performance of NMS.

Table 6; Correlation between information sharing and supply chain performance

		Performance	Information sharing
Performance	Pearson Correlation	1	.425(**)
	Sig. (2-tailed)		.001
	N	116	116
Information sharing	Pearson Correlation	.425(**)	1
	Sig. (2-tailed)	.001	
	N	116	116

** Correlation is significant at the 0.01 level (2-tailed).

The Correlation coefficient of ($r=0.425$ at $p < 0.05$) shows that there was a moderate positive significant relationship between information sharing and supply chain performance of NMS.

4.3 Objective Two: Relationship between information quality and supply chain performance at NMS

Objective aimed at assessing the relationship between information quality and supply chain performance of National Medical stores. Analysis of qualitative responses is shown in Table 7 below;

Table 7; Information quality and supply chain performance at NMS

Statement	SD (%)	D (%)	N (%)	A (%)	SA (%)
Facility orders are complete with details of supplies required from NMS for refill	5.0	5.0	7.5	60.0	22.5

Statement	SD	D	N	A	SA
	(%)	(%)	(%)	(%)	(%)
Facility orders submitted to the NMS warehouse have reasonable level of accuracy	0.0	5.0	17.5	62.5	15.0
The time given in the annual delivery schedule for order deadline is realistic	2.5	2.5	2.5	55.0	37.5
NMS has an accurate order data capture system	2.5	0.0	5.0	55.0	37.5
The orders submitted by health facilities have full information as required	2.5	2.5	17.5	62.5	15.0
Orders at the ware house are well checked and filed before encoding	2.5	7.5	2.5	52.5	35.0
Sales team is competent to interpret facility orders.	2.5	2.5	7.5	27.5	60.0
The six NMS delivery cycles in a financial year are adequate	2.5	2.5	2.5	37.5	55.0
All the received at the warehouse orders are accurately encoded in time	0.0	12.5	10.0	57.5	20.0
Order picking and packing is done on first to expire first out	0.0	0.0	7.5	30.0	62.5
Order dispatch to facilities is done according to published schedules	0.0	5.0	0.0	40.0	55.0
All the dispatches have accompanying shipping documents	0.0	0.0	5.0	27.5	67.5
All the facility orders are fully filled at the NMS warehouse	0.0	60.0	3.0	2.0	0.0
There are shipping errors the NMS customer orders delivered to facilities	0.0	10.0	0.0	40.0	50.0

Source: Primary data

4.3.1 Descriptive statistics for information quality and supply chain performance at NMS

The interpretation and possible use of the forecast data and orders depend on the quality of the information. This quality depend on the standards set by the receiving organisation.

During the study 60% of the respondents agreed that facility orders were complete indicating the details of supplies required from NMS warehouse for refill, while 62 % of the respondents agreed that the facility orders submitted to the NMS warehouse had reasonable level of accuracy.

As order submission determines adherence to the delivery schedule 55 % of the respondents agreed that the two months period given for order deadline is realistic. In the same respect, 62 % of the respondents agreed that the orders submitted by health facilities had full information as required. One of key informants indicated that:

Orders submitted from health facilities sometimes have incorrect data, incomplete data, and wrong units of measure, wishful orders that do not match procurement plans, late and / or non-submissions at all.

Whereas 55 % of the respondents agreed that NMS had an accurate order data capture system, 52.5 % of the respondents agreed that the data contained on orders was well checked at the warehouse and filed before encoding by the sales staff. It was also observed that 60 % of the respondents strongly agreed that the sales team was competent to interpret facility orders.

In the aspect of delivery cycles 55 % of the respondents strongly agreed that the six NMS delivery cycles in a financial year were adequate.

While 57.5 % of the respondents agreed that all the orders received at the warehouse were accurately encoded in time, 62.5 % of the respondents strongly agreed that order picking and packing is done on the basis of first to expire first out. As the picked and packed orders are

destined for beneficiary health facilities 55 % of the respondents strongly agree that order dispatch to facilities is done according to published schedule. Besides 67.5 % of respondents, strongly agreed that all the dispatches have accompanying shipping documents.

A section of respondents disagreed that clients orders were fully filled by NMS. In the same respect 90% also agreed that some orders go with shipping errors. A documentary review about order fulfilment at NMS revealed the following:

In the period of January 2014 to December 2014 NMS received 92,154 orders for HIV, TB and malaria medicines and related supplies. Of the 381 sampled orders 287(75.33%) were accessed and analysed for fulfilment. Out of the analysed orders 203(70.73%) were fully filled, 28(9.76) overfilled, 50(17.42%) under filled and 6(2.09%) were not served at all, (Appendix VII).

This indicates a sizeable gap of order fulfilment disparities the organisation may need to fix to make the health service delivery better.

4.3.2 Hypothesis two: There is a relationship between information quality and supply chain performance

All the responses in 4.2.2 were analysed using Chi-Square and Pearson r correlation. These were done to determine the relationship and statistical significance of information quality and performance of NMS. The statistical analysis results are presented in the Tables 8 & 9 below;

Table 8; Chi-Square test for information quality and supply chain performance

		Agree	Not agree	Total	chi-square	p-value	r	p-value
information quality	Agree	97.5%	61.1%	86.2%	13.824 ^a	.000	.488	.000 ^c
	Not agree	2.5%	38.9%	13.8%				
	Total	100.0%	100.0%	100.0%				

The compound bivariate analysis indicates that 97.5% of the respondents agree that the quality information shared between NMS and beneficiary health facilities affects supply chain performance. The Chi-square value of 13.824 indicates there is a significant relationship between information sharing and supply chain performance at NMS.

Table 9; Correlation between information quality and supply chain performance

		Performance	Information quality
Performance	Pearson Correlation	1	.488(**)
	Sig. (2-tailed)		.000
	N	116	116
Information quality	Pearson Correlation	.488(**)	1
	Sig. (2-tailed)	.000	
	N	116	116

** Correlation is significant at the 0.01 level (2-tailed).

The Correlation coefficient of ($r=0.488$ at $p<0.05$) shows that there is a moderate positive significant relationship between information quality and supply chain performance at NMS.

4.4 Objective Three; Relationship between information system applications and supply chain performance at NMS.

Objective set to assess the relationship between Management Information Systems (MIS) and supply chain performance of National Medical stores. The MIS system used at NMS is MACS for warehouse operations and SAGE finance. Distribution fleet is managed by MIRI RADAR information system. The qualitative responses are tabulated below;

Table 10; Information Systems applications and supply chain performance at NMS

Statement	SD	D	N	A	SA
NMS has an appropriate management information system	0.0	0.0	5.0	52.5	42.5
All the order picks are generated by the MIS software	0.0	2.5	5.0	42.5	50.0

Statement	SD	D	N	A	SA
Order dispatch is according to journeys created in the MIS system	0.0	2.5	0.0	30.0	67.5
Inventories are controlled by the MIS software	0.0	0.0	2.5	32.5	65.0
The IT system has a provision for processing back orders	2.5	5.0	32.5	30.0	27.5
The stock movements in the ware house are prompted by the software	2.5	0.0	22.5	35.0	40.0
Stock transactions are Just In Time (JIT)	2.5	10.0	25.0	40.0	22.5
The IT system supports Vendor Managed Inventory(VMI)	5.0	5.0	42.5	32.5	15.0
The system down time affects the affects order processing	0.0	0.0	10	37.5	52.5
Dispatches are prompted by the soft ware	2.5	0.0	22.5	35.0	40.0
MIS system able to track supplies up to facility level	2.5	15	15	42.5	22.5
There are challenges with information system applications	0.0	2.5	22.5	62.5	12.5

Source: Primary data

4.4.1 Descriptive statistics for Information system applications and supply chain performance at NMS

In general there are two information asymmetry including internal information exchanges and external information opacity. These exchanges are facilitated by electronic devices and information system technologies. This is important for supply chain systems and their information flow channels as technology decreases the risk of information flow interruption.

In the study 92.5 % of the respondents agreed that NMS has appropriate management information systems for its operations.

Whereas 50 % of the respondents agreed that all the order picks are generated by the MIS software, in the same respect 67 % of the respondents agreed that order dispatch is according to journey routing created in the MIS system.

Whereas 65 % of the respondents strongly agreed that inventories are controlled by the software, only 32.5 % of the respondents agree that the IT system has a provision for processing back orders. In the aspect of stock management 75 % of the respondents agree that stock movements in the ware house are prompted by the software and 62.5 % of the respondents agreed that the stock transactions are just In Time.

Whereas 42.5% of the respondents were neutral about the IT system supporting Vendor Managed Inventory, 52.5% of the respondents strongly agreed that the system down time affects order processing and other inventory operations.

Regarding the stock dispatch to facilities 42% of the respondents strongly agreed that dispatches are prompted by the software and 42% of the respondents agreed that MIS system is able to track supplies up to facility level. This contrasts with one of the key informant who said;

The MIS system at NMS stops at the dispatch point. Cartons of medicines are marshalled, scanned and loaded. Delivery documents printed and delivery Trucks are dispatched to beneficiary health facilities. Items are delivered to facilities, manually verified and the delivery documents signed by both parties as proof of delivery. These are submitted back to NMS for records.

As the entire processes of NMS are system driven 62.5% of the respondents agreed that there are challenges with information system applications that precipitate that delay in both internal and external processes. One of the key informant described the MIS system at NMS as below;

They are multiple challenges with MIS system at NMS. These included but are not limited to system hanging, system log outs leading to loss of data and time, limitations to some order processing aspects, transcription error due to manual entry, ghost stock, limited user rights and user competence. There is seemingly underutilisation of the MACS functionality to make the sales department work better.

4.4.2 Hypothesis Three; There is a relationship between information system applications and supply chain performance

All the above responses in 4.4.2 were subjected to statistical analysis using Chi-Square and Pearson r correlation. These were done to determine the relationship and statically significance of information quality and performance of NMS. The statistical analysis results are in the table below;

Table 11; Chi-Square test for information system applications and supply chain performance

		Agree	Not agree	Total	chi-square	p-value	r	p-value
information system	Agree	90.0%	38.9%	74.1%	16.913 ^a	.000	.540	.000 ^c
	Not agree	10.0%	61.1%	25.9%				
	Total	100.0%	100.0%	100.0%				

The compound bivariate analysis indicates that 90.0% of the respondents agree that 90% of the respondents agreed that is a relationship between information system applications and supply chain performance. The Chi-square value of 16.913 indicates there is a significant relationship between information system applications and performance of NMS.

Table 12; Correlation between information system applications and supply chain performance

		Performance	Information system
Performance	Pearson Correlation	1	.540(**)
	Sig. (2-tailed)		.000
	N	116	116
Information system	Pearson Correlation	.540(**)	1
	Sig. (2-tailed)	.000	
	N	116	116

** Correlation is significant at the 0.01 level (2-tailed).

The Correlation coefficient of 0.540 at P-value of ($p < 0.05$) shows that there is a strong positive significant relationship between information system applications and supply chain performance at NMS.

CHAPTER FIVE

SUMMARY, DISCUSSION OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The purpose of this study was to establish the extent to which information flow affects supply chain performance at National Medical Stores (NMS). The study specifically information sharing, information quality and information system applications and their relationship to supply chain performance at NMS. Performance was measured under the aspects of customer response time, customers complaints order fill rate and shipping errors.

This chapter presents the summary, discussion, conclusions and recommendations of the report. The facts of the observed trends in the study were further compared with previous studies done about the subject matter to draw inferences and to make recommendations regarding information flow and supply chain performance of NMS.

5.2 Summary of the study findings

Under this subsection the summary of the study findings were grouped under the three specific objectives of the study. The researcher noted that under all the three objective as graphically in Tables 4, 7 and 10 that several responses had notably high percentages of neutrality which may be interpreted as lack of adequate information by NMS staff members about its operations. It can also be attributed to inadequate understanding of the questionnaire and reluctance to provide information.

5.2.1 Information sharing and supply chain performance at NMS

The study findings indicate that frequent and appropriate communication is done through the appropriate channels available. The study also confirmed that health facilities receive information about stock available at NMS and also receive other important information from NMS. The study also found out that the supply chain planning involves beneficiary facilities

creating ownership of the values chain. However it was not clear to the respondents whether NMS and health facilities shared periodic individual performance reports which are key in determining the day to day utilization. The correlation between the two variables ($r=0.425$, $p<0.05$) indicated that information sharing is significantly linked to supply chain performance at NMS, and when improved can positively impact NMS service delivery to its customers.

5.2.2 Information quality and supply chain performance at NMS

The study findings indicate that NMS has set standards of the quality of information shared between its customers. This is based on completeness, timeliness, order capture tools and order processing procedures. The study findings indicate that the orders are submitted with reasonable completeness and accuracy for the six annual delivery cycles. The study also found out that the orders are well captures and accurately processed and dispatched to beneficiary facilities with accompanying delivery documents. However the study noted no significant relation with the sales team competence to interpreted facility orders and performance of NMS. The correlation between the two variables ($r=0.488$, $p<0.05$) indicates that information quality was significantly related to supply chain performance at NMS, and when improved can positively impact NMS service delivery to its customers.

5.2.3 Information system applications and supply chain performance at NMS

Study findings indicate that management information applications are essential for the supply chain activities at NMS. The study findings confirm that the available applications are appropriate and the all the inventory activities are system controlled. The study also found out that order processing and dispatch activities are also system driven. The study revealed that MIS system down time heavily weighs down the warehouse activities. The study however noted the inability of the available system applications to process back orders. The correlation between the two variables ($r=0.540$, $p<0.05$) indicates that information system applications are significantly

related to supply chain performance at NMS, and when enhanced can positively impact NMS service delivery to its customers.

5.2.4 Order Fulfilment

The order retrieval chances from the archives yielded 75.33% while the order fulfilment rate was found out to be 70.73%. This represented the orders that are fully filled to the exact requirement by the beneficiary health facilities. A section of orders were found to be overfilled (9.76%) while some were under filled (17.42%). Occasionally some orders were not filled at all and this represented (2.09%).

5.2.5 Customer complaints and Resolution times

The customer complaints were raised from health facilities by the commodity users at health facilities. Some concerns were contextually sorted immediately. According to the records reviewed, the lowest customer complaint resolution time recorded was 0.00days with highest being 324.80 days. The average resolution time was 78.75 days. Of the 1,942 customer complaints raised in the period 1,468(75.59%) were discrepancies in deliveries of supplies. The greatest number of complaints were realised from lower level health facilities. The study considered 1,107 events by facility level and 505 (45.62%) were at the Health Centre III, most probably because there exists two modes of delivery i.e. predetermined kit delivery for essential medicines and pull orders for HIV care commodities and laboratory supplies as well.

5.3 Discussion of the study findings

This section presents the discussion of the findings under the three objectives of information sharing, information quality and information system applications and their relationship with supply chain performance at NMS. It will also incorporate the previous studies done in the discipline and the key informant information.

5.3.1 Information sharing and supply chain performance at NMS

The study found out that NMS role is known by the beneficiary health facilities and that there is reasonable communication between the two parties. This is greatly attributed to the information sharing levels. The study was not unique to NMS but also relates to (Evelyne et al, 2009) observation, who define information sharing in the supply chain as the sharing of knowledge among partners to serve downstream customers effectively and efficiently. They further note that the knowledge shared included information on the production status and the planning process, but also on changes in the business environment and the goals of the companies. It was further argued by (Tibin et al 2012) that information sharing and the harmony mechanism of supply chains were important tactics of improving the performance of supply chains.

However (Kaipia 2009) argues that in many cases information sharing alone did not improve supply chain performance. He asserted that physical flow coordination among the trading partners was also required. The study found out that the facilities were aware of the range of items at NMS and that they submit accurate orders on a bimonthly basis. This guided NMS customers on the items to order and the quantities needed. These potential benefits of information sharing include supply chain coordination, bullwhip effect reduction and decreased supply chain costs (Evelyne et al, 2009). This is further supported by (Lee et al, 2007) who supplemented that Real-time information exchange with suppliers in the upstream and with customers in the downstream created an opportunity where optimization can take place. The linkage helps reducing lead-times which undoubtedly will reduce the adverse effect (i.e. bullwhip effects) and contribute to enhancing performance. The bullwhip-effect is a direct consequence of a lack of real-time information sharing and efficient information flow through the entire supply chain (Weiss et al, 2013).

They however indicated that although technology has made the sharing of information easier, managers should not assume that more information automatically implies better performance.

During the course of the study it was observed that NMS has frequent face to face planning with customers. The study noted that there were available means of order submission and that they were appropriate. While traditional information sharing methods involve the use of telephone, fax, e-mail, written and face-to-face contact, advanced information sharing methods refer to computer-to-computer links, EDI and enterprise resource planning (ERP) (Evelyn et al, 2009).

The key informant highlighted that internal coordination between procurement, sales and stores, regional customer care staff, last mile delivery teams to health facilities, social media platform for just in time updates (WhatsApp).

The medical stores in this case (NMS) must maintain effective communications with suppliers, procurement and inventory control units, with lower level warehouses and health facilities, and with managers from the Ministry of Health. The above discussion confirms that information sharing is pertinent to supply chains and has a bearing to performance. NMS will need to consider all channels possible and utilise them fully to have information shared adequately between stakeholders. This will impact positively corporation performance.

5.3.2 Information quality and supply chain performance at NMS

The study found out that a reasonable section of orders submitted to NMS were accurate and complete indicating the details of what is required by facilities. Kaipia (2009) defines information quality as the degree to which the information meets the needs of the organisation. Information quality includes such aspects as accuracy, timeliness, adequacy, completeness, credibility, ease of access, and compatibility across users. Weiss et al (2013) noted that accuracy with regard to information flow deals with the correctness of the data or information which is used to make decisions. This is agreement with (Evelyne et al, 2009) who found out that the major problem in information processing in organizations is not the lack of data, but the lack of clarity of the data. This is in asserted by Forslund & Johnson (2007). They further argue that information quality is measured by the degree to which the information shared between supply

chain partners meets the needs of the different partners. The study also revealed that the bimonthly order cycle for the NMS beneficiary facilities was adequate. This keeps the corporation the contextual cycle of serving the needs stakeholders particularly health facilities.

Evelyne et al, (2009) confirms that the information flow strategy is highly dependent on the relational characteristics and the business context of the strategic alliance. They further described high quality information as being accurate, frequently exchanged, and recent and containing the appropriate content.

The key informant source contextually highlighted that a section of facility orders to NMS are received with incorrect data, incomplete data, wrong units of measure, wishful orders that do not match procurement plans and worse still submitted late and some were never submitted at all.

The study found out that that NMS was committed to keeping the proper record of dispatches using the MIS software MACS and also the delivery documents for dispatches done to beneficiary facilities. MIS facilitates all the functions of supply chain at NMS. Among the gaps the system had was that it lacked vendor managed inventories (VMI) and collaborative planning, forecasting and replenishment (CPFR). This is supported by (Evelyne et al, 2009).

The study concludes that for NMS to perform better and competitively in the medical supply chain information quality up and down stream must be emphasized.

5.3.3 Information system applications and supply chain performance at NMS

The study noted the presence of management information system application at NMS that facilitates the warehouse inventory management. Information technology (IT) plays a critical role in supply chain management activities as it permits the sharing of large amounts of information between firms (Evelyne et al, 2009).

The key informant interview revealed that MIS system manager inventory right from when items are received through storage until they are dispatched to beneficiary

facilities. He further explained that for the picks for all the orders are blinded to eliminate bias.

MIS system at NMS also facilitates scanning of cartons using hand held electronic devices connected through RFID.

The study found out that a number of users still had inadequate knowledge on how to use some applications of the existing system. Forslund, (2010) indicated that the need for systematic knowledge in this area show positive relationships between well-functioning supply chain and high on-time delivery performance. Forslund (2010) further related well-integrated ERP systems in the supply chain to performance advantages. This is in agreement with the study which found out that the system down time at NMS leads to loss of man hours given that all the warehouse activities are system facilitated.

In a supply chain perspective ERP systems and applications can be a means of optimizing planning applications, monitoring production constraints, managing demand forecasting and keeping order delivery promises. NMS will need to acquire a robust system with application that perform the above functions.

5.4 Conclusions of the study

This section presents the study conclusions on the information sharing, information quality and management information applications and how they affect supply chain performance of the organisation in that order. The conclusions are based on the conceptual and contextual situations in the organisation and inferences are drawn in the light of the report.

5.4.1 Information sharing and supply chain performance at NMS

The corporation has put a number of arrangements in place to make sure that information reaches all the stakeholders especially the beneficiary health facilities. From the findings of the study the NMS role is known by the beneficiary health facilities and that there is reasonable frequent communication between the two parties and other stakeholders. NMS has put

arrangements in place to ensure health facilities are part of procurement planning at the beginning of every year and hence are aware of the range of items for which they submit orders on a bimonthly basis. NMS does and disseminates customer satisfaction surveys that are a form self-evaluation reports annually to facilities. It was noted that NMS has various communication channels in place for information exchange with the stakeholders. These are majorly used for order submission and delivery updates.

The study found out the shows that there was a moderate positive significant relationship between information sharing and supply chain performance. Therefore NMS will need to strengthen and improve the existing channels of communication. This will improve performance of the corporation.

5.4.2 Information quality and supply chain performance at NMS

As regards in information quality the study found out that a reasonable section of orders submitted to NMS were accurate and complete indicating the details of what is required by facilities. The corporation has instituted the bimonthly order cycle for the NMS beneficiary facilities since 2009 and has worked well and deemed sufficient was adequate. The checking and capture of the orders before encoding ensure that data on which order fulfilment is valid. This emphasizes the accuracy of the order translation into medical supplies the go to facilities on a bi-monthly basis. The study found out that there was a moderate positive significant relationship between information quality and supply chain performance. NMS will need to strengthen and upgrade the information quality checks, tools and channels to minimise errors in transactions to its customers.

5.4.3 Information system applications and supply chain performance at NMS

Management information systems (MIS) and their applications are key in supply chain operations. According to the study findings NMS has a management information system

application that facilitates the warehouse inventory system. It also facilitates processing and posting orders to beneficiary facilities. However this information system does not process back orders and does not have a vendor managed inventory feature. It was also noted that that the MIS system at NMS captures data Just In Time (JIT) although it is locally hosted hence cannot be accessed outside NMS. This weighs down the tracking of the medicines outside the corporation. The corporation has instituted RFID system and linked it MACS where mobile data can be relayed to the servers. This commonly applied while handling deliveries and scanning of cartons prior to loading delivery trucks. The study also concluded that a number of MIS system users still had inadequate knowledge on how to use some applications. The study findings show that there is a strong positive significant relationship between information system applications and supply chain performance. NMS needs to upgrade the current MIS infrastructure and technology and to all its customers. The corporation will also need to institute regular trainings for staff and stakeholders to maximise the use of all the applications and functionalities of the system.

5.5 Recommendations of the study

This section highlights the recommendations arising out of the study findings, which when put into action will improve supply chain performance at NMS. The recommendations will be laid out under information sharing, information quality and management information system applications.

5.5.1 Information sharing and supply chain performance at NMS

NMS has got in place a number of information sharing channels which include but are not limited to post office, email, telephone, paper and electronic media. The study findings indicate correlation between the two variables ($r=0.425$, $p<0.05$) translating into information sharing being significantly related to supply chain performance at NMS. NMS has 9 liaison offices across the country that disseminate information to stake holders. The liaison office will need to increase to 11 to reduce the current ratio from 13 to 10. The information sharing platforms will

need to increase to cover all the available that reach for all like SMS alerts. These need to be made more frequent. Information stock availability is vital and should be frequently availed to beneficiary health facilities. The newly created M&E office will need to share individual performance reports that reflect utilization of commodities at facility level. Sensitisation about all the information channels need to be emphasized through the public relations office and the regional liaison offices. The above will available more information to stakeholders and will improve supply chain performance of the corporation.

5.5.2 Information quality and supply chain performance at NMS

The supply chain cycle concludes when the supplies for the ware house are received ate facility. The supplies are distributed to health facilities through orders guided by the annual delivery schedule. According to the study findings there is correlation between the two variables at ($r=0.488$, $p<0.05$) and this indicates that information quality is significantly related to supply chain performance at NMS. The study recommends that the NMS regional officers in collaboration with health development partners strengthen the health facility staff on how to make accurate and complete orders that determine the supplies that will be distributed by the warehouse. Web based ordering which is currently limited to antiretroviral drugs should roll out to cover all other medical supplies on the NMS stocklist. The MIS system should also be improved to convert web based orders into order picks to minimise transcription errors. Although the study noted no significant relation with the sales team competence to interpreted facility orders and performance of NMS, technical expertise on medical supplies especially laboratory commodities need to be emphasized to give guidance on highly specialised laboratory supplies to eliminate incorrect deliveries.

5.5.3 Information system applications and supply chain performance at NMS

In NMS establishment management of supply chain is essentially controlled by MIS applications right for receipt of supplies up to dispatch to the health facilities. The study found out that the

correlation between the two variables of ($r=0.540$, $p<0.05$), information system applications were significantly related to supply chain performance at NMS.

The study recommends that training needs assessment for the system users be done and the identified individuals get trained to improve their capacity to utilize the system applications. The study noted that the current MIS system is not locally supported. The study recommended that MIS system be locally supported to reduce the down times that weighs down performance. NMS will need to upgrade the system to give it a feature of online access to enable vendor managed inventory. The upgraded system should be able to process the back orders to minimise repetitive ordering. It should support web based ordering to minimise paper work and minimised transcription errors that lead to incorrect deliveries. The fleet monitoring MIS application needs to be reinstated to monitor the trucks on the way to beneficiary facilities. This will guarantee the chain of custody for the health supplies along the distribution routes to beneficiary health facilities.

5.6 Recommendations for further research

The scope of the study was limited to information and supply chain performance at NMS. The supply chain performance of NMS is scored on the basis of when the right supplies are delivered to the right health facility in the right time and in the right condition. Since the supplies come to NMS thorough established contracts, any gaps in contract execution can lead to shortage of supplies at the ware that may weigh down the corporation performance. Future studies should consider contract execution and supply chain performance at NMS.

The study also did not extend into information flow efficiency in supply chain organisations particularly NMS. Future research studies should explore the measurement of information flow efficiency in Supply Chain Management (SCM) and develop possible measures (indicators and metrics) for measuring the efficiency of information flow at NMS.

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APPENDICES

Appendix I; Questionnaire

INFORMATON AND SUPPLY CHAIN PERFORMANCE IN UGANDA: A CASE STUDYOF NATIONAL MEDICAL STORES

Dear Respondent,

I am called Izidoro Sunday, a student of UGANDA MANAGEMENT INSTITUTE (UMI) pursuing a Masters degree in Management studied carrying out a study on information and supply chain performance at National Medical Stores.

You have been identified and selected to participate in this study because of valuable and vast knowledge in the subject matter. The information you will provide will be treated with utmost confidentiality. I appreciate your voluntary participation and your valuable time to answer the questionnaire, in advance.

KEY

Response	Abbreviation	Score
Strongly Agree	SA	5
Agree	A	4
Neutral	N	3
Disagree	D	2
Strongly Disagree	SD	1

SNo	Questions	SA (5)	A(4)	N (3)	D (2)	SD (1)
IV1	Items measuring Information sharing ; <i>Awareness and Ordering</i>					

SNo	Questions	SA (5)	A(4)	N (3)	D (2)	SD (1)
100	All the beneficiary facilities are aware of the role of NMS and its operations					
101	NMS communicates the delivery schedules to beneficiary facilities and stakeholders two months before the next financial year					
102	Health facilities and stakeholders are aware of the range of stock available at NMS whenever they need.					
103	Health facilities regularly receive stock lists updates from NMS					
104	The frequency of information sharing between NMS and stakeholders is adequate					
105	Facilities share future demand forecasting information with NMS annually					
106	All the ordering facilities submit their orders to the NMS ware house on a published bimonthly delivery schedule					
107	Facilities share performance evaluation information with NMS annually					
108	NM has very frequent face-to-face planning and communication with health facilities					
109	The means of order submission available are appropriate					
110	There are appropriate channels for NMS stakeholders to submit their feedback to NMS					
111	Response to customer complaints is immediate.					
112	NMS has a protocol for resolving customer complaints well					

SNo	Questions	SA (5)	A(4)	N (3)	D (2)	SD (1)
	laid down					
113	Health facilities have overall satisfaction with organisation customer service.					
IV2	Items measuring Information Quality; Accuracy, Completeness and order processing					
200	Facility orders are complete indicating the details of supplies required from NMS warehouse for refill					
201	Facility orders submitted to the NMS warehouse have reasonable level of accuracy					
202	The time given in the annual delivery schedule for order deadline is realistic					
203	NMS has an accurate order data capture system					
204	The orders submitted by health facilities have full information as required					
205	Orders at the ware house are well checked and filed before encoding					
206	Sales team is competent to interpret facility orders.					
207	The six NMS delivery cycles in a financial year are adequate					
208	All the received at the warehouse orders are accurately encoded in time					
209	Order picking and packing is done on first to expire first out					
210	Order dispatch to facilities is done according to published schedules					
211	All the dispatches have accompanying shipping documents					
212	All the facility orders are fully filled at the NMS warehouse					
213	There are shipping errors the NMS customer orders delivered to facilities					
IV3	Items measuring Information systems; System					

SNo	Questions	SA (5)	A(4)	N (3)	D (2)	SD (1)
	<i>Applications</i>					
300	NMS has an appropriate management information system					
301	All the order picks are generated by the MIS software					
302	Order dispatch is according to journeys created in the MIS system					
303	Inventories are controlled by the MIS software					
304	The IT system has a provision for processing back orders					
305	The stock movements in the ware house are prompted by the soft ware					
306	Stock transactions are Just In Time (JIT)					
307	The IT system supports Vendor Managed Inventory(VMI)					
308	The system down time affects the affects order processing					
309	Dispatches are prompted by the soft ware					
310	MIS system able to track supplies up to facility level					
311	There are challenges with information system applications					

General comment.

Thank you very much for taking your valuable time through this questionnaire.

Appendix II; Krejcie and Morgan Table

<i>N</i>	<i>S</i>	<i>N</i>	<i>S</i>	<i>N</i>	<i>S</i>
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	100000	384

Note.—*N* is population size. *S* is sample size.

Source: Krejcie & Morgan, 1970

The ever increasing need for a representative statistical sample in empirical research has created the demand for an effective method of determining sample size. To address the existing gap, Krejcie & Morgan (1970) came up with a table for determining sample size for a given population for easy reference.

Appendix III; Key informant interview guide

Dear Respondent,

I am called Izidoro Sunday, a student of UGANDA MANAGEMENT INSTITUTE (UMI) pursuing a Master degree in Management studied carrying out a study on information and supply chain performance at National Medical Stores.

You have been identified and selected to participate in this study because of valuable and vast knowledge in the subject matter. The information you will provide will be treated with utmost confidentiality. I appreciate your voluntary participation and your valuable time to answer the questionnaire, in advance.

Guide for the Sales Officer

- How often do you receive orders from beneficiary facilities?
- How do the facility orders get to NMS?
- What prompts the facility orders to come to NMS?
- Do you have any challenges with the orders submitted?
- How do you track the facility orders submitted?
- How are the orders translated into customer requirements?
- Are you able to cover all customer quantities required in an ordering cycle?
- Explain the cycle between customer order submission and receipt of the consignment.
- Do you ever receive complaints?
- What is the commonest nature of complaints?
- Is there any customer complaint handling desk?
- What is the general response from customers about the service at NMS?
- Any challenges with the Information system application?

Guide for the stores management officer

- What guides in picking and packing customer orders?
- How do you decide to which facility the consignment should go?
- When do you send consignments to facilities?

- How do you track the dispatches to facilities?
- How do you ensure that the consignments reach the intended facilities?
- How do you get feedback from facilities about the delivered medicines?
- Any challenges with the Information system application?
- How do you monitor the inbound and outbound stock?
- How do you rate the use of information systems in your operations?
- To what extent does information system enable you to accomplish your tasks?
- How do you ensure that customer orders fully fill filled?
- What measures are put in place to ensure that there are no shipping errors?
- How do you reconcile discrepancies in physical and system stock levels?
- What is your opinion on stock outs, overstocks and expiries at the warehouse?
- What is your level of engagement in the flow supplies through the warehouse?
- Any challenges with the Information system application?

Guide for the transport and logistics

- How is process of dispatch of medical supplies from NMS destined for facilities carried out?
- How do you deliver medicines to the intended user facilities?
- What challenges do you face in delivering the medicines?
- How do you coordinate with other stake holders in the delivery process?
- How is the feedback received back to the NMS warehouse?
- Any challenges with the Information system application?

Appendix IV; Distribution data retrieval guide

Aspect	Details
Request to access archives	Special request was made to access the archived distribution records for medicines and medical supplies to National Medical Stores beneficiary health facilities.
Preparation of the facilities	All the facilities for recording the data were prepared. These included computer, pens, paper, tally sheets, calculators and file folders.
Reports	Distribution reports for the period under study were extracted using MACS software and were validated.
Sampling	As per the sample size taken using the Krejcie and Morgan table 1970, orders were randomly selected and the copies printed. The printed copies were used as guide to the archive files.
Data capture	Order transactions on the files were read off comparing the quantities facilities ordered against what was issued by NMS. This information was recorded and tallied. The data was entered into computer software for analysis.
Return of files to the archives	The files were returned to their shelves in the archives after data capture.

Appendix V; NMS Customer complaints analysis January 2014 to December 2104

Complaint Nature	Frequency
Damaged Items	18
Discrepancy	1468
Double Supplies	15
Excess Supply	79
Expired or near Short life	68
Incompatible	8
Item not ordered for	30
Missing Documents	2
Non Delivery	81
Non-existent facility	2
Obsolete/out dated item	31
Order Not Fully Serviced	29
Over priced items	2
Over Stocked	49
Over Supply	15
Quality Issues	18
Wrong address	2
Wrong Item	25
Grand Total	1942

Source: Secondary data

Appendix VI; NMS Customer complaints analysis January 2014 to December 2014 by facility level

Health Facility Level	Frequency of Events
Hospitals	147
HC IV	212
HC III	505
HCII	243

Source: Secondary data

The table above categorises the complaints per level of healthcare. The complaints are frequent the lower levels than the higher levels, particularly level three at 45.62%. This is attributed to this level receiving predetermined kits for essential medicines and also submit orders for laboratory supplies and HIV care commodities.

Appendix VII; NMS Customer order fulfilment in the period January 2014 to December 2104

Broadly defined, the term order fulfilment refers to everything a company does between receiving an order from a customer (the point of sale) and placing the product in the customer's hands. At NMS order fulfilment defines the steps taken from when the order is submitted to NMS to the time medicines and medical supplies are delivered to beneficiary facilities. This defines the quantity, the quality the expected time of delivery. For this section the researcher focused on the quantities ordered against what was delivered to health facilities.

Dimension	Absolute Values	Relative Values (%)
Orders Submitted	92,154	100%
Orders Sampled	381	100%
Orders Analysed	287	75.33%
Orders fully filled	203	70.73%
Orders over filled	28	9.76%
Orders Under filled	50	17.42%
Orders Not served	6	2.09%