SUPPLY CHAIN INFORMATION MANAGEMENT AND SERVICE DELIVERY IN PUBLIC HEALTH SECTOR ORGANIZATIONS

A CASE STUDY OF NATIONAL MEDICAL STORES

BY

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DECLARATION

"This dissertation is my original work and has not been presented for a Degree or any other academic award in any University or Institution of Learning".

Signature of PULE Samuel

(Candidate)

Date

APPROVAL

"I/We confirm that the work reported in this dissertation was carried out by the candidate under my/our supervision".

Signature of Dr. Peter W. Obanda (Principal Supervisor)	Signature of Mr. Wuma Samuel Alfred (Second Supervisor)
Date	Date

DEDICATION

This work is dedicated to my late Dad and Mum, Mr. Olwa Peter, and Mrs. Akallu Catherine for the good beginning they gave me. May they rest in Peace!

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LIST OF ABBREVIATIONS

NMS	:	National Medical Stores
SCM	:	Supply chain management
SCIM	:	Supply chain information management
SCIP	:	Supply chain information processing
SCIS	:	Supply chain information storage
SCIF	:	Supply chain information flow
SD	:	Service delivery
QSDM	:	Quality service delivery management
CMSD	:	Cost management in service delivery
TSDM	:	Timely service delivery management
EDI	:	Electronic data interchange
ERP	:	Enterprise resource planning
CPFR	:	Collaborative Planning, Forecasting, and Replenishment
PCC	:	Pearson Correlation Coefficient
OAG	:	Office of the Auditor General
IGG	:	Inspector General of Government
PAC	:	Parliamentary Accounts Committee
EPRC	:	Economic Policy Research Centre
UCI	:	Uganda Cancer Institute
NDA	:	National Drug Authority
URA	:	Uganda Revenue Authority
EPOS	:	Electronic Point of Sale
SPSS	:	Statistical Package for Social Scientist

ABSTRACT

This study intended to examine the relationship between supply chain information management and service delivery efficiency in public health sector organizations. The four objectives of the study were to: examine the relationship between supply chain information processing and service delivery; assess the relationship between supply chain information storage and service delivery; evaluate the relationship between supply chain information flow and service delivery; and lastly, examine the relationship between supply chain information management and service delivery. The researcher employed a descriptive, case study and correlational designs. Using a researcher's made questionnaire, data was collected from a sample of 56 respondents from National Medical Stores (NMS) and 63 respondents from Mulago Hospital and Kisenyi Health Centre IV. Data analysis was done using frequencies, percentages, means, standard Deviation (SD) and the Pearson Correlation Coefficient (PCC) analysis. Findings revealed that, the level of supply chain information storage was highest at average mean of 4.06, followed by the level of supply chain information processing at an average mean of 3.95, and lastly, supply chain information flow at an average mean of 3.91. The overall mean of supply chain information management constructs therefore came to 3.97, interpreted as high. On the other hand, service delivery management indicated an overall mean of 2.94, interpreted as undecided. Of its constructs, quality service delivery management ranked highest at an average mean of 3.81, followed by cost management in service delivery at an average mean of 3.65, and lastly, timely service delivery management at an average mean of 1.94. With this therefore, the relationship between supply chain information management and service delivery was indicated to be positive and significant at ($r = 0.244$, Sig. $= 0.02$). This implied that the alternative hypothesis of the study was accepted, and the researcher concluded that efficient supply chain information management positively affects service delivery. It was recommended that; NMS create an environment that encourage health centres and Hospitals to easily make requisitions whenever there is a need of drugs, there is need for more supply chain professionals at NMS to bridge the gap that exist between operations work and prevailing numbers of staff, there is need to invest in Information Communication Technologies (ICT) to boast inter-organizational relationship and information flow between NMS, Hospitals and health centres throughout the country.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Currently, public entities are required to ensure that their performance objectives are met through being efficient and effective in their operations and in order to meet their 21st century global objectives; such as poverty alleviation, eradication of tropical diseases, and ensuring accountability, (National Health Policy, 2009). This has forced many of them to change their operating systems from traditional/ manual, to information driven, in order to be in position to capture wide stakeholders' data and maximize responsiveness, (Lee, & Whang, 2000). With this in mind, public sector health organizations are trying to improve their agility level with the aim of being flexible and responsive to meet the changing global requirements. In an effort to achieve this, many public entities have instituted information management systems in their supply chain networks, which include among others, Electronic Data Interchange (EDI), Enterprise Resource Planning (ERP), and Collaborative Planning, Forecasting, and Replenishment (CPFR), (McLaren et al., 2004). Supply chain information management (SCIM), as a concept that emanates from blending supply chains and information management, is increasingly becoming a common phenomenon in organizations today, and in helping improve quality of services delivery, reduce costs and improve responsiveness of the supply chain and organization at large, (Marinos 2005; Wamba, & Boeck, 2008).

In Countries like UK, USA, and Japan, companies and government entities have increasingly desired to obtain competitive advantage by employing more advanced sourcing approaches, innovation and research in areas of business, science and information technology, (Loppacher, et al., 2007). The search for new and better ways to compete, information technology and management systems will continue to receive increasing attention. One area in which globalization practices in supply chain and information management can move from traditional to hi-tech global sourcing, an advanced approach to sourcing and supply management that involves integrating and coordinating common materials, information processes, product designs, technologies and suppliers across the global environment, (Trent, & Monczka, 2005).

In most African countries, organizations have not yet developed their sourcing and supply chain practices/ strategies, something which has made them lose many opportunities in the global arena. This has mainly been attributed to the low level of information management and technological development, (Ambe, & Weiss, 2010). Shifting from a narrow cost-reduction emphasis to a more integrated and coordinated supply chain level requires a lot with regard to investing in information management systems that eventually would revamp supply chain practices in Africa. The reality however, is that, most companies and government entities in East Africa for instance, currently lack the understanding, capability or willingness to operate at such demanding levels. This has caused serious consequences with regard to the level of service delivery in those countries in form of the quality of services offered, rate of responsiveness in service delivery and the level of operational efficiency, among others, (Lynch, et al., 2010; Public Procurement Oversight Authority, 2007).

In East Africa, health supply chain information systems are not different from those in other countries, for instance, in Kenya the country faces great challenges in data collection, analysis, evaluation and interpretation of health indicators to guide evidence based policy making. This is because of lack of low institutional capacity, lack of clear functional linkages between the different components of the health system, inadequate funding, among others, (Health Metrics Report of Kenya, 2008), while in Rwanda, much as government initiated TRACnet systems to help manage health data, the system is largely paper based and has significant limitations ranging from being slow in passing data/ information from one program area to another or passing it from one system to another, which results in limited data entries, duplication, loss of critical information, higher costs, and missing opportunities for timely intervention and prevention, (Frasier, et al., 2008). Similarly, in Tanzania, a health information system was initiated to help supply each level of the health sector with the necessary information in a timely and accurate manner. However, the system was limited by members of health Ministry being frustrated by the difficult process of implementation. For instance, data collection and reports to senior management were accorded little attention yet it was a key factor in improving the effectiveness of health care within the country, (Smith, et al., 2008).

In Uganda, several reforms have been made in the public sector procurement and supply chain systems, all aimed at improving service delivery within the country. These reforms

include, among others, the formation of the NMS as a corporation in 1993, (Kabateraine, 2012). The formation of NMS was aimed at promoting efficiency and accountability in the procurement of medicine; ensuring secure, safe and efficient storage, administration, distribution of drugs; establishment and maintenance of systems to ensure high quality of medicines supplied, among others, (NMS Act, 1993). In order to achieve this, NMS operated a demand pull system whereby supply of drugs would be based on what Hospitals and health centre have ordered/ requisitioned for at that time. However, by 2008, this system had shown some gaps in the manner in which it anticipates demand shocks/ uncertainties, (Tumwine et al., 2010). Because of this, in 2009, NMS changed from a demand pull driven system to a combined driven system that incorporated both the pull and push of drugs/ medical supplies in Hospitals and health centres'. The pull system is aimed at mitigating demand shocks/ uncertainty through improved forecasting in hospital, and health centre IV levels, while the push systems targets basic illness like malaria at health centre II and III through analyzing previous consumption rates with regard to basic medications, (Nakkazi, 2011 New Vision Article). The enactment of the e-Transaction Act, (2010), and the e-Commerce Act, (2011) is a good direction towards the growth of information management systems and technology within the country. Other prospects include, but not limited to, companies like URA embracement e-Procurement, the shifting from analogue to digital systems of data transmission (what some call as digital migration) among others. This will greatly improve communication and business in general within the economy, since issues like supplier sourcing, e-Payments for instance in the payment of tax, and business to business collaboration will be enhanced, (Economic Policy Research Centre, 2010).

1.2 Problem Statement

The NMS Act, (1993) mandates the Uganda National Medical Stores (NMS) to procure and ensure the effective supply of drugs within the country. Given this mandate the NMS devises approaches in which it can best realize this objective, among other approaches include the combined supply chain system of push and pull of drugs by Hospitals and health centers. This system operates under information management through demand tracking and forecasting, (Uganda Health System Assessment Report (2011). However, despite this, recent reports including but not limited to Auditor General's Report (OAG) on NMS (2010), OAG Report on Statutory Corporations (2011), Parliamentary Accounts Committee (PAC) (2012), Uganda

Cancer Institute (UCI) Report (2010), and the Economic Policy Research Centre (EPRC) Report (2010) among others have indicated continued inefficiencies in the supply chain process of drugs within the country. These inefficiencies are manifested in form of, delays in the delivery of drugs, expiry of drugs in stores, and shortages of basic items and drugs', something which has culminated into loss of lives and resources, poor functioning of Hospitals and health centers, among others. It is because of this, that the study sought to examine, why in spite of all initiatives at NMS, service delivery has remained a serious challenge.

1.3 General Objective of the Study

To examine the relationship between supply chain information management and service delivery in public health sector organizations

1.3.1 Specific Objectives

i) To examine the relationship between supply chain information processing and service delivery in public sector health organizations.

ii) To assess the relationship between supply chain information storage and service delivery in public sector health organization.

iii) To evaluate the relationship between supply chain information flow and service delivery in public sector health organizations.

1.4 Research Questions

i) What is the relationship between supply chain information processing and service delivery in public sector health organizations?

ii) What is the relationship between supply chain information storage and service delivery in public sector health organizations?

iii) What is the relationship between supply chain information flow and service delivery in public sector health organizations?

1.5 Research Hypothesis

i) There is a significant relationship between supply chain information processing and service delivery in public sector health organizations.

ii) There is a significant relationship between supply chain information storage and service delivery in public sector health organizations.

iii) There is a significant relationship between supply chain information flow and service delivery in public sector health organizations.

1.6 Scope of the Study

1.6.1 Content Scope

The study aimed at examining the relationship between supply chain information management and service delivery in public health sector organizations. Supply chain information management (SCIM) in this context is the independent variable influencing service delivery which is the dependent variable. SCIM constitutes the following constructs; supply chain information processing, supply chain information storage, and supply chain information flow, which affect service delivery in form of; quality, cost, and timeliness of services delivered, as indicated in the conceptual framework below.

1.6.2 Geographical Scope

The study was mainly conducted at the NMS Headquarters located on Plot 4 – 12, Nsamizi Road, Entebbe, where data extracts on supply chain information management were obtained. Whereas, data extracts on service delivery where obtained from supplementary sources like Mulago Hospital and Kisenyi Health Centre IV. This is because such supplementary sources are beneficiaries of NMS services. Mulago and Kisenyi health centre IV are both located in the central District of Kampala, and were conveniently selected, while NMS was purposively selected because of the nature of the study, which aimed at examining the relationship between supply chain information management and service delivery efficiency in public sector health organizations, of which NMS best suites the study of this kind.

1.6.3 Theoretical Scope

The study was based on the information theory for data management developed by Srivastava and Venkatasubramanian (2009), which states that with the explosion of computer power and computing infrastructure, data generates can be done in multitudes, differing formats, at different scales, and in inter-related areas. This also provides us with the tools to quantify information gain or loss using dynamic systems in order to improve our ability to design mechanisms of performance. Supply chain information management can therefore better be realized if the use of information communication technologies (Computer power) is adopted, (McLaren, et al., 2004). This is because information processing, information storage, and information flow within supply chain network can easily be enhanced as a result of such technologies or use of computer power.

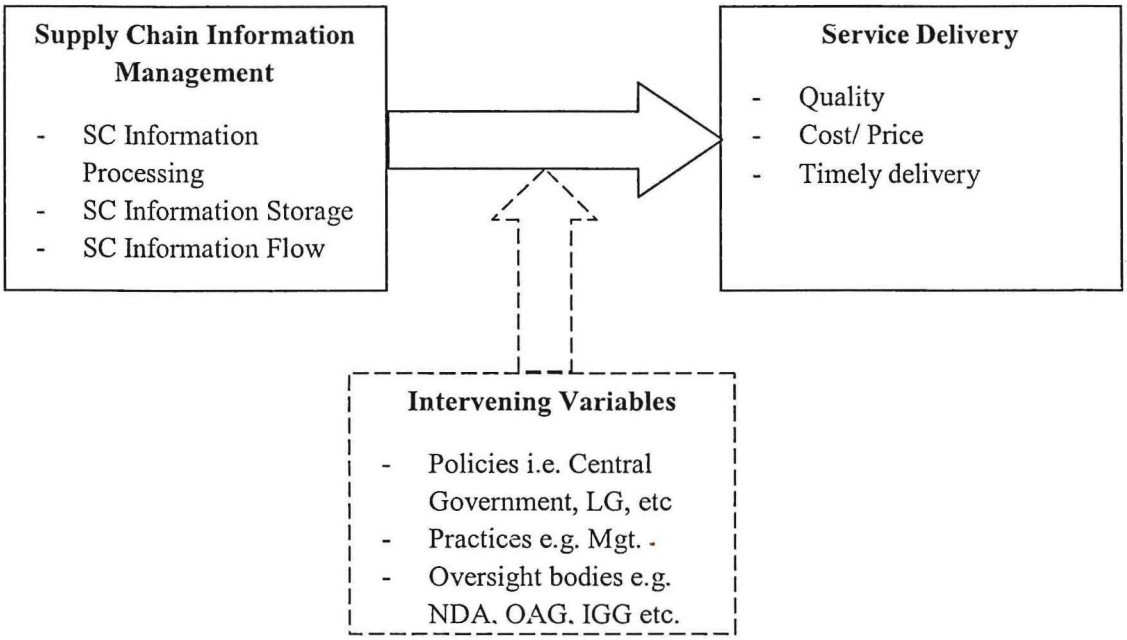
1.6.4 Time Scope

The study was conducted in a period of eight (8) months. This is because, it is the maximum period granted to us (Graduate students) by the University to conduct and report on our study findings.

1.7 Conceptual Framework

Oso, W.Y., & Onen, D., (2008) defines the conceptual framework as a scheme of concepts or variables which the researcher operationalises in order to achieve set objectives. It helps explain the relationship among variables. For instance, as indicated under this study, Supply chain information management, positively or negatively influences service delivery (quality management, efficiency and delivery time).

Fig 1: Conceptual Frame Showing the Relationship among Variables of the Study



Source: *Researcher's Formulation basing on the works of authors like Humphreys, et al., (2000), Gunasekaran & Ngai (2004), Bode, et al., (2004), Auramo, et al., (2004), Irani & Love, (2008), Lee & Whang, (2000), Mclaren, et al., (2004), & Marinos, (2005).*

Supply chain information management is the independent variable. It constitutes the following constructs; SC Information processing, SC Information storage, and SC Information flow that directly influence service delivery the dependent variable, which is constituted by the following constructs, Quality management, Cost/ efficiency management, and timely delivery. While the intervening variables (central/ local government policies, rules, management practices, oversight bodies like the National Drug Authority and others), also come into play, to influence service delivery, as the influence of supply chain information management is being operationalized. However, it should be noted that, the intervening variables were not discussed in this study, but were merely used to explain indirectly the relationship between supply chain information management and service delivery.

1.8 Significance of the Study

The results of the study may be useful in the following ways:

i. The study may enable academicians, administrators, and policy makers comprehend the importance of information management within the supply chain process, how they can accurately capture downstream information, safely store that information, and disseminate it information for effective decision making.

ii. It may help central government, and practitioners to appreciate the role of different players within the supply chain network and in enhancing visibility and cohesion as a catalyst in achieving effective cost management, quality, and overall delivery efficiency within public sector entities.

iii. It may add on the existing knowledge about supply chain information management in Uganda as a whole.

1.9 Definition of Terms

For the purpose of this study the following terms were defined to have meaning as used in this study:

- **Supply Chain Management**

  This is defined as the integration of all key business processes from end users up to suppliers who provide materials, products, and information in form of value addition for better customers and stakeholders' satisfaction.

- **Information Management**

  This is the capture, analysis, storage, and dissemination of information within or outside an organization, usually with the aim to support decision making.

- **Supply Chain Information Management**

  This is the management of information within the supply chain network to ensure effective coordination and collaboration among supply chain partners.

- **Supply Chain Information Flow**

  This involves the movement of information from one party to another within the supply chain network.

- **Supply Chain Information Storage**

  This is the safe custody of supply chain information from any persons that would alter or use it for their selfish interests.

- **Service Delivery**

  This is the provision of desired service to the people in need of it in the right quality/ standard, at the right time, and within reasonable cost framework.

- **Quality Management**

  This is the provision of goods/ services that are fit for purpose to the people in need of them.

- **Cost Management**

  This is the provision of goods/ services within reasonable cost framework and efficiency to the people in need of them.

- **Timely Delivery**

  This is the provision of goods/ services within reasonable timeframe to the people in need of them.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter discusses the concept of supply chain information management (SCIM), service delivery (SD) and their relationship as presented by different scholars, experts and practitioners. It will also present the theoretical perspective, challenges, and recommendations of SCIM and SD as analyzed below:

2.2 Theoretical Perspective

The study employed the information theory for data management developed by Srivastava and Venkatasubramanian (2009). The theory states that, with the explosion of computer power and computing infrastructure, data generates can be done in multitudes, differing formats, at different scales, and in inter-related areas. This also provides us with the tools to quantify information gain or loss using dynamic systems in order to improve our ability of designing good representations, storage mechanisms, and analysis tools for data dissemination. It looks at how information is generated, and can be analyzed to accurately, the cost-benefit analysis of information, and so on. For instance, if we store more information, we get better answers to queries, but we pay the price in terms of increased storage. Conversely, reducing the amount of information we store improves performance at the cost of decreased accuracy for query results.

In respect to this study, the information theory for data management shall be used as a cornerstone in improving the data collection process, analysis, and dissemination among supply chain members. The theory shall also provide clarity on the associated costs and benefits of information management and in helping solve complex questions using dynamics systems which are computer-aided approaches for analyzing and solving complex problems, such as determining uncertainties and consumer behavior within the supply chain network, and used to provide feedback to understand the dynamic behavior of complex systems. These dynamics were developed from the work of Forrester, J.W. which helped in the understanding and forecasting

behavior of the situations, establishing a structural framework for decision making, challenging industrial assumptions, shortening delivery times, improving customer service quality, and discovering new strategies. System dynamics has been applied to logistics and supply systems by e.g. Mason & Towill (1997); & Christopher, (1992) as cited by Lee, & Whang, (2000).

2.3 Conceptual Review

Supply chain information management and its influence on service delivery will be analyzed basing on the three constructs of supply chain information processing, supply chain information storage and supply chain information flows, as discussed below:

Supply chain information processing and service delivery; whenever information is properly collected, managed and used appropriately, service delivery is believed that it will effectively be managed, whereas if it is not well managed the opposite is true. Srivastava, & Venkatasubramanian (2009) further observe that, if we process more information, we get better answers to queries, but we pay the price in terms of increased processing costs. Conversely, reducing the amount of information we process, reduces processing expenditure at the expense of making accurate analysis of query results based on facts. Therefore, both private and public entities can improve the quality of their products, manage costs and efficiency within their operations if information is effectively processed and managed, (Irani, & Love, 2008).

Supply chain information storage and service delivery; effective information storage and maintenance within the supply chain process allow managers to plan and account for their decisions through records management. Stored information can be used for quality and cost checks, as well as, benchmarking against previous performances that the product improvement development processes. Secondly, stored information or records can be used for reference purposes, and to support monitoring and evaluations within a supply chain network, hence being a catalyzed in process or product improvement, (Srivastava, & Venkatasubramanian 2009).

Supply chain information flow and service delivery; According to Gunasekaran (2003), information flow within an organization and its trading partners is crucial for visibility, checking quality and ensuring efficiency within the supply chain network. With the aid of current technologies like the ERP, EDI and CPFR supply chain members can share strategic information

to mitigate against quality, cost and time management problems, thus effective service delivery, (Marinos, 2005; Wamba, & Boeck, 2008).

2.4 Supply Chain Information Management

Monczka, et al., (2002) defines supply chain as all activities associated with the flow and transformation of goods from the raw materials stage (extraction), through to end users, as well as the associated information flows. It involves managing systems, operations, and assembling, purchasing, production scheduling, order processing, inventory management, transportation, warehousing, and customer service. Lysons and Farrington, (2006) on the other hand, defines it as the network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in form of products and services in the hands of the ultimate customer or consumer.

According to Lambert et al., (1998) the integration of key business processes from end users through original suppliers that provides products, services, and information and hence adds value for customers and other stakeholders is what is known as Supply chain management. It is the systematic, strategic coordination of traditional business functions and the tactics across business functions within a particular company and across businesses within the supply chain, for the purpose of improving the long-term performance of the individual companies and the supply chain as a whole, (Mentzer et al, 2001).

Blending information management and supply chain is what gives us the concept of supply chain information management, (Sun, & Yen, 2007). Therefore, supply chain information management is the establishment of a full set of elements, technology based, process specific and organizational in nature that are necessary to (1) collect information from discrete processes, (2) transform this information from data into knowledge, and (3) distribute this information efficiently and in a timely manner to the appropriate data consumers, (Marinos, 2005). In his view, information was seen as critical component in the supply chain network that facilitates decision making. Information management for this matter is the harnessing of information resources and information capabilities of the organization in order to enable the organization learn, adopt and create value, both its self and for its clients or customers. It involves managing organizational process and systems that acquire, create, organize, distribute, and use information.

In this view information management is a continuous cycle of five closely related activities namely: identification of information needs, acquisition and creation of information, organization and storage of information, information dissemination, and lastly information use, (Choo, 1995 as cited by Sihlezana, 2006).

Information within the supply chain drives the creation of value across all of the critical business processes. According to studies like that of Marinos (2005); Mentzer et al., (2001); and Lambert et al., (1998) information management within the supply chain offers the following benefits: (1) improving logistics within organizations through improved visibility, tracking and monitoring of transit vehicles, fleets and cargo with the aid of technologies such as RFDI thus enhancing physical distribution operations among firms, (2) the use of EDI has promoted collaborations within the supply chain process thereby enhancing forecasting, and demand planning which reduces uncertainty problems like the bullwhip, (3) Bar coding, and EPOS systems are known for capturing data which in turn is used to detect inventory levels thus effective stock management, among others. However, Mason & Towill, (1997); Langley, et al., (2008) urges that, information systems and management within the supply chain process can posse the following challenges: (1) expensiveness not only in terms of maintenance but also in instituting them; (2) due to the high levels of technical skills required such systems are normally resisted by staff members of most organizations especially during inception. This calls for the need for training which may be expensive for some organizations.

Despite the role of information management in supply chain, research has shown that few empirically derived models can suitably analyze the effect of supply chain information management on service delivery. As a result, organizations face complex and risky decision analysis in selecting appropriate information solutions for their organizations (McLaren, et al, 2004; Redy, & Redy 2001; Mentzer, et al., 2001). In this context therefore, using selected SCIM dimensions/ constructs (SC information processing, SC information storage, and SC information flow) and their influence on service delivery which is depicted in form of (quality management, cost/ efficiency management, and timely delivery) as shown in conceptual framework (fig. 1 above) can extensively be analyzed as follows:

2.4.1 Supply Chain Information Processing

This relates to information capture, analysis, interpretation, and dissemination with the supply chain process.

Data/ Information Capture; In all public entities, be it in central Government or Local Government (LG), data/ information collection on the needs of people is crucial for effective procurement planning and budgeting. According to McBurney, (2001) needs assessment/ identification is one of the major components of data collection/ capture which involves the use of instruments such as participatory rural appraisal, observation, interviews and others. In the private sector the use of electronic systems such as EPOS, bar cords, CCTV cameras and others is a common phenomenon in capturing data for effective decision making, (Wamba, & Boeck, 2008); Mukaddes, et al, 2010). In the same context, firms ought to use order management systems (OMS) or automatic requisition systems which are used to manage initial contact with the customer at the time of product inquiries and order placement. It is the forefront of the Logistic Information System (LIS). The OMS communicates with the warehouse management system to check product availability, either from inventories or from production schedules, which provides information about availability thus facilitating effective delivery planning and management, (Mukaddes, et al., 2010).

At NMS data collection practices mainly focus on regional hospitals and health centres in order to determine demand levels of drugs for the entire region or districts. Using the combined supply chain system of demand pull and push to deliver drugs in hospitals and health units, NMS receives daily requisitions, records them, and determines when, and how to executes its cardinal function of ensuring appropriate supply of drugs throughout the country. Secondly, using the combined supply chain approach of demand pull and push problems of demand shocks/ uncertainty can be mitigated through improved forecasting at regional hospitals, and health centre IV levels, and consequently mitigating basic illness like malaria at health centre II and III through the push system, (Nakkazi, 2011 New Vision Article). Requisitions using this system are done manually or electronically by health centres and hospitals, using communications systems, such as e-mails, free toll lines, physical delivery or received by field staff in-charge of data capture throughout the country. According to the Auditor General Report, (2010) despite NMS basing its needs assessment of the demand pull and push system, the entity uses data bases on

actual average monthly consumption (AMC) sales for the previous six month to determine what, how much and when to procure drugs. This however, may result into improper decisions on the actual drugs to procure given the demand levels at hand, since previous assessment never provide actual figures on what prevails today. The report also indicated that, sometimes assessments were done exclusive of customer orders which were not honored which can be the cause of inconsistent delivery chains of drugs by NMS to Hospitals and health units. This shows that, NMS majorly executes its drug delivery operations based on the Push systems rather than the demand Pull system. McLaren, et al., (2004) observes that when decisions are based on previous information rather than current situational occurrences then they are bound to be irrationally made. In line with this, NMS cannot use AMC sale to determine the prevailing demand at hand. This partly explains the mismatch in order fulfillment process by NMS to Hospitals, and health centers which was highlighted in reports like, the Auditor General Report on NMS, (2010), AOG, on statutory corporations, (2011), and the Uganda Cancer Institute Report (2010), among others.

According to the Auditor General Report, (2010) in order to improve the data collection and assessment process, the management of NMS should put in place appropriate systems and develop staff capacity for collection, and processing of information needs. This is because the identification of information needs should be sufficiently rich and complete in representing and elaborating the users' true needs. Depending on the information use requirement, information could emphasize hard or soft data, elaborating existing goals or suggesting new direction, helping to define problems or make assumptions explicit, or provide future forecasts, (Sihlezana, 2006).

These data collection systems should not only operate in the downstream in form of capturing information from users of services/ medical supplies, but also capturing intelligence information from upstream sources in form of supply base analysis. A combination of both downstream and upstream data collection will enable NMS to be in full visibility of the supply chain process both in terms of warehousing control and physical distribution management. In 2010 the Auditor General's Report indicated that the inability of the NMS to use the appropriate data to plan and procure the right types and quantities of drugs is responsible for incidences of wrong deliveries, inadequacy, and excessive supply of medical products at health centers and

regional hospitals. This shows that, data management in particular, the data capturing systems, need to be improved through automation and recording, right from the field. This will improve demand planning, budgeting and physical distribution management by NMS, thus offering effective service delivery.

With regards to other public entities, data collection similarly plays a key role in effective planning and budgetary process. For instance, according to the Local Government Act (2006), government is not mandated to fund procurement of any nature without prior community needs assessment/ identification (part of data capture). This is aimed at enhancing needs, based on procurement and addressing key pressing demands for the people. Through community participative mechanisms like Participatory Rural Appraisal (PRA) these needs are identified, qualified and subjected to attention of local leaders/ councilors before a notification is given to government or Ministry of Finance, for funding.

Data Entry and Codification/ cleaning; The Health Information Systems Report of Africa, (2008) states that, data entry is one of the key functions of information processing in that, if data is wrongly entered into the system, the output will definitely be affected (does not reflect the true picture/ state of affair on the ground). Further, McBurney (2001) asserts that since data are facts, which support rational decisions, it must be handled/ entered professionally. Secondly, the use of appropriate software tools such as EpiData is critical in mitigating human errors and mistakes. Whilst most public sectors entities in Uganda record data manually using paper files, NMS developed data management mechanisms known as Open Database Connectivity (ODBC), On-Line Analytical Processing (OLAP), and On-Line Transaction Processing (OLTP) to try mitigate human associated error involved in data management/ entry (Daka, 2008). These tools automatically compute and codify information/ data once entered. They also makes it simple and easy for people managing data, allocate/ identify any piece of information that is needed, for instance, establishing the number/ quantity of current stock can now be done electronically.

According to the A Frost & Sullivan White Paper (2010), data management practices particularly entry systems, are taking a new twist, especially in the field like finance, accounting, public administration and others, because of their importance. If data is not accurately entered into a system everything becomes misrepresented. So because of the sensitivity of data nowadays computerization and professionalism is pertinent for its effective management. Taking an

example of a slight mistake involved in entering electro results; this would significantly give misrepresentation of the true picture on ground. The need for advanced data management practices, such as computerization, professionalism is crucial for the success of any organizations, (Petrovic, 2001)

Data Analysis and Interpretation; This involves systematically examining and assessment of the various data that has been captured and drawing meaning from it for effective decision making. Lysons & Farrington, (2006) avers that, rational planning is pertinent for effectiveness of supply chain operations. These operations may include but not limited to inventory functions, production management, and physical distribution and others which are fundamental in defining any entity. In the same way, public entities, like NMS, ought to a touch adequate consideration in professionalism and the use of computerized techniques of data analysis/ interpretation, for effective planning and management of supply chain activities. Computerized programmes like SPSS and EpiData can, for instance, help in the effective analysis and interpretation of quantitative data collected from the field, (Oso, & Onen, 2008).

Reporting/ Dissemination of Information; when data has been interpreted, conclusions are drawn and decisions made. It is now up to managers and/ information users, to decide what to do with this information. Managers are key information users, because they work in an environment that is full of uncertainty, which requires making decisions basing on collected facts. According to McLaren, et al., (2004), it is through information that knowledge is created. Knowledge not just in the sense of data and facts collected, but knowledge in the form of representations that provide meaning and context for purposive action. However, managers should understand the requirements for information dissemination and methods that provide high degree of flexibility in information representation. This will facilitate vigorous exchange and evaluation of multiple representations among individuals and situation circumstance, thus aiding effective decision making, (Sihlezana, 2006).

With this in place, information can then be disseminated to the respective supply chain partners in order to support decision making. Timely and accurate information dissemination among supply chain partners enhances efficiency and coordination, which eventually improves service delivery and customers satisfaction, Vanpoucke, et al., (2009). Information sharing as the main reason for dissemination among most organizations increases visibility within the supply

chain process thereby mitigating against upstream and downstream challenges, such as supply scarcities and demand fluctuation, among others, (Ballou, 2004). In this spirit, government entities can employ inter or intra-organizational mechanisms to exchange data among the various departments and trading partners. NMS for example is currently engaged with various stakeholders/ partners in a bid to enhance its supply chain efficiency, for example, it has signed a memorandum of understanding with entities like Center for Disease Control (CDC), USAID, Malarial Control Project (MCP) and others, to enhance procurement, and the supply chain process of drugs within the country, (Auditor General Report on NMS, 2010).

2.4.2 Supply Chain Information Storage

Supply chain information storage (SCIS) refers to all mechanisms an organization puts in place to provide safe custody of information/ data that is received and not yet used in the supply chain. Information storage / record management should be seen as a corporate area of endeavor involving the administration of all business information throughout their life cycle. According to the ISO 15489: 2001 standard, information management activities include 'the creation, receipt, maintenance, use and disposition of records, including the processes for capturing and maintaining evidence of information about business activities and transactions in form of records.' This makes record management/ information storage a key function within the organization. For this matter, Hasan, et al. (2008), classifies SCIS into two broad categories namely; manual information storage and computerized information storage as follows:

Manual storage/ recordkeeping systems; this involves keeping information/ data in paper form/ hard copies, as evidences of business activities. Manual storage systems are the most information storage systems used in developing countries, because they are easy to manage and have limited risks of loss, of information compared to the computer storage systems. According to the Australian Standard AS (ISO 15489 2002), this types of information storage systems (manual), operates in such a way that, when information is captured/ received, it is sorted, and filed as evidence of business activities, which can later be used in decision making, such as pursuance of legal obligations or in business transaction. The State Records Act, (1998) therefore, defines manual information storage systems as any document or other source of

information compiled, recorded or stored in written form or on film, or by electronic process, or in any other manner or by any other means.

However, manual storage/ record management systems require huge space within the organization in form of physical stores that are used to keep documents/ archives. In most cases this physical space is a challenge since it is scarce and not readily available to most organizations. In Uganda, manual information storage is the most common form of information storage systems, which is usually in form of files. For instance, in Courts of Law, Local governments, and other ministries information is still commonly kept in paper files with the claim that computerized systems can easily be manipulated by hackers and information distorted, something which makes most of these entities reluctant to institutionalize computerized data/ information storage systems.

Joseph, (2012), urges that manual supply chain information storage systems can be advantageous in the following ways: (1) they are less expensive to set up, (2) correcting entries may be easier with manual systems, as opposed to computerized ones that can leave complicated audit trails, (3) the risk of corrupted data is much less, (4) data loss is less of a risk, particularly if records are stored in a fire-proof environment, (5) problems with duplicate copies of the same records are generally avoided, (6) the process is simplified as you don't need to be familiar with how accounting software calculates and treats your information, among others. However, this mechanism of information storage is slow, and full of human error which makes it unreliable and consequently affecting service delivery, (Hasan, et al., 2008).

Computerized information storage systems; these keep data/ information in soft copies, with aid of computer technologies such as the Internet, Web portal, databases and others. They involve the use of limited paper work, as it is the case, in the manual storage systems. In Uganda, computer based storage systems are just gaining momentum with a few entities currently using it. NMS in particular has adopted Database management solution called 'SAP', which it uses to centralize data and make it easier and efficient for users to access and execute their respective duties. Since 2008 when the solution was established, it is on record that stock control problems have reduced from large operating figures to relatively small characterized by minimum losses, mistakes/ errors and mismanagement of stock information.

Due to globalization however, and the interconnection of entities today, managers have opted to use digitalized systems to enable become competitive in the global environment. The nature and sophistication of consumer needs, products and business environment as a whole is one of the driving factors towards information technology, innovations and research in organizations today. The use of IT aided storage systems and interconnection is simply reaction towards global enterprise to notions of accuracy, efficiency and broad band data storage and operating systems, (Ambe, & Weiss, 2010).

Sharma, (2012), further explores the benefits of computerized supply chain information storage systems as: (1) helps you record your business transactions, including income and expenses, payments to workers, stock and asset details, (2) efficient way to keep financial records and requires less storage space, (3) provides the option of recording a sale when you raise an invoice, not when you receive a cash payment from a client, (4) easy to generate orders, invoices, debtor reports, financial statements, employee pay records, inventory reports, (5) automatically tallies amounts and provides reporting functions, (6) keeps up with the latest tax rates, tax laws and rulings, (7) many accounting programs have facilities to email invoices to clients, orders to suppliers, or taxation offices, (8) and lastly it allows you to back up records and keep them in a safe place in case of fire or theft.

With such benefits many entities are continuously opting for computerized storage systems, than the manual ones. However, Hasan, et al., (2008) argues that computerized information storage systems in supply chain can be crippled by numerous cyber challenges such as viruses, Trajan horses, worms, hackers and others, which endangers the organizational key information resources.

2.4.3 Supply Chain Information Flow

Supply chain information flow (SCIF), relates to how information is shared/ distributed among supply chain partners in order to improve on decision making and service delivery. Information sharing, as a dimension of supply chain information flow, relates to how critical and proprietary information is communicated to one's supply chain partner, (Wamba & Boeck, 2008). Effective information flow should consider the following four questions: (1) *what* to share, (2) *whom* to share with, (3) *how* to share, and (4) *when* to share. This helps supply chain

members optimize performance by minimizing overload or deficiency, reduces supply chain cost, and promotes responsiveness within the physical supply or distribution process, (Sun and Yen, 2006). Supply chain information flows generally involves sharing information in form of (1) order quantities and prices, (2) operational information such as inventory and point-of-sale (POS) information, and (3) strategic and competitor's information on demand and competition among others, (Wamba & Boeck, 2008). With this kind of information sharing, supply chain members are enabled to adequately plan for anomalies that accrue within the supply chain network, hence effective decision making.

Public sector entities like NMS, regional hospitals, and health centers engage in supply chain information flows/ sharing in many ways including but not limited to communicating to their suppliers, logistical personnel, store managers, and business partners, among others. NMS for instance, ensures the safe management of fleets or transit vehicles by using ICT technologies like the radio data frequency identification methods (RDFI) as system that promotes visibility and control of vehicles in transit against risks of theft, and vandalism of cargo taken to a particular destination. Empirical evidence on studies like Tumwine et al., (2010); Marinos (2005); Sweeney, (2006) & Mukaddes et al., (2010) and others indicate the pertinence of information technology in supply chain management.

According to Gunasekaran (2003), information flow within the supply chain process can broadly be categorized in two ways, namely; intra and inter-organization supply chain information flow as discussed below:

Intra-organizational supply chain information flow; this relates to data flows within an organization, i.e. among the various departments of the organization. It involves sharing information using e –technologies like electronic data interchange (EDI), internet, among others. Intra-organization information flow is important in improving decision making within the organization, although such systems are costly to implement. They also require people and processes in an organization to undergo significant change, learning, adaptation and growth in response to the introduction of IT. The changes are often drastic and cause intra-organizational tensions. Integration of the supply chains activities and processes before development and implementation of the information systems in SCM is needed, (Cited by Kuruppuarachchi et al., 2002 in Gunasekaran & Ngai, 2003).

In 2009, NMS decided to shift from the pull system to a combined distribution strategy. Under this strategy, NMS experienced vast structural changes that involved vigorous staff training, and adaptation, streamlining of operations from manual to information driven systems that fully incorporate IT, for instance, the entity stopped automatically sending pre-packaged medicine kits to the health units every three months (the "push" system). Instead, funds for purchase of medicines for each health facility would be put at the NMS, as a "Credit Line". Each health facility would make its requisition directly to the NMS and order for only those products which it needs, progressively reducing its credit at NMS, (Maniple, everdmaniple@umu.ac.ug. Though the system has so far recorded good results in terms of enhancing responsiveness in service delivery, quality improvement and accuracy in ordering, it was characterized by downsizing of staff members, and huge amount of money to install.

Inter-organizational supply chain information flow; this relates, to the flow of information, among different entities/ organizations within the supply chain. According to Ballou (2004), such entities are called 'Super-organization'. The super-organization is a group of firms related through their business processes and mutual objectives (satisfying customers and maximizing profit), but which are legally separate. They share a common interest in their individual decision, which make them forge alliances in order to best achieve their objective. For example, NMS and organizations like Global Fund, Center for Disease Control (CDC)/USAID, Malarial control Project, UNFPA, MoH, Leprosy, and others, are some of the entities in partnership with NMS with a view of supplying or improving the supply of drugs within the country. These partner entities, through signing a memorandum of understanding entrust NMS to work on their behalf and fulfill their agenda of health improvement within the country, (Auditor General Report, 2010). Partner institutions mainly support health within the country through donations, advising NMS, and sometimes, helping in procurement of drugs within the country, (Uganda Health Assessment Report, 2011).

Health being a Millennium Development Goal, some scholar's argued that it cannot be achieved without collaborative alliances, and information sharing/ flows among supply chain members. Gunasekaran & Ngai, (2003) observe that, information sharing/ flows among supply chain members, be it suppliers, consumers, or distributors is essential for visibility, and accuracy within the supply chain network, and in order to procure, store the rightful quantities, and

ensuring appropriate supplies to final consumers. This was one of the main challenges of NMS in 2011/ 2012. For instance, despite the existence of enough stocks of drugs at NMS, there were shortages in health facilities, and all what these entities (NMS and health units) would do is to accuse each other of various failures in the delivery chain. This indicated lack of effective information flows between NMS and health units, which culminated into poor supply chain management, (PAC Report on Health, 2012)

In both public and private sector organizations inter and intra-organizational information flow takes a variety of forms which include corporate portals, intranet, and extranets among others. These platforms of communication or information flow are supported by information technologies like the internet, electronic data interchange (EDI), and the use of enterprise resource planning facilities, (Vaidya et al., 2006; Gunasekaran & Ngai, 2003). To support inter, and intra-organizational sharing of resources and competencies in network structure, communication and co-ordination need to be maintained. Information technology has a pivotal role to play in improving communication and co-ordination by acting as an enabler. Through this, e-business is promoted through procurement, joint design, consultations and information support, which are catalysts in the establishment of computer network that aid the search and retrieval of support information within the supply chain, thus leading to effective decision making and coorporation among firms and their departments, (Cited by Love, 2004; Kalakota & Whinston, 1996 in Gunasekaran & Ngai, 2003).

Despite such benefits that come across, as a result of inter and intra-organization information flows, Ballou, (2004) observes that, the growth and development of IT has been crucial in promoting effective information flows within the supply chain network, in that, efficiency and the speed of communication/ information sharing has been enhanced through the use of technologies like e-mail, cell phones and others. With this, buyer-supplier relationships have been improved through purchasing consortiums, partners and other forms of strategic alliances, thus reshaping the global environment. The impact of IT on SCM is much larger as it facilitates both inter and intra-organizational communication, which in turn improves the product development process, reduction in lead time, and enhances quality management since strategic information can easily be shared among department and partner organizations, (Gunasekaran & Ngai, 2003).

Further, information systems such as e-Commerce provide opportunities for organization(s) to expand their markets worldwide. For instance, once a company places its products/services on the internet, its demand is expected to increase because of exposure. So given these opportunities that come along with IT, the need for SCM systems becomes mandatory for most organizations today in order to meet such growing demand. Coupled with agility, supply chains should meet customer requirements that are online, through embracing open platforms of communication such as, the use of ERP systems, and EDI. These technologies support seamless integration of partnering firms, and facilitate an increase in agility and a reduction in cost. They enhances teamwork and customer relationship management (CRM) for designing new products and act as platforms for receiving feedback from customers, promoting proactiveness in responding to changing market requirements, (Humphreys, et al., 2000; Gunasekaran & Ngai, 2003).

2.5 Service Delivery

Service delivery refers to the provision of services to the intended clients/ customers. Customers' referring to the recipients of these services being offered, (e.g. the general public). In the public sector, provision of services can be in form of; road construction, education, health, and security among others. The effective provision of services (quality, cost, and timelines in delivery) is a constitution mandate of government to its citizens, (Constitution of the Republic of Uganda, 1996). As an economic function, government taxes its citizens in order to facilitate public finance activities, such as, provision of health services, education, security, and public assets like roads among others. Service delivery in the public sector should be guided by the principle of 'service to the people,' which means that the system of service delivery should be reoriented towards the customer's favour, (Economic Policy Research Centre, 2010).

According to the Best Practices Sub-Committee Report (2012), if citizens/ customers are put first, delivery of public services will substantially address the needs of the people. With effective public service delivery systems, the public is made to hold public servants to account for the service they receive, something which promotes the energy and commitment of public servants to introduce more customer focused ways of working. In the same way, the South African Department of Public Service and Administration Report (1997), asserts that

governments should at least have a list of service delivery principles which guide the operations of each and every entity within the country. These principles must be aligned with democracy and accountability in order to be owned by people/ citizens as follows: (1) users and consumers of public services should be consulted about the level and quality of the services they receive and, wherever possible, to be given a choice about the services that are offered, (2) users and consumers of public services should be told what level and quality of service they will receive so that they are aware of what to expect, (3) users and consumers of public services should be treated with courtesy and consideration, (4) users and consumers of public services should expect full, accurate information about the services they are entitled to receive, (5) the public should expect to be told how national departments and provincial administrations are run, how much they cost, and who is in charge, (6) users and consumers of public services should expect that, when the promised standard of service is not delivered, they will be offered an apology, a full explanation and a speedy and effective remedy, and that any complaint will produce a sympathetic, positive response, (7) and lastly, the public should expect that public services will be provided as economically and efficiently as possible (value for money).

In respect to the conceptual frame of this study, service delivery (SD) is a dependent variable with constructs like quality management, cost management, and time management in delivery of service to the public. These key constructs can be compressively analyzed as follows.

2.5.1 Quality Management in Services Delivery

According to the ISO 8402, as cited by Loppacher, et al., (2007), quality is defined as the totality of features and characteristics of a product or service that bears its ability to satisfy stated or implied needs. It is the fitness of the delivered item to be used/ or how the delivered items meets the required standard of use. In Uganda, quality management is enforced by UNBOS which is a regulatory body of standards within the country. It inspects and certifies all products and services produced locally, and those imported from other countries. UNBOS works alongside the International Standards Organization (ISO), which is the regulating body of standards throughout the world. ISO is based in Geneva, Switzerland.

Quality management in public service is overseen by the Auditor General, Public and Disposal of Assets Authority (PPDA), Parliamentary Accounts Committee (PAC), and the

Inspector General of Government (IGG) and others who are responsible for ensuring that values for money is attained when money is allocated to entities. The NMS for instance, through its functional departments like procurement Unit, and Quality control Unit and others ensures that quality of goods and services procured, stored and distributed is maintained throughout the supply chain process, (Auditor General Report, 2010).

Quality can also be checked through consulting the final user/ customers of the products being offered for consumption. Since they are the ones consuming the products they know best how it tastes. According to Akao, (1990) the best way of determining the quality of a product is to consult the users of a product. And that organizations should use quality management tools like the QFD which is a planning and analysis tool for translating the customers' requirements (as expressed in their own words) into the appropriate technical requirements for each stage of marketing, production planning, product design, manufacturing engineering, operations, sales and services. It helps to identify the design requirements to be optimized and the quality characteristics to be controlled (Oakland and Dule, 1994). This is practically possible if NMS is to use a needs assessment approach such as Participatory Rural Appraisal (PRA) to identify the needs of the people/ health centers and regional hospitals, before drugs are procured and distributed. This is meant to minimize instance of delivering wrong/ substandard items/ drugs as cited by the Auditor General's Report on NMS, (2010). Some of the quality management issues cited under this report can be summarized as follows:

- Pilferage of drugs during distribution resulting from poor handling, especially during transportation, loading and offloading consignments. This led to contamination of drugs thereby affecting their quality components.
- Ineffective information sharing mechanisms between health centers, NMS and the Ministry of Health on health management information such as drug usage and stocking positions and others greatly affected the quality of drugs in the supply chain process, which consequently, made patients in health units desperate and probably resorted to any available drugs in the market, regardless of the quality.
- Defective/poor quality drugs such as Fansidar were delivered to Adjumani District, having been procured from M/S RENE Industries based in Kireka, Kampala. These

tablets were of poor quality and changed colour from white to pink, (Auditor General Report, 2011).

Despite the existence of a quality control unit at NMS, the entity is still being challenged with regards to ensuring quality in its drug supply chain process. Some reports like the PAC Report on the State of Health (2012) have indicated that, NMS and health units were pointing fingers at each other for failing to effective supply drug to health unit something which shows that there was lack of coorporation and information sharing between these entities. It is very challenging to precisely fulfill a customer's needs without consulting them. So the use of QFD tools/ approaches is pertinent if an entity like NMS would accurately fulfill the needs of hospitals and health units within the country, Akao, (1990).

2.5.2 Cost Management in Service Delivery

Whilst it is known that public health services are offered for free, people in charge of managing the physical distribution process of health services/ drugs and associated supplies should not take it for granted, since this is public money, (Uganda Health System Assessment, 2011). Every public servant is expected to exhibit due diligence with regard to managing public resources. This is when value can be realized out of the services offered. When resources are wasted/ or misused the taxpayers lose, yet they facilitate the operations of government and the smooth running of the economy through paying taxes. Managers therefore, ought to account for all resources entrusted to them, (Humphreys, 1998).

Pfeffer & Salancik, (1978) cost is normally associated with the concepts of 'economy and efficiency', where *efficiency* is an internal standard of measuring performance. It looks at resources as being utilized within an organization, while the term *economy* is used to refer to how one uses minimum possible resources to achieve a desired output. The operationalisation of these concepts (efficiency and economy) in the supply chain process is crucial in lowering the price of the final product/ service being offered, (McLaren et al., (2004). For instance, if the supply chain process of drugs in NMS is made efficient and economical as possible, then it will imply that few resources will be used and minimum time taken in the procurement, and distribution of drugs to health centers, thus effective service delivery.

According to the Auditor General's Report (2011), cost management in the supply chain operations of NMS is challenged in the areas of procurement, storage, and distribution of drugs as indicated below:

- Failure to supply Reagents to the Uganda Cancer Institute (UCI) for almost a year negatively affected the operations of health centres. For instance, expensive machines were subjected to redundancy/ waste during that time of hold.
- Supply of drugs not regularly used under the credit line/ kit system led to the accumulation of unnecessary stock in health centre IIs and IIIs of districts like Mpigi, Masindi, Hoima, Kiryandongo, and Adjumani, among others.
- In addition, there were high stock levels of Coartem anti malarial at the health facilities at the expense of other desired essential drugs that were required. This denied majority of the population to access drugs. .
- NMS delivery of drugs to health centres was not consistent with the budgets of those health Units. For instance, to some, deliveries were significantly below the budget, while to others, deliveries were significantly above the budget framework. These variations negatively affected budget system of health centres. Secondly, such over deliveries caused excessive drug stocks which got exposed to the risk of getting expired.

With this, NMS needs to devise necessary solution to mitigate some of these challenges, McLaren et al., (2004) urges that for an organization(s) to address the problem of stock shortage, and excessive stock, it needs to: (1) employ adequate and professional personnel within appropriate department, (2) ensure appropriate system of information management, and lastly (3) collaborate with key supply chain members e.g. customers, suppliers, business partners and others. All these into play, efficiency will be enhanced and wastes minimized within the internal operations of that entity, hence effective service delivery.

2.5.3 Timely Service Delivery Management

This is one of the key aspects / ingredient of measuring service delivery which is depicted in terms of how responsive and efficient services are delivered against the required or stipulated time. Auramo, et al., (2004) argues that in contracts management, a contractor is measured on how he/she completes his/ her assignment on time without compromising quality and the

quantity of a service. Poor time management is a result of lack of competitiveness, lack of priorities, interruptions within your way of operation, inability to say "No", procrastination, and poor self- organization skills, among others, which culminate into poor service delivery in form of delays, cost escalation, low productivity among workers, and loss of customers, thus reduced organizational competitiveness, and consequential failure, (Humphreys, 1998).

Despite the need for timely delivery management of services in the public sector, Reports likes the Auditor General, (2010), PAC Report on Health, (2012) and PPDA Baseline Survey, (2010) indicate some gaps in the rate of responsiveness in the provision of drugs in Hospitals and health centers through the country. Such kinds of delays/ irresponsiveness is largely attributed to lack of sufficient resources, use of unskilled workforce, and the absence of an effective information management systems to operate an organization's activities with due diligence and ease, (Ambe, & Badenhorst-Weiss, 2010).

In NMS timely service delivery management has been ensured through the combined delivery system of pull and push, maintain existing logistical facilities like trucks, and continual retrieval of feedback information from Hospitals and health centers in order to deliver effectively forecast and supply the required items. However, despite this, the Auditor General Report on NMS, (2010) and his Statutory Report on Corporations, (2011) highlight the following cases regarding poor time management of service delivery by NMS:

- The National Medical Store's failure to benchmark best practices in sales management that includes but not limited to having stipulated time for processing and delivery of customer orders is a major contributor for unnecessary delays in the processing and delivery of drugs to health centers.
- Although several assets had been earmarked for boarding off, there was a delay in implementing the disposal. The items listed for disposal included among others the following vehicles: seven tracks, two Land Cruiser vehicles, and one Mercedes Benz among others. This continued delay in the disposal process could lead to further loss in value and high holding and maintenance costs of such assets.
- Stock outs caused irregular supply of essential drugs to hospitals and health centres. This is because the supply chain pattern gets disrupted as a result of these stock outs.

With due respect to the above, the supply chain process of drugs is often based on deadlines and unexpected demand fluctuation depending on the prevailing condition, for instance when epidemics like Ebola, Cholera, and others strike, NMS is expected to respond accordingly, and there is no at one time that a delay or short of drug would be desired since this would cost lives. Strong management systems of information management, HR, and supply chain operations, need to be put forth at all times in order to realize this agenda, hence effective service delivery.

2.6 Challenges Faced in Supply Chain Information Management

Smith, (2003); Kaseje, (2006); Kimaroa & Nhampossab, (2007) observed that, despite the importance of information management within the supply chain networks of most public health sector organization, there many challenges faced, including but not limited to:

Limited resources; this is one of the most underlying factor for the deficits in data management in Africa. While the effects of resource limitations are felt in all countries, they are particularly pronounced in the sub-Saharan Africa. The problem of inadequate resources limits government capacity to collect health information/ data among hospitals and health units. For instance, the problem of inadequate expertise in collecting and reporting health sector information limits the operations of institutions like NMS in terms of information management and service delivery, (Uganda Health System Assessment, 2011).

Similarly, most sub-Saharan countries have limited budgets, something that renders their institutions inefficient in terms of service delivery. The question of adequate funding in pertinent in the efficient and effective operationalization of public sector health organizations activities, such as managing drug distributions within a country. Essential Drugs Monitor, (1998) observes that, employees need to be paid, systems need to be instituted and logistical facilities need to be maintained if the drug supply chains are effectively to be managed; without money, this is practically impossible, and service delivery will definitely be affected.

Limited skilled workforce; The limited number of opportunities for higher education available in Africa means that only a small proportion of the population is able to attain tertiary

training in specialized fields such as drug epidemiology, pharmacy and medicine. In Uganda for instance, not over five academic institutions offer training courses in pharmacy, and medicine, which makes the profession have very few qualified staff within the country. The major challenges now in the region, is how to address the problem of the lack of basic indicator data and how to train staff to the standard required to undertake health data collection. One of the key tasks for the development of sound data collection practices is to build human resource capacity through the provision of training and training materials. In an environment where such specialized knowledge is lacking, it becomes necessary to consider the validity and reliability of such data, since they may have been collected without consideration being given to potential indicators, (Smith, 2003).

Political influence; One of the main objective of any health supply chain information systems is to build capacity for data collection through collaboration with national counterparts. However, these counterparts are usually selected with the support and approval of Governments and the delegated counterpart is therefore often a government department or individual civil servant. This institutionalizes the system, which improves sustainability, but also exposes projects to the foibles of politics. The effects of this can be felt at the level of individuals, parties and, indeed, the entire nation. Political activity can not only disrupt the smooth development of projects, but can also jeopardize their feasibility. In a number of countries in Africa, surfer political instability is in form of civil conflicts which affect the supply chain process and associated information management practices.

Insufficient modern information communication technologies and infrastructures in most health sector organizations of Africa, renders service delivery a big challenge. For instance, in Uganda the lack of adequate modern technologies and infrastructures of communication such as the internet connection makes it hard for entities like NMS to effectively communicate to health units and hospitals that are located in rural area where most of such technologies are not found. This renders data capture and information flows practically inefficient within the drugs supply chain system of Uganda, hence, poor service delivery, (Auditor General Report on Statutory Corporations, 2010).

Similarly, poor records management, is a challenge, without modern information systems of storage. It has been indicated that many of the sub-Saharan countries lack computerized information systems of management, and that most of the records are stored manually in files. This makes it hard and expensive for such organizations to safely keep broad band information without consuming lots of space and resource.

Inadequate collaborative networks, among key supply chain players, in the public sector service delivery process. According to the National Health Policy (2009), most health organizations have invested less in collaborative networks with their partner organizations like suppliers, customers, and donor agencies, which render information exchange and collaborative planning among them practically difficult. For instance, NMS has to establish linkages for data collection among health units and hospitals, and also provide feedback to the Ministry of Health with regard to the state of drugs within the country, (Health Sector Strategic Plan III).

2.7 Measures of Improving Supply Chain Information Management

Clearly there is a need for managing supply chain information in public sector health organizations if services are to effectively be delivered. Several scholars propose measures to mitigate supply chain information management challenges indicated above as follows:

There is need to collaborate with Governments at the highest level possible in order to mitigate the impediments of politics and resource limitations, (Health Sector Strategic Plan III). When key government officials are well briefed on the importance of information management within the supply chain process of drugs for instance, political support and resource allocation will easily be realized and given the priority it deserves. Secondly, lobbying key government officials supports effective policy formulations and assessment of key information management practices for the betterment of service delivery within a given country.

Innovative approaches are required to respond to the lack of routine data collection practices within public sector health organizations, such as the use of key informant networks. According to the PAC report 2012, NMS had failed to embrace innovative and proactive approaches to handle complaints and concerns of health facilities within the country, which caused NMS and health units to accuse each other for the failures in the drug delivery chain.

Innovative approaches like encouraging health sector information flows right away for the downstream is critical for demand planning and management, hence effective service delivery.

Training of key health sector officials at the grass-roots level is crucial for data captures, and management within public sector health organizations like NMS. This helps in broadening the identification of needs at local service level such as health centres, something that can improve information management within the supply chain process and service delivery. Similarly, the introduction of more medical and science courses at higher institutions of learning is crucial for promoting health professionalism and supply chain data management across the country, given the fact that, research has shown that, one of the main causes for the failures in service delivery, especially in the health sector, is the absence of adequately qualified personnel to manage health sector systems such, as data collection, analysis and representations, which is clear evidence in most health units within the country, (Uganda Health System Assessment, 2011).

There is need to establish basic infrastructure and communication networks to collate and report on drug information within the country. Government needs to provide computer equipments, software's and the internet in all hospitals and health centres across the country, if it wants to fully optimize supply chain practices. According to the Economic Policy Research Centre, (2010), such technologies will help in the efficient data collection process, management and dissemination among health sector institutions like the NMS, NDA, and Ministry of Health, which enables the effective tracking and monitoring of health information, especially, at the local level across the country.

Finally, there is a need to mobilize local support and leadership in the active involvement and in the provision of assistance on how information can best be collected, managed and communicated to government, in order to overcome communication barriers, and in providing technical guidance in the development of local training programmes that will enhance the collection of data and in the development/ implementation effective of service delivery systems within the country, (Humphrey, 1998).

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the research design, population of the study, sampling methods, data collection and analysis method, data control and ethical procedure as follows:

3.2 Research Design

The study adopted a descriptive and case study design to allow for in-depth analysis, contextual understanding and description of the research problem. Correlation technique were used in data analysis because of the nature of the study that was aimed at measuring the relationship between two variables, that is to say, supply chain information management and service delivery efficiency within public sector health organizations, (Mugenda & Mugenda, 2003). The researcher majorly employed a quantitative approach of data management which involved the use of closed-ended questionnaires in data collection, while frequencies, percentages, means, standard deviations and correlations were used in data analysis, interpretation and presentation of statistical findings. Qualitative methods like interviews and observations on the other hand, were also used to support and authenticate quantitative findings of the study. Interviews in particular, offered detailed information in form of peoples' opinions and quotations, which were then, analyzed thematically, thus enabling the researcher conclude about situational occurrences, (McBurney, 2001).

3.3 Area of Study

The study was mainly conducted at the National Medical Stores (NMS) Headquarters located on Plot 4 – 12, Nsamizi Road, Entebbe, where data extracts on supply chain information management were obtained. Whereas, data extracts on service delivery were obtained from supplementary sources like Mulago Hospital and Kisenyi Health Centre IV. This is because such supplementary sources are the beneficiaries of NMS services. Mulago and Kisenyi Health Centre IV are both located in the central District of Kampala, and were conveniently selected, while

NMS was purposively selected because of the nature of the study, which aimed at examining the relationship between supply chain information management and service delivery efficiency in public sector health organizations, of which NMS best suites the study of this kind.

3.4 Research Population

Oso, & Onen, (2008) defines a research population as the total number of subjects or the total environment of interest to the researcher. According to the Human Resource Manager of NMS, the entity (Head Office) has approximately 121 employees. Of these 60 are senior, middle managers and operational supervisors, which the study majorly considered for examination over the concept of supply chain information management the independent variable of the study. On the other hand, responses on service delivery the dependent variable of the study were drawn from the beneficiaries or users of medical products/ drugs supplied by National Medical Stores, and these users included Mulago Hospital and Kisenyi Health Centre IV.

3.5 Sampling Technique and Procedure

According to Oso, & Onen, (2008) this refers to the description of the strategies which the researcher uses to select representative elements/ subjects/ respondents from the target population. The study therefore employed two main sampling methods namely: the probability and the non-probability sampling methods/ techniques as discussed below:

i. The selection of National Medical Stores as the main Unit of analysis was based on purposive sampling. Purposive sampling is when the researcher chooses an element of study based on how it would provide information regarding the study. Since NMS is one of those entities within the country, that deal in large supply chain practices, the researcher chose it as the case of this study. On the contrary, subsidiary sources (Mulago Hospital and Kisenyi Health Centre IV) were conveniently selected based on how easy it was to access the research area. This was also used because it helped save time and money, given that the research had a time limit, (Suzanne, 1998).

ii. Selection of Operational Personnel: the employees of National Medical Stores were selected using simple random sampling. The researcher would abruptly select

respondents who seem free and not occupied with work assignments, which gave those categories of employees' equal chances of getting selected for interviews. This enabled the researcher acquire wide views with regard to operational work, supply chain, information management and service delivery. On the other hand, Operational employees (Nurses, Doctors, Paramedics and others) in Mulago Hospital and Kisenyi Health Centre IV were conveniently selected basing on how one would easily be accessed at a given time.

iii. Selection of Tactical Personnel/ Managers: both at National Medical Stores, and subsidiary sources (Mulago Hospital and Kisenyi Health Centre IV) tactical staff were selected using purposive and stratified sampling, which involved targeting specific people presumed to be highly conversant with the subject matter of study, among others, including supply chain specialists, procurement managers, pharmacists, doctors, store keepers/ managers and others. This method was utilized because it gave the research room for interaction and detailed discussion about the subject of the study.

iv. Selection of Senior Managers/ Personnel: this comprised of mainly top administrators/ senior managers at NMS who were presumed to be highly conversant with the subject matter of study. Using purposive sampling methods such respondents were selected. This helped the researcher collect focused and enriching information, (Mugenda & Mugenda, 2003).

3.6 Sample Size and Selection

A total of 119 respondents were examined both at the National Medical Stores, Mulago Hospital, and Kisenyi Health Centre IV. Of these, 56 came from NMS, 42 from Mulago Hospital, and 21 from Kisenyi Health Centre IV. A sample size that is too small may affect the generalisability of the study regardless of how well the sample was determined. Similarly, it could be practically impossible to analyze an entire population if it is too big, (Amin 2005; Mugenda & Mugenda, (2003). This into perspective, the researcher employed the Krejcie and Morgan, (1970) sample size determination model in order to ascertain the appropriate sample size for the study as indicated below:

Table 3A: Sample Size and Sampling Techniques

Category of Respondents	Population	Sample Size	Sampling Techniques
Administrators	7	7	Purposive Sampling
Procurement, & Logistics Officers	12	11	Stratified Sampling
Marketing & Sales	5	5	Stratified Sampling
Finance & Accounting	4	3	Stratified Sampling
Management Information Systems	4	4	Stratified Sampling
Operations	28	26	Simple Random Sampling
Total for NMS	**60**	**56**	
Supplementary Sources (Mulago Hospital & Kisenyi Health Centre IV		63	Simple Random & Convenient Sampling
Grand Total for NMS & the Supplementary Sources		**119**	

Source: ***Primary Data Sampled using the Krejcie and Morgan Sampling Technique, (1970)***

3.7 Sources of Data

Data was collected both from primary and secondary sources in order to obtain enriching and reliable facts in regard to the concept of supply chain information management and service delivery as discussed below:

3.7.1 Primary Source

This involved collecting data at original source such as the National Medical Stores, Mulago Hospitals and Kisenyi Health Centre IV. Mugenda and Mugenda, (2003) asserts that primary data is pertinent to the study, because it is the best in offering the researcher with a true picture on what is happening on the ground, and to help draw conclusions about the study. Data from primary sources were obtained through interviews, observations and issuing questionnaire to respondents, (Oso & Onen, 2008; Amin, 2005).

3.7.2 Secondary Source

These are representations in which the researcher described the works of others. They include publications written by authors who were not direct observers or participants in the events described, but merely reporting on the works of someone else, (Oso, & Onen, 2008). Such sources in this report included but not limited to research articles, books, casual interviews, published or unpublished reports, newspapers, online information, among others. They gave a

quick overview of researches related to the problem, and how similar studies were tackled by different authors. Secondly, secondary information helped communicate the areas of agreement and disagreement between the various scholars and therefore show the remaining gaps that the research could fill. It also helped in discussing the results of the study and showed how the results of the study concurred with what already existed about the problem or gave room for disagreeing with what already existed, (Mugenda & Mugenda, 2003).

3.8 Data Collection Instruments

Marshall and Rasssman (1989) as cited by Suzanne (1998), states that making a choice among the different data gathering techniques involves considering their appropriateness and relative strengths and weaknesses. Therefore, the instruments that were considered for the study include the following:

3.8.1 Questionnaire

According to McBurney, (2001) the use of questionnaires involves collecting data using structured questions that are designed prior one goes to the field for data collection. The nature of the questions can either be closed or open-ended. The study mainly used closed ended questionnaires in data collection which were designed using a Five Point Likert Scale method. This helped respondents to easily rank their responses' with regard to order of importance for particular questions which were asked. Secondly, data analysis/ computation in form of frequencies, percentages, and means became easier because of discreteness of the responses which were collected using closed-ended questions. On the other hand, open-ended questions were captured in circumstances were the respondent attached a statement/ an opinion on the questionnaire which was issued to them. This helped collect qualitative data which was used to enrich the findings of the study, since some of these statements were detailed and well explained than the closed-ended responses, (Amin, 2005).

3.8.2 Interview

These were orally administered questions using interview guide. Interviews were conducted face-to-face with respondents in order to collect detailed data which was quite difficult to obtain using closed-ended questionnaires. Interviews however were a little expensive

to administer because the researcher was required to physically travel and meet the respondents like twice or thrice a week, something which was not only costly but also time consuming. For the purpose of the study, key respondents who were considered for interviews included, but not limited to, administrators, senior managers, supply chain professionals, IT specialists, doctors, and nurses, among others, both at National Medical Stores, Mulago Hospitals, and Kisenyi Health Centre IV.

3.8.3 Observation

This is the purposeful, systematic and selective way of watching & listening to an interaction or phenomenon as it takes place in the study situation, (Oso & Onen, 2008). It involved the use of sight or visual senses to analyse how things are done and the settings of the study area. This into perspective, the researcher systematically observed the internal arrangement of systems, communication flows among organisations departments, reporting mechanisms between employees, and their supervisors among others. McBurney, (2001) maintains that observations help note out non-verbal expressions, physical setting/ appearance of the study situation, and exchanged glances, among others which are crucial for the researcher in analyzing study occurrences. Observations' were non-participative/ naturalistic in nature, that is to say, the researcher did not physically engage/ participate in group activities, neither did he pretend to be a member of the organisation. He merely watched and recorded data and later made conclusion pertaining the study.

3.9 Data Quality Control

3.9.1 Data Validity

Keeves, (1988) as cited by Amin, (2005) urges that, validity measures are essential to successful scientific activities, because of its wide acceptability among science methodologist, theoreticians, researchers, and philosophers. It is the most important idea to consider when preparing or selecting an instrument for use. This is because interferences cannot be made from data that has been collected with instruments not serving the purpose for which they are intended. To ensure validity, the researcher consulted experts, lecturers and colleagues in line with my academic field to design these instruments. Secondly, each and every objective/ research question with regard to the topic of the study was considered while drafting these

instruments. The average content validity index for supply chain information management and service delivery was computed and was above 0.72. This was accepted because when an instrument is to be accepted as valid, its average index should be 0.70 and above, (Amin, 2005). This showed that, the quality of data collected had little or no errors.

3.9.2 Data Reliability

This is the measure of the degree to which a research instrument yields consistent results or data after repeated trials. Reliability in research is influenced by random error. As random error increases, reliability decreases. Random error is the deviation from a true measurement due to factors that have not effectively been addressed by the researcher. Errors may arise from inaccurate coding, ambiguous instructions to the subjects, interviewer's fatigue, interviewee's fatigue, interviewer bias, and others. Taking into account of all these, the researcher ensured that data is accurately coded, clear instructions devised and pre-test made. After all this, the Cronbach's alpha coefficient was used to test the reliability of the instrument, the average output statistic was 0.5. According to Amin (2005), an alpha of 0.5 or higher is sufficient to show reliability of the study.

3.10 Data Collection Procedure

After the successful defense of the proposal the researcher made the required corrections and shared the revised version with University supervisors for approval. The researcher thereafter obtained a letter of introduction from the Kyambogo University Graduate School to enable the researcher access information. The questionnaire was then subjected to lecturers and other experts to ensure validity and reliability of the research instruments. Thereafter, questionnaires were administered to employees of National Medical Stores, Mulago Hospitals, and Kisenyi Health Centre IV for a period of one to three weeks.

3.11 Data Analysis

Oso, & Onen, (2008) defines data analysis as the organization, interpretation and representation of collected data. It is a postulate of how data will be analyzed. Data analysis entails separation of data into constitution parts or elements to distinguish its component parts or elements separately and in relation to the whole. To ensure this, data was analyzed quantitatively

or qualitatively. Quantitative data was edited, coded, and entered into the Statistical Package for Social Scientist (SPSS) system for tabulation and analysis. Using simple frequencies, percentage distributions, means, and standard deviations, the researcher described the extent of supply chain information management and serviced delivery efficiency at NMS. The Pearson's Correlation Coefficient (PCC) was used to measure the relationship between supply chain information management and service delivery efficiency at the National Medical Stores. An item analysis based on means was also used to identify the strengths and weaknesses of constructs of supply chain information management and service delivery. The following numerical values and response modes were used to interpret the means:

Mean Range	**Response Mode**	**Interpretation**
4.30 – 5.00	Strongly Agree	Very High
3.50 – 4.20	Agree	High
2.70 – 3.40	Not Sure	Undecided
1.90 – 2.60	Disagree	Low
1.10 – 1.80	Strongly Disagree	Very Low

On the other hand, Qualitative data were analyzed thematically according to the objectives and research questions of the study. By grouping related data into themes, meaning was drawn and conclusions made with regard to peoples opinion, quotations, and the various documentations reviewed.

3.12 Ethical Considerations

To reduce all forms of suspicion of respondents before, and during the study, attention was put on ensuring confidentiality throughout the study. Care was taken to ensure that all those who accepted to participate in the study did so voluntarily and provided informed consent without being subjective. An introduction letter from the Graduate School of Kyambogo University, backed by the identity card was used for the researcher's identification throughout the study and in order to mitigate against suspension and all forms of biasness that would arise due to fear or doubt on the researcher's study.

3.13 Limitation of the Study

Permission to collect data from the National Medical Stores was delayed by the management of the entity in form of verification of my proposal which made the Researcher spend a lot of money on transport, commuting day-by-day, trying to follow up for an approval.

Secondly, some respondents delayed to fill in the questionnaires, while other respondents were nowhere to be seen. This failed the researcher to collect 100% of the questionnaires which were administered (56 out of the 60 were collected). In a bid to track these respondents the researcher also ended up spending more than what he expected in terms of transportation costs and the actual time within which data was to be collected.

CHAPTER FOUR

ANALYSIS, PRESENTATION AND INTERPRETATION OF DATA

4.1 Introduction

This chapter presents, analyzes and interprets the findings of the study in accordance with the research objectives developed from the two main research variables, namely supply chain information management, and service delivery in public sector health organizations. Using closed ended questionnaires data was collected which was then analyzed using the Statistical Package for Social Sciences (SPSS) to come up with meaning and interpretations on the collected data as follows:

4.2 Profile of the Respondents

The study had two sets of respondents. The first set were employees of National Medical Stores (NMS) who were the main target group of the study, while the second set of respondents were employees of Mulago Hospital and Kisenyi Health Centre IV, who were examined on the dependent variables of the study in order to establish their perception over service delivery by the NMS. For this matter therefore, the study presents two data sets on the profile of respondents as follows:

4.2.1 Profile of Respondents at NMS

Out of 60 (100%) questionnaires that were issued out to the employees of National Medical Stores to examine the extent of supply chain information management, 56 (93%) were returned. The other 4 (7%) which were not returned, were lost or misplaced by the respondents. In some cases, the respondents were in the field and so the researcher could not allocate them to return the questionnaires. Nevertheless, the researcher managed to ascertain the required sample of the study with regard to examining key respondents of the study such as tactical managers, operational managers and other officials who are directly involved in managing supply chain activities at NMS.

Table 4A: Profile of Respondents

Category	Subcategory	Frequency	Percent
Type of Organization	NMS	56	**100.0**
Department within the organization	Administration	7	12.5
	Procurement & Logistics	11	19.6
	Marketing & Sales	5	8.9
	Finance & Accounting	3	5.4
	Management Information Sys	4	7.1
	Operations	26	46.4
	Total	**56**	**100.0**
Position in the organization	Top Management	2	3.6
	Middle Management	23	41.0
	Operational	31	55.4
	Total	**56**	**100.0**
Highest Education Qualification	Masters	17	30.4
	Bachelors	25	44.6
	Diploma	14	25.0
	Total	**56**	**100.0**
Educational Specialization	Pharmacy	14	25
	Nursing & Paramedical	5	8.9
	Procurement & Supplies Mgt	10	17.9
	Transport & Logistics Mgt	5	8.9
	Social Sciences	10	17.9
	Accounting & Finance	7	12.5
	Computer Science	5	8.9
	Total	**56**	**100.0**
Professional Qualification	CIPS	10	17.9
	ACCA	12	21.4
	Others	7	12.5
	None	27	48.2
	Total	**56**	**100.0**
Length of Service in the Organization	1-4 Years	26	46.4
	5-9 Years	27	48.2
	10-14 Years	2	3.6
	15-19 Years	1	1.8
	Total	**56**	**100.0**

Source: Primary Data, 2013

From Table 4A above, 56 respondents were examined at NMS. Out of these respondents, 26(46.6%) came from the Operation's Department, 11(19.6%) from Procurement and Logistics Department, 7(12.5%) from Administration, 5(8.9%) from Marketing and Sales, 4(7.1%) from Management Information Systems, and lastly 3(5.4%) from the department of Finance and Accounting. The large numbers of respondents came from the Operations, Procurement and Logistics departments because most of the respondents under the Operation's Department, the

Procurement Unit, Transport Unit, and Store Units were key Units in ascertaining objective responses towards this study. On the other hand, the department of Finance and Accounting, Marketing and Sales, Management Information Systems, and Administration had few respondents participating in the study because majority of them are tactical managers and are generally few in Offices.

Concerning employee positions in the organization, the operations level took the majority 31(55.4%) share of responds who were examined, followed by the tactical level with 23(41%), and lastly, the strategic level with 2(3.6%). This indicates that more employees are engaged in operation work such as distribution management, marketing and sales, productions among others, which is why the Operations, Procurement and Logistics Department had the largest representation during data collection of 26(46.6%) and 11(19.6) respectively. These departments are engaged more in supply chain management than any other department at the NMS.

Concerning the highest educational qualification among the respondents, 25(44.6%) of the respondents were Bachelor holders, 17(30.4%) Masters holders, and lastly, 14(25%) Diploma holders. Most of the Bachelors and Diploma holders' came from the operations level (Stores Unit, Transport, Marketing and Sales) among others. While the tactical and strategic level produced most of the Master holders and some few Bachelors holders. In the same vein, out of the 56 respondents who were examined at NMS, 10(17.9%) were members of the Chartered Institute of Procurement Professional (CIPS), 12(21.4%) had ACCA qualifications, 7(12.5%) indicated having other qualifications like CILT, CIMA, and a hooping 27(48.2%) had no professional qualifications. Majority of these respondents with professional qualities were tactical and strategic managers, and very few were from operations yet it constituted the largest number of respondents. There is need to encourage operational staff to undertake professional training, since they largely handle, the core functions of the entity, and in order to increase productivity.

Concerning educational specialization, 14(25%) of the respondents examined were Pharmacists, 5(8.9%) Paramedics, 10(17.9%) Procurement and Supplies Managers, 5(8.9%) Transport and Logistical Managers, 10(17.9%) Social Scientist, 7(12.5%) Finance and Account Specialist, and lastly, 5(8.9%) Computer Scientist. Some of these respondents had mixed qualifications, that is to say, Pharmacists or Paramedics having professional qualifications like

ACCA, CIPS and others, which made the entity, well professionalized with regard to work competence and the execution of operational work.

Lastly, with regard to length of service in the organization, the study indicated that, a majority 27(48.2%) of the employees had served at NMS for a period of 5-9 years, followed by those who had served between 1-4 years at a rate of 26(46.4%), then those with 10-14 years at 2(3.6%), and lastly, those who had served between 15-19 at 1(1.8%). This implies that, over half of the staff population at NMS have worked in their current positions for over 5 years and for this matter therefore, without doubt these employees seem to be conversant with the dynamic of their jobs (managing the supply chain of drugs within the country), but what makes many wonder is that, in spite of all this experienced personnel, their levels of qualifications, and staff ratios at NMS service delivery has been reportedly challenged, (Auditor General, 2010, Economic Policy Research Centre Report, 2010).

4.2.2 Profile of Respondents at Mulago Hospital and Kisenyi Health Centre IV

A total of 63 respondents were examined in Mulago Hospital and Kisenyi Health Centre IV. Of these 21 were from Kisenyi Health Centre, while 42 from Mulago Hospital. These responded on the extent of service delivery by the NMS as a dependent variable of the study. The method of data collection was still in form of using closed-ended questionnaires, although some interviews were also conducted on a few operational staff.

Table 4B: Profile of Respondents

Category	Subcategory	Frequency	Percent
Type of Organization	Mulago Hospital	42	66.7
	Kisenyi Health Unit	21	33.3
	Total	**63**	**100.0**
Department within the organization	Administration	2	3.2
	Procurement & Logistics	5	7.9
	Medical	56	88.9
	Total	**63**	**100.0**
Position in the organization	Middle Management	7	11.1
	Operational	56	88.9
	Total	**63**	**100.0**
Highest Education Qualification	Masters	6	9.5
	Bachelors	32	50.8
	Diploma	25	39.7
	Total	**63**	**100.0**
Educational Specialization	Pharmacy	7	11.1

	Medicine & Surgery	21	33.3
	Nursing & Paramedical	29	46.0
	Procurement & Logistics	3	4.8
	Social Sciences	3	4.8
	Total	**63**	**100.0**
Professional Qualification	CIPS	3	4.8
	Total	**3**	**100.0**
Length of Service in the Organization	1-4 Years	35	55.6
	5-9 Years	23	36.5
	10-14 Years	4	6.3
	15-19 Years	1	1.6
	Total	**63**	**100.0**

Source: Primary Data, 2013

From Table 4B above, 63(88.9%) of the residents were from the Medical Department, followed by 5(7.9%) from Procurement/ Logistics Department, and lastly 2(3.2%) were from Administration. Of these, 56(88.9%) were from the Operations level, and only 7(11.1%) were at the Managerial level. Concerning their academic qualifications, 32(50.8%) were Bachelors holders, followed by 25(39.7%) Diploma holders, and lastly 6(9.5%) Masters degree holders, only 3(4.8%) had a professional qualification (CIPS). Concerning their educational specialization, the majority 29(46%) were Nurses and Paramedics, 21(33.3%) Medicine and Surgery, 7(11.1%) Pharmacy, 3(4.8%) Procurement/ Logistics, and lastly, 3(4.8%) were Social Scientists. Of these, 35(55.6%) had worked for 1-4 Years, 23(36.5%) had a length of service between 5-9 Years, 4(6.3%) had worked for a period of 10-14 Years, and lastly 1(1.6%) had a length of service between 15-19 Years. These respondents offered answers on service delivery since they are the immediate consumers of NMS services and so, the researcher presumed them fit to giving responses with regard to the dependent variable of the study.

4.3 Supply Chain Information Management

This was the independent variables in the study and was divided into three constructs namely; (1) supply chain information processing, (2) supply chain information storage, and (3) supply chain information flow. Using closed ended questionnaires, respondents were asked to rate the operations of NMS with regard to the extent of supply chain information processing. All questions were rated using a five point Likert scale, where 1 = Strongly Disagree; 2 = Disagree; 3 = Not sure; 4 = Agree; 5 = Strongly Agree. The extent to which each of these constructs is managed is analyzed and interpreted using mean as indicated below:

4.3.1 Supply chain Information Processing

This was the first specific objective in the study which sought to examine the relationship between supply chain information processing and service delivery in public sector health organizations. Supply chain information processing is further divided into three sections namely: (1) activities, processes, and factors affecting supply chain information processing; (2) challenges affecting supply chain information processing, and (3) solutions to the challenges of supply chain information processing as discussed in table 4C, 4D and 4E below:

Table 4C: Extent of Supply Chain Information Processing

Activities & Factors Influencing SC Information Processing	Mean	SD	Interpretation	Rank
Generally, effective information processing (collection, analysis and dissemination) promotes quality, cost minimization, and timely delivery within the entire supply chain process	4.62	.49	Very High	1
Interpreted data/ information is disseminated to the various respective user departments/ or members of the supply chain for efficiency.	4.57	.49	Very High	2
Information on drug supply is collected directly from regional hospitals and health center IVs by National Medical Stores officials	4.55	.50	Very High	3
Effective information processing (collection, analysis & dissemination) promotes timely delivery of drugs in health units/ hospitals by enabling SC members plan effectively and be in position to meet deadlines.	4.55	.50	Very High	4
Effective information processing (collection, analysis and dissemination) promotes quality management in the delivery of drugs by availing factual information on the needs of peoples to NMS.	4.54	.50	Very High	5
Information/ data received on drug requirement/ requests from health centers/ regional hospitals is verified when deliveries are made	4.52	.53	Very High	6
Effective information processing (collection, analysis and dissemination) promotes cost minimization by enabling NMS identify cost effective suppliers and distribution channels within the SC	4.45	.50	Very High	7
Information on drug requirement/ status should always be supplied by health centers/ hospitals, instead of NMS collecting it from them	4.45	.50	Very High	8
Information/ data is tabulated/ analyzed with the aid of computer programmes/ systems in order to come up with accurate interpretation.	4.43	.49	Very High	9
Health centers/ and regional hospital officials communicate drugs requirements/ requests on time to National Medical Stores	4.43	.49	Very High	10
The users (regional hospitals and health centers IV officials) are the ones who request/ demand for drugs in case a need a rises	4.43	.49	Very High	11
Information quality communicated by health centers/ regional hospitals is usually accurate and reliable	4.36	.65	Very High	12
Information/ data is recorded with the aid of electronic gadgets like computers	4.34	.55	Very High	13
Information/ data is collected using electronic systems like Bar coding and Electronic point of sales/delivery (EPOS)	2.73	1.0	Undecided	14
Average Mean	**4.36**		**Very High**	

Source: Primary Data, 2013

The results in table 4C indicate presence of a very high level of supply chain information processing at NMS with an average mean of 4.36. Unlike collecting data using electronic system given by a mean of 2.73, which was undecided upon, the rest of the activities, processes and factors influencing supply chain information processing indicated a very high response rate. This shows that, data collection, analysis and dissemination are considered pertinent within the entity. According to Bode, et al., (2011) in their study which empirically investigated the effects of supply chain disruptions within organizations they concluded that effective processing greatly shaped stability and the way organizations could predict future circumstance which improves decision making. This could partly be the reason why NMS values information processing as a concept in engendering its cause of effectively delivery medicines throughout the country.

Table 4D: Challenges of Supply Chain Information Processing

Challenges of SC Information Processing	Mean	SD	**Interpretation**	**Rank**
Information from health centers/ and regional hospitals in form of requisition is usually full of mistakes, and normally delivered late	3.96	.60	High	4
The overall number of supply chain employees is small to be in position to carryout entire supply chain activities comprehensively	2.73	.94	High	3
Staff lack adequate facilitation in the field in form of adequacy of data collection gargets, commission fee, and transportation	2.18	.83	Low	2
Rarely are staff development and training programs are conducted to update employee with modern techniques and ways of managing supply chain problems	1.96	.57	Low	1
Average Mean	**2.71**		**Undecided**	

Source: Primary Data, 2013

From Table 4D above, supply chain information processing faces some challenges at a tune of average mean of 2.71, interpreted as Undecided. With this, poor data quality sent from Hospitals and Centres' took the highest with a mean of 3.96, followed by insufficient staff numbers allocated under supply chain operations at a mean of 2.73, interpreted as high. These probably could be the source of most supply chain problems within NMS. If data capture is inaccurate its output will definitely be affected. There is need to improve the manner in which health units and Hospital make requisitions to the NMS because this is the most important of all, Health unit officials need to be trained on how to assess need within their entities, make specifications before requisitions are finally made in order to mitigate against such requisition mistakes and errors across the supply chain process.

Table 4E: Solutions to the Challenges of Supply Chain Information Processing

Solutions to Challenges	Mean	SD	Interpretation	Rank
Sensitization of health centers/ regional hospital staff on the importance of providing timely information to NMS	4.57	.49	Very High	1
Staff are adequately facilitated in the field by providing data collection gargets, commission fee, and transportation	4.21	.53	High	2
Occasionally staff trainings are conducted to update supply chain employees with modern techniques and ways of managing supply chain problems	3.68	.92	High	3
The entity needs to recruit more supply chain staff to beef up the current numbers	2.70	.83	High	4
Average Mean	**3.79**		**High**	

Source: Primary Data, 2013

Results in Table 4E suggest the solutions to supply chain information processing challenges highlighted in Table D above. The solutions indicated a high average mean of 3.79 in solving supply chain information processing bottlenecks. Of all solutions which were examined, sensitization of health workers on the importance of providing timely, and accurate information to NMS took the lion's/ largest share of mean of 4.57, interpreted as very high, followed by facilitation of staff with a mean of 4.21, then staff training with a mean of 3.68, and lastly, recruitment of more staff with a mean of 2.70. These solutions, according to the respondents at NMS, will enhance/ eliminate some of the challenges associated with information processing, such as; the inaccurate requisitions sent by health units, delays in making requisitions, and staff gaps within the supply chain operations of National Medical Stores, as indicated under Table 4 D, among others.

4.3.2 Supply Chain Information Storage

This was the second specific objective in the study. It sought to assess the relationship between supply chain information storage and service delivery performance in public sector health organizations. Table 4F explores various questions/ statements which were asked in a closed ended questionnaire to come up with interpretations and ranks that depict that status of information storage at NMS.

Table 4F: Extend of Supply Chain Information Storage

Supply Chain Information Storage	Mean	SD	Interpretation	Rank
Generally, effective information storage promotes quality, cost minimization and timely delivery within the supply chain process.	4.71	.46	Very High	1
Computer storage systems promote accuracy, efficiency and economy in space than manual systems/ paper form recording systems	4.64	.48	Very High	2
Effective information storage promotes quality management by maintaining records on the status of drugs such as expiry dates, special care to given on particular drugs and others.	4.62	.49	Very High	3
Effective information storage promotes cost minimization by maintaining records, which in turn help maximize service delivery efficiency, and effectiveness through improved visibility.	4.61	.49	Very High	4
Effective information storage promotes time management by maintain records on delivery deadlines of drugs, thus effective supply chain management process	4.59	.49	Very High	5
Paper recording/ manual recording is normally used to supplement, and backup soft copies/ information in case it is lost from the computers	4.52	.63	Very High	6
Access to stored information is usually restricted from organizational staff for purpose of security and alterations/ tempering	4.34	.48	Very High	7
Information resources stored are usually classified according to the timelines of drug expiration, regions in which they are collected & others.	4.32	.47	Very High	8
Firewalls, anti-viruses, and social engineering/ training staff are some of the ways in which the entity protects its information resources	4.11	.71	High	9
Information collected/ received by the entity is stored in soft copies with the aid of computers, instead of being recorded manually/ in paper form	3.86	.72	High	10
Computer storage systems are safer in terms of data storage than the manual recording systems	3.02	.90	Undecided	11
The entity is challenged with cyber space risks such as viruses, worms, and Trajan horses by its computerized storage systems	1.43	.54	Low	12
Average Mean	**4.06**		**High**	

Source: Primary Data, 2013

Table 4F examines the extent of supply chain information storage at NMS. Results indicate a high level of supply chain information storage at NMS an average mean of 4.06. In addition, the study suggested information storage generally promotes quality, cost, and time management in service delivery with a mean of 4.71. Responses also further indicate that, because of the importance of information, NMS stores in both soft and hard copies denoted by a mean of 4.52, and also use cyber protection systems, anti viruses to protect it given by a mean of 4.11, interpreted as high. All these put in mind, show how pertinent information could be and that if not properly safeguarded it can be a source of an organization's failure to execute, its operations. Entities use past information/ records to make future decisions, plan for uncertainties,

and facilitate in the monitoring/ evaluation of performance in an organization, which is why it is pertinent for entities to keep it safe, (Tomas, et al., 2004)

4.3.3 Supply Chain Information Flow

This was the third specific objective intended to evaluate the relationship between supply chain information flow and service delivery in public sector health organizations. Table 4G, presents the findings of the study with regard to supply chain information flows at NMS.

Table 4G: Extent of Supply Chain Information Flow

Supply Chain Information Flow	Mean	SD	Interpretation	Rank
Generally, effective information flow among the various organization's departments and other external entities promotes quality, cost minimization and time delivery within the supply chain process	4.70	.46	Very High	1
Effective information flows among the various organization's departments and other external entities, such as the suppliers, promotes time management in the delivery of drugs by increasing accuracy, innovation and vigilance	4.59	.49	Very High	2
All staff members within the supply chain process are trained on how to handle information and ensure it is used optimally.	4.55	.50	Very High	3
Absence of effective information flow from the users (health centers/ regional hospitals) affects the quality, cost and time of drug delivery.	4.55	.50	Very High	4
Effective information flows among the various organization's departments and other external entities such as the suppliers promotes cost minimization in the supply chain process of drugs by increasing accuracy, innovation and vigilance.	4.45	.50	Very High	5
Effective information flows among the various organization's departments and other external entities such as the suppliers promotes quality management in the supply chain process of drugs by increasing accuracy, innovation and vigilance	4.36	.48	Very High	6
Absence of effective information flow between NMS and its suppliers negatively affects quality management, cost, and the delivery time.	4.34	.48	Very High	7
Information flow among the different organization's departments and other external entities is a common practice.	4.16	.63	High	8
Information flow among the various organization's departments and others entities is done electronically using computer to computer systems like electronic data interchange/ and the internet.	2.70	.99	High	9
Information flowing within the cyber space is protected from crackers using private key encryption systems of authentication/ verification.	2.68	.81	High	10
Information flowing within the cyber space is normally threatened by illegal intruders/ crackers within the supply chain process.	1.91	.58	Low	11
Average Mean	**3.91**		**High**	

Source: Primary Data, 2013

The results in Table 4G indicate that, supply chain information flow at NMS is high with an average mean of 3.91. With this, the largest number of respondents indicated that, effective information flow among the organizational departments and its partner firms generally promotes quality, cost, and time management in service delivery by a mean of 4.70, interpreted as very high. This is because, through information flows an organization share operational information which eventually promotes efficiency in workflows, minimizing conflicts and lack of coordination among supply chain members, thus effective service delivery, (Humphreys, Lai, & Sculli, (2001). Despite the benefits that may accrue as a result of effective information flows, company secretes can be at risk of cyber crime, especially if information is transmitted through electronic media such as the internet, which denoted by a mean of 1.91.

4.3.4 Summary of Average Mean of the Extent of Supply Chain Information Management

The three constructs of supply chain information management that constitute the independent variable of the study generally had fair representations with regard to the extent at which NMS uses them to ensure effective service delivery of drugs within the country. The following is a table summarizing each of the supply chain information management in terms of average means as extracted from the responses obtained in the field.

Table 4H: Summary of Average Mean of the Extent of Supply Chain Information Management

Constructs' of SC Information Management	Average Mean	Interpretation	Rank
Supply chain information storage	4.06	High	1
Supply chain information processing	3.95	High	2
Supply chain information flow	3.91	High	3
Overall mean	**3.97**	**High**	

Source: Primary Data, 2013

The overall mean of the independent variable of the study (supply chain information management) is 3.97, interpreted as high. This suggests that NMS pays attention to supply chain information management. However, much attention is on supply chain information storage at a mean of 4.06, followed by supply chain information processing flow at a mean of 3.95, and lastly, supply chain information flow at a mean of 3.97.

4.4 Service Delivery

This was the dependent variable in the study. It constituted the following constructs; (1) quality management in service delivery, (2) cost management in service delivery, and (3) time management in service delivery. Using a closed ended questionnaire, respondents from Mulago Hospital, and Kisenyi Health Unit IV were asked to rate the extent of service delivery by the National Medical Stores (NMS). All questions were rated using a five point Likert scale, where 1 = Strongly Disagree; 2 = Disagree; 3 = Not sure; 4 = Agree; 5 = Strongly Agree. The extent to which each of these constructs is managed is analyzed and interpreted using mean as indicated below:

4.4.1 Quality Service Delivery Management

This was the first construct under service delivery management as a dependent variable. Table 4I, analyses the response rate of employees of Mulago Hospital and Kisenyi Health Unit IV with regard to Quality service delivery management by the National Medical Stores.

Table 4I: Quality Management in Service Delivery

Quality Service Delivery Management	Mean	SD	Interpretation	Rank
Information on the quality and requirement of drugs to be supplied is provided by health centers/ regional hospitals to National medical stores	4.70	.46	Very High	1
The standard of drugs delivered by NMS to health centres and Regional Hospitals is always of high quality	4.61	.49	Very High	2
Drugs that require refrigeration are always accompanied by the refrigeration facilities provided by National Medical Stores	4.57	.49	Very High	3
You are occasionally advised how to handle particular drugs, which are considered delicate and need special consideration.	4.48	.50	Very High	4
Delicate/ fragile drugs are usually delivered when they are still intact and not contaminated or spoiled	4.34	.48	Very High	5
Quality standards like the ISO and UBOS are usually observed by National medical stores	4.27	.56	High	6
Inspections/ verifications of the quality & accuracy of drugs are jointly done both by NMS and health centers/ hospital officials upon delivery.	3.50	.83	High	7
Drug specifications as ordered by regional hospitals/ health centers is usually observed and fulfilled by National medical stores	2.00	.76	Low	8
NMS makes consultations from regional hospitals/ health centers on the exact descriptions and quality of drugs before delivery	1.84	.73	Low	9
Average Mean	**3.81**		**High**	

Source: Primary Data, 2013

From Table I, quality service delivery management by the National Medical Stores is at an average mean of 3.81, interpreted as high. This is attributed to the very high level of information quality on the requirement of drugs sent to NMS by hospitals and health centers denoted by a mean of 4.70, followed by the standard of drugs delivered by NMS to health centres and hospitals within the country at a mean of 4.61, accompaniment of facilities like refrigeration when drugs are delivered at a mean of 4.57, advice on how to handle certain types of drugs at a mean of 4.48, and delivering fragile goods when they are still intact at a mean of 4.34, among others. These responses have shown a very high response rate of practice by the National Medical Stores with regard to quality management in service delivery, which is a very good gesture to the heath of Ugandans.

4.4.2 Cost Management in Service Delivery

This is the second construct under service delivery management as a dependent variable. The findings over this concept are summarized under Table 4J on how employees of Mulago Hospital and Kisenyi Health Unit IV perceive the issues of Cost management in service delivery by the National Medical Stores.

Table 4J: Cost Management in Service Delivery

Cost Management in Service Delivery	Mean	SD	Interpretation	Rank
Usually drugs delivered by National medical stores are cheaper than other suppliers in the market	4.54	.54	Very High	1
National Medical Stores usually does not attach any costs to the drugs delivered.	4.54	.50	Very High	2
Drugs delivered by National medical store are easily accessible and affordable to every patient	3.98	.56	High	3
National Medical Stores role in the economy of Uganda is key in controlling the cost of drugs in the country	3.46	.57	High	4
Centralizing drug procurement and supply chain system the way it is in Uganda under NMS generally improves supply chain efficiency and cost management.	1.75	.58	Very Low	5
Average Mean	**3.65**		**High**	

Source: Primary Data, 2013

Table J, shows the results of cost management in service delivery by NMS being at an average mean of 3.65, interpreted as high. This performance is attributed to the very high rankings given to drugs delivered by NMS being cheap, compared to other providers in the

market, and not attaching any cost when delivering drugs in health units or hospitals, both at a mean of 4.54, interpreted as very high. This is followed by accessibility of drugs to patients at a mean of 3.98, among others. When the costs of drugs within the country are high, health becomes compromised within the country. Government therefore oughts to curtail/ control drugs prices by operating/ having mechanism that controls drugs supply chain within the country, in order to provide basic medicines e.g. Malaria drugs, ARVs and so on, thus providing effective health management within the country.

4.4.3 Time Management in Service Delivery

The third construct under service delivery management (dependent variable) was time management in service delivery. Table 4K, analyses the response rate from Mulago Hospital and Kisenyi Health Centre IV on their perception with regard to time management in service delivery by the National Medical Stores.

Table 4K: Time Management in Service Delivery

Time Management in Service Delivery	Mean	SD	Interpretation	Rank
Centralizing drug procurement and supply chain system the way it is in Uganda under NMS generally improves time management in delivery and effectiveness.	1.46	.50	Very Low	1
In case of medical emergencies the National medical stores strives hard to respond to the needs of people on time	1.34	.48	Very Low	2
Drugs are usually delivered on time by National Medical Stores to health centers/ regional Hospitals	1.29	.46	Very Low	3
Average Mean	**1.36**		**Very Low**	

Source: Primary Data, 2013

From Table 4K, the extent of time management in service delivery by NMS is very low at an average mean of 1.36. This is mainly attributed to centralization of the drug supply chain system within the country denoted by a mean of 1.46, followed by very low levels of responses to medical emergencies, like the outbreaks of pandemics within the country at a mean of 1.34, among others. This is contrary to the mandate of NMS which state that drugs will be provided on time when a need arises within the country, (NMS Act, 1993). Mechanisms like ensuring buffer stocks at times within the National Medical Stores should be emphasized in order for the country

to be in position to respond to medical emergencies like Ebola, Cholera, and Marburg in case of outbreaks in the country.

4.4.4 Summary of Average Mean of the Level of Service Delivery Management

Table 4K shows the summery on the level of service delivery management at the National Medical Stores. Service delivery as the dependent variable of the study was broken into three constructs namely; (1) quality management, (2) cost management, and time management as indicated below:

Table 4L: Summary of Average Mean of the Level of Service Delivery Management

Constructs' of Service Delivery Management	Average Mean	Interpretation	Rank
Quality management in service delivery	3.81	High	1
Cost management in service delivery	3.65	High	2
Timely service delivery management	1.36	Very Low	3
Overall mean	**2.94**	**Undecided**	

Source: Primary Data, 2013

The overall mean of service delivery management is 2.94, interpreted as undecided. This suggests that, the National Medical Stores averagely pays attention to service delivery management within the country. This is largely attributed to the very low levels of time management in service delivery at a mean of 1.36. Some attention though, is accorded to quality management with a mean of 3.81, and cost management at a mean of 3.65. These findings therefore, suggest that, more effort should be put on improving the delivery time of drugs within the country. This would save many lives, especially when medical emergencies like Ebola, Marburg and Cholera have occurred.

4.5 Relationship between Supply Chain Information Management and Service Delivery

The general objective of the study was to examine the relationship between supply chain information management and service delivery in public sector health organizations with a major interest on the National Medical Stores. The researcher hypothesized that there is no significant relationship between supply chain information management and service delivery in public sector health organizations. To test this null hypothesis, the researcher correlated the mean scores for

supply chain information management and mean scores for service delivery management using the Pearson's Correlation Coefficient (PLCC).

Table 4M: Correlation of Supply Chain Information Management and Service Delivery

Variables Correlated	r-value	Sig.	Interpretation	Decision on H_1
Supply chain information processing and level of service delivery	.328	.014	Significant Relationship	Accepted
Supply chain information storage and level of service delivery	.009	.048	Significant Relationship	Accepted
Supply Chain Information Flow and level of service delivery	.176	.033	Significant Relationship	Accepted
Extent of supply chain information management and level of service delivery	.244	.020	Significant Relationship	Accepted

Source: Primary Data, 2013

Table 4M shows results of the main objective of the study which was to examine whether there is a significant relationship between supply chain information management and service delivery in public sector health organization (a case study of NMS) obtained using Pearson Correlation Coefficient (PLCC). Results show a positive and significant relationship of (r= 0.244, and Sig. 0.020) between supply chain information management and service delivery. This implies that the Alternative hypothesis is adopted and the conclusion is that supply chain information management positively relate with service delivery.

The study further reveals that, supply chain information processing contributes more than any other construct under supply chain information management. The study shows that, supply chain information processing significantly relate with service delivery by (Sig. Value = 014 and r = 0.328). This confirms the information theory of data management which assumes that effective information processing (data collection, analysis, and dissemination) leads to better service delivery management in organizations, (Srivastava and Venkatasubramanian, 2009).

Concerning supply chain information storage, the study indicated a positive and significant relationship of (Sig. = 0.048 and r = 0.009). This implies that supply chain information storage weakly affects service delivery management and that their relationship is low. This could possibly be resulting from the fact that information storage is an organizational

internal factor that does not directly deal with extending service to the common people/ health centres/ hospitals.

Concerning supply chain information flow and service delivery, the study revealed a relative low positive relationship between the two variables (Sig. 0.033 and r = 0.176). This implies that, whenever NMS invests in supply chain information flow, service delivery is affected by 18 percent, which is quite significant for the delivery of drugs within the country. The promotion of internal organizational interactions as well the external ones with trading partners and the use of information communication technology (ICT) are crucial for the attainment of these results within the National Medical Stores.

4.6 Findings from Interviews

This section presents the results of interviews which were held with respondents at the National Medical Stores and Mulago Hospital as follows:

4.6.1 Supply Chain Information Management

All respondent interviewed acknowledged that information management within the supply chain process is essential for the effectiveness of service delivery. When a question of the systems of supply chain information management in place, was asked, all the 7 respondents indicated that, the Combined system of pull and push system is not only used to deliver drug within hospitals and health centre IVs, but also used as mechanism for efficient data collection and management.

> "We encourage hospitals and health units to send their requisitions before stock is completely finished in their stores," says the Store Managers at NMS. He furthers asserts that, in most instances, this is not the case; "hospitals and health units wait for their stock to get finished before they requisition NMS. Because of this, stock shortages in hospitals and health units cannot be avoided, which affects the final delivery of service to the public".

The study indicated that, in a bid to resolve this problem, NMS conducts physical inspections to verify/ confirm the status and consumption rate of drugs among hospitals and

health centers throughout the country. An overwhelming response of 6 out of 7 responses concurred that physical inspections are actually done. In the same vein, one of the operations officers affirmed that:

> "We conduct assessment on the consumption rate in all health units throughout the country, which enables us to plan and ensure the effective supply of drugs in those health units, and to meet the prevailing needs throughout the country."

This clearly shows that, the combined system of pull and push is dependent on information, which is physically collected by NMS officials from the field. However, this information is supplemented by past consumption levels and requisition made by hospitals and health centre IVs. It is upon this that drugs a supplied proportionately in all hospitals and health centers throughout the country, thus leading to effective service delivery management.

4.6.2 Service Delivery

Concerning quality service delivery management, all the respondents who were interviewed (11 out of 11) agreed that drugs supplied by NMS are of good standards. However, it was noted that, sometimes drugs supplied are of short expiry dates. According to a Pharmacist at Mulago Hospital:

> "Drugs supplied meet required quality standards, but sometimes they have short expiry dates, which require us to consume them immediately. But this is sometimes, practically impossible, especially when there are few/ no patients that require such drugs and this is why, we sometimes record expiries."

Concerning cost management in service delivery, the study indicated a positive response of 9 out of the 11 respondents who were interviewed. The findings reveal that, drugs supplied by NMS are relatively cheaper and are sometimes given for free, which is not the case in the open market. According to a nurse at Mulago Hospital:

> "We receive many patients compared to other hospitals majorly because of the free services we offer. This is because most people cannot afford private hospitals or clinics, making them opt for public hospitals like Mulago."

One of the objectives under the National Development Plan (NDP) of Uganda is to promote health services through providing affordable health care to Uganda, but this cannot be realized without NMS being cautious of its supply chain costs such as ensuring that drugs are not scarce. Just like other products, whenever there is scarcity they tend to be expensive, drugs are also similar. "So NMS should ensures that this does not happen, by procuring and distributing drugs in hospitals, and health units across the country, which somehow controls/ lowers the drugs price levels within the country," says one of the Operations Officer at NMS.

Concerning timely service delivery management, 9 out of 11 respondents who were interviewed disagreed that NMS always delivers drugs on time. The Store Assistant of Mulago Hospital for instance maintained that:

> "Very many times we need certain drugs urgently, but NMS delayed to deliver them, they were either out of stock or take time in ensuring approvals before they are finally supplied. So what the doctors do is to tell the patients to buy them from private pharmacies. This is a bit expensive for the patients, and those who cannot afford end up dying or getting seriously ill."

With this, a mechanism of efficiency should be devised by NMS in order to improve on their data collection approach, and be in position to stop such occurrences of drug shortages and delay, among hospitals and health units. For instance, the entity can deploy field staff/ officers in hospitals and health centre to keep track on stock level, and ensure that feedback is provided on time and with accuracy by their own officers. This will improve efficiency, especially with regard to data collection, hence minimizing stock shortages in hospitals and health units, says one of the Store Assistant at Mulago Hospital.

CHAPTER FIVE

DISCUSSION, SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the discussions, summary of major findings, conclusions and recommendations of the study. The areas that need further research have also been proposed.

5.2 Discussion of Findings

This section discusses the finding of the study in comparisons with other studies conducted in the similar field of supply chain information management. It discusses areas of disagreement and agreement relation to the findings of this study.

5.2.1 Profile of Respondents

Respondents Profiles from the National Medical Stores

According to Rao (1999), an organizations human competency is crucial in the achievement of organization objectives. This into perspective, biographic results indicated that, human recourse competence at NMS was high. For instance, those with Bachelor degrees were at 44.6%, followed by Master degree holders at 30.4%, and then Diploma holders at 25%. In addition, some employees had professional qualifications like CIPS, ACCA, CIMA, CILT and others, something what showed emphasis on academic professionalisms in the organization. According to Dessler, (2000), when an organization employs professionals, it is likely to gain competitive advantage thereby out competing other organizations that deal in similar products within that market environment. Human resource competence is a key factor in realizing quality service provision, efficiency and effectiveness in service delivery among organizations, (Aswathappa, 2001).

At NMS, apart from academics and professional qualifications, this was also denoted by longer length of service that employees had, with 48.2% of them having served between 5-9 years, 46.4% of the employees had served between 1-4 years, and 3.6% had at NMS between 10-14 years, while 1.8% had served between 15-19 years, which clearly indicate that, competence is

a key factor in explaining such results, especially with regard to quality management and efficiency/ cost management within the supply chain process of NMS. More so, the entity indicated high levels of educational specialization with 25% of the respondents being Pharmacists, 8.9% Paramedics, 17.9% Procurement and Supplies Managers, 8.9% Transport and Logistical Managers, 17.9% Social Scientists, among others. This shows the level of academic relatedness among staff members with regard to their job description. According to (Aswathappa, K., 2001), when an employee is assigned a job in an area of his academic specialization he/ she is likely to be more productive than when he/ she is allocated a job which is not under his areas of academic specialization. "We assign roles according to peoples areas of specialization in order to realize the best out of them," Says the Human Resource Manager, NMS.

Respondents Profiles from the Mulago Hospital and Kisenyi Health Unit IV

The study also indicated that, majority of the people who were charged with providing information to NMS from Hospitals and health centres about the status of drugs, were competent with regard to their academic qualifications. For instance, out of the 63 respondents who were examined, 50.8% were Bachelors holders, 39.7% Diploma holders, and 9.5% Masters holders. All of these related educational specialization with the nature of their jobs, for instance, 46% were Nurses and Paramedics, 33.3% Doctors, 11.1% Pharmacist, 4.8% Procurement and Logistical officers, and lastly, 4.8% were Social Scientists. This indicates that knowledgeable people are employed in these areas, and therefore, can provide rightful information/ requisition to NMS. "We order for stock when we see that it is about to run out," Says the Stores Supervisor, Mulago Hospital. This shows that, these people charged, with managing stores in hospitals and health units are aware of stock management controls, like handling Buffer stocks, regulations and others, which is a sign of competency.

In addition, findings indicate that, a majority of the respondents had worked for a long time in their organizations, with 55.6% of the respondents having a length of service between 1-4 years, 36.5% a length of service between 5-9 Years, 6.3% a length of service between 10-14 years, and lastly, 1.6% a length of service between 15-19 years is a sign that, these respondents were very conversant with the nature of their work and that their opinion is reliable with regard to what they think about service delivery with the organization.

5.2.2 Supply Chain Information management

As the independent variable of the study, supply chain information management consisted of three constructs namely; supply chain information processing, supply chain information storage and supply chain information flow. Their results/ finding are discussed as follows:

Supply Chain Information Processing

The study indicated a positive and significant relationship between supply chain information processing and service delivery (r = 328, Sig. 014), something that confirms the theory of information data management, which was forwarded by Srivastava and Venkatasubramanian (2009). The theory assumes that information processing (data collection, analysis, and dissemination) influence the level service delivery management among organization, in that if managers invest in proper data collection mechanism, analysis, interpretation and dissemination decisions will be improved regarding quality management, cost rationalization and time management. Although cases of inefficiencies in quality delivery, cost management, and timely delivery seem to be linked to poor information processing by NMS, in form of lack of collaboration between NMS and its clients (hospitals, and health centres) as cited by the Auditor General Report (2010). This can be effectively mitigated through timely and adequate funding of NMS to allow the entity effectively plan its operations, support field staff in form training, provision of sufficient field allowances, and data collection gargets, like the use of laptops, IPods, among others, (Researcher's Field Data, 2013).

Supply Chain Information Storage

An average mean of 4.06, interpreted as high, was highlighted, which indicted a positive relationship between supply chain information storage and service delivery (Sig. 0.048). With this, the researcher concluded that supply chain information storage contributes to service delivery management by a low margin of r-value of 0.009. This however does not mean that NMS should not consider information storage as a component in realizing organizations objectives. Sharma (2012) observes that, supply chain information storage promotes accountability, and supports an organization in performing the monitoring and evaluation function. Managing operations involves keeping records/ documentations regarding the day-to-day activities of an organization such as receipting sales, procurement expenses incurred and all

other managerial decisions that are made on a daily basis. Whenever such supply chain information is captured and stored accountability can be enhanced and whenever accountability is enhanced, public confidence is build which in term makes it easy for that organization to solicit for fund, hence supporting organizational overall supply chain functions, thus effective service delivery management, (Hasan, et al., (2008).

Supply Chain Information Flow

A high level of supply chain information flow at NMS was indicated by an average mean of 3.91, with a significant relationship of 0.033. With this, the researcher concluded that supply chain information flow leads to service delivery by r-value of 17%. This confirmed Marinos (2005) findings on his study about information supply chain as a way of achieving business objectives. He concluded that supply chain information flows promotes visibility within the supply chain network which in term enables companies easily forecast demand and supply forces thus leading to effective planning, and hence attainment of organizational goals. With this into perspective, NMS should embark on collaborating with hospitals and health units in order to easily predict demand levels of drugs within the country. In this way, problems like shortage of drugs as cited in the Auditor General's Report on NMS (2010), Auditor General's Report on Statutory Corporations (2011), Uganda Cancer Institute Report (2010), among others, will be eliminated.

5.2.3 Service Delivery Management

As the dependent variable of the study, it consisted of three basic constructs namely; quality management in service delivery, cost management and timely service delivery management as discussed below:

Quality Service Delivery Management

An average mean of 3.8 was indicated, interpreted as high, on the extent of quality service delivery management at NMS with the highest attention accorded to information on the quality and requirement of drugs forwarded to NMS by hospitals and health centres being very high at a mean of 4.70. This is in agreement with Akao's (1990) argument that, effective quality management practices originates from the views of the customer(s) on how a product/ service should look like before it is produced/ delivered to them. With this in mind, quality management

at NMS can largely be achieved through devising an organization wide approach to understanding precisely what customers need and consistently delivering accurate solutions within budget, on time and with minimum wastes (in form of delivering unrequested drugs, unnecessary delays, and delivering short expiry drugs) within the supply chain process, (Goetsch & Davis, 1999).

Cost Management in Service Delivery

This was reflected at a mean of 3.65, still interpreted as high, regarding the extent of cost management in service delivery at NMS. Further, the study showed that, drugs usually delivered by NMS to health units and hospitals are cheaper than those in the open market by a mean of 4.54, interpreted as very high. This is in line with the objective of NMS of providing affordable medical supplies to Ugandans, (NMS Act, 1993). In addition, cost management is crucial in determining the price of products that an entity delivers in the market, in that, if the cost of providing a product(s) in the market is high, then the price of those products is also likely to be high. Equally the opposite is true, (Pfeffer & Salancik, 1978). With respect to this, managing supply chain delivery costs is paramount to promoting affordable products/ drugs by the NMS within the market (hospitals and health centres) and in improving the quality of life among the citizens of the country.

In the same vein, Porter (2001) as cited by Lyson and Farrington, (2006) observes that, supply chain cost drivers that entities like NMS should never forget to consider when making decisions concerning cost rationalization, include but not limited to the following; (1) the extent at which organizational(s) engage in economies of scale, (2) the level of strategic linkages and interrelationship, timing of market entries, and lastly, (4) government policies like imposition of taxes, among others. These drivers once observed by NMS, service delivery cost, will lower, thereby making its product/ drugs continually cheap/ affordable in the market for hospitals and health centres through the country.

Time Management in Service Delivery

Represented by a very low average mean of 1.36, poor timely service delivery management was majorly attributed to the demise associated with centralization of the supply chain process of drugs in the country at a mean of 1.46. This is in agreement with the Auditor

General Report (2010) that indicates delays in the supply of drugs by NMS to District like Adjumani, Nebbi, Hoima, Masindi and others. According to the Mulago Hospital Stores Supervisor problems of late delivery of drugs by the NMS are associated with lack of consultation by NMS. He further observed that, NMS just delivers drugs without finding out what is needed most in a given time. This leads to products/ drugs expiring before they are consumed, which is a waste. A waste is any unwanted time in the supply chain process, which cause by inefficient management of systems. Wastes can be in form of expired products, unwanted process, long lead time, and others, (Oakland and Dule, 1994).

5.2.4 Relationship between Supply Chain Information Management and Service Delivery

A positive and significant relationship between supply chain information management and service delivery was indicated at r-value of 24%, and a 0.02 level of significance. This concurs with Sun and Yen (2007), argument that supply chain information management promotes service delivery by enhancing visibility and demand forecasting within the supply chain network of most private and public organizations, thereby promoting effective planning and allocation of resources within organizations, in order to meet such demand changes, thus effective service delivery management. Further, information exchange among supply chain members through collaborative alliances, consortiums, and in reciprocating technical decisions leads to effective quality, and time management with the supply chain process, (Mentzer et al., 2001)

According to Marinos (2005), organizations that invest in strong supply chain information management practices, like the use of information communication technologies, their service delivery level are likely also to increase. This probably explains why, NMS fairly embarks in computerization of data capture processing denoted by an average mean of 4.43, information storage at a mean of 4.32 and information flows at a mean of 2.70, within its supply chain network. In the same vein, information communication technologies enhance supply chain management practices, which eventually trickle on service delivery performance in terms of effective quality management, cost management and time management in service delivery within an organization(s), (Lambert et al., 1998). In addition, intervening variables like government policies, management practices and the role of oversight bodies also influence service delivery, however, their influence were not considered for detailed discussions in this study, (see figure 1).

5.3 Summary of Findings

The researcher intended to examine the relationship between supply chain information management and service delivery. The study was guided by four objectives which included; (1) examining the influence of supply chain information processing on service delivery by the National Medical Stores, (2) assessing the influence of supply chain information storage on service delivery performance by the National Medical Store, (3) evaluating the effect of supply chain information flow on service delivery by the National Medical Stores, and lastly, (4) examining the relationship between supply chain information management and service delivery management by the National Medical Stores.

5.3.1 Profile of Respondents

Respondents Profiles from the National Medical Stores

Out of the 56 respondents who were examined at NMS, the majority 46.4% came from the Operational Department, followed by those in the procurement and Logistics Department at 19.6%, and the least come from the Finance and Accounting Department at 5.4%. Concerning employee positions in the organization, the operations level took the majority of 55.4%, followed by tactical level at 41%, and lastly, strategic level at 3.6%. Concerning educational qualification, Bachelors holders took the majority share of 44.6%, followed by Masters holders at 30.4%, and lastly, Diploma holders at 25%. In the same way, 17.9% were CIPS holders, 21.4% ACCA holders and 12% had other types of professional qualifications. Concerning educational specialization, the majority 25% were Pharmacists, followed by 8.9% Paramedics, and the least, were Computer Scientist at 8.9%. Lastly, concerning length of service in the organization, the majority (48.2%) of the employees had served between 5-9 years, followed by those between 1-4 years (46.4%), and the least had served between 15-19years (1.8%).

Respondents Profiles from the Mulago Hospital and Kisenyi Health Unit IV

A total of 63 respondents were examined in Mulago Hospital and Kisenyi Health Centre IV. Of these 19 were from Kisenyi Health Centre, while 38 from Mulago Hospital. Of these, 88.9% of the residents were from the Medical Department, followed by 7.9% from Procurement/ Logistics Department, and lastly, 3.2% from Administration. Of these, 88.9% were from the Operations level, and only 11.1% were at the Managerial level. Concerning their academic qualifications, 50.8% were Bachelors holders, followed 39.7% Diploma holders, and lastly, 9.5%

Masters degree holders, only 4.8% had a professional qualification (CIPS). Concerning their educational specialization, the majority 46% were Nurses and Paramedics, 33.3% Medicine and Surgery, 11.1% Pharmacy, 4.8% Procurement/ Logistics, and lastly, 4.8% Social Scientists. Of these, 55.6% had a length of service of 1-4 Years, 36.5% a length of service between 5-9 Years, 6.3% a length of service between 10-14 Years, and lastly, 1.6% a length of service between 15-19 Years.

5.3.2 Supply Chain Information management

This was the independent variables in the study. It was divided into three constructs namely; (1) supply chain information processing, (2) supply chain information storage, and (3) supply chain information flow as follows:

Supply chain Information Processing

This was the first specific objective in the study. It aimed at examining the extent supply chain information processing and its influence on service delivery. Supply chain information processing was divided into three aspects namely: (1) activities, processes, and factors affecting supply chain information processing; (2) challenges affecting supply chain information processing, and lastly, (3) solutions to the challenges affecting supply chain information processing as discussed below:

Activities & Factors Influencing SC Information Processing

The study indicated a very high presence of supply chain information processing activities within NMS at an average mean of 4.36. This was precipitated by a very high response rate in conformity with information processing promoting quality, cost and timely delivery at a mean of 4.62. However, low levels of using electronic system in data collected were cited at a mean of 2.73.

Challenges faced by Supply Chain Information Processing

Results indicated that supply chain information processing faces challenges at an average mean of 2.71, interpreted as undecided. Of these, a high response rate was cited in form of poor data/ requisition from hospitals and health centres at a mean of 3.96, followed by insufficient numbers of staff allocated to handling supply chains functions at a mean of 2.73, and lastly, lack of adequate field staff facilitation at a mean of 2.18, which was relatively low.

Solutions to the Challenges faced in Supply Chain Information Processing

Responses also suggested that, supply chain information processing challenges are solved at an average means of 3.79, interpreted as high. Of these solutions, sensitization of health workers on the importance of providing timely and accurate information, ranked highest at a mean of 4.57, followed by facilitation of staff at a mean of 4.21, then staff training at a mean of 3.68, and lastly, recruitment of more staff within the supply chain processes of NMS at a mean of 2.70. This is a fair representation of how information processing can be improved.

Supply Chain Information Storage

As the second specific objective in the study it sought to assess the influence of supply chain information storage on service delivery performance by the National Medical Stores. The finding indicated a high level of supply chain information storage at NMS with an average mean of 4.06. This was precipitated by a very high response rate on the fact that, information storage promotes quality, cost, and time management in service delivery, with a mean of 4.71. Secondly, very high responses were also cited in storing information, both in soft and hard copies at a mean of 4.52, which signaled the pertinence of information. Furthermore, data was protected in forms of anti viruses and social engineering method, which were represented by a mean of 4.11.

Supply Chain Information Flow

This was the third specific objective intended to evaluate the effect of supply chain information flow on service delivery. Results indicated a high level of supply chain information flow at an average mean of 3.91. This was precipitated by the hooping number of respondents who indicated that, effective information flow among the organizational departments and its partner firms generally promotes quality, cost, and time management in service delivery by a mean of 4.70. In confirmation of that, respondents also suggested that absence of effective information flow from health units and hospitals affects the quality, cost and time of service delivery by a mean of 4.55. Cyber crime, virus and Trajan horses affected data transmission by a mean of 1.91, which was a low level threat to the entity.

5.3.3 Service Delivery Management

Quality Service Delivery Management

This was the first construct under service delivery (the dependent variable) in the study. Quality management in service delivery was cited with a high average mean of 3.81. This was attributed to a very high level of information quality on the requirement of drugs sent to NMS by hospitals and health centers at a mean of 4.70, followed by the standard of drugs delivered by NMS to health centres and hospitals within the country at a mean of 4.61, and the accompaniment of facilities, like refrigeration when drugs are delivered at a mean of 4.57, among others as indicated in table IV.

Cost Management in Service Delivery

As the second construct under service delivery management, responses also showed a high level of cost management in service delivery by NMS at an average mean of 3.65. This performance is attributed to the highest rank given to drugs delivered by NMS being cheap compared to other providers in the market, and secondly, not attaching any cost when delivering these drugs to health centres and hospital, both at a mean of 4.54. Furthermore, accessibility of drugs to patients recorded a high response rate of mean 3.98, among others, which makes Government drugs preferred by many, as compared to those bought from private pharmacies.

Time Management in Service Delivery

This was the third construct under service delivery. It aimed at assessing the extent of time management in service delivery by NMS, which was cited very low at an average mean of 1.36. This performance was attributed to the centralization of the drug supply chain management process at a mean of 1.46, followed by very low levels of response to medical emergencies at a mean of 1.34 and lastly, the frequent late deliveries of drugs within the country at a mean of 1.29, which is not the desired response to medical emergencies like Ebola, Cholera, Marburg and other, in case they have struck the country.

5.3.4 Relationship between Supply Chain Information Management and Service Delivery

The main objective of the study was to examine the relationship between supply chain information management and service delivery. The researcher hypothesized that there is no significant relationship between supply chain information management and service delivery. To

test this hypothesis, the researcher correlated the mean scores for supply chain information management and mean scores for service delivery management using the Pearson's Correlation Coefficient (PLCC) and the results indicated a positive and significant relationship of (Sig. 0.020, r = 0.244) between supply chain information management and service delivery, which implies that the alternative hypothesis is accepted. In the same way, the study indicated a positive and significant relationship between supply chain information processing of (Sig. 0.014, r = 0.328), followed by supply chain information flow (Sig. 0.033; r = 0.176), and lastly, supply chain information storage (Sig. 0.048; r = 0.009). All this put into perspective; supply chain information management positively affects service delivery.

5.4 Conclusions

From the finding, the researcher concluded on the hypothesis as follows: (1) there is a positive and significant relationship between supply chain information processing and service delivery, (2) a positive and significant relationship between supply chain information storage and service delivery was indicated, similar (3) there is a positive and significant relationship between supply chain information flow and service delivery management.

That notwithstanding, supply chain information management and service delivery in general indicated a positive and significant relationship, resulting into acceptance of the alternative hypothesis. The researcher concludes that, supply chain information management does affect/ influence service delivery within public health sector organizations.

5.5 Recommendations

The researcher puts forward the following recommendations, basing on the study findings:

1. National Medical Stores should create an environment that encourages health centres and hospitals to easily make requisitions whenever there is a need within a health Unit/ hospitals across the Country. This will allow easy capture of data/ request, thus promoting affective planning for delivery management

2. Hospital and health centre personnel should be trained and enlightened on the procurement process and in particular how to assess their needs and make rightful specification. This will reduce the problem of errors associated with making requisitions by health units/ and hospitals.
3. There is need for more supply chain professionals within NMS to help manage procurement and the distribution process of drugs within the Country. This is because the entity handles large scale operations of supply chain, yet the prevailing numbers seem not to be sufficient.
4. The National Medical Stores should invest in ICT in order to enhance data collection, analysis, storage and dissemination. The rate at which data is collected using modern gargets is low, and yet studies have shown that such tools capture vast datum, and are accurate compared to the manual systems, largely being used by the entity currently.
5. Occasionally, NMS should meet with health centre/ hospital officials to plan for drug deliveries within the Country, and in order to coordinate information regarding drug stocks within health units/ hospitals, which will eventually eliminate the problem of poor response to medical emergencies like Ebola, Cholera, and Marburg, when they strike the country.
6. Lastly, Government should continuously support NMS by adequately funding it. This will enable NMS to maintain an adequate stock level and avoid problems of drug shortages within the country, and in order to efficiently manage its internal operations like facilitation of field staff, acquisition of modern data management gargets, and others, thus enabling effective supply chain management of drugs within the Country.

5.6 Areas of Further Research

1. Supply chain information management and service delivery efficiency in private sector organizations in Uganda.
2. Physical distribution information management and the performance of private sector organizations in Uganda.
3. Strategic supply chain management and performance of public sector health organizations in Uganda.

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APPENDIX A: QUESTIONNAIRES

RESEARCHER'S LETTER TO RESPONDENTS

Dear Respondent;

I am a student of Masters of Science in supply chain management (MSc.SCM), Kyambogo University. I am conducting a study on: ***'Supply Chain Information Management and Service Delivery Efficiency in Public Sector Health Organizations'.***

You are kindly requested to respond to this questionnaire that has been sent to you. The study is purely for academic purposes, and the information given shall be treated with ultimate confidentiality.

Instructions:

- You may not indicate your name on the questionnaire.
- You are requested to take some minutes of your time and fill this questionnaire as honestly as possible
- Have it ready for collection by the researcher within a period of one week.
- Your participation/ contribution is highly appreciated.

Yours faithfully:

PULE Samuel

MSc. SCM CANDIDATE

0782 889 502

Section A: Profile of Respondents

Please fill and use a tick (√) to indicate your responses, (where applicable)

1. Organization

   .....

2. Your department within the Organization

   .....

3. Position in the Organization

   .....

4. Highest Education Qualification

PhD	Masters	Bachelors	Diploma	A' Level	O' Level	Primary	Others

5. Educational Specialization

Pharmacy	Human Medicine & Surgery	Nursing & Paramedical	Procurement & Supplies Mgt	Transport & Logistics Mgt	Engineering	Social Sciences	Others

6. Professional Qualification

CIPS	NEVI	ACCA	CPA	CPS	Others

7. Length of Service in the Organization

1 -4 Years	5 -9 Years	10 – 14 Years	15 – 19 Years	20 & above

Section: B Supply Chain Information Management

The following tool/ statements are to be answered by the staff of National Medical Stores (NMS). It aims at assessing the extent to which supply chain information management (SC information processing, SC information storage, and SC information flows) influences service delivery at NMS.

Please rate /indicate/ tick (√) appropriately your response with respect to the importance of the statements below:

1. *Strongly Disagree*	2. *Disagree*	3. *Not Sure*	4. *Agree*	5. *Strongly Agree*

Supply Chain Information Processing							
	Activities, Processes, & Factors Influencing SC Information Processing						
1.	Information on drug supply is collected directly from regional hospitals and health center IVs by National Medical stores officials	**1**	**2**	**3**	**4**	**5**
2.	The users (regional hospitals and health centers IV officials) are the ones who request/ demand for drugs in case a need a rises					
3.	Health centers/ and regional hospital officials communicate drugs requirements/ requests on time to National Medical Stores					
4.	Information quality communicated by health centers/ regional hospitals is usually accurate and reliable					
5.	Information on drug requirement/ status should always be supplied by health centers/ regional hospitals, instead of NMS collecting it from them					
6.	Information/ data received on drug requirement/ requests from health centers/ regional hospitals is verified when deliveries are made					
7.	Information/ data is collected using electronic systems like Bar coding and Electronic point of sales/delivery (EPOS)					
8.	Information/ data is recorded with the aid of electronic gadgets like computers					
9.	Information/ data is tabulated/ analyzed with the aid of computer programmes/ systems in order to come up with accurate interpretation.					
10.	Interpreted data/ information is disseminated to the various respective user departments/ or members of the supply chain for efficiency.					
11.	Effective information processing (collection, analysis and dissemination) promotes quality management in the delivery of drugs by availing factual information on the needs of peoples to NMS.					
12.	Effective information processing (collection, analysis and dissemination) promotes cost minimization by enabling NMS identify cost effective suppliers and distribution channels within the supply chain					
13.	Effective information processing (collection, analysis and dissemination) promotes timely delivery of drugs in health centers/ regional hospitals by					

	enabling supply chain members plan effectively and be in position to meet deadlines.					
14.	Generally, effective information processing (collection, analysis and dissemination) promotes quality, cost minimization, and timely delivery within the entire supply chain process					
	Challenges affecting SC Information Processing					
1.	Staff lack adequate facilitation in the field in form of adequacy of data collection gargets, commission fee, and transportation					
2.	Rarely are staff development and training programs are conducted to update employee with modern techniques and ways of managing supply chain problems					
3.	The overall number of supply chain employees is small to be in position to carryout entire supply chain activities comprehensively					
4.	Information from health centers/ and regional hospitals in form of requisition is usually full of mistakes, and normally delivered late					
	Solutions to the Challenges affecting SC Information Processing					
1.	Staff are adequately facilitated in the field by providing data collection gargets, commission fee, and transportation					
2.	Occasionally staff trainings are conducted to update supply chain employees with modern techniques and ways of managing supply chain problems					
3.	The entity needs to recruit more supply chain staff to beef up the current numbers					
4.	Sensitization of health centers/ regional hospital staff on the importance of providing timely information to NMS					

Supply Chain Information Storage						
1.	Information collected/ received by the entity is stored in soft copies with the aid of computers, instead of being recorded manual/ in paper form	**1**	**2**	**3**	**4**	**5**
2.	Computer storage systems promote accuracy, efficiency and economy in space than manual systems/ paper form recording systems					
3.	Computer storage systems are safer in terms of destruction, and loss than manual recording systems					
4.	The entity is challenged with cyber space risks such as viruses, worms, and Trajan horses over its computerized storage systems.					
5.	Firewalls, anti-viruses, and social engineering/ training staff are some of the ways in which the entity protects its information resources					
6.	Information resources stored are usually classified according to the timelines of drug expire, regions in which they are collected and others					
7.	Paper recording/ manual recording is normally used to supplement, and backup soft copies/ information in case it is lost from the computers					
8.	Access to stored information is usually restricted from organizational staff					

	for purpose of security and alteration/ tempering					
9.	Effective information storage promotes quality management by maintaining records on the status of drugs such as expiry dates, special care to given on particular drugs and others.					
10.	Effective information storage promotes cost minimization by maintaining records which turn help maximize service delivery efficiency, and effectiveness through improved visibility.					
11.	Effective information storage promotes time management by maintain records on delivery deadline of drugs, thus effective supply chain management process					
12	Generally, effective information storage promotes quality, cost minimization and timely delivery within the supply chain process.					

Supply Chain Information Flow						
1.	Information flow among the difference organization's departments and other external entities is a common practice.	**1**	**2**	**3**	**4**	**5**
2.	Information flow among the various organization's departments and others entities is done electronically using computer to computer systems like electronic data interchange/ and the internet.					
3.	Effective information flows among the various organization's departments and other external entities such as the suppliers promotes quality management in the supply chain process of drugs by increasing accuracy, innovation and vigilance.					
4.	Effective information flows among the various organization's departments and other external entities such as the suppliers promotes cost minimization in the supply chain process of drugs by increasing accuracy, innovation and vigilance.					
5.	Effective information flows among the various organization's departments and other external entities such as the suppliers promotes time management in the delivery of drugs by increasing accuracy, innovation and vigilance					
6.	Generally, effective information flow among the various organization's departments and other external entities promotes quality, cost minimization and time delivery within the supply chain process					
7.	Absence of effective information flow between NMS and its suppliers negatively affects quality management, cost, and the delivery time.					
8.	Absence of effective information flow from the users (health centers/ regional hospitals) affects the quality, cost and time of drug delivery.					
9.	Information flowing within the cyber space is normally threatened by illegal intruders/ crackers within the supply chain process.					
10.	Information flowing within the cyber space is protected from crackers using private key encryption systems of authentication/ verification.					
11.	All staff members within the supply chain process are trained on how to handle information and ensure it is used optimally.					

Section C. Service Delivery

The following tool/ statements are to be answered by the beneficiaries/ users of the drugs supplied by National Medical Stores (NMS), that is to say, Hospitals/ or health centers. The tool is aimed at assessing the level of service delivery by NMS. Service delivery constitutes constructs like quality of services delivered, cost/price of services offered/ delivered, and timeliness in meeting delivery deadlines within the supply chain process.

Quality Management						
1.	The standard of drugs delivered by National medical stores to health centers and regional hospitals is always of high quality	**1**	**2**	**3**	**4**	**5**
2.	Drug specifications as ordered by regional hospitals/ health centers is usually observed and fulfilled by National medical stores					
3.	Inspections/ verifications of the quality and accuracy of drugs are jointly done both by NMS and health centers/ regional hospital officials upon delivery.					
4.	Information on the quality and requirement of drugs to be supplied is provided by health centers/ regional hospitals to National medical stores					
5.	The National medical stores makes consultations from regional hospitals/ health centers on the exact descriptions and quality of drugs before delivery					
6.	Quality standards like the ISO and UBOS are usually observed by National medical stores					
7.	Delicate/ fragile drugs are usually delivered when they are still intact and not contaminated or spoiled					
8.	You are occasionally advised how to handle particular drugs, which are considered delicate and need special consideration.					
9.	Drugs that require refrigeration are always accompanied by the refrigeration facilities provided by National Medical Stores					

Cost/ Price Management						
1.	Drugs delivered by National medical store are easily accessible and affordable to every patient	**1**	**2**	**3**	**4**	**5**
2.	Usually drugs delivered by National medical stores are cheaper than other suppliers in the market					
3.	National medical stores role in the economy of Uganda is key in controlling the cost of drugs in the country					
4.	Centralizing drug procurement and supply chain system the way it is in Uganda under NMS generally improves supply chain efficiency and cost management.					
5.	National Medical Stores usually does not attach any costs to the drugs delivered.					

Delivery Time Management						
1.	Drugs are usually delivered on time by National medical stores to health centers/ regional hospitals	**1**	**2**	**3**	**4**	**5**
2.	In case of medical emergencies the National medical stores strives hard to respond to the needs of people on time					
3.	Centralizing drug procurement and supply chain system the way it is in Uganda under NMS generally improves time management in delivery and effectiveness.					

APPENDIX B: INTERVIEW GUIDE

Supply chain Information Management

Information Processing

1. NMS has any information system used in ensuring affective distribution management of drugs in Hospital/ and health centers? If yes, what is it called? How is it operated? What benefits and challenges does it posses to NMS?
2. In 2009 the NMS introduced a drug supply chain system that integrates both elements pull and push. What benefits and challenges have been realized from this kind of combined system? How is it different from the previous demand pull system?
3. Does the entity collect information from stakeholders (e.g. Hospitals and Health centers)? If yes how is it collected and probably disseminated among the key stakeholders of NMS? What is the rationale behind collecting such information/ data, and what challenges do you face as an entity in collecting this kind of information? What measures have your devised to improve your information collection and dissemination process as an entity?
4. How is information managed after being collected? Is it classified/ categorized according to its importance? How is it entered into the entity's system? Any challenges faced during this stage of information management? If yes, what is it, and how have you gone about mitigating such challenges.
5. How often does the entity collects data from its recipients (hospitals and health centers) in order to improve its operations of procurement and physical delivery.

Information Storage

6. How is information stored at NMS? Are there any particular systems used in storing information? If yes, what are they, and what benefits/ challenges does it provide to the entity? How have you gone about mitigating the challenges?

7. Information loss or misuse is sometimes common in organizations; how have you as NMS ensured that your information is kept intact? What challenges are you facing in ensuring this, and how have gone about them?

Information Flow

8. Do you as an entity share information with other firms/ organizations in similar business? If yes, why? What challenges do face in doing this? How has management mitigated such challenges?
9. Does NMS share information with its customers (hospitals, and health centers)? If yes, why? What challenges do you face in sharing information with them? How do these challenges affect service delivery? How have you tried to resolve/ mitigate such challenges?
10. Is there any information dissemination mechanism used by NMS to its shareholders (hospitals, health centers, business partners and others)? If yes, what is it, and how does it work? What benefits does it provide to the entity and may be NMS stakeholders? What challenges does the system possess and how have you tried to resolve them?

Service Delivery

Quality Management

11. Are the drugs delivered by NMS meet your expected quality standards? If no, what could be the problem?
12. Does NMS consult you with regard to quality matters? If yes, in which way, and how do you advice on improving quality standards by NMS?
13. Are their instances where the entity has ever received expired drugs? If yes, what explanations did NMS give?
14. Do you agree that the drugs NMS provides are among the best brand in the world? If no, why? What should be done to ascertain the best brands?

15. Does the NMS conducts periodical assessments to establish whether drugs have reached your health center or not? If not, how do you let it know that your request where not fulfilled?

Cost/ Efficiency Management

16. The NMS delivers cheap/ for free, true or false? If false, why do you think so? What should be done to lower the cost of drugs in the country?
17. Do you agree that NMS is efficient in delivering drugs to health centers or not? If no, what could be the problem, and what should be done to improve efficiency in service delivery by NMS?
18. What benefits accrue when drugs are delivered efficiently by NMS? And what challenges faced by NMS in the efficient delivery of drug to health centers? How have the challenges been tackled?

Timely Service Delivery Management

19. Have you ever received late drugs? If yes, how many times, and what do you think should be done by NMS to ensure timely delivery?
20. In case of any delivery problem faced (such as misallocation, late delivery or wrong deliveries), what has the entity done to address such anomalies?
21. Does NMS meet all its delivery orders on time? If no, what could be the problem, and what should be done to improve time management in delivery?
22. In case of incomplete order fulfillment, does the NMS quickly replenishes the unfulfilled orders in time or not? If not, what could be the problem, and what should be done to ensure efficiency in replenishing or fulfilling the unfulfilled orders?

APPENDIX C: LETTER OF INTRODUCTION

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Kyambogo University Graduate School

Your ref.....
Our ref: KYU/GSch/01/13

11th July, 2013

To Whom It May Concern

Dear Sir/Madam

RE: LETTER OF INTRODUCTION

This is to introduce to you **PULE Samuel Reg No: 2011/HD/306/MSc.SCM** who is a student of Kyambogo University pursuing a Master of Science in Supply Chain Management of Kyambogo University.

He is carrying out a research on ***"The Supply Chain Information Management and Service Delivery Efficiency in Public Sector Organizations"*** A case study of National Medical Stores in partial fulfillment of the requirements for the award of the Master of Science in Supply Chain Management of Kyambogo University.

This is to kindly request you to grant him permission to carry out this study in your establishment.

Any assistance rendered to him will be highly appreciated.

Yours faithfully.

Dr. M.A. Byaruhanga Kadoodooba
Dean, Graduate School

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