



**ASSESSMENT OF THE USABILITY OF SAGE L500 IN THE  
MANAGEMENT OF PHARMACEUTICAL INFORMATION  
SYSTEM**

**Case study: Medical Production and Procurement Division of Rwanda  
Biomedical Center**

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**SCHOOL OF PUBLIC HEALTH**

**MASTER OF SCIENCE IN HEALTH INFORMATICS**

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**By**

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**In the College of medicines and health sciences**

**Supervisor:** Dr. NGARAMBE Donart

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# DECLARATION

## A. DECLARATION BY THE STUDENT

I, **RWABUKERA Fidele**, hereby declare that the thesis has been written by me without any external unauthorized help, that it has been neither presented to any institution for evaluation nor previously published in its entirety or in parts. Any parts, words or ideas, of the thesis, however limited, which are quoted from or based on other sources, have been acknowledged as such without exception.

Date and Signature of the Student

.....

## **DEDICATION**

To God Almighty

To my beloved wife NYIRASONI Florence

To my beloved children

To all my family

## **ACKNOWLEDGMENT**

My thanks go especially to my Supervisor Dr. NGARAMBE Donart and NYANDWI Theogene for their valuable advice, comments, criticism, and suggestions for accomplishment of this work. My acknowledgement goes also to my family for encouragement and advices. I am heartily thankful to my lecturers for encouragement, guidance and support from the initial to the completion of studies and this work.

Lastly, I offer my regards and blessings to all of those who supported me in any respect to the completion of the project.

## ABSTRACT

**Background:** Pharmaceutical information system is a branch of Health information system aimed at enabling production of quality data to support decision making.

In some countries especially in Sub-Saharan Africa, the medicine supply system are often unreliable and therefore do not guarantee regular supply of these essential medicines. This developing world has shown constrains related to routine health information system performance at the country-level which include poor data quality; limited use of available information; weaknesses in how data are analyzed; and poor information management practice. Although Rwanda integrated Information Technology in all spheres of the country life including health sector, to date there is scarce information on how the system is used in drugs management and report production. This is why there is a need to explore challenges related to information management systems in place thereby avoiding Stock outs, overstock and expiry of drugs.

**Methods:** The staff at RBC/MPPD actively involved in information management was part of the participants of this cross-sectional qualitative study design which was employed to meet the objectives of the present study.

**Results:** Across all the eighteen interviewees, the respondents said that they use SAGE L500 as tool to manage pharmaceutical products. All respondents in their respective units indicated that this software itself cannot process all information necessary to provide direct reports.

**Discussion:** The study highlighted that the use of SAGE L500 is crucial especially for essential medicines and highly active anti-retroviral therapy drugs management. The use of the system was reported by most of the interviewees to impacted positively on drug management in RBC/MPPD and suggested to upgrade and customize SAGE L500 so that it can cover all steps of supply chain in a warehouse and enable direct generation of reports without exporting data to other software for data analysis.

**Recommendation:** To invest more in pharmaceutical information management systems to strengthen the existing ones and come up with the solutions to the raised suggestions by the users.

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## **LIST OF ACRONYMS AND ABBREVIATIONS**

ART: anti-retroviral Therapy

ARV: anti-retroviral

CAMERWA: Centrale d'achat des Médicaments Essentiels, Consommables et Equipements Médicaux du Rwanda

CDC: Center for disease Control

ERP: Enterprise Resource Planning solution

IT: Information Technology

LMIS: Logistic Management Information System

MDGs: Millennium Development Goals

MIS: management information systems

MMU: Materials Management Unit

MOH: Ministry of Health

MPPD: Medical Procurement and Production Division

OI: Opportunistic infection

PEPFAR: President's Emergency Plan for AIDS Relief

PMIS: Pharmaceutical management information system

RBC: Rwanda Biomedical Center

RTRC: Regional Technical Resource Collaboration

SCM: Supply Chain Management

SCMS: Supply Chain Management system

USAID: United State Agency for International Development

WHO: World Health Organization

WMS: Warehouse Management System

## **OPERATIONAL DEFINITION**

**SAGE L500** is an Enterprise Resource Planning solution, commonly known as ERP, which integrates the Finance modules, Distribution module and Manufacturing module. For MPPD, the General Ledger, Account payable, Account Receivable, Cash Management, Fixed Asset, the Purchase Order Processing, Inventory Control and Sales Order Processing are implemented.

The term **pharmaceutical** encompasses medical products, vaccines, contraceptives diagnostics and medical supplies (1).

**Pharmaceutical management** is the set of practice aimed at ensuring the timely availability and appropriate use of safe, effective, quality medicines, health products, and services in any health care setting (1).

**Usability** is a quality attribute that assesses how easy user interfaces are to use, methods for improving ease-of-use during the design process (2).

**Pharmaceutical management information system (PMIS)** is a branch of Health information system aimed at enabling decision to be made in transparency based on evidence provided by the system, thus helps in producing quality data to support decision making. PMIS has been introduced for pharmaceutical stock management as well as drugs supply (1).

# **CHAPTER ONE: INTRODUCTION**

## **1.1 BACKGROUND**

Information management technology in pharmaceutical industry is traced back to the 1970s as a result of meeting the demands in health services delivery where accuracy, safety, and efficiency in medication use by regulatory authorities, manufacturers, health care professionals, and consumers was a priority in health care system (3).

The pharmacy profession has grown from dispensing and compounding drugs in the 1950s toward a more patient-oriented practice and development of the concept of clinical pharmacy in the mid-1960s. Thereafter was the provision of drug therapy in early 1990s to more of optimizing therapeutic outcomes and promoting safe, efficacious, cost-effective medication use, and then the need of information technology became evident in the united States (4).

The information technology in pharmacy management is likely to be a new paradigm in pharmacy practice as was revealed in a report from the American Pharmacy e-HEALTH Information Technology Collaborative (4). It has put in place the road map for pharmacy health information technology in developed world health care to stress that by the end of 2011, the pharmacy should be aware of available technologies and regulations that enable them to deliver best care within the electronic health information technology framework (4).

In low and middle income countries, more than two billion people lack adequate access to essential medicines. This impressed the integration of technology in all spheres of development including pharmaceutical management in addressing issues being placed on the pharmaceutical industry and thereby contributing to access to medicines for poor patients (5).

The Central Medical Store has responsibilities of the receipt, storage and distribution of all the supplies to the lower levels of the tier. On the other hand Health facilities are expected to get their supplies from the appropriate Regional Medical Stores, depending on their location (6).

A study on the health logistics systems in Ghana revealed that greater decision space was related to better performance for financing, planning and budgeting (6). Otherwise, worse performance was related to procurement, inventory control, storage, logistics management information systems, training, and client contact (6) .

Information system in pharmacy management in Tanzania has shown positive results especially in monitoring information regarding quantities received, stock on hand, monthly consumption, expired medicines, expiry date, purchases orders and others.

The information provided is shared by the medical stores and program managers, the Ministry of Health and Social Welfare officials as well as partners in health programs for decision (7).

Health information technology is reported to be linked to a number of challenges ranging from financial, work force, strategic, cultural, structural, technical, and privacy to security issues (3).

The Regional Technical Resource Collaboration for Pharmaceutical Management (RTRC) in East Africa has drawn a joint partnership to boost skills in pharmaceutical management through training in Uganda, Rwanda, Tanzania and Kenya, Rwanda has made efforts to incorporate pharmacy supply management in curriculum of pharmacy and medical students to bridge the gap of scarcity of qualified staff in pharmacy management and in drug supply chain (8).

The Rwanda ministry of health through the pharmacy task force is responsible for the drug requisition and distribution through policy formulation applicable in drug management at all levels from university hospitals, districts pharmacies, district hospitals and health centers; the Rwanda Biomedical Center through Medical Procurement and Production Division (RBC/MPPD) is responsible for drugs purchasing, district pharmacies serve as central clearing house, hospital and health centers are the specialized for drug use as well storage (9). The introduction of SAGE L500 in pharmacy management at RBC/ MPPD was to integrate Information Technology in all spheres of the county life including health sector to facilitate in the medical sales and distribution (10). To date, the scholarship on how the system is used in drugs selection, procurement, storage, distribution and report production is scarce, the present study is likely to explore challenges related to information management system in place to guide management of pharmacy thereby avoiding Stock outs, overstock and expiry of drugs.

## **1.2 PROBLEM STATEMENT**

The Pharmaceutical management information system (PMIS) is the set of practices aimed at ensuring timely availability and appropriate use of safe, effective, quality medicines, health products, and services in healthcare setting (1). In addition, to manage the stock and supply of medication is essential for health care delivery (11). Moreover, to achieve the Millennium Development Goals (MDGs) 4, 5 and 6 which are; to reduce child mortality, improve maternal

health and combat HIV/AIDS, malaria and other diseases, effective and efficient management of health logistics including medicines is very crucial in countries (6).

However, developing world has shown constrains related to routine health information system performance at the country-level which include poor data quality, limited use of available information, weaknesses in how data are analyzed and poor information management practices (6,12). Rwanda is committed to integrate Information Technology in all spheres of the country life including health sector, within this perspective, SAGE L500 information management system was introduced by RBC/ MPPD to facilitate in the management of pharmaceutical products(10). To date there are some reported cases of stock outs, overstock and expiry of drugs; in addition, there is scarce information on whether the gaps are due to the fault of users or the weakness of the system. Therefore there is a need to explore challenges related to information management systems in place and its users, to guide management of health sector to provide appropriate solution to close the mentioned gaps.

### **1.3 RESEARCH OBJECTIVES**

The main objective of the research is to assess the usability of SAGE L500 in the management of pharmaceutical information system at RBC/MPPD.

#### **Specific Objectives:**

- To identify the used functionalities of SAGE L500 in the drug management cycle.
- To assess the reported improvement in service delivery since SAGE L500 is used at RBC/MPPD.
- To assess users' challenges associated with SAGE L500 in drug management.

### **1.4 RESEARCH QUESTION**

- What are the utilized functions of SAGE L500 in drug management cycle?
- What reported improvement has SAGE L500 brought to RBC/MPPD?
- What are the associated challenges with SAGE L500 in drug management?

## **1.5 SIGNIFICANCE OF THE STUDY**

The study contributed to knowledge production in health information system in pharmaceutical industry specifically by use SAGE L500, thus creating awareness on the existing solution, the way they operate, possible challenges users face during the implementation phase, and contributed to the shift from paper based pharmacy management towards an integrated system easily used to guide decision making process.

## **1.6 SUBDIVION OF THE PROJECT**

The study is divided into six main chapters. The first chapter discussed the introduction to the study; which includes the definition of key terms, the study background, problem statement, research objectives, research questions, significance of the study and ends with the subdivision the study. The second chapter presents the literature pertinent to the study. The third chapter details the methodology used to capture the results, this is followed by the results chapter as fourth chapter. The fifth chapter discusses the main results while the sixth chapter draws conclusions and recommendations of the study.

## CHAPTER TWO: LITERATURE REVIEW

### 2.1 SUPPLY CHAIN MANAGEMENT SYSTEM

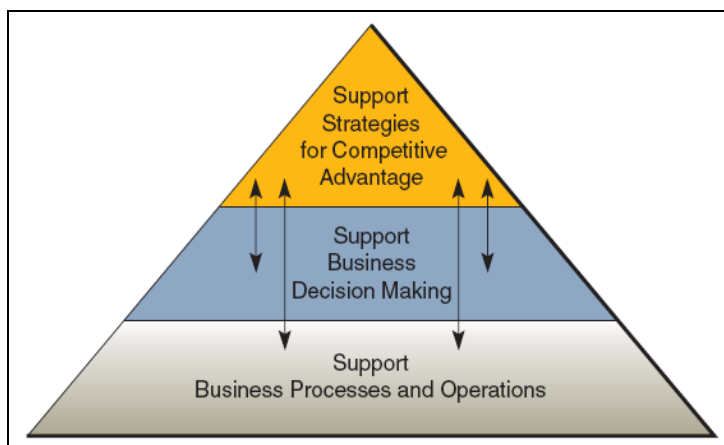
The material, equipment, food, drugs, etc. used in daily life are sourced from different parts of the World. This process involves at least three players: a supplier, your company, and customer (16). Consumer philosophy refers to getting of a high quality product using less money. This makes business challenging, and the need for supply chain management (SCM) becomes critical for doing sales, marketing and finance today. As a consequence, the companies or organizations are looking SCM by using information system as the one way to beat their competitors by offering better service at lower cost (16).

### 2.2 INFORMATION SYSTEMS IN ORGANIZATION

Information system is an integrated set of components for collecting, storing, and processing data and for delivering information, knowledge and digital products; known commonly as Enterprise Resource Planning (17).

Information systems have to support flexibility and innovation, to help organizations and business firms to carry out and manage their operations by visibility and control, interact with their customers and suppliers competitively in the marketplace (17).

Information system therefore helps people carry out their routine activities efficiently and the organization at large achieves competitive advantages. The figure 2.1 summarizes the role of information system in organization.



**Figure 2.1 Summary of the role of information system in organization.**

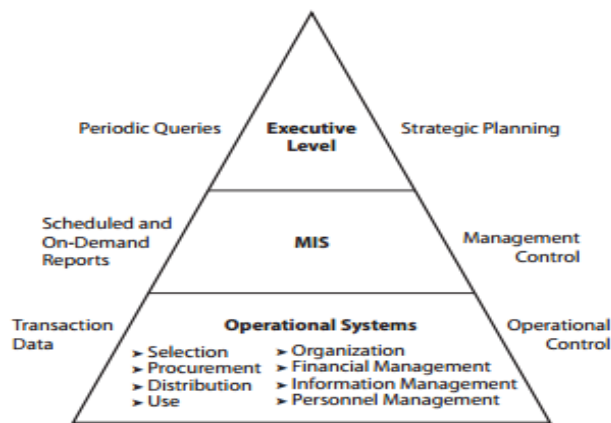


## 2.3 PHARMACEUTICAL MANAGEMENT INFORMATION SYSTEM (PMIS)

The PMIS is an organized system for collecting, processing, reporting and using information that help staff at all levels of a country's health system make evidence-based for decisions to manage pharmaceutical services (13).

Careful management of pharmaceuticals is directly related to a country's ability to address public health concerns. Even so, many health systems and programs run into difficulty achieving their goals because they have not addressed how the medicines essential to saving lives and improving health will be managed, supplied, and used (1).

An effective PMIS is able to synthesize the large volume of data generated by pharmaceutical management operations. It then processes the data into information for use in planning activities, estimating demand, allocating resources, monitoring and evaluating pharmaceutical management operations. Other important function of a PMIS is to improve accountability. Much of the recording and reporting in a PMIS is intended to create an audit trail for products as they enter or leave a pharmaceutical supply system (13).



**Figure 2.2 Information system pyramid**

Viewing information system as a pyramid may be helpful (fig 2.2). At the base of the pyramid are operational systems. These include Subsystem procurement, distribution financial management that handles data at the transactional level. Every item that moves in and out of inventory must be trucked, and decision must be made about how much to deliver to a health facility, when to reorder, and how much to bill. This level is characterized by a high volume of

data that must be recorded and processed, usually daily and at the time of transaction. Data recording accuracy is very important at this level because every unit of medicine matters.

The next level of pyramid is formed by management information system (MIS). These systems typically provide summaries of operational data on a periodic basis (for example, monthly or quarterly) to help managers of specific departments monitor the performance of their units. Annual reports often summarize information on key indicators from many operational subsystems, such as procurement, personnel, financial management or stock control. Information provided by the MIS helps manager's questions as the following:

How do expenditures compare with the budget at a given level of operations? How effective is inventory control system in eliminating stock outs and cutting stock losses? What is the delivery performance of the last period? Are the trends generally favorable, or are indicators worsening? Information at this level may demonstrate reduced accuracy because errors are introduced during the consolidation of data; so a certain level of variation is normal.

The highest level of the information system pyramid is the executive level. At this level the system further summarizes management information for use in strategic planning and policy making. The executive level of the MIS typically generates program wide information on how effective the organization is in accomplishing its mission. System at this level tracks a very limited number of indicators less frequently. They provide users with the tools such as total variables cost analysis and price comparison analysis, to perform periodic queries on data at every information system level, either to investigate the cause of the problem or to perform "what if" analysis to test the effect of changes in strategy. Some of the strategic questions that can be answered with executive level information include the following:

Should the transport and delivery function be contracted out? Could saving be obtained by combining orders with those of another large buyer? Which districts are the best served? Would targeting underserved areas with more marketing and training be worthwhile?

The operational systems level of a PMIS can be examined using the analogy of the information systems pyramid. This level typically contains four subsystems: selection, procurement, distribution and use. Information is necessary within each of these subsystems to efficiently manage finance, pharmaceutical stocks and personnel (1).

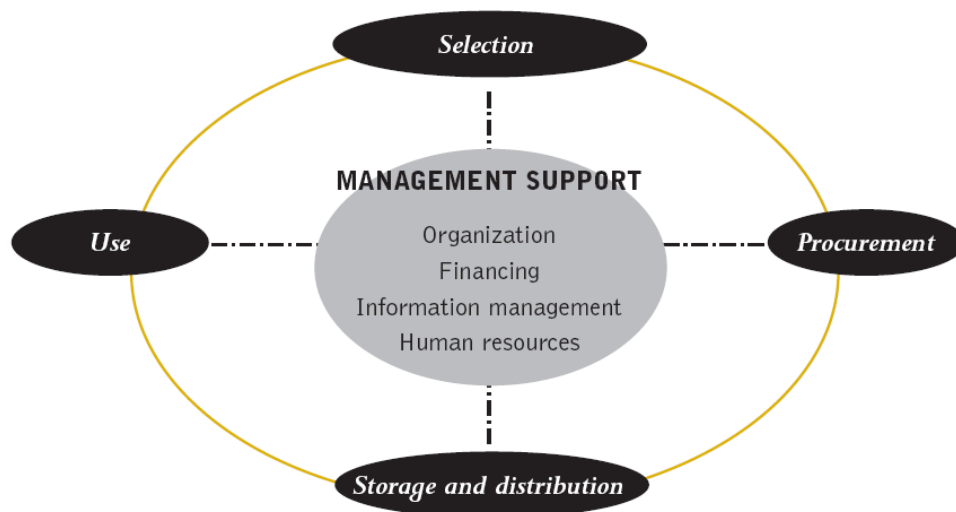
Considering the importance of medicines and limited resources, many ways have been developed to improve the supply and use of medicines while minimizing costs. Pharmaceutical

management represents the whole set of activities aimed at ensuring the timely availability and appropriate use of safe, effective quality medicines and related products and services in any health care setting (1).

Poor information quality attributed to lack of sufficient information, inaccurate information and information delay could also affect the information exchange both at operational and strategic level. Eventually, this could have an adverse impact on supply chain performance (14).

## 2.4 DRUG MANAGEMENT

According to World Health Organization; drug management is undertaken in four principal phases as shown in figure 2.3. All the phases are interlinked and are reinforced by appropriate management support systems, and policy & legal framework. Drug management cycle Starts from drug selection to drug use, through procurement, storage and distribution. A whole range of management capacities are required and necessitate using the appropriate tools within a given legal and policy framework.(15).



**Figure 2.3 Drug Management Cycle**

**Selection of drugs:** Drug selection refers to the process of determining the types of drugs, dosage forms and the quantity of drug to be procured.

**Drug procurement:** This involves procuring required drugs based on the needs and funds available. This process involves quantification, specification gathering, tender preparation,

tender publication, bids evaluation, contract management, goods receptions and quality inspection. The process then ends after reception and payment is done.

**Drug Distribution:** This involves all activities required to move drug from manufacturer to patient.

**Use of drugs:** The rational use of drugs requires that a drug is prescribed for a particular patient after proper diagnosis is done. Rational use of drugs requires that a patient with a specific health problem receives appropriate drugs.

## **2.4 DRUG MANAGEMENT INFORMATION SYSTEM EXAMPLES**

Information system or LMIS have been used in drug management and provide great contribution in forecasting and quantification, Procurement, Calculating authorized stock level and emergency order point at health facilities, Inventory management at the field level, National pipeline monitoring. In this research, the examples of Nepal, Zambia, Guyana and Ethiopia are given.

### **2.4.1 THE USE OF INFORMATION SYSTEM IN NEPAL**

According to study done in Nepal by USAID|DELIVER, before 1993, there was no integrated health logistics system. By 2005, Nepal's health logistics system had been developed, scaled up, and become a model of integration and effectiveness. In part because medicines and other supplies became available, the quality of health services and access to basic health services by poor, underserved, and marginalized populations has dramatically improved. As a result, donors have put more funds into commodities and the government contribution has increased, contributing to improved health services for the population at large.

An effective and integrated LMIS had enabled staff to monitor drugs and supplies at each service delivery point and throughout the system to ensure that resources are used efficiently. It helped for key decision making such as manage stock, distribution and transportation, ensures that drugs are in good condition, rationalize drug storage points, reduce theft and fraud, and provide information for the forecasting of needs(18).

## **2.4.2 THE USE OF INFORMATION SYSTEM IN ZAMBIA**

According to the study done in Zambia, the Ministry of Health with support from SCMS, designed a national logistics system in October 2007. In response to the national ART program scale up, the new logistics system was created to manage laboratory commodities in the supply chain.

At the beginning of SCMS's work in Zambia, no LMIS for laboratory supplies existed. Working through Laboratory Technical Working Groups that include the Zambian Ministry of Health and CDC, SCMS facilitated the design of a new, integrated system that was rolled out to all regions in the country (19,20). MOH piloted and tested the system for almost a year before its official implementation in December 2009.

Health facilities report using paper forms on a monthly basis to the central Logistics Management Unit, which calculates refills using a computerized system. These changes helped reduce laboratory commodity stock outs of 185 priority commodities from 70% of items in 2007 to less than 3% at the end of 2008 (19).

## **2.4.3 THE USE OF INFORMATION SYSTEM IN GUYANA**

Guyana has launched a warehouse management system (WMS) in June 2007, a tool that incorporates hand-held and radio frequency technology into a newly organized warehouse for the Materials Management Unit (MMU) of the Ministry of Health in Guyana (Supply Chain Management System, 2007).

Prior to that WMS, only rudimentary inventory management and support systems were in operation. The Picking and packing at the MMU before the warehouse system was implemented. MMU warehouse had utilized an Excel-based system that was prone to inaccuracy and provided limited visibility into inventory levels and product shelf life, resulting in inefficiencies and product expiration.

Through improved inventory management, the warehouse staff produces more accurate supply plans and forecasts and complaints regarding shortages of drugs and other supplies have already fallen significantly. The successful implementation of the new system in Guyana would serve as a model for other countries. (21)

#### **2.4.4 THE USE OF INFORMATION SYSTEM IN ETHIOPIA**

The customization of one existing electronic information system performed inventory and warehouse management for the regional hubs for distribution of pharmaceuticals. This Pharmaceutical Information Management System improved communication across projects and reporting levels, reporting rates increased from 70% of facilities to more than 99 % and reduced reporting times from 1-2 months to within 3-5 days of the reporting period closing (20).

#### **2.4.5 INFORMATION MANAGEMENT SYSTEM IN GHANA**

The assessment of medicine supply chain find that there are weakness in forecasting and quantification due to the lack of reliable data coordination between the central and periphery, lack of guidelines and rules to facilitate the process of engaging and monitoring suppliers, information for quantification and forecasting was not forthcoming from the facility level to the central procurement unit for decision making (6).

#### **2.5 INFORMATION ABOUT SAGE L500**

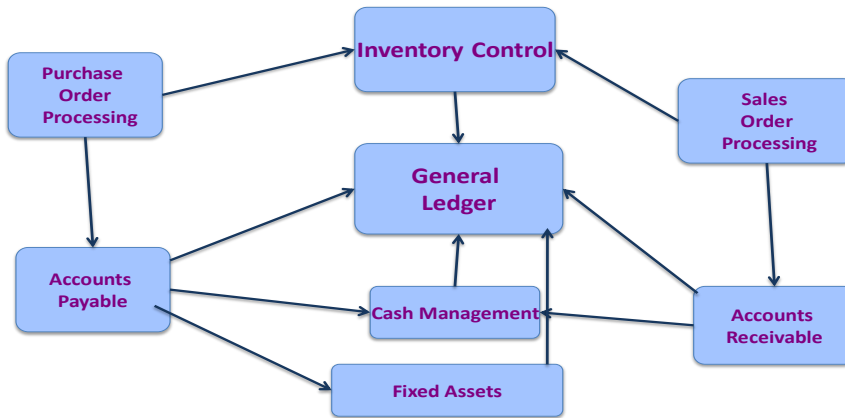
According to the report on the gap analysis of Warehouse Management System Transformation done at exCAMERWA (RBC/MPPD) in 2010; since April 2009, exCAMERWA has been utilizing the SAGE L500 Financial Management System (SAGE FMS) and MACS Warehouse Management System(s) (MACS WMS). The SAGE FMS was directly interfaced to the MACS WMS. During the period subsequent to the implementation, numerous problems have been experienced by users of the system including the issues with stock accuracy, financial records and system usage.

The Transformation GAP Analysis was conducted and documented SAGE L500 Inventory Control, Sales & Purchasing capabilities, features and functionality into 6 main areas, namely:

**Procure to Pay** is the process covers in the acquisition of product, services, equipment and supplies for the CAMERWA organization from tendering to receipt and payment to vendors

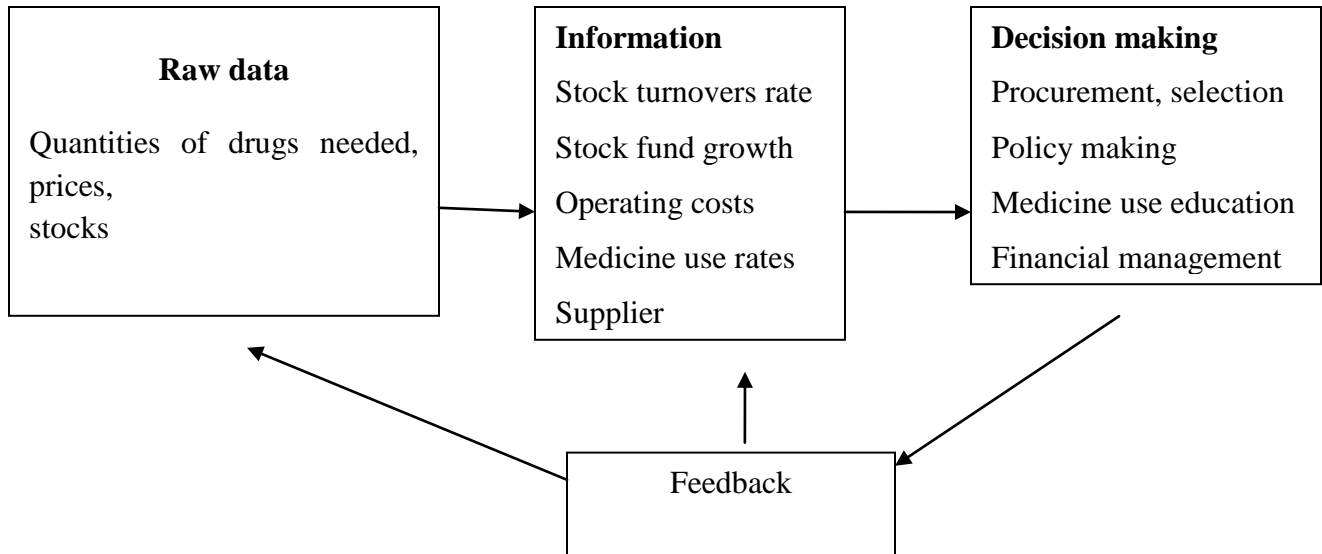
**Order to Cash** describes the following: Sales order cycle from quotation to the invoicing, Invoicing to Cash Receipt (Finance), Return of Goods from Customer

**Warehouse Management, Finance, Master Data Management, Budget Holder and Donor Management** (27). The figure 2.4 below shows the integration between the SAGE L500 modules.



**Figure 2.4** Integration between the SAGE L500 modules

**2.6 THEORITICAL FRAMEWORK GUIDING THE PRESENT STUDY**



**Figure 2.5** The frame work illustrating pharmaceutical information system users and information needs (13)

An effective PMIS is able to synthesize the large volume of raw data generated by pharmaceutical management operations. The figure 2.5 illustrates the process of transforming data into information and interpreting them for use in decision making. The key steps are processing data, presenting information, interpreting information and taking action (13).

The other important function of PMIS is to improve the accountability. Much of the recording and reporting in PMIS is intended to create an audit trail for product as they enter or leave a pharmaceutical supply system (13).



## **CHAPTER THREE: METHODOLOGY**

### **3.1 STUDY AREA**

This research was conducted in Rwanda Biomedical Center /Medical Production and Procurement Division which an entity affiliated to the ministry of health whose mission is to put at the disposal of all people living in Rwanda drugs and medical equipment. RBC/ MPPD has 4 objectives including boosting local production of essential medicines, to align the pharmaceuticals production capacity to the procurement needs, income generation through supply chain management, quality assurance for laboratory commodities. It is through the vision and objective that the research is design to be a contributing element towards excellence.

### **3.2 STUDY DESIGN**

Crosssectional qualitative study design was employed to meet the objectives of the present study. The qualitative study refers to a broad methodological approach to the study of social action and one of its aim is to get actor's perspective by in-depth description and understanding of action (22). While a cross sectional study collects data at one time and analyzing it.

### **3.3 STUDY POPULATION**

The staff at RBC/MPPD actively involved in information management was part of the study participants. To date, RBC/MPPD documents 5 units that use SAGE L500 to generate as well as put forward information that is used in decision making in drugs supply management. The study will include 30 participants from five units of finance, quantification, procurement, warehouse and sales distribution.

### **3.4 STUDY SAMPLE**

Eighteen key informants were selected from 30 employees registered in information management system at RBC/MPPD.

### **3.5 SAMPLING STRATEGY**

Key informants selected purposively based on role and responsibilities of employees in information system at RBC/MPPD and each unit constitute the basis of selecting the sample.

### **3.6 DATA COLLECTION METHOD AND PROCEDURES USED**

The data were collected by means of a semi structured interview that was developed in based on information system guidelines recommended by the World Health Organization.

Two research assistants were trained on the questions and prepared for the whole procedure of data collection. The data collection was conducted from 4<sup>th</sup> to 9<sup>th</sup> December, 2014. The research assistant first contacted the participant to make an appointment prior to data collection. The assistant then explained the purpose of the study and assure full confidentiality and anonymity of the information and the right to withdraw at any time. The research assistant after then conducts an interview within 10-15 minutes and writes the answer below each question. In a case of an appointment, the participant was contacted on day as scheduled. The data were collected in normal working hours and after the data collection, the research assistant kept data in the dataset and hand in to the principal investigator.

### **3.7 DATA COLLECTION INSTRUMENTS**

A semi structured interview was used to get a general picture of challenges of SAGE L500 information management system in drugs selection, procurement, storage, distribution and report production for decision making.

### **3.8 DATA ANALYSIS**

After data collection, data were categorized into themes, cleared, interpreted qualitatively. The data were described and themes were discussed accordingly.

### **3.9 PROBLEM AND LIMITATIONS OF THE STUDY**

The accessibility of the staff during normal working hours delayed the period of data collection. Since there is a limited literature in the domain of pharmaceutical information management

system not only in Rwanda but also elsewhere, the comparison of results would not be possible and thus not generalizable.

### **3.10 ETHICAL CONSIDERATIONS**

Before conducting the study, ethical issues were addressed, starting by requesting the ethical clearance at University of Rwanda, College of Medicine and Health Sciences Research and ethics committee. Thereafter, permission to collect data was requested from RBC/MPPD. The information regarding the study was provided to the participants before the interviews. The participants were explained about the purpose of the study, and anonymity and confidentiality of the information was assured. Then the consent form was signed by respondent who agree to participate in the study. The information regarding the institution was treated with the strictest confidentiality.

## **CHAPTER FOUR: RESULTS PRESENTATION AND ANALYSIS**

### **4.0 INTRODUCTION**

The present chapter presents the results from the qualitative data collected to answer the objectives of the present study. The data collection process was conducted between 4<sup>th</sup> and 9<sup>th</sup> December 2014. The semi-structured interviews with open ended question were conducted to get information on pharmaceutical management information system at RBC/MPPD. A total of eighteen key informants were contacted from 7 units: 4 key informants from drug selection and forecasting (quantification and stock monitoring); 2 from procurement; 5 from storage and distribution; 4 finance; 1 from quality assurance; 1 pricing officer and 1 IT at RBC/MPPD to respond to the questions. The main themes quoted in the present study are; utilization and impact of SAGE L500, challenges of system applications and users' limitations, and finally proposed actions to increase efficiency of SAGE L500.

### **4.1 UTILIZATION AND IMPACT OF SAGE L500**

Across all the eighteen interviewees, the questions were asked unit by unit. At drug selection and forecasting (quantification and stock monitoring) which is the starting point of drug management cycle, on the question of availability of a list of products that are supposed to be managed; all the respondents said yes and one of them specified that:” *The list of product managed is coming principally from the National list of Essential Medicines and the medicines which are mostly asked by the customers and regularly updated to meet the customer requirements*”. On the side of lab commodities, respondent specified that: “ *There is no national standard list of lab commodities but there is a list which is monitored at MPPD and there is a list of reagents that are required for existing machine but other are requested according to the introduction of new machines*”.

On the question of the number of product managed; according to the specialty of each respondent in forecasting unit; they said that they manage about 700 items of essential medicines; 49 Anti-retroviral and OIs medicines for HIV Program; 263 Lab commodities for HIV program; 50 items for malaria program; 50 items for TB program; 250 items for lab reagents and consumables for MEG; some items for family planning, and community health...

This is in conformity with the scholarship which documents that any firm in the pharmaceutical industry requires efficient and effective management information systems (MIS) to support managerial functions of different drugs (23).

On the question about the tools used to estimate the need and role of each tool; all the respondents in forecasting unit mentioned that; they use SAGE L500 in combination with MICROSOFT EXCEL and two of them mentioned other computer software: FORLAB, QUANTIMED and PIPELINE for the same purpose of drug management.

About the use of SAGE L500 one respondent specified that;” *SAGE L500 is used as a source of data that are used in the quantification. In SAGE L500 we extract the sales report that has the information about distribution, batch traceability and batch recall if needed. These distribution data help to estimate the need. There are some stock details: quantity by item, batch number, shelf life, cost (value), entry date (reception), location and budget holder*  
*Active PO helps to monitor the execution of purchase order to analyze the products in pipeline”*

About the use of Excel there are different responses according to the activity of each respondent. But in general the data are exported from SAGE L500 to Microsoft Excel for analysis to get meaningful information about the available stock on hand, the average monthly distribution of each item, the product in pipeline, and the stock out. They predict the stock for the next 6 months basing on the stock on hand, available stock in pipeline and the average monthly distribution.

One respondent specified that: “*QUANTIMED only helps to estimate quantity of ARVs and medicines for opportunistic infections (OIs) needed”*

Another respondent said that:” *FORLAB is software that is used to estimate the need. It uses the data from the system (SAGE) after analyzing them through EXCEL and PIPELINE is software that provides a summary report of stock, stock projection, supply planning, supply chain problem and action to take”*.

On the question on the impact of SAGE L500, it was further mentioned by different respondents that SAGE L500 is useful in both storage and retrieval of information necessary for drug management activities. One from drug selection and forecasting unit said: “*...In this way SAGE L500 has impacted a lot: it is easy to find the credit note, stock transaction, batch inspection, it provides important information needed for to estimate the need, the distribution done in the past,*

*the time for each transaction done, expiry date for each product. All of these reports are available for each one who has access to the system...”*

Another respondent from procurement unit affirmed without any doubt that they use SAGE L500 only in the last step of procurement process of PO for easy track of deliveries on PO placed to suppliers; if the supplier has provided all the products as requested; and for the overall control of the entire content in pipeline and the available product in the stock.

At drug storage and distribution unit which appears to be central for data integration of tasks for pharmaceutical management through SAGE L500, a respondent reported that since inception of SAGE L500 there have been changes regarding tracking of products or batch, allowing location of the product placed in the warehouses (5 warehouses at different locations: Kacyiru, Rwandex, Akagera, Nyamirambo and at Free trade Zone) with a quick view of a bin location for each product. Moreover the system allows record keeping and easy information retrieval, physical retrieval of the location bin of the product, quick information about inventory and the stock on hand. Sharing of information was also mentioned among other benefits of SAGE L500 with the emphasis on easily control expiries, stock on hand, and batch inspection for the purpose of quality service delivery.

On the side of pricing there is automatic calculation of price of products received and this is also emphasized by IT and one respondent from finance unit that the management fees and the markup are no longer done manually.

The respondent from finance unit pointed out that most of the information used in finance derives from other units including procurement, warehouse, and others. With respect to sales and marketing. The respondent from IT unit similarly outlined that inventory control, cash management; procure to pay, order to cash, are all integrated within system. A respondent from his routine IT work appreciated SAGE L500 *for its record keeping and retrieval of information, in business support process and operations, traceability of information in electronic management of mark up, pricing, fees which otherwise would be done manually. In addition there is visibility of information at different levels from procurement to finance.”*

The respondent from quality assurance unit described that among other activities, they use SAGE L500 in three main activities including post shipment quality control, management, and disposal

of use product. On the side of distribution, respondent said that SAGE L500 has improved data capturing, record keeping and quick and easy retrieval of products physically, increased ability to manage the bin location in the warehouse, minimized errors about batch confusion and location. Easy intra-units and inter-units reporting and improved traceability of stock received from the suppliers, stock on hand and the stock deliveries as well.

The data reported in the aforementioned quotes document the utilization of SAGE L500 in pharmaceutical management, and are in line with the literature which reported usability of SAGE L500 to integrate drug selection, procurement, and distribution. The use of the management software system is in conformity with other studies done elsewhere in some other countries to evaluate the usefulness of information systems to manage drugs such as the case of Haiti where the use of web based system to support nine clinics in rural Haiti has helped in tracking 450 products supporting care for 1.78 million patients visits annually and fall in stock outs which have dropped to more than half and 97% of stock requests delivered were shipped within 1 day (24). In addition, the Guyana implementation of a warehouse management system (WMS) was attributed to improved inventory management, accurate supply plans and forecasts reduction in complaints regarding shortages of drugs and other supplies (21). In Ethiopia, the implementation of Pharmaceutical Information Management System streamlined communication reporting levels, reporting rates increased significantly reduced reporting times from months to days of the reporting period closing (20).

#### **4.2 CHALLENGES OF SYSTEM APPLICATIONS AND USERS' LIMITATIONS**

The challenges linked to SAGE L500 since its inception at RBC/MPPD were assessed across all the seven working units as earlier mentioned. All respondents in their respective units have exhibited that this software itself cannot process all information necessary to provide direct reports. It requires data export to Microsoft Excel for analysis and interpretation. To supplement on the aforementioned weakness of the system, one respondent from quantification unit said” *...SAGE L500 is not used directly for forecasting because it lacks component to aggregate the batch and data analysis*” All respondents from procurement unit disclosed that the system users have a little knowledge about the components of SAGE L500 and how they can use it fairly adequate. Since SAGE L500 does not have e-procurement component, the users must almost

always rely on Microsoft office especially Microsoft Excel for most procurement activities. In support of previous other respondents from storage and distribution mentioned a couple of challenges including little knowledge about applications software of SAGE L500, and delay of the support from the software provider in case of software crash.

Concerning drug storage and distribution, a respondent said” *Sometimes the products are not issued due to the technical problem (stock recalculation, or entry errors) and the product may be expired without being used. Some internet connectivity problem leads to the delay of the customer service. In addition, the software doesn’t alert on the level of reordering system to replenish certain products*” another respondent from storage and distribution said that “*The main problems faced are related to human errors because most of the staff doesn’t know to use SAGE, every action need more than 3 stapes to be completed and the implication of every action done to the whole system*”.

This has been emphasized by a respondent from quantification unit by specifying that: “*Most of the staff doesn’t know correctly to use SAGE; the users have been trained on the module that they were supposed to use and no overview of the whole system.*

*There are no report done by SAGE; the data provided by SAGE have to be exported in another application in order to produce a report*”. This exportation of data has been identified as a challenge by another respondent from sales and marketing unit that there is a difference between the data of the system and the exported data through internet.

In finance all respondent mentioned the main challenge is not linked to SAGE L500 but to the users; because most of them are not well trained on its use and how to look for the needed information. Some modules are not used like budget management, credit management and management of fixed asset with real figures of depreciation. This problem of options that are not used is identified also warehouse and distribution. These options are: set of max level, min level, inventory policy, reorder level, safety level, lead time, review time, reorder day, safety day,... They mentioned also the problem of limitation on ownership of the data by the institution because when error is made there is no easy way to make correction.

Challenges encountered in sales unit as reported include missing functions of pro-activities in warehouse management since there is no historical data about stock availability as also said by a respondent from quantification unit. The reported challenges are mostly related to the ability of



the system to forecast the stock, inability of the system to provide alerts, limited knowledge of the users on the system itself and the limitation of system to depend on internet connectivity which is most of the time on and off. These challenges are not a particularity for SAGE L500, rather an issue for the pharmacy information management systems in general. This is evidenced by the study done in Namibia to examine the influence of implemented PMIS on the health care delivery; the study revealed that the main challenge in implementing PMIS in primary health care is limited knowledge for users among others. The author recommended that the implementation of PMIS training for employees requires the engagement and utilization of the PMIS (25). The reported challenges including weaknesses in forecasting and quantification due to lack of coordination between the central and the periphery, lack of guidelines and rules to facilitate the process of engaging and monitoring, suppliers, information for quantification and forecasting was not forthcoming from the facility level to the central procurement unit for decision making as was the case for the study conducted to document the status of medicines supply management system in the public sector in Ghana (26).

#### **4.3 PROPOSED ACTIONS TO INCREASE EFFICIENCY OF SAGE L500**

The respondents from all units closely proposed some actions to be emphasized in order to overcome emerged technical challenges within the applications of SAGE L500. In general they proposed to upgrade and customize SAGE 500L so that it can cover all steps of supply chain in a warehouse and enable direct generation of reports without exporting data to other software for data analysis. The other general recommendation was a need of refresher and advanced training to all staff according to what they do in SAGE L500.

In addition to those general recommendation said by all respondents, there are other specific to each unit. In drug selection and quantification unit they specifically recommend a setting of report on monthly distribution and the period of coverage of existing stock; to upgrade the system in order to do analysis and provide information for decision making, good practice of storage and stock monitoring.

In finance Unit they specifically recommend to use the module of budget in order to generate a report of budget execution; the need of the institution to own the data and have the right to make

correction when needed; the users have to respect the settings of the process and to have in mind that SAGE 500L is the main tool that can be used like is planned.

In procurement unit, all respondents proposed to include all activities of procurement process and not be limited on the last step of generating PO only or integrate e-procurement; the same proposition has been said by a respondent from IT unit.

A respondent from quality assurance said that; *“there is a need to decrease the dependence on the vendor of software; to assess in all unit what to add into SAGE in terms of reporting and data capturing which can facilitate to have the full information in one system; to reduce as much as possible the use of other software and manage the full information of supply chain in the same system”*.

A respondent from storage unit proposed to have a local support on behalf of the vendor of the software this idea is shared by all respondents from distribution unit to have in country support; the same respondent from distribution unit and IT proposed to increase the capacity of the software in order to receive many users at the time on the same function (invoice, bin to bin function,...), to increase the carefulness in the use of the system and the usage of all functions. The respondent from IT unit rightly mentioned and supported that: *“there is a need to add some components to the system and in order to meet the users’ requirements”*. Another respondent finds standardization of the format of printing as an added value.

The reported actions to be taken are mostly related to technical challenges which hinder a timely access to the information to allow decision making. These results are in agreement with those from Addis Ababa which showed that the information needed for stock status in order to make vital decisions about procurement and resupply of drugs, and to ensure accountability and transparency is very essential for effective and efficient logistics management. However, the report indicated that the information was not always easily available or well organized leading to overstock, stock-outs, and expiry of drugs (18).

#### **4.4 PROPOSED ACTIONS TO IMPROVE SYSTEM USERS’ CONVERSANCE**

The respondents proposed some actions to the side of the users in which equipping users with knowledge and skills through periodic organized trainings of all relevant staff about the

applications of SAGE L500 was greatly emphasized. Training would be effective if oriented not only to the general knowledge about the applications of this software but equally targeting different users at their respective units taking account into different tasks requirements.

## CHAPTER FIVE: DISCUSSION

The present chapter discusses the main results from the present study, from the levels of utilization of SAGE L500 in the drug management cycle at RBC/MPPD, the changes in service delivery, the user's challenges towards SAGE L500 in drug management cycle and finally the proposed measures to be undertaken to improve the user conversance.

The study highlighted that the use of SAGE L500 is crucial because it allows the integration and management of all pharmaceutical product in one system. The functionalities of SAGE 500L allows its use in forecasting, procurement, tracking the products in pipeline, receiving, storing, distributing, inventory activities, gives the value to each product and report to the finance. It facilitates easy retrieval of information by recording each transaction done about product, customer, supplier and the staff who processed the operation. The use of the system was reported by most of the interviewees to have impacted positively on drug management in RBC/MPPD, and this can be supported by the Haiti (24), Guyana (21) and Ethiopia case studies (20).

The main challenge related to the software application is that; it doesn't contain the data analysis component which limits report production that is the core function to enable decision making as was mentioned by most of respondents. In addition, there are some limitations of the system reported in some units like in forecasting and in procurement. Other challenges are related to the limited user's knowledge about the system itself; where users declare the lack of some function, while they are available but not used such cases are perceived in Finances, storage and distribution units. The reported challenges are not only the case of RBC/MPPD in Rwanda but also elsewhere like the case of Ghana (26).

The proposed actions to come up with solutions in relation to SAGE L500 efficiency and users' conversance are mainly in relation to upgrading its capacity to deal with all aspects of drug management process to avoid the use of multitude of the systems. The other important aspect proposed by the users is to equip them with knowledge and skills to be able to use the system efficiently in managing the stock and supply of medication for better health care services delivery. The interviewed highlighted the need to have an incorporated system which clearly encompasses all components of drugs selection of procurement, distribution, till the utilization of drugs.

## CHAPTER SIX: CONCLUSION AND ARECOMMENDATIONS

The present study highlighted the usability of SAGE L500 in the management of pharmaceutical information system at medical production and procurement division of Rwanda Biomedical center (RBC/MPDD) which mainly showed the positive impacts towards shifting from multiple softwares to one warehouse management information system that integrates stock management and finances. The reported changes are specified in the main stages of pharmaceutical management process. However, the user's knowledge on the system about stock management like to provide alerts on stock out, average monthly consumption and the ability of the system on reports production were reported to be not promising; therefore, the following recommendation can be taken into considerations:

**To the Rwanda Biomedical Center:** to invest more in pharmaceutical information management systems to strengthen the existing ones and come up with the solutions to the raised suggestions by the users by reviewing the process and customize the system to the need and use it efficiently; provide a refresher and advanced training to all staff About utilization of SAGE L500

**To the College of Medicine and Health Sciences through Health Informatics department:** to partner with the health facilities towards training and sensitizing on the use of health information system for better service delivery and funds savings, as well as training of users of existing systems to equip them with knowledge and skills on different aspects of the system.

A limited literature in the domain of information management system specifically in pharmacy not only in Rwanda but also elsewhere, the comparison of results wouldn't be possible there by recommend to the future researchers to work on pharmaceutical information system.

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## APPENDICES

### ETHICAL CONSIDERATION

#### 1. ETHICAL CLEARANCE CERTIFICATE & APPROVAL FOR DATA COLLECTION



COLLEGE OF MEDICINE AND HEALTH SCIENCES

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Research Centre

September 8<sup>th</sup>, 2014

Ref: UR/RECC/177/2014

Dear

**RWABUKERA Fidele**

Master of Health Informatics Program

**RE: ETHICAL CLEARANCE CERTIFICATE & APPROVAL FOR DATA COLLECTION**

With reference to the application for Research and Ethical clearance; and approval for data collection for the study entitled "Assessment of the Usability of Sage 500L in the Management of Pharmaceutical Information System at Medical Production and Procurement Division of Rwanda Biomedical Center"

Following the review of your research proposal by Research, Ethics and Consultancy Committee in accordance with the authority granted to it; the reviewers recommended that your study be granted a Research and ethical certificate. It is on this note that the Directorate of Research, Ethics and Consultancy also grants approval for data collection. You will be required to submit the progress report and any major changes made in the proposal during the implementation stage. Also at the end of the study, the Directorate of Research, Ethics and Consultancy shall need to be given the final report of the study.

I wish you success in your study.

A handwritten signature in blue ink, appearing to read 'Maurice Kanyoni'.

Mr. KANYONI Maurice

Chairperson of Research Ethics and Consultancy Committee

Cc:

- Principal, College of Medicine and Health Sciences
- Director of Postgraduate studies
- Director of Research Centre



## 2. REQUEST FOR PERMISSION TO DO RESEARCH



**UNIVERSITY OF  
RWANDA**

**COLLEGE OF MEDICINE AND HEALTH SCIENCES**

**OFFICE OF POSTGRADUATE STUDIES**

Kigali, on *11/09/2014*

N° *75/UR-CMHS /DPGS/14*

**The Director  
Medical Production and Procurement Division /RBC**

Dear Director,

**SUBJECT: REQUEST FOR PERMISSION TO DO RESEARCH IN YOUR CENTER**

Kindly refer to the heading of this letter.

In the process of fulfilling the partial requirement for the award of Master of Science in Health Informatics students are required to write a dissertation in their area of study. In that regard, **RWABUKERA Fidele** has been granted ethical clearance to conduct a study entitled “**Assessment of the Usability of Sage 500 L in the Management of Pharmaceutical Information System at Medical Production and Procurement Division of Rwanda Biomedical Center**”

I will therefore highly appreciate if you could allow the student to conduct the study in your Center.

Thank you in advance for your assistance.

A handwritten signature in black ink, appearing to read 'Kato J. Njunwa', written over a circular official stamp.

**Prof Kato J. NJUNWA  
Director of Postgraduate Studies  
College of Medicine and Health Sciences  
University of Rwanda**

**Cc:**

- Academic Registrar, UR-CMHS
- Director of Research, UR-CMHS
- Coordinator of Health Informatics, UR-CMHS

### 3. PERMISSION TO DO RESEARCH



A Healthy People. A Wealthy Nation

Kigali, 22/09/2014

Ref/N° 1254/RBC/MPPD/SM/RF/2014

Medical Procurement and Production Division

The Director of Post graduated Studies  
College of Medicine and Health Sciences  
University of Rwanda

Dear Director,

**SUBJECT: PERMISSION TO DO RESEARCH IN OUR DIVISION**

Reference is made to your letter N° 75/UR-CMHS/DPGS/14 of 11<sup>th</sup> /09/2014 requesting for permission to do research in our center in the process of fulfilling the partial requirement for the award of Master of Science in Health informatics of your student **RWABUKERA Fidele**. As the candidate has been granted ethical clearance to conduct his study, we allow the requested permission and request you to share with MPPD the recommendation of the assessment.

Sincerely

**Celsa MUZAYIRE GAJU**  
The Head of Medical Procurement and Production Division

Cc:

- Academic Registrar, UR-CMHS
- Director of Research, UR-CMHS
- Coordinator of Health Informatics, UR-CMHS

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[www.rbc.gov.rw](http://www.rbc.gov.rw) / [info@rbc.gov.rw](mailto:info@rbc.gov.rw) / P.O.Box 7162 Kigali, Rwanda

**4. CONSENT FORM**

**TITLE OF THE STUDY: ASSESSMENT OF THE USABILITY OF SAGE L500 IN THE MANAGEMENT OF PHARMACEUTICAL INFORMATION SYSTEM AT MEDICAL PRODUCTION AND PROCUREMENT DIVISION OF RWANDABIOMEDICAL CENTER**

I, \_\_\_\_\_ agree to participate in the study “ASSESSMENT OF THE USABILITY OF SAGE L500 IN THE MANAGEMENT OF PHARMACEUTICAL INFORMATION SYSTEM AT MEDICAL PRODUCTION AND PROCUREMENT DIVISION OF RWANDABIOMEDICAL CENT ”. I am aware that participation in the study is voluntarily and I will not be paid for the participation. In addition, all information provided will be treated with confidentiality and that my anonymity will be maintained. I am aware that the results of this study may be published but I will not be identified as an individual. I reserve the right to withdraw from the study at any time if I so wish.

\_\_\_\_\_

.../.../...

Signature of participant

Date

-----

Signature

RWABUKERA Fidele

## **INTERVIEW GUIDE**

### **1. DRUG SELECTION AND FORECASTING “Quantification and Stock Monitoring”**

#### **Position:**

#### **Section:**

1. Is there a list of product that are you supposed to manage?
2. Is that list fixed or updated?
3. How many item that are managed?
4. Which tool do you use to quantify the needs?
5. In which activity do you use each tool mentioned?
6. How do you estimate the need?
7. After estimation of need do you use SAGE L500 immediately to create the order?
8. In which ways do you think SAGE L500 has impacted on information exchange between units in drug selection and quantification at RBC/MPPD?
9. What do you think has changed in drug selection in terms of time for service delivery since SAGE L500 inception?
10. Does SAGE L500 allow the system of reporting and feedback?
11. What are the challenges linked to SAGE L500 since its inception in drug selection at RBC/MPPD?
12. Propose solutions that can be put in place to address the aforementioned challenges

#### Management support

How do you perceive the use of SAGE L500 with respect to:

- Management of finance within the organization
- Generation of reports
- Decision making

What do you think are the challenges related to SAGE L500 with respect to supporting the organizational management?

What do you propose to be useful in improving the usability of SAGE L500 with respect organizational management?

## 2. FINANCE

### Position:

### Section:

1. What are the main activities of finance?
2. Is there some activity done out of SAGE L500?
3. In which ways do you think SAGE L500 has impacted on information exchange between units in financial management at RBC/MPPD?
4. What do you think SAGE L500 has improved your daily activity?
5. Is there any feedback report to the person who did that report?
6. What are the challenges linked to SAGE L500 since its inception in finance unit at RBC/MPPD?
7. Propose solutions that can be put in place to address the aforementioned challenges

### Management support

How do you perceive the use of SAGE L500 with respect to:

- Management of finance within the organization
- Generation of reports
- Decision making
- What do you think are the challenges related to SAGE L500 with respect to supporting the organizational management?
- What do you propose to be useful in improving the usability of SAGE L500 with respect organizational management?

### 3. INFORMATION TECHNOLOGY

**Position:**

**Section:**

1. What are the main activities of The Unit?
2. In which ways do you think SAGE L500 has impacted on information exchange between units in drug pricing at RBC/MPPD?
3. What do you think SAGE L500 has improved your daily activity?
4. Is there any reporting and feedback module into the system?
5. What are the challenges linked to SAGE L500 since its inception in pricing unit at RBC/MPPD?
6. Propose solutions that can be put in place to address the aforementioned challenges?

#### Management support

How do you perceive the use of SAGE L500 with respect to?

- Management of finance within the organization
- Generation of reports
- Decision making

What do you think are the challenges related to SA GE 500 L with respect to supporting the organizational management?

What do you propose to be useful in improving the usability of SAGE L500 with respect organizational management?

#### 4. PRICING OFFICER

**Position:**

**Section:**

1. What are the main activities of The Unit?
2. What are the activities done out of SAGE L500?
3. In which ways do you think SAGE L500 has impacted on information exchange between units in drug pricing at RBC/MPPD?
4. What do you think SAGE L500 has improved your daily activity?
5. Is there any reporting and feedback process to the person who did that report?
6. What are the challenges linked to SAGE L500 since its inception in pricing unit at RBC/MPPD?
7. Propose solutions that can be put in place to address the aforementioned challenges

#### Management support

How do you perceive the use of SAGE L500 with respect to:

- Management of finance within the organization
- Generation of reports
- Decision making

What do you think are the challenges related to SAGE L500 with respect to supporting the organizational management?

What do you propose to be useful in improving the usability of SAGE L500 with respect organizational management?

## 5. PROCUREMENT

**Position:**

**Section:**

1. Which activities those are done into SAGE L500?
2. What are those activities done out of SAGE L500?
3. In which ways do you think SAGE L500 has impacted on information exchange between units in drug procurement at RBC/MPPD?
4. In which ways do you think SAGE L500 has impacted on drug procurement process at RBC/MPPD?
5. What do you think has changed in drug procurement process since SAGE L500 inception at RBC/MPPD?
6. What are the challenges linked to SAGE L500 since its inception in drug procurement at RBC/MPPD?
7. Propose solution that can be put in place to address the aforementioned challenges

### Management support

How do you perceive the use of SAGE L500 with respect to:

- Management of finance within the organization
- Generation of reports
- Decision making
- What do you think are the challenges related to SAGE L500 with respect to supporting the organizational management?
- What do you propose to be useful in improving the usability of SAGE L500 with respect organizational management?



## 6. QUALITY ASSURANCE

**Position:**

**Section:**

1. What are the main activities of The Unit?
2. What are the activities done in SAGE L500?
3. In which ways do you think SAGE L500 has impacted on information exchange between units in drug selection at RBC/MPPD?
4. What do you think SAGE L500 has improved your daily activity?
5. Is there any reporting and feedback process to the person who did that report?
6. What are the challenges linked to SAGE L500 since its inception in finance unit at RBC/MPPD?
7. Propose solutions that can be put in place to address the aforementioned challenges

### Management support

How do you perceive the use of SAGE L500 with respect to:

- Management of finance within the organization
- Generation of reports
- Decision making

What do you think are the challenges related to SAGE L500 with respect to supporting the organizational management?

What do you propose to be useful in improving the usability of SAGE L500 with respect organizational management?

## **7. STORAGE AND DISTRIBUTION**

### **7.1. STORAGE**

**Position:**

**Section:**

1. What are the activities done into SAGE L500?
2. In which ways do you think SAGE L500 has impacted on drug storage and distribution at RBC/MPPD?
3. What do you think has changed in drug storage and distribution since SAGE L500 inception at RBC/MPPD?
4. What are the challenges linked to SAGE L500 since its inception in drug storage and distribution at RBC/MPPD?
5. Propose solution that can be put in place to address the aforementioned challenges

Management support

How do you perceive the use of SAGE L500 with respect to:

- Management of finance within the organization
- Generation of reports
- Decision making
- What do you think are the challenges related to SAGE L500 with respect to supporting the organizational management?
- What do you propose to be useful in improving the usability of SAGE L500 with respect organizational management?

## 7.2 DISTRIBUTION

**Position:**

**Section:**

1. Activity done in SAGE L500
2. In which ways do you think SAGE L500 has impacted on drug storage and distribution at RBC/MPPD?
3. What do you think has changed in drug storage and distribution since SAGE L500 inception at RBC/MPPD?
4. What are the challenges linked to SAGE L500 since its inception in drug storage and distribution at RBC/MPPD?
5. Propose solution that can be put in place to address the aforementioned challenges

### Management support

How do you perceive the use of SAGE L500 with respect to:

- Management of finance within the organization
- Generation of reports
- Decision making

What do you think are the challenges related to SAGE L500 with respect to supporting the organizational management?

What do you propose to be useful in improving the usability of SAGE L500 with respect organizational management?