

A Framework for Implementing Mobile Enterprise Resource Planning (m-ERP) System to improve healthcare services in Zimbabwe.



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ABSTRACT

This study sought to develop a framework for the implementation of mobile Enterprise Resource Planning (m-ERP) System to improve healthcare services in Zimbabwe: A case of Chitungwiza central hospital. Information was gathered using a case study research strategy accompanied with interviews, questionnaire, records review and observation approaches. In recent years, due to the development of cloud computing and portable devices, a new mobility era is starting. The popularity of smartphones and tablet computers has changed the behavior of mobile-phone users and enhanced the development of more integrated functions for ERP systems users to operate and access company information through various mobile devices anywhere, anytime. However, mobile ERP is still in the development stage. On the whole, there has been relatively little research into the framework and system implementation of healthcare mobile ERP systems until recently. Participants were selected from patients and staff members at Chitungwiza central hospital. The results obtained suggested that there is need to develop a framework for the implementation of mobile ERP system to improve healthcare services in Zimbabwe. The evidence collected reflects that top management involvement is key to the successful implementation of the mobile ERP system. There is need for gaining trust and support from top management as they are the ones who avail resources for successful implementation of the mobile ERP system. The proposed framework suggested a three-tier mobile ERP system involving database, connect and user interface. There are also issues that must be addressed before moving the data to a mobile computing environment, namely: individual, corporate, strategic well as security issues. These issues have to be address at every stage for successful implementation of the mobile ERP system. The study recommended that for Chitungwiza central hospital to gain competitive advantage, it is important to allocate sufficient time towards proper training of users, involving users from the project commencement, gain support and trust from the top management. In addition, enough resources must be allocated towards the problem while involving qualified and experienced people to be part of the project team to avoid loss of company resources. Mobile ERP system is supported by mobile computing, which is the ability to access resources from anywhere at any time. Future research can explore on the storage capacity and mobile data encryption in aggregation with the proposed mobile ERP implementation framework.

Keywords: Mobile ERP, Mobile Computing, Cloud Computing

DECLARATION

I, Kefasi Jaravaza, hereby declare that I am the sole author of this document. I authorise Midlands State University to lend this thesis to other institutions or individuals for the purpose of scholarly research.

Signature _____ Date _____

APPROVAL

This dissertation entitled “A Framework for Implementing Mobile Enterprise Resource Planning (m-ERP) System to improve healthcare services in Zimbabwe” by Kefasi Jaravaza meets the regulations governing the award of the degree of Master of Science in Information Systems Management of the Midlands State University, and is approved for its contribution to knowledge and literary presentation.

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This research would not have been successful had it not been for the support I received from a great number of people, and I thus owe them a great deal of gratitude.

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DEDICATION

I dedicate my dissertation work to my family and many friends. A special feeling of gratitude to my mother, Juliet Mawarire and wonderful friend Peace Gwavava, for being there for me throughout the entire Master of Information System Management programme. Both of you have been my best cheerleaders.

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ABBREVIATIONS

ERP	Enterprise Resource Planning
MRP	Material Resource Planning
M-ERP	Mobile Enterprise Resource Planning
ICT	Information Communication Technology
IT	Information Technology
SAP	Systems Application Products
SCM	Supply Chain Management
HTML	Hyper Text Markup Language
XML	eXtensible Markup Language
GUI	Graphical User Interface
ITS	Internet Transaction Servers
ITS-Mobile	Internet Transaction Servers for Mobile Devices
ICM	Internet Communication Manager
ABAP	Advanced Business Application Programming
BAPI	Business Application Programming Interface
BPI	Business Process Integration
SLA	Service level Agreement

CHAPTER 1: INTRODUCTION

1.1 Introduction

The aim of this study is to build up a framework for mobile ERP implementation to improve healthcare services in Zimbabwe. The widespread implementation of mobile technology can streamline organisational processes through some benefits of mobility (Scornavacca and Barnes, 2008). With the increasing availability and use of mobile technologies, healthcare institutions can be more competitive if they combine their SAP systems with mobile apps (Kalakota and Robinson, 2002; Sorensen, 2011). Real-time access to information anywhere, anytime can improve the efficiency of Zimbabwe's healthcare sector. The use of mobile ERP systems increases organisation's productivity, efficiency and effectiveness, and ultimately improves users' quality of life (Pavin and Klein, 2013). This research aims to come up with a conceptual framework for the implementation of mobile ERP system improve healthcare services in Zimbabwe. Though there are several frameworks for ERP implementation, none of them has clearly written records specific to the healthcare industry because of the uniqueness in the handling of healthcare transactions. In addition, mobile ERP systems are a recent technology in the chronological evolution of ERP systems (Cailean and Sharifi, 2013). The problem statement reflects lack of an appropriate mobile ERP implementation framework that can improve healthcare services in Zimbabwe. This chapter will help to introduce the research and give a brief outline about the research.

1.2. Background to the study

Enterprise Resource Planning systems emerged in the 1960s, starting with Material Requirement Planning (MRP) systems (Rashid, Hossain and Patrick, 2002; Basoglu, Daim and Kerimoglu, 2007). After MRP system reached an advanced stage, it was then transformed into MRP II. The MRP system further evolved into a more sophisticated system and included detailed capacity planning, master scheduling, long range planning, capacity planning, and resource planning (Xue, Yajiong, Liang, Boulton and Snyder, 2005). MRP II systems further incorporates planning related to operations and sales, and a financial interface.

Tsai, Hwang and Hsu, 2010 asserts that the Year Two Thousand (Y2K) challenge, in the late 1990s, resulted in enterprises migrating to ERP systems. Various success factors made implementation of ERP system successful. Recently, with the rapid usage of mobile devices, the

ERP vendors have found that the ever-growing mobile users cannot keep up with their existing capabilities. As a result, the vendors have realised the need to build the new mobile apps, which is a hybrid ERP system that combines cloud services and mobile apps (Lee and Choi, 2018). The next step into making their systems easier to use and less expensive to implement and maintain is mobile ERPs which can be used at any time with the help of a mobile device. Castellina (2014) asserts that the migration of on-premises ERP systems to mobile apps is an urgent demand to execute enterprises processes anywhere and anytime thereby improving their Return on Investment (ROI). Willis (2002) suggests that mobile ERP is an extension and future of ERP systems, that helps in solving the data capture problem. Mobile ERP system permits the user to take the system anywhere. Cailean and Sharifi (2013) describes mobile ERP systems as the current wave of ERP systems, as illustrated by the chronological evolution of ERP systems diagram in Figure 1.1 below.

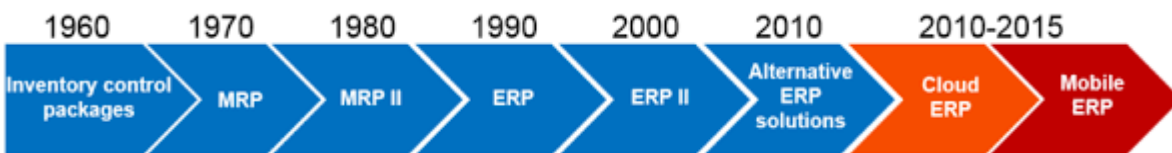


Figure 1.1: Chronological evolution of ERP systems

Source: Cailean and Sharifi (2013)

According to The Independent in Business (2013), Syspro, a Johannesburg-headquartered ERP developer and vendor with a strong global footprint, boasts several blue-chip clients in Zimbabwe, and will be launching a new product in which ERP will be accessed via a mobile phone. Lee and Choi (2018) highlight that the use of mobile technology is proposed due to the increased mobility of users to improve immediate transaction or database access for decision making to support ERP systems. This research is worth doing because most of the preceding researches focused on on-premises ERP solutions for Small and Medium Enterprises (SMEs) with little focus on the healthcare sector in Zimbabwe.

1.3. Problem statement

A mobile ERP system is a recent technology emerged from cloud-based ERP systems between 2010 and 2015, as specified in the chronological evolution of ERPs (Cailean and Sharifi, 2013). This implies the mobile ERP systems are not yet dominant in several institutions of less

developed countries such as Zimbabwe. No research has been carried out to develop a framework for mobile ERP system adoption to improve healthcare services in Zimbabwe. A large capital investment is required to accomplish a typical ERP implementation initiative which can take one to three years to complete (Monk and Wagner, 2006). Thus, for the top management to make informed decisions, there is need for an appropriate framework which will guide them on the amount of resources and support required for successful project implementation.

Though there are plentiful benefits that can be enjoyed by healthcare institutions through using mobile ERP systems, there is still underutilisation of mobile ERP systems (Adam and Doherty, 2000). Mobile ERP system allows mobile access to key healthcare information anytime, anywhere for a comprehensive view of the care delivered to each patient, thereby improving the efficiency of Chitungwiza central hospital. The Zimbabwe's healthcare sector focuses on keeping healthy (prevention), diagnosing diseases, detecting health problems, treating diseases, and providing for a good end of life. Clinicians, physicians, nurses and management in the healthcare sector of Zimbabwe fall short of quality tools in order to improve and cope with emerging medical technologies and methods to maintain quality healthcare services (Miller and Sim, 2004). Most healthcare organisations in Zimbabwe are currently relying on Excel spreadsheets with duplicates of healthcare information full of anomalies. The data and information are not secured. By adopting the mobile ERP system, there will be integration of all functional areas into a single integrated mobile system. The mobile system will offer an offline capability that allows users to use the mobile even when there is no mobile or wireless signal. Mobile ERP system will also allow easy access to ERP business data and information, enabling Chitungwiza Central Hospital executives to keep an eye on business anywhere and at any time.

1.4. Research Objectives

The primary objective is to build up a framework for the adoption of mobile ERP system to improve Zimbabwe's healthcare services using a case study of Chitungwiza Central Hospital. Other sub-objectives of the study are stated as follows;

- ❖ To identify security measures that guard against threats to confidentiality and integrity of data in order to improve Zimbabwe's healthcare services.

- ❖ To find out the mobile computing infrastructure requirements that minimise the cost of implementing the healthcare mobile ERP system.
- ❖ To find out opportunities for mobile ERP system that can enhance business functional performance of Zimbabwe's healthcare industry.
- ❖ To identify the leadership roles in initiating change management to guarantee proper mobile ERP system adoption in Zimbabwe's healthcare industry.

1.5. Research Questions

The main research question is how to bring forth a framework for mobile ERP system implementation to improve healthcare services in Zimbabwe?

The research shall be guided by the following sub research questions;

- ❖ What security requirements are required for successful implementation of mobile ERP system to improve Zimbabwe's healthcare services?
- ❖ What are the mobile computing infrastructure requirements for implementing mobile ERP system to improve Zimbabwe's healthcare services?
- ❖ What are the opportunities and encounters associated with mobile ERP system in the Zimbabwe's healthcare industry?
- ❖ What are the leadership roles in initiating change management to guarantee proper mobile ERP system adoption in Zimbabwe's healthcare industry?

1.6. Research Methodology

The study extensively examines the concepts of mobile ERP systems by comparing ERP system before and after the addition of mobile capabilities. The aim of this comparison is to evaluate the significance of running ERP system on mobile computing environment compared with the performance of the cloud-based ERP system currently running at Chitungwiza Central Hospital. Migration from cloud-based to mobile ERP systems can extend the life span of ERP systems by a period of about ten to fifteen (10-15) years (Lee and Choi, 2018). For example, SYSPRO healthcare mobile ERP's offline capability allows users to use the app on their mobile devices

even without a mobile or wireless signal, and this is an enhancement from cloud-based ERP system to mobile ERP system (SYSPRO, 2012).

Research objectives can be fulfilled through analysing previous researches on ERP systems and find out the challenges involved. The investigation of mobile ERP system is done in accordance with mobile computing characteristics. The investigations are carried out using research onion. An elegant framework which integrates organisation's business processes in different functional areas is proposed.

A deductive approach shall be considered and used to formulate recommendations to Chitungwiza Central Hospital. Deductive approach embodies the most common view of the relationship between theory and research and findings from this approach are developed through logical reasoning (Bryman and Bell, 2007). The data findings shall be compared against existing literature to determine if they harmonise with what has already been developed in the area of healthcare ERP systems implementation.

A case study research strategy shall be adopted and due to the inevitability of time limitation, the study shall be that of a cross sectional time frame. Primary and secondary data collected shall be used to answer the research questions mentioned earlier on. For the research to determine the role of mobile ERP system in enhancing healthcare sector business processes in Zimbabwe, secondary data will be collected through literature review. The literature will be drawn from World Health Organisation (WHO) articles, ERP journals, healthcare journals, scholarly publications, books and newspaper articles of related material. A qualitative research will be conducted to gain insight into the existing healthcare sector ERP systems (primary data) through interviews, questionnaire, document review and onsite observation.

Interviews shall be used to get results pertaining to sensitive issues of data sharing and information systems security and they will offer increased insight into people's thought, feelings and behaviour. The interviews are going to be carried in person where possible and over telephone for follow up on more issues that need clarity. Qualitative telephone interviews will be carried out to key informants from the senior management following the access granted who have been in the organisation for more than 5 years. Semi-structured interviews will be defined by a pre-set question guide. The interviews shall provide in-depth results through informal discussions with respondents. This qualitative interview method will be chosen over

unstructured or structured interviews, because this study intends to answer the research questions by asking specific questions, but not so much (unstructured) that it generates useless data, and not so less (structured) so as not to miss out on any unanticipated information (Collis and Hussey, 2003). Purposive sampling will be done to select the interviewees from other healthcare sector stakeholders. This non-probability sampling technique will be very appropriate for the qualitative data needed and also for the limited time to accomplish the research. The interviewees will be selected from representatives from various departments at Chitungwiza central hospital who have an appreciation of the need for the ERP system to be integrated on mobile computing environment.

Quantitative questionnaires will be used to get responses from staff members who have more than two years' experience at the hospital, and patients who will be visiting the hospital to get healthcare services. Reviewing documentation will enable quick learning of the history of the ERP system. Documentation will provide information about Chitungwiza central hospital such as its operations, strengths and weaknesses. A physical tour will be made at Chitungwiza central hospital upon given permission by the hospital authorities. All the respondents will be informed well in advance before the physical tour begins. The existing ERP system will be observed during the normal business hours.

Once the framework is drafted, both industry and academic expert reviewers will assess the framework and identify areas that will require further refinement.

1.7 Significance of the study

The significance of this research stems from opportunities and benefits derived from mobile ERP system implementation to improve healthcare services in Zimbabwe. Zimbabwe's healthcare institutions shall benefit from this research study as it seeks to explore their operations and identify challenges and opportunities. The study shall assist the healthcare industry through its recommendations in the successful implementation of mobile ERP system that will help in gaining competitive advantage. The mobile ERP system will also assist in the integration and mobilisation of various functions of Chitungwiza Central hospital. These functions will be performed anywhere, anytime with the convenience of users' handheld mobile devices.

The mobile ERP system will also streamline various functions involved at the hospital which include operations management, customer management, analysing reports. The top, middle and bottom of the organisational hierarchy will be empowered by the system in a more simplified approach.

The results of this research shall increase awareness on the significance of providing better services that enhance customer satisfaction within the healthcare industry. The research findings shall enrich the existing body of knowledge much to the benefit of the academia and students who would want to pursue studies into the business aspect of healthcare mobile ERP systems.

1.8 Assumptions, Scope, and Limitations/Delimitations

This part focuses on the assumptions, scope of the study and limitations and delimitations of the study.

1.8.1 Assumptions

Several healthcare institutions in Zimbabwe are using on-premises and cloud-based SAP healthcare applications. With the emerging mobile computing technologies, the healthcare operations need to be mobilised to allow users to access healthcare information as easily as if they were at their desks. This technological advancement requires healthcare users to work anytime, anyplace, on any popular mobile device and even on their desktop, even when there is no mobile or wireless signal.

The benefits of enterprise mobility force healthcare institutions to adopt mobile ERP systems as a necessity. The sample that will be chosen shall be representative of the entire population of Chitungwiza Central Hospital including patients visiting the hospital.

All the selected respondents in this study have to provide necessary data which imitate what is happening at the hospital. The research will also take into consideration all ethical issues that can hinder participants from providing reliable information regarding their confidentiality, privacy and anonymity. This will ensure that respondents give evidence without any panic.

1.8.2 Scope of the Study

This study targets Chitungwiza Central Hospital in Zimbabwe. The study explores on the ERP system currently running at the hospital. It also assesses whether the implementation of the ERP

system was done appropriately or not. The research will then identify the requirements for proper implementation of mobile ERP system to improve healthcare services in Zimbabwe.

1.8.3. Limitations of the research

In conducting this research, there are some limitations encountered. The research is restricted to one organisation (Chitungwiza Central Hospital) hence difficulty in generalising the research findings. Moreover, some of the interviewees may give biased feedback which may affect the accuracy and reliability research findings. Time and resources constraints will also factor in during the course of the research. The management may have tight programs which will make it difficult for them to offer their support towards the adoption of the mobile ERP system. Furthermore, the number of participants may exceed the anticipated one, and this may result in challenges for making further appointments. To address these limitations, objectivity has to be maintained and adopt the use of triangulation to deal with participants' bias. The researcher shall draw a manageable sample in line with resources available and time.

1.8.4. Delimitations of the research

The research intends to cover Zimbabwe's healthcare industry by considering the general operations of the hospital. As far as the healthcare sector is concerned, the research indicates that assessment and evaluation will concentrate on Chitungwiza Central Hospital alone, of which healthcare services in Zimbabwe are provided by both private and public health institutions including NGOs within and outside Zimbabwe. There are several issues beyond the scope of the study that involve other healthcare institutions like medical insurance, pharmaceuticals and surgeries.

1.9. Proposed contribution

This research deserves to be carried out as it intends to develop an elegant framework that can be adopted for mobile ERP system implementation to improve Zimbabwe's healthcare services. It will also improve the existing body of knowledge much to the benefit of the academia and students who would want to pursue studies in the health care sector's information systems. The is also going to be used by healthcare specialists and technocrats who would want to implement mobile ERP system in Zimbabwe's healthcare industry.

1.10. Conclusion

The chapter made a case for the conduct of a study and presented the research problem. The chapter looked at the background of the research, research questions and objectives. It also gave an overview of research approach, research design, research instruments and data collection procedures to be adopted during the research. The research is justified methodologically and on the basis of its uniqueness and contribution to business administration studies. The succeeding chapter takes a survey of the existing body of knowledge.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The purpose of this study is to develop a framework for implementing mobile ERP system to improve healthcare services in Zimbabwe. The research study was introduced in Chapter one by asserting the research questions, the purpose of the research as well as the importance of the research. This chapter allows reviewing of all available literature in the domain of mobile ERP implementation. Most of the previously developed frameworks for mobile ERP adoption are going to be discussed. This chapter will also focus on the prospects that can be adopted to improve the healthcare services and develop a noteworthy business situation for the study. The firmness of this literature review is to find out and assess the studies relevant to the mobile ERP implementation, and to explore and grasp some important concepts from philosophies that enlighten the research under study. The current work about the adaptation of mobile ERP system was reviewed in order to get an appreciation of the impacts of the framework when implementing mobile ERP systems at various angles.

2.1.1 Chitungwiza Central Hospital Today

Chitungwiza Central Hospital is a government institution situated in Chitungwiza town which is about thirty kilometers (30km) south-east of the city of Harare. Chitungwiza hospital was upgraded to offer tertiary level of health care delivery services since September 2005. The five hundred (500) bedded hospital attained ISO (International Organization of Standardization) in 2008 and retained the certificate to date. The catchment area of this hospital includes Chitungwiza town, neighboring farms, Epworth and the whole of Mashonaland East Province. The hospital has got many clients from Harare and other parts of the country who choose to seek their health.

2.1.2 Enterprise Resource Planning (ERP)

According to Deshmukh (2006), in 1990s, ERP systems were implemented in organisations for the purpose of integrating diverse and complex corporate operations. Ovalmind (2012) asserts that the definition of ERP system originally defined in articles and reports created by analysts in the technology sector in the early 1980's. ERP systems refer to enterprise-wide or company-wide software systems that connect and manage information to every department and employees in the organisation regardless of business functions, physical location, or industry sector. The adoption of ERP systems was inspired by management's need for timely accessing information across the diverse functional areas of the organisation. More general motivations for implementation of ERP systems consist of regulatory compliance, upgrading legacy systems, business process reengineering, integration of operations and management decision support.

ERP systems can also be defined as integrated cross-functional systems made up of software modules that can address a wide-range of operational activities which include finance and accounting, human resources management, manufacturing, sales and invoicing as well as logistics and distribution (Robey, Ross and Boudreau, 2002). ERP systems can be used by management to respond to the rising business needs in more reliable ways. As the real-time data sharing across the organisation is provided by the ERP systems, they also contribute in the integration and automation of business processes (Spathis and Constantinides, 2004). ERP systems integrate across functions to create a single, unified system, rather than a group of separate, insular applications (Alshawi, Themistocleous and Almadani, 2004).

2.1.3 Mobile Computing

There is need to have a better understanding of mobile computing technology in order to have proper implementation of mobile ERP systems. Mobile ERP systems cannot be addressed without taking into consideration the concepts of mobile computing. Mobile technologies can assist the management to make quick and reliable decisions and ensure that organisations gain more business opportunities (Charlton, 2014). Many authors proposed various definitions of mobile computing. From these definitions, it can be deduced that mobile computing is the back born of mobile ERP systems. Cuddy (2009) argues that

mobile computing implies wireless transmission. However, not all mobile devices have built in wireless internet connectivity - although the vast majority does.

Mobility and computing are two areas that are covered by mobile and wireless systems. A definition for what mobile computing is: it means non-stop access to the user, while wireless supplies interacting and communicating using no wire (Malladi and Agrawal, 2002). Musolesi, Hailes and Mascolo (2004) claim that when it comes to accurate mobility models, mobile computing is one of the most critical and tough features of systems designed for mobile environments.

2.2 Mobile ERP system

Mobile ERP systems are capable of streamlining organisation's workflow processes, strengthen customer relationships, improving operational efficiency and enhancing managerial decision making (Charlton, 2014). Mobile ERP systems make use of mobile devices such as smartphones or tablets to carry out various business functions through one integrated system. All (2014) urges that a mobile ERP system supports the concept of *bring-your-own-device* (BYOD) in today enterprise domain, thus, it has been regarded as an emerging core requirement in this modern business world. This mobile ERP technology demonstrates an increasing utilisation curve across industries due to the real-time access to relevant information and to diverse functions (Schneider, 2013). According to Trefis Team (2014), the market for mobile ERP is projected to continue to grow at a constant annual rate of 39% through 2017. Al Bar, Mohamed, Akhtar and Abuhashish (2011) argue that mobile ERP is a business solution involving web-based mobile cloud computing technology, favouring the internet infrastructure to bring the software as a service to a business.

Advances in mobile computing and wireless data communication have made a new computing model, which provide services whenever and wherever for everybody (Rochaa, Costab, Moreirab, Rezende, Loureirob and Boukerchec, 2010). Rochaa et-al. (2010) suggest that such an environment gives users an easy access to several applications by using their handheld mobile devices. Some applications such as voice and video streaming and file transfers are developed for this environment. There are many reasons why it would be possible to implement healthcare ERP applications on a mobile computing environment (Zutshi, 2012). The reasons include the following:

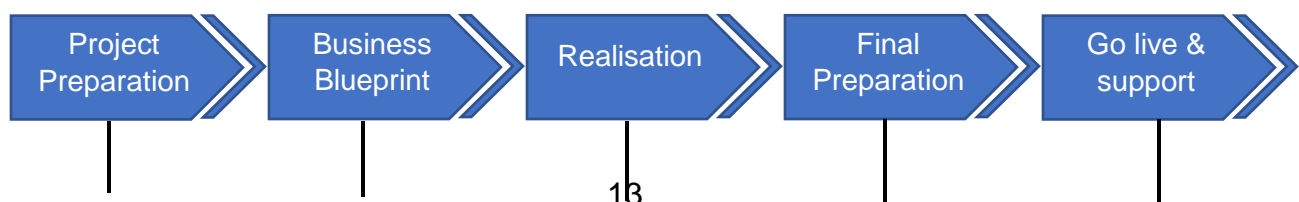
- ❖ Technology advances: by moving beyond 4G would mean that mobile users in the healthcare sector would be assured to get to the speed of hundreds of Mbps. This takes the network limitation out of consideration.
- ❖ Light Apps: Moving toward lighter applications creates an opportunity to install the ERP system on mobile devices. It is not unexpected to have all ERP functions light enough to be deployable on different mobile devices. At present, this can be considered as the biggest limitation in getting ERP mobile. Coupled with the technology advances mentioned earlier this will be possible.
- ❖ Rich use cases and newer business models: progresses in technology in running of the main business areas are confirming that more and more business functions can be accessible through mobile devices.

According to Al Bar et al. (2011), mobile ERP embodies a collection of online interactive applications, which is possible because of popularity of mobile broadband. Cellular networks equipped with technologies like General Packet Radio Service (GPRS) and Universal Mobile Telecommunications System (UMTS) are connected to the Internet via Media Gateways to transfer data. Mobile Enterprise depends on protocols based on High-Speed Downlink Packet Access (HSDPA) and High-Speed Uplink Packet Access (HSUPA) technology. Like different technologies used in mobile messaging, mobile enterprise supports enterprise mobility.

The Zimbabwe's current economic recovery in government operations requires innovation and transparency in all operations of government agencies in order to attract foreign direct investment (FDI). The government agencies need to review their current business models and address the current challenges in order to remain competitive.

2.2.1 ERP implementation stages

The stages for implementing ERP system are classified into five (5) main stages as regarded for implementing SAP ERP systems for big corporations (CIE42 Proceedings, 2012). These stages are summarised in Figure 2.2 below:



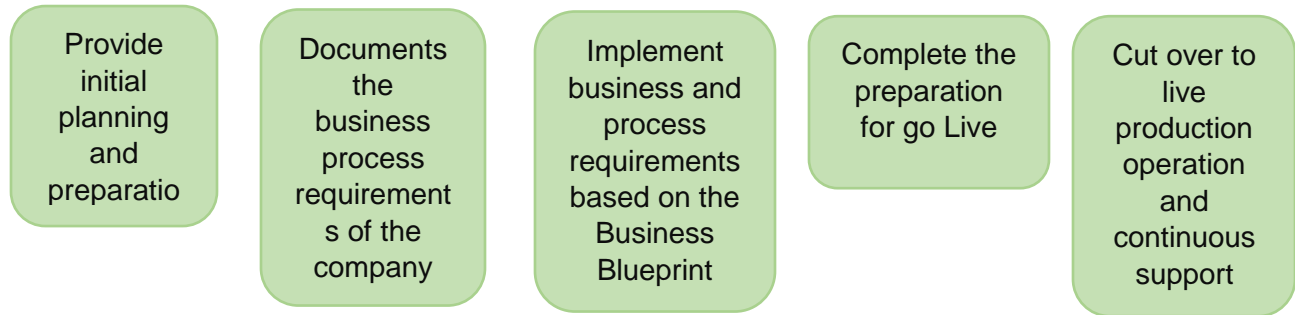


Figure 2.2: ERP implementation Stages

Source: Chikowere (2012)

2.3 ERP implementation framework

Adopting an enterprise architecture approach will help the organisation to achieve seamless integration of various systems. The ERP system architecture describes the ERP system as a composition of distinct business domains, each with its own autonomous processes and being able to share information. The architecture depicts the structure and inter-connections of parts, as well as the standards and rules that oversee their design and evolution over a certain period. It is with these two portrayals that enterprise architecture framework can be created.

Figure 2.3 below shows the framework for ERP system architecture as crafted from the global best practice methodologies in healthcare systems.

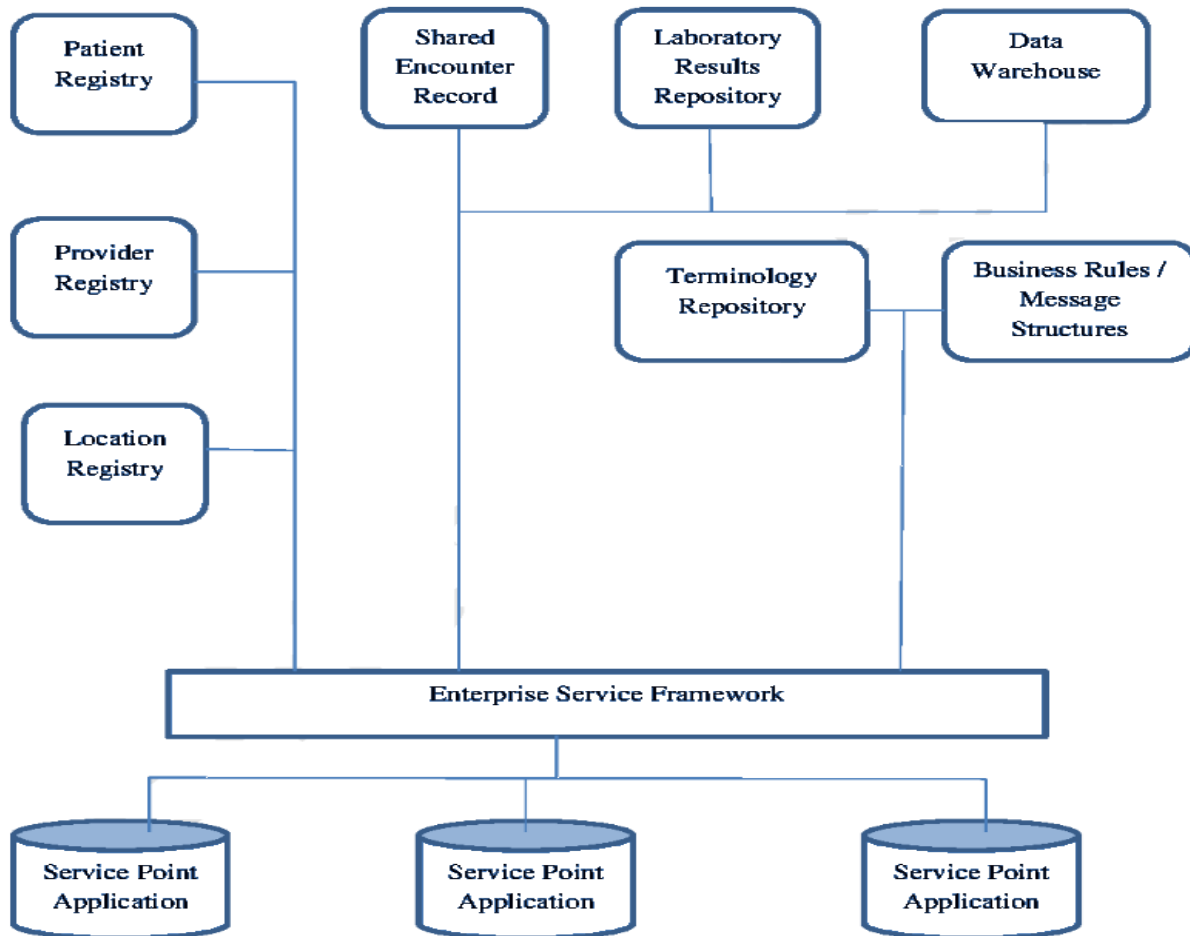


Figure 2.3: ERP architecture framework

Source: Zimbabwe's eHealth Strategy (2012)

The architectural framework in Figure 2.3 shown above highlights the key components that are as follows;

Patient Registry - This record represents all patients registered in the Zimbabwean national health care delivery system. A unique identification number is allocated to each citizen registered as a patient.

Provider Registry - These registrations are used for verification and providing access to all health care providers in Zimbabwe.

Location Registry – This is a record of all key service locations and related geographic information system coordinates.

Laboratory Results Repository – This record all medical encounters, investigations and laboratory-based findings.

Shared Encounter Record – This record allows all service point systems to update summary encounter data.

Data warehouse - All de-identified data attributes for decision support are stored in this repository.

Terminology Repository – This stores all medical terms and meanings created to support common meaning of terms across systems.

Business Rules/Message Structure - This ensures enforcement of the agreed rules across systems.

Service Point Applications - These applications include pharmacy management information, electronic medical record systems and laboratory information systems which are executed at the service provider site.

2.3.1 Benefits of ERP system in the healthcare sector

Zimbabwe's healthcare institutions can benefit more from ERP systems as they can make reliable decisions which improve their competitiveness. Managerial decision making can be enhanced thereby assisting management reporting on organisation's performance if there is access to a single database (Kumar, Maheshwari, and Kumar, 2003). Shehab et-al. (2004) highlight that ERP systems allow automation of organisation's business activities into one integrated system, thereby making information more accessible and easily shared within and outside an organisation.

Some of the benefits of implementing ERP in four major functional areas of a healthcare sector are as follows;

1. Front Office

This is also called front desk. It assists patients with updated information. Front office usually accesses information such as specialised services, patients' appointments with doctors and bed availability. The front desk can operate effectively with the aid of ERP system.

2. Financial Management

Costs and risks can be minimised by using the ERP system. ERP software can assist in reporting and analysis and enhances the prediction of financial results. It allows integration of numerous financial processes within a hospital and manage them in a more proficient manner. Several industry experts have a notion that no ideal ERP system is offered for the healthcare sector. Nevertheless, healthcare institutions can greatly enjoy the benefits of ERP system (Stefanou and Revanoglou, 2006).

3. Operational Costs

With ERP systems, information transfer is rapid and fully automated to minimise interference by employees in various tasks. ERP systems also minimise the size of labour required to carry out healthcare business processes (Stefanou and Revanoglou, 2006). This can ultimately contribute to improved productivity and efficiency of the organisation.

4. Inventory Management

Healthcare institutions usually face challenges in managing inventories daily. Thus, an ERP software can help in streamlining the flow of materials as well as keeping track of the status of materials, customers and suppliers (Stefanou and Revanoglou, 2006). In addition, a single device allows transparency and accountability on how data is accessed, modified or queried in the database, thereby promoting efficient decision making by management (Kumar et-al., 2003).

Furthermore, organisations adopt ERP systems for several reasons which include integration of business processes, cost reduction, having centralised database accessible by each functional area, and allowing the opportunity for redesigning of business practices (Gattiker and Goodhue, 2005). Moon (2007)'s literature review of 79 journal articles outlines that ERP systems offer similar functions to those of decision support systems.

2.3.2 Limitations of ERP System in the healthcare sector

Despite the benefits offered by ERP systems, there are some problems associated with these systems. Lengnick-Hall, Lengnick-Hall and Abdinnour-Helm (2004) assert that ERP systems pursue strict routines, which do not allow switching to other options. However, this promotes

organisation's transparency as the information is accessible and shared through a centralised database.

Lengnick-Hall et-al. (2004) further state that the defined processes within ERP systems do not allow for alternatives. In addition, Gupta (2000) claims that the way organisations operate can be changed by using ERP systems. Even though some organisations benefit from successful implementation and integration of ERP system, they may face resistance from employees who find it difficult to shift to the new system. This resistance to change can take a longer period for the organisation to realise the benefits of the new system.

ERP system are also associated with errors and there are high chances that errors may be continue persisting without being identified till the completion of the implementation process. Moreover, ERP systems are generally expensive to buy from software vendors (Gupta, 2000). Furthermore, enough data storage and networking capability are required to successfully implement an ERP system networking capability. Overhead needs such as effective staff development and training is also required (Shehab, Sharp, Supramaniam and Spedding, 2004). There are several hidden costs associated with ERP systems that normally arise upon completion of the implementation process. These hidden costs involve staff development and training costs, testing software for integration (Wailgum, 2008).

In summary, the cost of implementing and integrating ERP systems may be very for an organisation, as highlighted by Rashid, Hossain and Patrick (2002); Shehab et-al. (2004) and Abukhader (2014). In addition, Rashid et-al. (2002) emphasise that the ERP vendors continue to place their hand throughout the entire operations of their ERP systems, particularly for servicing and maintenance.

2.4 Security concerns for implementing the mobile ERP system

Users that are new to mobile apps must take into account the security of the mobile application being considered. The protection of migrated data depends upon the security levels of ERP vendor. The m-ERP system users might not have full control over how their data is secured and managed. However, it may be an advantage to the user if the system vendor offers reliable security mechanisms protect the m-ERP system. In on-premises ERP system, users would have

some control over every security detail that result in loopholes being developed if little resources are dedicated to the security of data (Garrely, 2015).

Accessing the ERP system via mobile devices poses a lot of security loopholes. Though users enjoy the convenience of choose-your-own-device (CYOD), bring-your-own-device (BYOD) and corporate-owned, personally enabled (COPE) devices, their valuable data in ERP systems need to be secured against threats to confidentiality and integrity of data using appropriate security mechanisms. This must be achieved by a strategy of maintaining a balance between usability and security to ensure that end-user satisfaction is not compromised.

In the m-ERP system, putting the patient information in electronic format enhances accessibility, confidentiality and privacy. Therefore, measures should be put in place to ensure that the patient electronic data is not associated with any patient identifiers. This implies that if data is misused, no patient will be identified or pointed.

2.5 Mobile computing infrastructure considerations in ERP system implementation

Mobile computing technologies can possibly address a portion of the difficulties presently being faced by Zimbabwe's healthcare institutions. Remote communities and other underserved networks customarily experience the ill effects of accessing healthcare services. The rising usage of mobile devices has accelerated the need for mobile ERP system implementation. This technology can eliminate the problems of geographical barriers and improves accessibility to healthcare services from any location, at any time.

Reliable infrastructure is required to help keep healthcare mobile ERP system accessible all the time. Improving accessibility of information can assist users to make informed decisions. Mobile computing infrastructure include WAN modems, wireless LAN or MAN adapters, web servers with wireless support, WAP gateways, communications servers, application or database servers, enterprise application servers, computers, internet facilities, mobile devices, electricity facilities, backup power services as well as GPS locator.

In Zimbabwe, setting up mobile computing infrastructure for healthcare mobile ERP system is very costly. However, some private companies, volunteers, sponsors, NGOs and development partners like UNDP play a significant role in assisting the government to provide internet access

to all areas. This will promote reliable flowing, sharing and accessibility of healthcare information.

Mobile computing infrastructure should ensure that all healthcare ERP systems can be accessed anytime, anywhere. Stable reliable internet facilities are required to create a national health information highway. Effective mobile computing infrastructure enhances accessibility to mobile ERP system and ensures timely provision of health care services.

2.6 Leadership role in ERP Systems implementation

There are various authors who have shown appreciation to the leadership roles of project managers, project leaders, project sponsors and steering committees. The leadership positions of project leader, project manager and project sponsor are frequently used in implementation of m-ERP systems and a misperception about their relationships, roles and duties still exists. The project manager is the one who warrants all the tasks to go as per schedule. The role of the project leader does not formally exist during m-ERP adaptation process. The project sponsor is recognised as the project manager in other organisations.

2.6.1 Change management in mobile ERP systems

Change management encompasses all actions related to ways in which procedures are communicated to individuals. Correct flow of information is significant throughout the entire implementation of m-ERP system and as a result it is mostly expected at each change within an organisation. According to Williams and Williams (2007), people react to change positively when they get to know its tenacity and importance. Al-Mashari and Zairi (2003) emphasise that ERP systems adaptation therefore needs an epic modification to the organisational structure and interjects the way users carry out their tasks and interact with each other. Thus, there must be a policy, system and techniques for implementation of ERP systems.

2.6.2 Impact of change

Failing to embrace change management will continue to recur within an organisation. Though there are various resources concentrated on the change effort, most of these resources are sponsored by the top executive. Organisations that neglect to support change end up facing catastrophes which may result in their downfall (Senge, 1990).

Senge (2010) and Kotter (2005) share the same view on their method to management of change. Kotter (2005) emphasises that change may not succeed due to failure by management to understand the significance of change and move through the stages. Schiavone (2012) argues that the “people” feature of change may be disregarded in change management and this weakens the capability to change.

The conflict arising from the clashing needs of members in the project should be dealt with as and when it arises rather than in a collective manner. Gallagher and Gallagher (2012) postulate that it is awful that the likeness among the schemes of ERP and organisational culture is a requirement for proper implementation of the ERP system.

However, Garvin and Roberto (2005) deliberate on the importance of the change through which the organisations need to navigate to progress to their favored state. Businesses can absolutely attain change through sustaining employees’ day-to-day tasks (Millis and Merken, 2008). Maintaining the workforces of organisations through change can help them adapt, monitor and achieve change. Millis and Merken (2008) also emphasise on the role of management to make sure that change is accomplished well and enlighten the workforce to have an appreciation of the change management procedures. Management has to give positive response according to the working conditions and competencies of the workers.

2.7 Challenges in implementing mobile ERP systems

Recent studies conducted by some authors, namely: Okazawa (2006); Kim, Lee and Gosain (2005); Al-Mashari, Zairi and Kumar et al. (2003) reflect that sometimes change management fails to produce with the pledged results. The efforts for change neglect to produce expected results due to several factors which include technical, cultural, user and organisational factors. The authors further point out that ERP implementations are associated with challenges like dealing with elements of change so that the proposed, anticipated changes are actualised effectively, at the same time avoiding the unintended surprises that are risky.

Currently there is no shortened model that can be approved for successful mobile ERP implementation to improve healthcare services in Zimbabwe. This is because there are issues concerning the organisation's workforce and its effect on the workforce which differ across

organisations. The key issues obligated for the failure to implement the mobile ERP system framework are highlighted by Umble and Umble (2003) as follows:

- ❖ Lack of business leadership support.
- ❖ Lack of leadership and preparation;
- ❖ Alteration of goals over the span of the project

Although many authors recognised the requirement for change, workers naturally resist change and acknowledge the individual aspect as the main critical change feature. Management of change can be viewed as being one of the intense achievement aspects, despite a reason that implementing the procedure for change management may be a major drawback since it is often disregarded.

Lee and Lee (2004) emphasise that it is critical to investigate the change effect in an organisational setup and review the impact change on the adaptation of ERP system. As a way of moderating the resistance to change, those who will operate the system should be included in the project team at the beginning of ERP system implementation in order to create a feeling of having a place and affirmation with systems implementation (Millis and Merken, 2008). If upcoming operators of the system are involved at the beginning of the project, there are many benefits since it portrays the primer sentiment for tending to vagueness and uncertainty due to the need for pursuing new standards brought by change in an organisation. From the worker's perspective, response to change may be hazardous to relieve issues connected to change (Aladwani, 2001).

Hence, introducing any change requires a methodology on the most proficient method to include the workforce and convey to them the need for change and the advantages connected with it to effectively accomplish it. Various implementations of ERP systems have been considered as insignificant dissatisfactions. Many of these ERP systems fail to accomplish the set objectives that they were familiarise with (Lee and Lee, 2004). These dissatisfactions are owing to a scope of causes; it is surprising that in any case these viewpoints have been outstanding and recorded, similar glitches are still being encountered by organisations with ERP systems.

A significant number of scholars who include Al-Mashari (2003), Hong and Kim (2007), McAdam and Galloway (2007), Huang, Chang, Li and Lin (2004), Worley, Ramamurthy and

Kirsch (2005), Aloini, Dulmin and Mininno (2007) and Shin (2008) explored on the change management domain. These authors share the same view by highlighting that absence of proper management of change is one of the major reasons for the failure of mobile ERP systems (McAdam and Galloway, 2007). Lee and Lee (2004) underscore the importance of successfully overseeing ERP implementation as a system constituting a wide variety of hierarchical propositions for change distinguished from a software system control technique. Several authors mentioned that this strategy which incorporates connecting technology, task, individuals, organogram and business standards, accomplishes a clear procedure for ERP system implementation, thereby allowing the identification, prevention and mitigation of change resistance problem.

However, resistance to change contributes more to the successful adoption of the mobile ERP framework (Hong and Kim, 2007). On the other hand, the social status for the implementation of mobile ERP framework ought to be circumspectly strategised (McAdam and Galloway, 2007). The failure of mobile ERP system implementation may be largely influenced by miscalculating the change management effort required (Aloini et-al., 2007).

The results from these authors accentuated that most of the problems arise as a result of ineffective training of mobile ERP system users which adversely affect the organisational operations. Most of these problems include huge training costs, lack of supporting team, improper data capturing, abuse of system and failure to consolidate business strategy with mobile ERP system.

The authors emphasise on the adaptability of information and users in terms of their obligations, abilities and skills in the organisation. The research has to ensure that the mobile ERP system can be upgraded by adapting business methods with users' viewpoints by unmistakably considering employees' roles, abilities and aptitudes.

The barriers to mobile ERP system adoption can be grouped into four classes as proposed in the model of Ebrahim and Irani (2005). These barriers include IT skills, IT infrastructure, privacy and security as well as organisational barriers. This research incorporates the organisational category as the main barrier to the adoption of mobile ERP system. The organisational barriers are summarised as follows:

- ❖ A poor leadership which may view the new innovation as a threat to power.
- ❖ A desire to keep established processes influenced by a bureaucracy with an organisational structure.
- ❖ Poor participation of departments that hinders the adoption process as departments may be hesitant to communicate the idea of the new innovation to other departmental areas.
- ❖ A blurred procedure and vision in regard to the use of the innovation.
- ❖ Top management may resist to change.
- ❖ A powerful urge to keep already existing business processes, energised by a bureaucratic structure.

2.7.1 Framework for mobile ERP implementation

Dabkowski and Jankowska (2003) proposed a mobile ERP system architecture in order to come up with a framework for the adoption of mobile ERP system. The mobile ERP system architecture is illustrated in Figure 2.4 below.

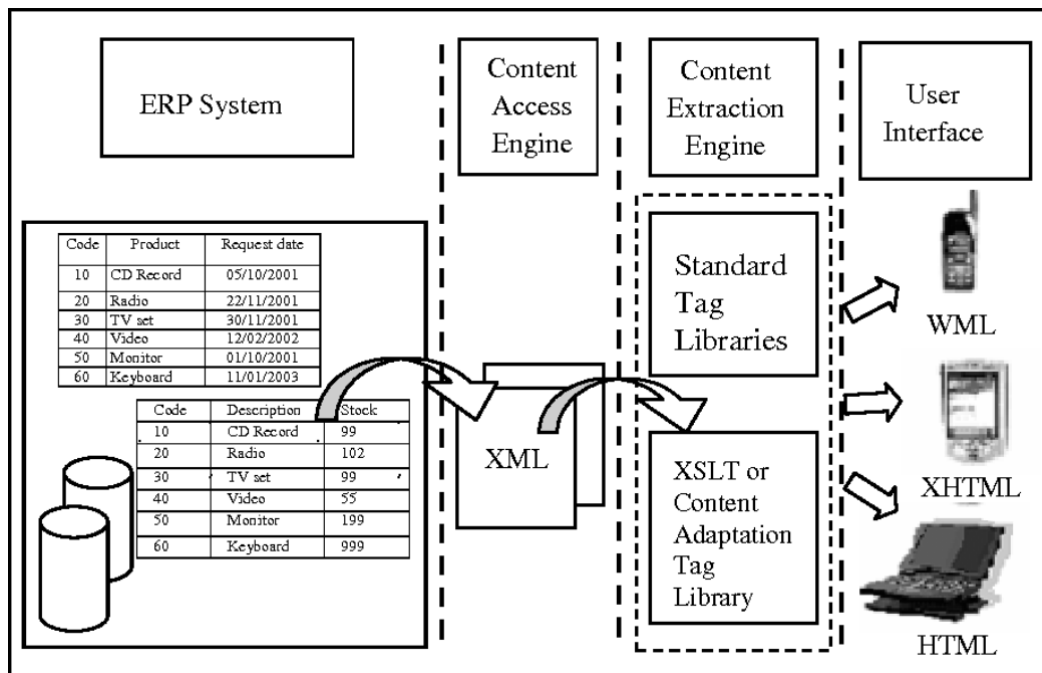


Figure 2.4: Architecture for mobile ERP system

Source: Dabkowski and Jankowska (2003)

The architecture shown in Figure 2.4 above is made up of database, logic, content extraction, and user interface tiers. The data tier, being the first tier, is mostly the mobile ERP system database. The second tier caters for the logic of the mobilisation process. The content extraction tier is responsible for device context aware content delivery. The presentation logic is encapsulated in the form of Content Extraction Engine. The last tier comprises various handheld mobile devices with their respective Graphical User Interfaces and browsers. However, this four-tier architecture framework shown in Figure 2.4 above is most suitable for organisations with few number of functional areas that needs to be integrated, and not appropriate for a big health care institution like Chitungwiza Central Hospital.

Homann, Wittges and Krcmar (2013) stipulate that mobile ERP systems generally apply client-server architecture and include data management, application, adaption, and user interface tiers. Dimitrios et-al. (2010) assert that the procurement and adaptation of mobile ERP system generally improves the quality and volume of production as the operational procedures across the company are already generalised and standardised by the time ERP system is implemented. Similarly, information can be effectively shared and circulated among the workforce in different functional units as shown in Figure 2.5 below.

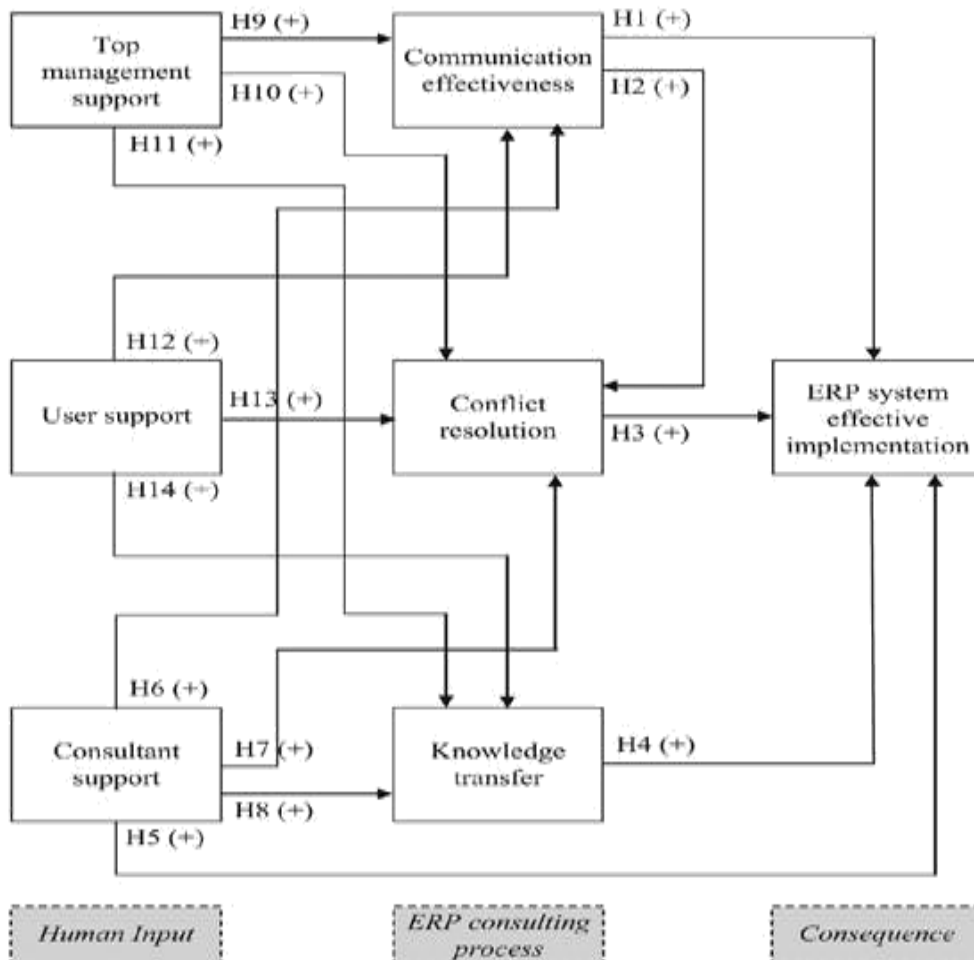


Figure 2.5: Mobile ERP implementation Framework

Source: Dimitrios, Dimitrios and Charalampos (2010)

Bradford and Florin (2003) note that common reasons for the ineffectiveness of m-ERP system are poor change management strategies during implementation. Other causes of failures are unavailability of m-ERP system implementation framework. Thus, the project manager will have no choice but to implement what he or she thinks is the best. More rationally, the mobile ERP implementation framework proposed explores the stages which need to be followed for successful implementation of the health care mobile ERP system.

Kurbel et-al. (2003) provides an architecture for mobile application that is based on the browsers and designed for thin client application. By applying this architecture, it is possible to get access to the ERP system functionality via a mobile device, so that the ERP system stays without any changes. The authors claim that their argument of architecture concentration does not comprise

the ERP system architecture but rather concentrates on the extra features that are required to do the mobilisation on such system.

The framework shown in Figure 2.6 below is a generalised framework most appropriate in industries like manufacturing and inappropriate in the healthcare industry.

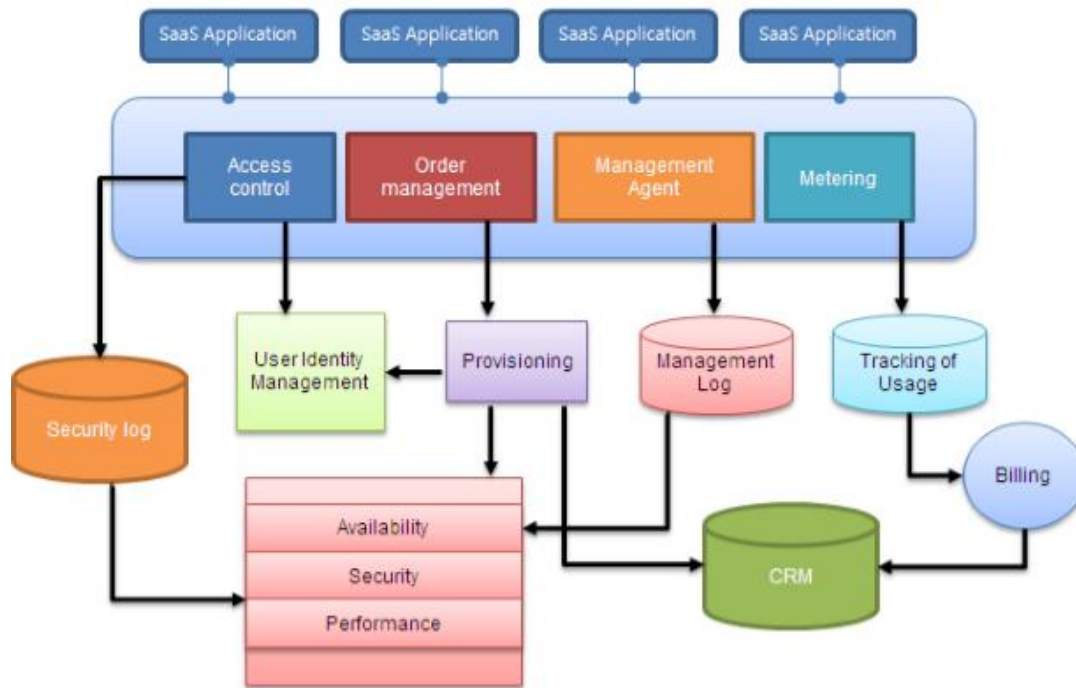


Figure 2.6: Cloud mobile ERP system components

Source: Gelogo (2014)

The other framework is represented by a mobile ERP system architecture which is designed with four tiers, namely: ERP system database, Content Access Engine, Content Extraction Engine and User Interface. The architecture is shown in the Figure 2.7 below;

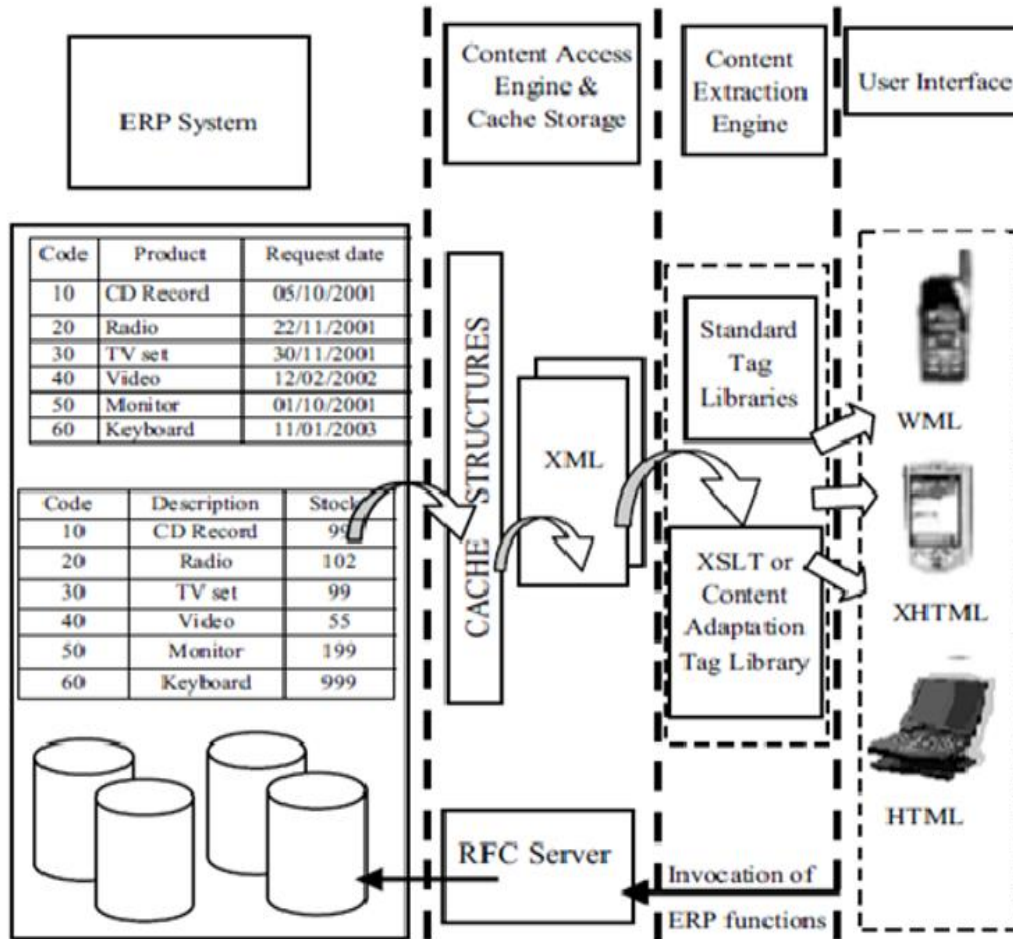


Figure 2.7: ERP System architecture

Source: Jankowska and Kurbel (2005)

According to Jankowska and Kurbel (2005), it seems that at present the ERP vendors are shifting to Service-Oriented Architectures built on Web Services. Accordingly linking mobile devices to such component-based information systems can be a critical issue. All these features are targeting the business agility, which means the organisation's capability to respond quickly and efficiently to the changes. Beside this, more benefits gained from implementing Service-Oriented Architectures include quicker time-to-market, reduced costs and risks. In fact, mobile access to an ERP system presents numerous advantages in terms of business agility.

Nowadays, most ERP vendors have moved develop and use their ERP systems using the mobile computing technology. Oracle, Microsoft and SAP vendors are the most powerful ERP systems vendors that implemented their systems on mobile computing environment. Mobile computing

technology improves the efficiency of getting ERP solutions into the indicators of the mobile workforce. Therefore, the framework shown in Figure 2.7 above is a general framework which can suit to other sectors like manufacturing but inappropriate to be adopted by the healthcare industry.

The Strategic Alignment Model is another framework that links business strategy and IT strategy through strategic integration (Henderson and Venkatraman, 1993). The framework shown in Figure 2.8 below focuses on business and IT.

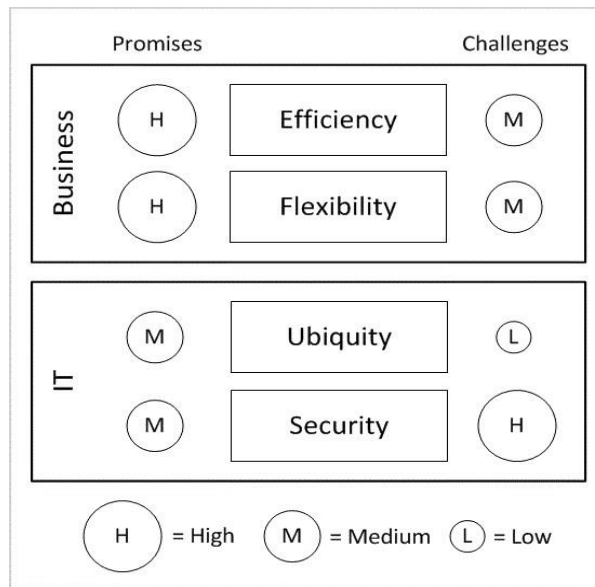


Figure 2.8: Mobile ERP evaluation framework

Source: Zhong (2014).

However, the framework shown in Figure 2.8 above does not include steps and who should be engaged in mobile ERP system implementation, so it cannot be utilised in the healthcare sector. However, the framework is useful to assess the post-implementation of mobile ERP system.

2.8 Conceptual Framework

The content of mobile ERP system is important in the implementation of the healthcare solution system. The implementation process in turn produces results or outcomes which point to the success or lack thereof in the adoption of the healthcare mobile ERP system. The implementation of the mobile ERP system is influenced by stakeholders who include, in this case, management

and subordinates at Chitungwiza Central Hospital and patients visiting the hospital to get healthcare services.

The framework for the implementation of healthcare mobile ERP system will be developed based on the conceptual framework shown in Figure 2.9 below.



Figure 2.9: Conceptual framework

Source: Omar and Jorge (2016)

2.9 Conclusion

It may be argued from the literature review that various factors contribute to the successful implementation of mobile ERP system to improve health care services in Zimbabwe. Most scholars agreed on the rationale for implementing mobile ERP system and factors necessary for the successful mobile ERP system implementation. There was also convergence on factors that may hinder the success of the project implementation. In this context, mobile ERP solutions offers many benefits to the Chitungwiza Central Hospital which can ultimately position it more competitively. The high implementation costs are a challenge to the adoption of mobile ERP system in the healthcare industry. The succeeding chapter examines the methodology adopted to conduct of this research.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

The primary objective of the study was to build up a framework for implementing mobile ERP system to improve health care services in Zimbabwe. The study includes a thorough investigation of the existing frameworks for mobile ERP systems and facts about how the respondents use the systems, as well as the investigation of the security dimensions too. The other objective of the study is to enhance business opportunities for mobile ERP system to improve business efficiency and effectiveness and to discover the security requirements for the system.

Sprague (2016) defines methodology as the appreciation of how to progress from the empirical research findings to make inferences about the truth of theories. Methodology is concerned with the sample, research design, data collection techniques, limitations as well as data analysis tools in a specific research (Burns and Grove, 2003). The methodology chosen is going to be affected by the nature and kind of research addresses that should be replied in the exploration.

In this research, the impact of risk issues and the infrastructure required to successfully implement mobile ERP system were assessed. Model justification was followed through one case study (Chitungwiza Central Hospital) whereby the ERP system being used at the hospital was reviewed for investigating the need for a more reliable and efficient mobile ERP system. The research methodology needs to be more proficient to eliminate errors in the processes of collecting and analysing data. A case study strategy used in this study was accompanied by data collection tools which include questionnaire, interviews, observation and records review. The study also involves defining of the research method, participants and data analysis techniques.

3.2 Research Philosophy

Research philosophies refer to beliefs on how facts about phenomenon must be gathered, evaluated and applied in researches. Research philosophy can be thought of in different ways that need to be scrutinised, namely: epistemology, ontology and axiology (Saunders, Lewis and Thornhill, 2009). Epistemology is concerned with what constitutes acceptable knowledge in the research area. Epistemology is what is known to be true, and this distinguishes it from doxology which describes what is believed to be true. Epistemology as opposed to doxology, constitutes

several philosophies of research approach. Saunders et-al (2009) further assert that the major research philosophies employed in research are positivism (scientific) and interpretivism (anti-positivism).

The research philosophy chosen is based on the research onion illustrated in Figure 3.1 below.

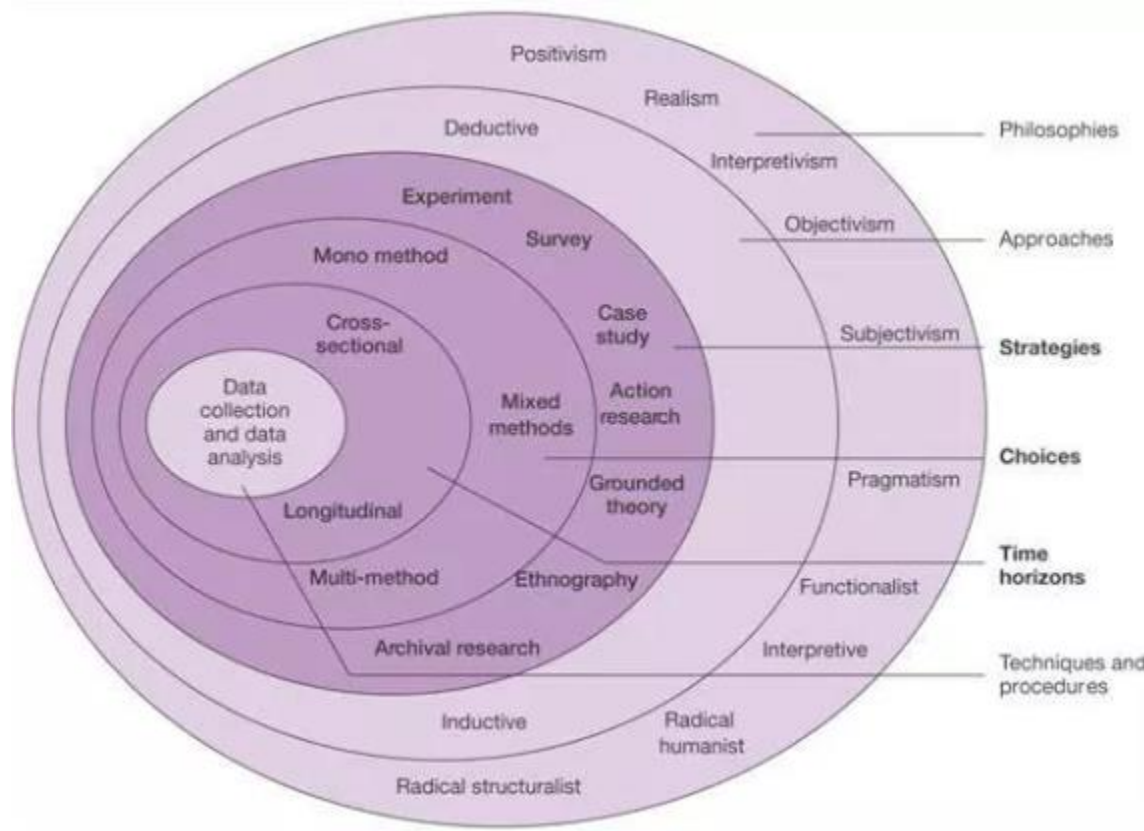


Figure 3.1: Research onion

Source: Saunders et-al (2009)

Methodological framework is described as a theory of how a study ought to be embraced, involving the theoretical hypothesis upon which the research is based, and the consequences of the approaches applied in the study (Saunders et-al, 2009). The steps taken during the research are shown in Figure 3.1 above. The research onion constitutes of six (6) layers, namely: research philosophies, choices, strategies, approaches, time horizons and data collection tools.

3.2.1 Discussion and rationale for choice of research philosophy

The major research philosophies are interpretivism and positivism. Denzin and Lincoln (2011) point out that positivists believe in the isolation and observation through manipulating the reality with disparities on a single independent variable to find out causal relationships. On the other hand, interpretivists believe in the study of the situation in its natural setting with the acknowledgement of investigator bias (ibid). This study follows the interpretivism philosophy as there was no manipulation of the variable but observation of phenomena in a natural setting.

The research requires exploring, analysing, and making recommendations to Chitungwiza Central Hospital on the most appropriate framework to adopt in the mobile ERP system implementation. The research was carried out without any restrictions guided by defined “laws” as outlined by positivists. An organisation’s best working practices does not fit in another organisation given the similarity in size of both organisations and their related business processes across the value chain. Thus, it is important to consider all aspects present and assess them accordingly in order to develop a proper framework suitable for all healthcare institutions.

3.3 Research approach

Inductive and deductive approaches are the major approaches used in research. Inductive research involves carrying out the study from bottom to up, developing themes and developing theories from the research (ibid). Deductive approach involves conducting a research from the general and the specific (Trochim, 2006).

This research followed a mixed approach since the two approaches are integrated. Moreover, to get an understanding of all mobile ERP dynamics, the inductive approach was not going to restrict this research to previously developed theories but allow creation of new theories.

A deductive approach was adopted as data was gathered and analysed. This approach is going to be used to articulate recommendations to Chitungwiza Central Hospital. Bryman and Bell (2007) emphasise that deductive approach embodies an overview of the affiliation between research and theory, and findings from deductive approach are created by means of logical reasoning. The results would be compared against present literature as a way of determining if they harmonise with the already developed theories in the area of healthcare ERP systems implementation.

3.4 Research strategies

Although there are many research strategies, analysis was done to assess the selected strategies that typically adapt to the interpretivist or positivist paradigms. Saunders et-al. (2009) outlines seven (7) research strategies, namely: experiment, survey, action research, case study, grounded theory, ethnography and archival research.

Inevitably, this research could be carried out using an experimental strategy since it is more appropriate on captive population (Saunders et-al., 2009). It was not feasible to assign employees to experiment their incapability on operating hospital ERP system. Moreover, the hospital staff and patients would not be eager to participate in experiments, while those who would like to contribute might not be representative.

The survey strategy typically falls under the deductive approach. This strategy is more useful when conducting research in areas of business and management. The strategy can provide answers to who, what, where, how much and how many questions. Thus, it is more aligned to descriptive or exploratory researches (Saunders et-al., 2009). Data gathered using the survey strategy is usually not wide-ranging as compared to data gathered through other research strategies like case study, hence survey strategy was not appropriate.

The case study research strategy embodies an empirical inquiry of a present phenomenon through use of various evidence sources (Robson, 2002). The boundaries between the phenomenon under investigation and the context within which the phenomenon is being investigated are not clear (Yin, 2003). This distinguishes the case study strategy from experimental strategy whereby the research is done in a controlled context. This strategy gathers a wide-ranging data which makes analysis more reliable.

Another research strategy that is normally adopted is action strategy. This strategy includes the one carrying out the research to be a member of the organisation under research and be involved in the change process (Saunders et-al., 2009). Thus, action research strategy was not appropriate in this study because of its emphasis on action embracing change within the organisation. However, action research strategy would be useful, in particular, for providing answers to ‘how’ questions.

Grounded theory is another strategy proposed by Saunders et-al. (2009). This strategy is typically considered under the inductive approach. It is also referred to ‘theory building’ through combining both deduction and induction. Goulding (2002) asserts that the grounded theory is mostly used for predicting and explaining behaviour, with focus on building theory.

However, grounded theory strategy is best suited grounding a theory in views of participants. This makes it ineffective to be adopted in this research. Moreover, grounded theory relies primarily on interviews as the only data collection technique.

Saunders et-al. (2009) also emphasise on ethnography strategy. This strategy is best suited in the inductive approach, and this makes it inappropriate in this study. It originates from the area of anthropology (Saunders et-al., 2009). The strategy takes a relatively longer period to accomplish the goal.

Another research strategy that can be employed is archival research strategy. This strategy relies on administrative documentation and records as the principal sources of data (Saunders et-al., 2009). All research which utilise data stored in administrative records is secondary data analysis. These data were initially gathered for other purposes like administration of the organisation. Records may not contain the specific data needed to provide solutions to the research question or fulfill the stated objectives. In addition, data may be omitted in the records, or access denied to data, or data may be censored for confidentiality reasons. Therefore, archival research strategy would not be the best solution to adopt in this research.

3.4.1 Rationale for choosing case study as a research strategy

The case study strategy was adopted to give solutions to the research question. This strategy was most suitable as it made description of research procedures easier. The case study strategy enhanced an appreciation of the research context and the processes being tackled in the study (Saunders et-al., 2009). The case study strategy provided solutions to the ‘*why?*’, ‘*what?*’ and ‘*how?*’ questions. This reason made the case study strategy more appropriate in the explanatory and exploratory research. The data collection tools used were the questionnaire, interviews, records review and observation. Interviews were carried out in a small space of time, thus a cross sectional time frame. Consequently, the case study strategy required usage and triangulation of several data sources. Semi-structured group interviews provided qualitative data which were an effective method for triangulation of quantitative data gathered by a questionnaire.

In summary, the case study was the most effective strategy as it enhanced understanding of the usage of existing ERP system at Chitungwiza Central Hospital and the benefits to be enjoyed after successful mobile ERP system implementation.

The research was carried out through the following steps:

- ❖ **Established Goals:** Listing down all what was to be learnt in the research. For example, the current ERP systems used by the Zimbabwe's healthcare sector.
- ❖ **Sample determination:** This step involved identifying the target groups. The process of determining whom to interview comprises two main components. The first being the nature of participants to be interviewed (target population). The second step was to decide the number of participants to interview. Time and budget constraints were used to determine the sample size.

The Table 3.1 below shows the separate techniques employed in the case study strategy as shown below;

Table 3.1: Case study strategy

STRATEGY	AIM	SAMPLE	TYPE OF QUESTIONS	METHOD OF ANALYSIS
1. Quantitative questionnaire	Quantify participants' understanding of the hospital ERP system	100 staff members with more than 2 years' experience at the hospital and 44 patients visiting the hospital	Closed-rating scale questions	Descriptive analysis (bar chart and pie chart).
2. Qualitative semi-structured interviews	Used to determine the benefits associated with hospital ERP system	5 members from the senior management with more 5 years' experience at the hospital.	Structured questionnaires. Open questions	Content analysis

3.4.2 Quantitative Questionnaire

The data collection process was accomplished using quantitative methods. The data collected was expressed in numeric form. The quantitative questionnaires were distributed to 100 staff members with more than two years' experience at the hospital, and 44 patients who have been visiting the hospital to acquire healthcare services. The questionnaire design consisted of rating scale questions, whereby participants were prompted to express their views and opinions on particular questions. The questionnaire also included secondary nominal data to determine the preference and status of respondents. The quantitative questionnaire handed out to participants is shown in Appendix. Quantifying and measuring the results against other variables was accomplished effectively using these quantitative questionnaires (Saunders et al, 2007).

3.4.3 Qualitative Semi Structured Interviews

Fifteen to twenty (15 – 20) minute interviews were conducted over the telephone to 5 key informants from the senior management with more than 5 years' working experience at Chitungwiza Central Hospital. Semi-structured interviews were guided by a pre-test question guide. The interviews aimed at providing comprehensive results by making use of informal discussions with participants. This qualitative interview technique was adopted over unstructured or structured interviews, because the intention of the research was to provide solution to the research questions through asking specific questions, but not so much (unstructured) that it generates unusable data, and not so less (structured) to avoid missing out any unexpected data (Collis and Hussey, 2003).

The semi-structured interview questions used in the research are shown in the Appendix. The themes used in the research were drafted mostly from reviewing existing literature and were useful in drafting questions that arose during the research process. The semi-structured interview also made it easier for probing answers. Answer probing assisted in getting feedback whereby more clarification was required to enhance understanding of the answers. The semi-structured interviews targeted at staff members who are currently using the ERP system at Chitungwiza Central Hospital.

The questionnaires were given to staff members from each department ahead of time. Approval was sought from the authorities and participants were given room to choose the questions they were familiar to respond to. All participants gave responses to some questions, whereas some questions were attended by particular individuals because of their expert knowledge. Table 3.2 below outlines the details of participants and their theme.

Table 3.2: Interview Respondents and Questions asked

Respondent	Role	Years at Chitungwiza Hospital	Subjects Covered
R1	Finance	2	ERP Benefits, Efficiency, User- friendliness
R2	Clinical Services	7	ERP Benefits, Efficiency
R3	Records	9	ERP Adoption, Efficiency, Effectiveness
R4	Pharmacy	3	Efficiency, Effectiveness, Challenges in ERP usage
R5	Information Technology	3	ERP adaptability, Compatibility, User- friendliness

Consent to interview was sought from the participants prior to the interview process. Participants' names were not mentioned as a way of preventing any mishaps if the interview contents were used or applied in other areas outside the academic field.

3.5 Research design

Denzin and Lincoln (2011) discuss research designs as strategies of inquiry within the quantitative, qualitative and mixed approaches that guides on a specific direction for the conduct of the research. The research used a case study research design. A case study is referred to as a design used to carry out a research which includes empirical examination of a phenomenon using several sources of evidence (Saunders et-al., 2012). The case study was considered most appropriate as ERP contextual implementation conditions are critical with researchers having no control over the process. It was mandatory to collect data from various sources and maintain the integrity of the data.

3.6 Strategy for sampling

Landreneau and Creek (2009) give explanations for sample, sampling and strategies for sampling. A sample is defined as a subset of a populace whereby respondents are chosen to participate in the study. Sampling refers to choosing a part of the population to represent a whole population in the research area. Sampling strategy is a plan laid out to be assured that the chosen

sample adopted in the research study adequately represents the population from which the sample is taken.

Many researchers argue that sampling ensures greater accuracy of results in overall than the case of an entire population (Saunders et-al., 2009). Collecting data from a selected sample implies that that more detailed information can be collected. Once data have been gathered, correspondingly enough time needs to be dedicated to scrutinising and testing the data before applying data analysis techniques.

There are various strategies for sampling that can be adopted in a research (Saunders et-al, 2009). Sampling strategies are grouped into probability sampling and non-probability sampling strategies as shown in the Figure 3.2 below.

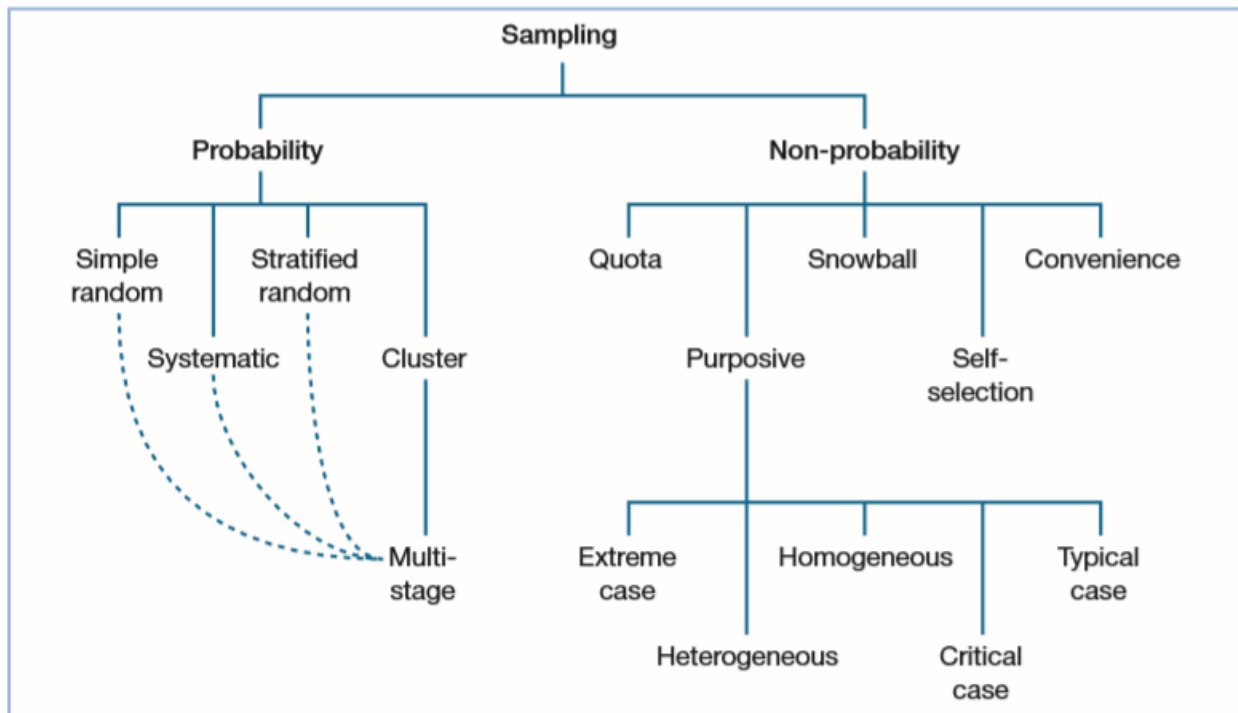


Figure 3.2: Sampling strategies

Source: Saunders et-al (2009)

Probability sampling: In this strategy, inferences are drawn from a sample to provide solutions to the research questions or to fulfil the objectives stated. The probability sampling process is subdivided into four steps which include:

1. Adopt an appropriate sampling frame based on the research questions or research objectives stated.
2. Choose on an appropriate sample size.
3. Choose a suitable sampling technique and choose the sample.
4. Verify that the selected sample is a representation of the population

Non-probability sampling: This strategy delivers various alternate methods to choose samples derived from a subjective judgement. A non-probability sample is the most practical at the exploratory stages of certain research projects, although it does not have the capability of determining the extent of the problem. Consequently, probability sampling tools may be used. A non-probability sample is most often used when adopting a case study strategy, as asserted by Saunders et-al. (2007). A non-probability sample, as described by (Oppenheim, 2000), is a sample in which the probability of each case being selected from the total population is not known. Research questions, objectives and the selection of research strategy may be uttered to non-probability sampling especially in certain business and management research projects. Mostly, an indepth study is required to provide solutions to the research question and fulfil the objectives stated. The study must concentrate on a small, possibly one, case chosen from the entire population. This sample would provide an information-rich case study in which the research question can be explored. Alternatively, limited resources or the inability to specify a sampling frame may dictate the use of one or a number of non-probability sampling techniques (Saunders et-al., 2009).

3.6.1: Rationale for the choice of sampling strategy

It was not feasible to collect data from the entire population of Chitungwiza Central Hospital as a way of answering the research questions. Sampling also saved time since there were tight deadlines. Sampling made data collection more manageable as fewer people were involved. The results were available more quickly, as there were fewer data to enter. Questionnaires were used to collect data from all departments at Chitungwiza Central Hospital but only a sample of the data collected were analysed. This was occasionally done to save time.

It would have been most suitable if all employees within Chitungwiza Central Hospital were interviewed, based on the research objectives and the issues under investigation. Therefore,

because of time and resource constraints inherent in the research, a non-probability sample of the population was selected.

3.6.2: Sample size

A sample of 100 staff members was selected from the entire population of Chitungwiza Central Hospital using purposive sampling (a non-probability sampling strategy). This sampling strategy targeted participants with relevant knowledge and expertise of ERP system. In addition, convenience sampling (non-probability sampling) strategy was used to select another sample of 44 participants from patients who visit the hospital to get healthcare services. The research instrument used was questionnaire.

Interviews were also conducted with 5 key informants to give a total sample of 149 consistent with other studies. The sample chosen for the study was a representation of the Chitungwiza Central Hospital's community. The usage of the hospital ERP system has a direct impact on these stakeholders, thus their inclusion in the study was justifiable.

The sample and the sampling strategies used in the research are outlined in the Table 3.3 below.

Table 3.3: Sample and sampling strategies used

Sample Characteristics	Sampling technique	Research instrument used	Extracted number of Respondents
Patients visiting the hospital	Convenience sampling	Questionnaire	44
Technical and Management Staff	Purposive sampling	Questionnaire	100
Key Informants (senior management)	Purposive sampling	Interview guide	5

3.7 Methods of Collecting Data

According to Mesly (2015), data collection can be undertaken using a primary source and secondary source. There are various techniques used to gather data in a research. All those techniques are grouped into two main classes, namely: primary and secondary data (Douglas,

2015). Both primary and secondary sources of data were utilised to answer the research questions stated in Chapter one.

3.7.1 Primary Data

Victor (2017) asserts that primary data is original, factual, and real-time data collected in the initial research. This type of data is collected for addressing the problem at hand. Primary data sources include observations, surveys, personal interview, experiments and questionnaire.

Interviews produced original, factual and real-time data applicable to the research study. Primary data was collected through emails templates sent to some department heads. Moreover, primary data was collected by the concerned party and this improved the reliability of results.

3.7.2 Secondary data

Victor (2017) highlight that secondary data refer to data collected for some other functions and at previous time period by a party not linked to the research. Secondary data provided an initial insight to the problem under investigation. Secondary data collection sources included healthcare E-Books, internet websites, publications, journals, articles and annual reports of Chitungwiza Central Hospital. Secondary sources were useful in complementing the literature review, research findings as well as development of the research instruments used. Secondary sources were also used especially those with ERP system related information and related variables underpinning the theoretical framework and also the methodology of the research. Internet based sources were used and some of the search words used include;

- ❖ Mobile Enterprise Resource Planning System
- ❖ Enterprise Resource Planning
- ❖ SAP
- ❖ ERP system
- ❖ Evaluation
- ❖ Effects

The word combinations of the above words were tried using Google as the search engine.

3.7.3 Questionnaires

Taylor, Wilkie and Baser (2006) assert that questionnaires are mostly used to collect data whereby participants give responses to a set of questions laid out in a predetermined order.

Designing and delivering of questionnaires was quite easy. Questions were clearly arranged in a way that made responding to questions much easier. Participants were selected from technical staff and management and patients to make it easier to assess the reliability, efficiency and effectiveness of the questionnaire method.

3.7.3.1 Pilot Testing of Questionnaires

Designing a questionnaire was a complex process. The possibility of making errors when designing a questionnaire is imminent, no matter how careful one can be (Denzin and Lincon, 2011). Pre-testing the questionnaire was adopted to fine tune the technique and guarantee that it would provide reliable results. The pretesting of the questionnaire also assisted in identifying and removing unambiguous questions or complex instructions.

The questionnaire at Chitungwiza Central Hospital was a pilot test involving respondents who were not part of the final respondents.

3.7.4 Interviews

More detailed business information can be collected using interviews (Epstein and Maltzman, 2013). Interviews play a significant role in gathering data and information. Using this technique, the interviewer could easily elucidate real-time responses in order to get unbiased responses. Stawarski and Phillips (2008) assert that interview plays a vital role in data collection since it collects data that cannot be collected by other techniques such as records review or observation.

Personal interviews were carried out in such a way that participants were given enough room for asking questions or elaborations. The interviewer could clearly understand the responses from participants. Interviews enhanced the certainty of information as there was non-verbal communication.

3.8 Findings' Reliability and Validity

The research was designed and carried out in a way that the phenomenon under study was accurately recognised and defined. This improved the credibility for the research findings. Kumar (2005) asserts that it is crucial to be aware of the problems and inefficiencies related to chosen research methods as it minimises errors as well as increasing the quality of the study.

Methodological triangulation was used in the research to intensify the validity of the study. Cohen, Manion and Morrison (2013) assert that methodological triangulation is an effort to give

a clear explanation on the complexity and richness of human behaviour by reviewing it from a more than a single standpoint. More comprehensive data was collected by means of methodological triangulation, and a greater insight into a research topic, far greater than adopting just one research method.

Reliability shows replicability and consistency over time. In addition, reliability can be viewed as the extent to which a test is error free in terms of measurements, since the more measurement errors occur the less reliable the test (Fraenkel, Wallen and Hyun, 2011). Repeatability of the research was enhanced through proper keeping of records of all the processes. Comparison was made to data from various study methods in order to evaluate whether the study was reliable.

The objective of reliability is that if a new researcher uses the similar measures as used by the previous researcher, the new researcher will come up with similar findings and conclusions thereby minimising biases and errors in the research. The goal is to assess the appropriateness of the methods used to the scientific enquiry set for the investigation. The pilot study and triangulation adopted enhanced the research validity and reliability.

3.9 Data analysis and presentation

Data analysis brings structure, order and interpretation to the collected data (Marshall and Rossman, 2014). Saunders et-al. (2012) assert that a data analysis method must fit the research design. The two main categories of data analysis are quantitative and qualitative.

Quantitative analysis techniques were used since data collected was also based on findings collected from numbers and analysis was done using graphs and statistics. The presentation methods stretch from constructing simple tables or drawings that denote frequency of occurrence and using statistics such as indices to make comparisons, by developing statistical relations between variables to complex statistical modelling. The analysis techniques range from Excel spreadsheets and Lotus 1-2-3 to more sophisticated statistical analysis software packages such as Stata, SAS, Minitab and SPSS. Other tools include more specialised survey design and analysis software packages like SphinxSurvey and SNAP (Saunders et-al., 2009).

Qualitative data analysis procedures assisted in building theory from the available data. They comprise of both inductive and deductive approaches. Qualitative data analysis was used to

analyse qualitative data, that is all data that is non-numeric or unquantifiable. Data were analysed and qualitative data analysis techniques were used to derive the meanings from the data.

3.9.1: Rationale for choosing data analysis techniques

Quantitative techniques were used to quantify variations, predict causal relationships and outline the characteristic features of the population while the qualitative techniques were used to outline and explain relationships, describe individual experiences and group norms.

Statistical Package for Social Sciences (SPSS) was used to analyse data. SPSS made it easier to import data from other sources like Excel. It was relatively simple to import an Excel spreadsheet to SPSS for the data analysis, as it required some preparation and a few basic steps.

SAS software has a menu designed for programmers or for those who have a programming background which makes it difficult to use, as compared to SPSS. SPSS software has a step-by-step help menu designed for those familiar with general statistics concepts. Learning to use the SPSS software does not require a programming background. However, SAS is not compatible on all operating systems. The latest version of SAS does not run under OS X, unlike SPSS and Stata. Stata is fully supported on all the three operating systems, namely: Windows, OS X, and UNIX/Linux. Therefore, data analysis techniques chosen were SPSS and Stata on the basis of their reliability, compatibility and efficiency.

The data analysis tools comprised of interrelated operations that rearranged and summarised the data. Editing, coding and processing data made is easier to accomplish data analysis. Data analysis began after data collection was accomplished. Data was then presented using graphs and tables.

3.10 Ethical Consideration

According to Resnik (2011), ethics refers to what is morally and legally right in conducting research. Ethics is very important in conducting research and the way research is always under scrutiny (Drew et al., 2008). According to Saunders, Lewis and Thornhill (2009), ethics refer to the suitability of the researcher's behavior in relation to the participants' rights in the research. The researcher accepted parts of both the search for information and the rights of the participants. During the process gathering information, participants were made aware of how data would be collected, analysed and reported. These considerations were made by the

researcher during the interviewing process. Participants were notified of their rights and allowed to participate voluntarily.

During the research process, participants' names were kept confidential and all participants were enlightened about the nature and purpose of the research and the way they would participate. Participants voluntarily gave their answers and were not restricted to quit from the research if need be. No participants were subjected to stress, awkwardness, maltreatment, embarrassment or anguish during the entire research. Research was not interrupted as there was a formal agreement sorted out between the researcher and participants (Chitungwiza Central Hospital employees and management). There was confidentiality of resources availed during the research as well as the feedback from participants.

3.10.1 Obtain Consent

Consent was sorted before the participants could start taking part in the research. No one was forced to participate in the research. This process accelerated the success of the research. The research was accomplished in a way that did not compromise the security of the respondents in any way whatsoever.

3.10.2 Privacy and Confidentiality

Confidentiality was sort to the data provided by the respondents during the entire research process. There was an assurance that data would be used for this research purpose only. Protection was also guaranteed to the respondents during and after the entire research process.

3.10.3 Deception

All participants took part in the research with their consent since a formal agreement had been achieved between respondents and the researcher. This made respondents participate knowingly and willingly.

3.11 Conclusion

This chapter looked at the methodology which offered guidance to the research study. The methodologies assisted in the development of the framework that can be implemented to improve healthcare services in Zimbabwe. The research utilised a qualitative and quantitative methods. Data was collected using English written questionnaires that were distributed to the

participants via email and hardcopy. The next chapter is going to present results of the study and make suitable recommendations.

CHAPTER 4: DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 Introduction

The previous chapter looked at the methodology followed to address the research objectives stated in chapter one. The research objectives highlighted in chapter one form the basis of this

current chapter which centers on the presentation and interpretation of the research findings. The study aimed at building up a framework for mobile ERP system implementation to improve health care services in Zimbabwe. This chapters aims to show and break down the data collected through various information gathering tools and work on the data. A case study strategy accompanied by questionnaires, interviews and on-site observation techniques was used to gain a rich understanding of the research perspective and the process being endorsed. The research findings provided answers to the research questions conveyed in Chapter one. This chapter is going to present all the information collected from information gathering tools in graphs and tables that expedites analysis to the data. Statistical analysis tools are going to be used in order to give recommendation and conclusions on the framework for implementing mobile ERP system to improve health care services in Zimbabwe. The presentation of results will help to answer the subsequent research question: “*How to develop a framework for mobile ERP implementation to improve health care services in Zimbabwe?*”.

4.2 Response Rate

The questionnaire was the most important data collection techniques supplemented by interviews and observation methods. The questionnaires were distributed to key staff heads of departments who would the forward to their subordinates. Patients who visited the hospital at the time of the conduct of the study were given questionnaires as well. The results shown in Table 4.1 below shows the background features of respondents who participated in the research.

Table 4.1: Questionnaire response rate at Chitungwiza Central Hospital

RESPONDENTS	ISSUED	COMPLETED	% RESPONSE
Patients	44	33	75
Staff	100	87	87
Total	144	120	83

A total of one hundred (100) questionnaires were administered to the employees, as indicated in the Table 4.1 above. Eighty-seven (87) questionnaires were completed successfully and returned back. This result denotes a response rate of 87 % and this signifies validity of the research

findings. The validity of these research findings is supported by Saunders et-al (2000)'s assertion that a response rate of 50% and above is sufficient enough to the warrant validity of the research findings.

Out of the forty-four (44) questionnaires distributed to patients, thirty-three (33) out of forty-four (44) questionnaires distributed to patients were completed successfully and returned. However, few respondents from the patients did not manage to bring back the questionnaires. This result denotes a favorable response rate of 75 % which signifies validity of the research findings.

Patients were not entitled to respond to all questions henceforth a few questions returned unanswered and some erroneously answered. Moreover, a few patients neglected to respond to the questions because of the fact that they were occupied to the extent of failing to meet the deadline for collection of responses. Some patients were hesitant to be appointed some tasks, thus they purposefully gave false replies. Participants were given enough space to go through the questions before responding. However, this questionnaire technique consumed more time as there were no immediate responses as in the case of face-to-face interviews.

The senior management and their subordinates from all the participating departments were interviewed. The Table 4.2 below illustrates the frequency distribution of interviews carried out in the research.

Table 4.2: Response rate of interviews

Designation	Targeted	Actual			Relative %
		Male	Female	Total	
Senior management	5	3	2	5	100

From the Table 4.2 above, among the five (5) respondents selected, all of them managed to respond to the questions asked. This implies a 100% overall interview response rate. The insights from each participating department enriched this research.

4.3 Findings from questionnaires and interviews

The research aimed at developing a framework for the implementation of mobile ERP system to improve healthcare services in Zimbabwe. The three preceding chapters introduced the need for a framework that can be adopted to improve healthcare services accompanied by an appropriate methodology design followed in the study. This section is going to present the research findings collected from data gathering tools, and analysed using a conceptual framework built on the basis of this research.

4.3.1 Issues associated with ERP system

This section is going to explore on the issues associated with mobile ERP issues and how the current ERP system is being used as well as the participants' knowledge of ERP systems.

4.3.1.1 Respondents by department

Chitungwiza central hospital rolled out SAP system to cover most of the hospital operations so as to improve health care services. The research covered all the departments that have embraced SAP system as shown by the number of respondents drawn from five (5) departments as indicated in the table 4.3 and figure 4.1 below.

Table 4.3: Respondents by department

	Departments				
	Finance	Clinical	Records	Pharmacy	IT
Percentage %	30	6	16	8	40

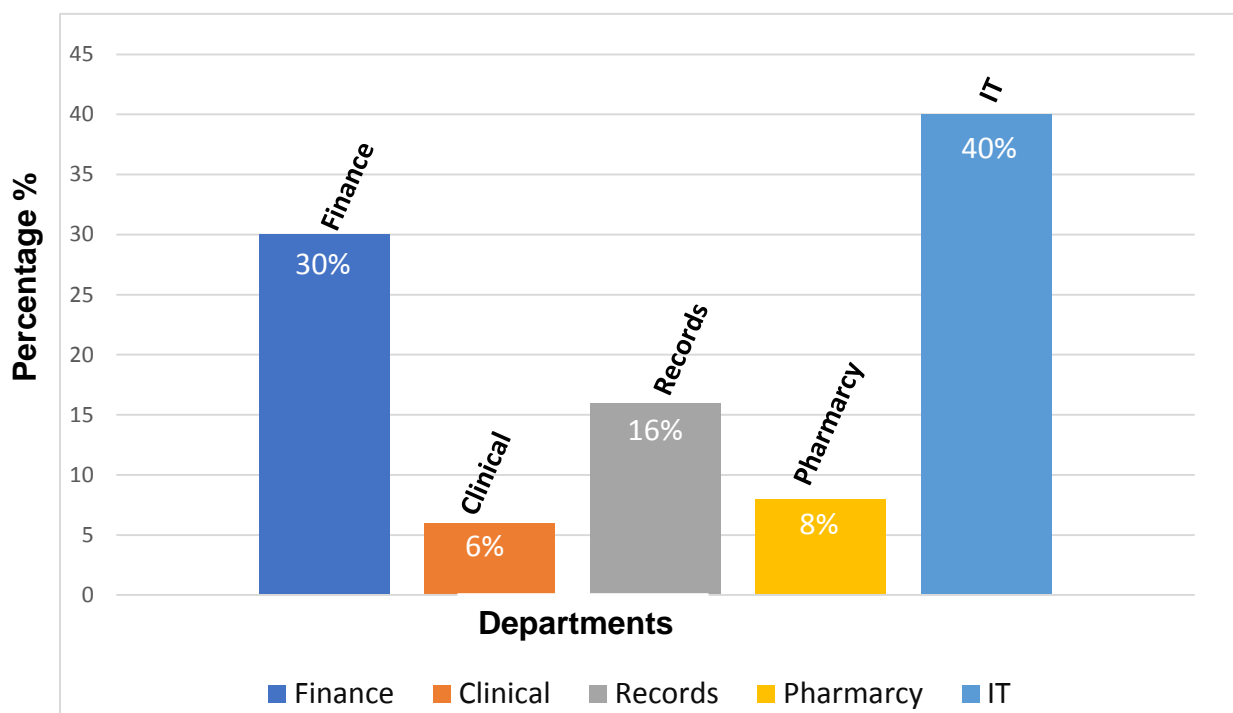


Figure 4.1: Percentage distribution of participants by department

From the Figure 4.1 above, the highest number of the respondents (40%) were drawn for the information technology department while a significant 29 % was drawn from the finance department. The IT department was responsible for the implementation of the ERP system at Chitungwiza central hospital and were well positioned to inform the research as they had hands-on experience with implementation, monitoring and evaluation of the performance of the ERP system. Other critical touch points for ERP within the hospital setup namely; clinical and records departments, made a significant contribution of 6% and 16% to the total number of respondents. This implies that the research was able to apprehend the issues critical to the implementation of health care mobile ERP system.

4.3.1.2 Respondents’ experience on working with the ERP systems

The period spent by the respondents at Chitungwiza Central Hospital forms the basis for the research as there was need to evaluate the impact of ERP system on hospital operations. This

demanded an understanding of the state of affairs before and after the of ERP system implementation.

A cross tabulation method was used to quantitatively analyse the relationship between multiple variables. This method was useful for studying the responses from the case study strategy (accompanied by questionnaires and interviews) employed in the research. Cross tabulation was done using SPSS, Stata, and Microsoft Excel and the results are illustrated in the Table 4.4 below.

Table 4.4: Percentage distribution of respondents by working experience

	Frequency	Percentage %
Less than 2 years	9	9
2 – 4 years	18	18
5 – 10 years	61	61
More than 10 years	12	12
Total	100	100

From the Table 4.4 above, a higher percentage of participants (61%) had working experience of between 5- and 10-years within their particular departments. This indicates that participants had ample time at the hospital, positioning them well to give comments as experience enhances their credibility in discussing issues concerning the mobile ERP system implementation in Zimbabwe’s healthcare industry.

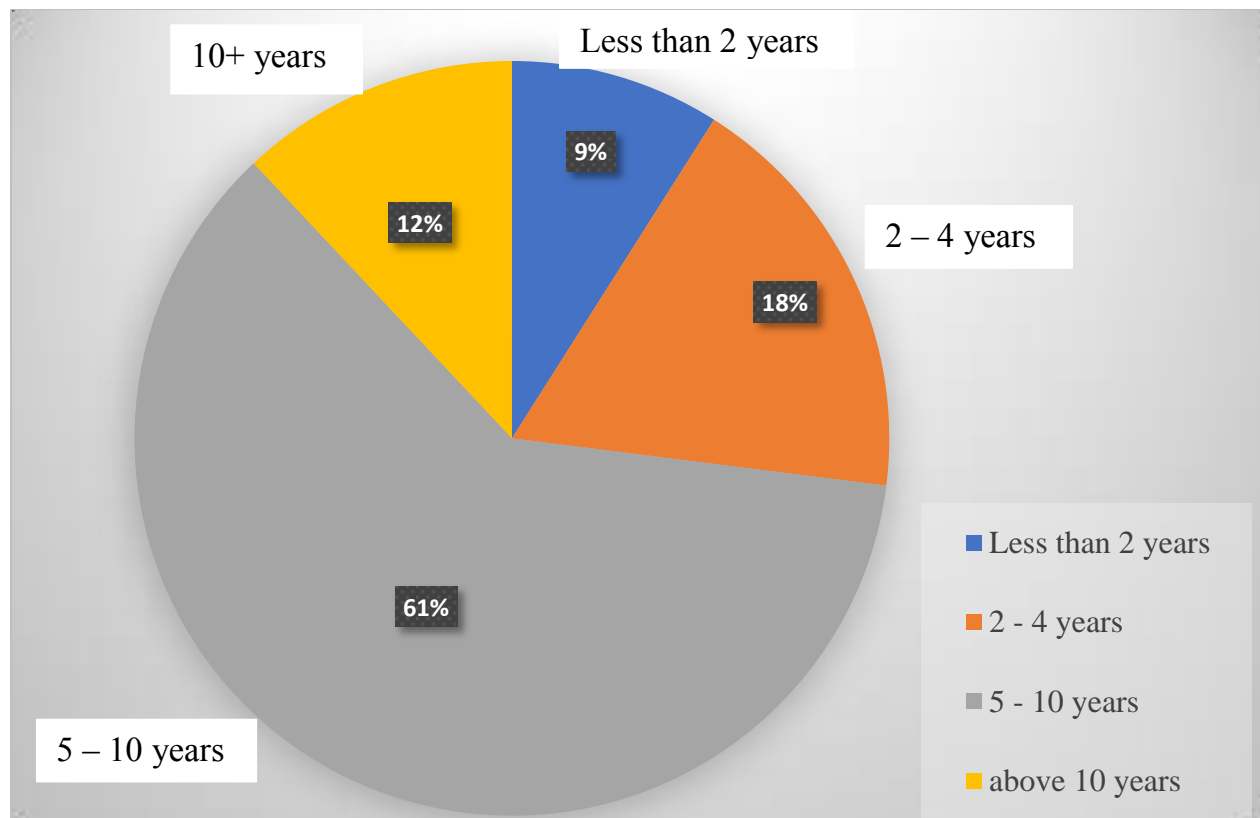


Figure 4.2: Respondents' experience on using ERP systems

From the Figure 4.2 above, a greatest percentage of participants (61%) have between 5- and 10-years' working experience of using ERP systems. These participants provided with helpful data as they now have adequate knowledge and expertise on the functionality of all the ERP modules implemented.

4.3.1.3 ERP modules and levels of satisfaction

ERP modules used by the respondents will be discussed in this section. Although the research specifically intended to assess the impact of implementation of mobile ERP healthcare solution system on accounting profitability, an examination of its impact on all the implemented modules was inescapable.

The results obtained from the study are demonstrated in the Table 4.5 below.

Table 4.5: ERP modules and levels of satisfaction

	Not implemented (%)	Unsatisfied (%)	Satisfied (%)	Very satisfied (%)	Very unsatisfied (%)
Quality management	1	24	37	31	7
Warehouse management	31	16	17	23	13
Sales and invoicing	0	7	25	70	3
Customer service management	6	6	67	18	3
Project management	29	40	17	13	1
Logistics & materials management	11	7	23	51	8
Payroll	5	24	21	49	1
Human resources	7	11	37	43	2
Finance and accounting	2	5	23	67	3

The Figure 4.3 below illustrates the percentage distribution levels of ERP satisfaction per department

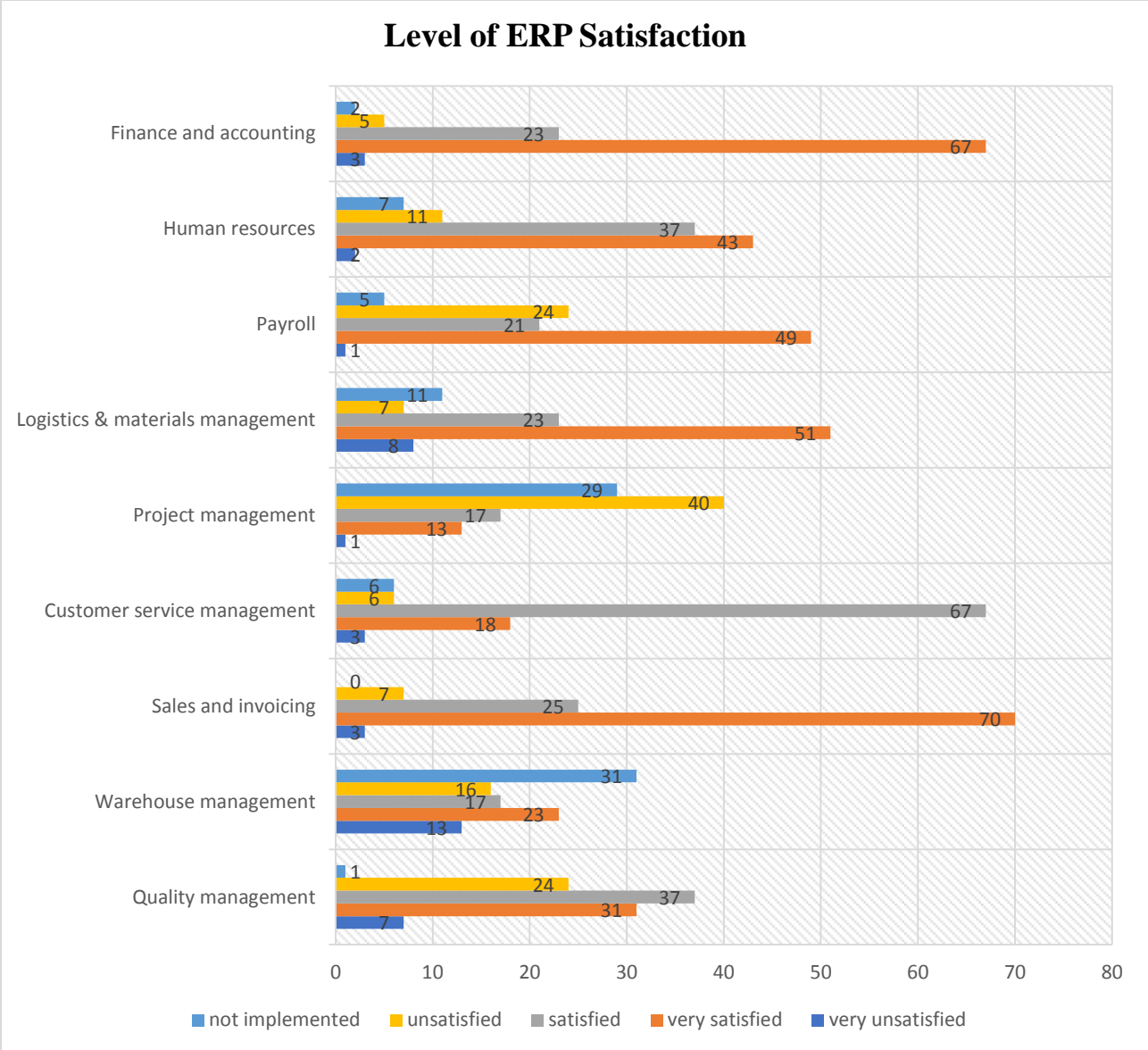


Figure 4.3 Percentage Distribution Levels of SAP Satisfaction Per Department

From the Figure 4.3 above, high levels of satisfaction are evident across departments making a case for the continued use and adaptation of ERP solutions, despite the challenges described in the preceding section. The ERP system has positively improved sales and invoicing, finance and accounting as well as customer service management for Chitungwiza Central Hospital. Most of the respondents (70%) were very satisfied with the positive effect of ERP on sales and invoicing operations. An equally high number of respondents (67 %) were also very satisfied with the implementation of ERP in finance and accounting. Relating to these figures, the researcher

argues that the ERP implementation process has significantly improved accounting profitability as the two departments whose activities are closely related to accounting profitability have recorded positive changes. Furthermore, one of the interviewees supported this supposition in the following statements;

The existing SAP system at Chitungwiza Central Hospital has enabled the hospital to effectively generate revenue by acting as a stop leak valve to the leakages that had characterised the traditional dispensation. Corrupt tendencies that had derailed the organisations financial goals have been eliminated by the standardisation of operations. The introduction of ERP has also made customer bill processing and credit follow ups much easier to conduct.

4.3.1.4 What is meant by the term ERP system?

The findings from the questionnaires and interviews conducted reflect that most of the respondents have some knowledge about ERP systems. Most of the respondents highlighted that an ERP system as an integrated cross-functional system consisting of software modules that can be selected, so that they address a wide-range of operational activities in the firm, such as human resources, sales and invoicing, manufacturing and distribution. Ninety percent (90%) of the respondents explained ERP system as a company-wide application that connects and manages information to every department and employee in the organisation irrespective of business functions, physical location, or industry sector. Furthermore, participants also emphasised that ERP system assists in integration of business applications by the use real-time information. Therefore, the findings indicated that participants have a respectable appreciation of the ERP system at Chitungwiza Central Hospital.

4.3.1.5 What is your assessment on mobile ERP system as a replacement for the current ERP system?

The findings from the questionnaire and interview methods reflect that the respondents have a notion of migrating from the existing SAP ERP system to a mobile ERP system, but their major areas of concern include compatibility of the mobile apps with their devices as well as data security issues when considering connectivity options, as large amounts of sensitive organisational and client information will be circulating internal networks. Most of the participants emphasised that it is costly to run a mobile ERP system due to high tariffs that have been currently imposed on the bandwidth by the Internet Service Providers in Zimbabwe. They

also raised another issue of excessive costs for acquisition of all the infrastructure required by the hospital's mobile ERP. This idea was, however, less significant as some of the respondents who have full knowledge in regard to the costs of running a mobile ERP system in comparison to the existing SAP ERP systems since there will be no costs of buying and maintaining server machines. Moreover, data security will be in the hands of the service provider who has strict standards in place to keep that data safe.

4.3.1.6 What effect do you assume mobile ERP can have on the issuance of healthcare services to the patients and hospital employees?

The mobile application will be more user-friendly. The system will provide real-time access to the reports. Reports can be produced anywhere, anytime, enhanced by automatic synchronisation. Mobile ERP provides for system agility. That means, the system will streamline the process of tiring, long implementations, through adding an extra layer of flexibility to existing ERP implementations, making the process faster and more cost effective. It allows for future modifications when incorporating new technologies to further enhance the users' experience.

4.3.1.7 How else do you assume this existing SAP ERP system may well be improved?

The possible solution is the adoption of a mobile ERP system for the hospital gain competitive advantage. Due to recent advances in mobile computing technologies, the hospital needs to mobilise the existing ERP system.

4.3.1.8 What is your understanding on the usage of mobile ERP at Chitungwiza central hospital and what are the related benefits?

Positive responses were collected from the participants about the adoption of mobile ERP system. Most of the participants supported that mobile ERP system have got many benefits to the hospital. They also highlighted that it would be quite easy to integrate of business applications by the use real-time information. Participants also appreciated the mobile ERP is able to streamline organisation's workflow processes, maximise operational efficiency, deepen customer relationships and stimulate managerial decision making. Through the use of mobile ERP, access to organizational information will done anywhere, anytime using mobile devices even when there is no wireless signal.

4.3.1.9 What do you consider were the causes of introducing ERP system at the hospital?

The respondents emphasised many reasons for the introduction of ERP at the hospital. The reasons are itemised as follows:

- ❖ Technological advances as suggested by the hospital's stakeholders. The emerging of advanced technologies necessitated the need for organisations to adapt to these technological advances.
- ❖ The hospital's strategic plan required adoption of an ERP system to streamline workflow processes and increase operational efficiency, thereby attaining competitive advantage.

4.3.1.10 What is your view on the feasibility of the implementation of ERP system at the hospital? Was the implementation a proper choice or it's a penitent?

Respondents emphasised the hospital is better off with ERP system implementation. They mentioned that the organisation is not regretting in regard with ERP system implementation, as shown by the reasons below.

- ❖ The time for implementation ERP system was relatively short. It only took few months to complete implementation.
- ❖ Fewer business interruptions.
- ❖ The ERP system had a quick Return on Investment (ROI).
- ❖ Work procedures and performance were significantly enhanced.

4.3.1.11 What are the encounters observed during implementation of the ERP system and their impacts to the Chitungwiza central hospital?

Participants acknowledged many challenges were encountered during ERP system implementation. The encounters highlighted by the participants are as follows;

Inadequate time - The time scheduled for ERP system adoption was relatively scarce.

Adaptableness - The respondents emphasised the negligence by some personnel adapt to ERP system. It took more time for the hospital staff to get used to the system because they did not have adequate knowledge on the flow of information into the system. Most of the staff feared the new system would substitute more of the hospital's workforce thereby resulting in some employees losing their jobs. The fear eventually wiped out as the personnel gained experience on working with the ERP system. However, some of the staff did not have the passion of learning

and understanding the ERP system and the value generated from the system. Those staff members who are computer literate found it easy to adapt to the ERP system.

Conflict - The conflict adversely affected the implementation of the hospital ERP system. It took a longer period for the management to reach consensus on the feasibility of the ERP system to the hospital. The economic feasibility of the ERP system includes measures like Return on Investment (ROI), Cost Benefit Analysis (CBA), and so forth.

4.3.1.12 What actions do you think should be effected to overcome the encounters? Who should take a leading role in addressing these encounters?

Most of the respondents emphasised that both employees and management should be involved to adapt to the change that is going on within the hospital. Furthermore, respondents need to take part in workshops and give their input to change management. The hospital would have benefited a lot about ERP system if management and their subordinates had attended change management workshops.

4.3.1.13 How do you imagine mobile ERP system progressing? What are the factors that leads to the success of mobile ERP system?

Executives found it easy to appreciate business procedures due to greater visibility of the mobile ERP system and the benefits to be accrued from the system. The executives now appreciate their involvement in mobile ERP system implementation and the importance of regularly scheduled meetings to allow them stay abreast of project status. Frequent debriefs would allow the executives high visibility into the project and alert them to issues as they arise.

4.3.2 Training of hospital management and subordinates

This section is going to focus on the training needs for ERP system and collect information from the respondents on their ERP knowledge and expertise.

4.3.2.1 What type(s) of training did you engage?

Table 4.6: Types of training

Type of Training	Number of Participants	Percentage
Project term training	12	15
End user training	56	70
Mobile-based training	0	0
Did not receive training	12	15
Total	80	100

Different types of training were conducted on the participants as illustrated by the pie chart graph in Figure 4.4 below.

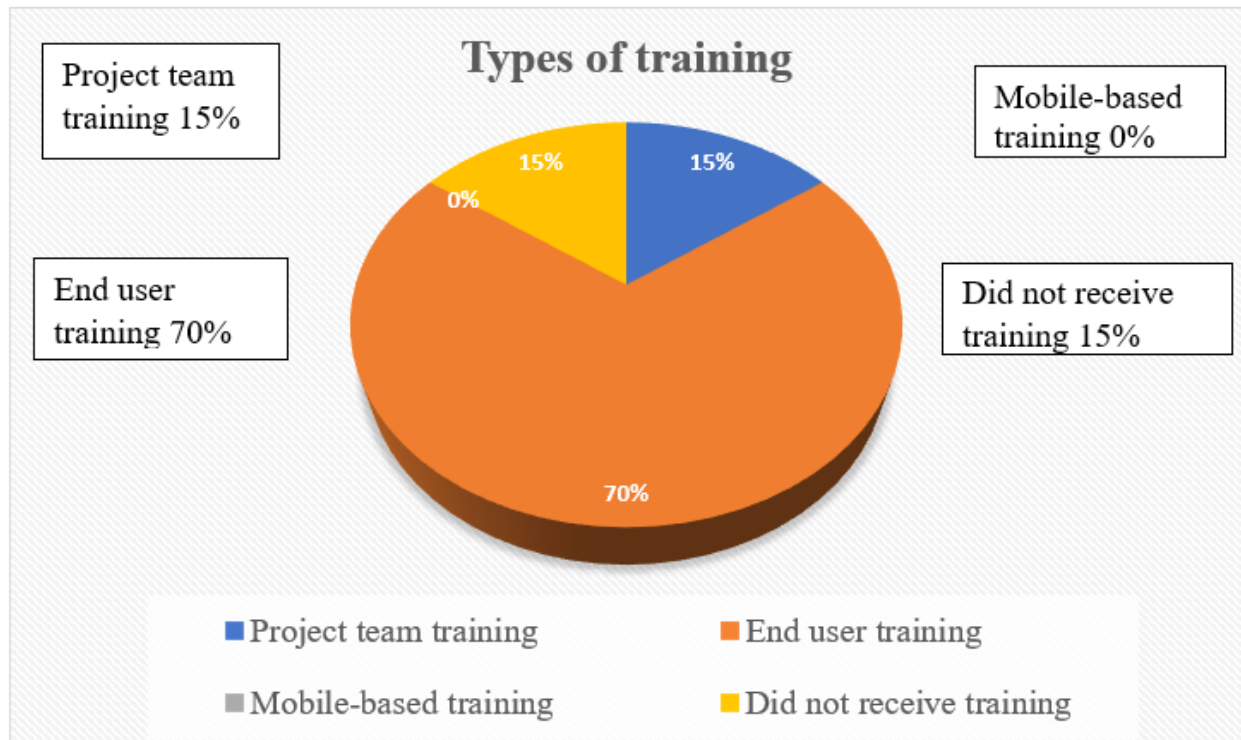


Figure 4.4: Types of training

The highest percentage (70%) of participants received end user training, as shown in Figure 4.5 above. Project team training was carried out to 15% of the participants. Only 15% of participants were not formally trained implying that they would get used to the system as they use it on their day-to-day business activities at the hospital. From the results shown in Figure 4.5 above, the

highest number of participants received end-user training because equipping end users of the system with skills assists them to timeously accomplish their day-to-day tasks. The IT staff and other department heads, constituting 15% of the participants, received project team training to equip them with skills of providing as much support as needed by the end users of the system.

4.3.2.2 If you get trained, how long will it take you become proficient in the ERP system?

Table 4.7: ERP system training period

Training Period	Number of Participants	Percentage
Master in a week	12	15
Master in a month	56	70
Master in three months	8	10
Master in six months	4	5
Still receiving training	0	0
Did not master	0	0
Total	80	100

The Figure 4.5 below illustrates the Training Period taken by the respondents to master the ERP system

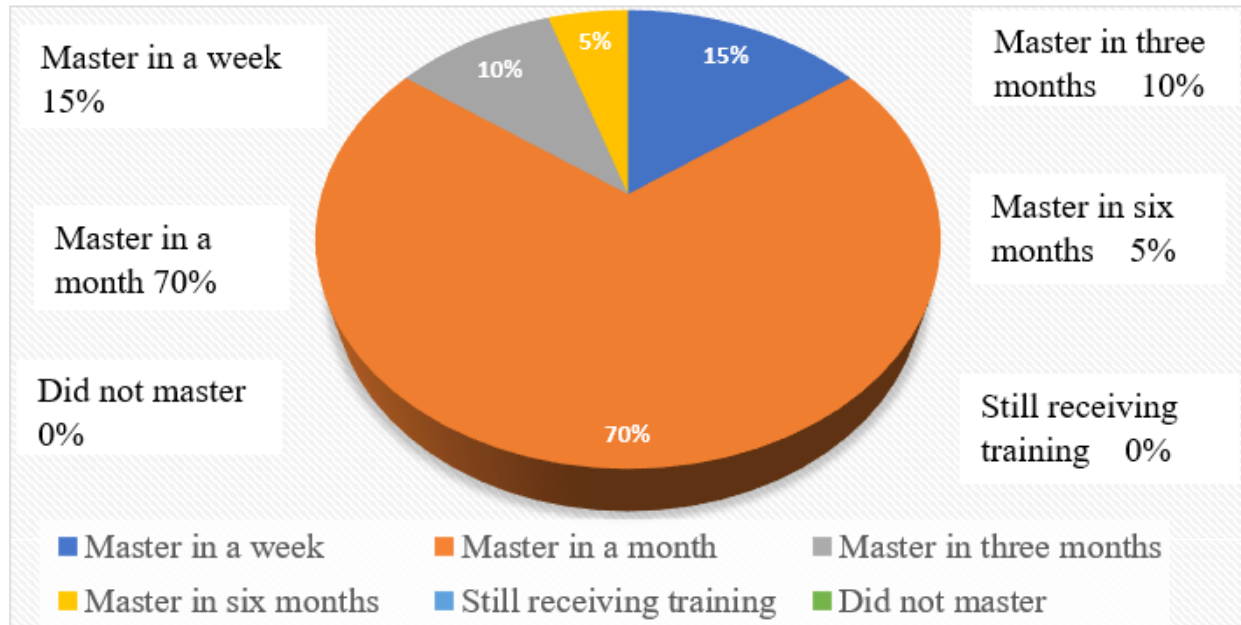


Figure 4.5: Training Period

From the results shown in Table 4.7 and Figure 4.5 above, a highest percentage of participants (70%) took a month to master the training concepts. 15% of the participants took one week to master concepts of training. These participants who master in a week are the IT staff who had a faster understanding of the concepts since they have a background in information systems. A relatively smaller number of participants (2%) include slow learners and those who are not computer literate.

4.3.3 Security threats and vulnerabilities affiliated to the implementation of ERP system

This section is going to discuss the security threats and vulnerabilities to ERP systems as well as the data collected from the respondents on their knowledge with the existing system.

4.3.3.1 What type of security threats you have encountered with the ERP system?

From the results obtained through questionnaire and interview methods, participants indicated that on-premises ERP systems faces several security vulnerabilities. All respondents ticked the all the security issues mentioned, namely: system viruses, denial of service (DoS) attacks, security policy breach, unauthorised access to the system and misuse of the ERP system by users.

4.3.3.2 How often do you change your password?

The respondents highlighted it is the hospital's policy to change passwords after every month. However, a few number of users tend to ignore this security issue and ended up being prompted to create new passwords after every month.

4.3.3.3 What are the best password combinations required to login to the system?

Most of the participants highlighted that a secure password policy has a minimum of eight characters in length which comprise of at least one letter in Caps, at least one numeric character, at least one special character and at least a letter in lower case.

4.4 Discussion of results from interview and questionnaire methods

This section is going to focus on the results from the responses of the 30 questions in the questionnaire. The response rates of 87% and 75% from staff and patients respectively, were exceptionally good. The data that was presented show that there are benefits and encounters in the mobile ERP implementation to improve healthcare services in Zimbabwe. The challenges should be dealt with as quickly as possible in order to meet the demands of the technological advances, which may make the Chitungwiza central hospital less competitive. There is need to adopt the opportunities since they make the hospital gain more competitive advantage.

4.4.1 Research Participants

Male participants constituted a large number as compared to their female counterparts. This indicates that only a smaller proportion of females are capable of supporting ERP systems. Girl child education needs to be put on priority and women need to be equipped with skills similar to those given their male counterparts. Majority of the participants comprised of the individuals with forty (40) of age and below. As mentioned earlier on, the research is titled "*A framework for implementing mobile ERP system to improve healthcare services in Zimbabwe*". The output

from this study is to come up with a mobile ERP system framework that improves health care services.

4.4.2 Opportunities

Majority of the respondents highlighted that the introducing the ERP system to the hospital promotes the hospital's competitive advantage. The ERP system streamlined the flow of business processes, thereby increasing productivity. However, participants were worried about the high bandwidth required by the ERP system as well as the capability of the system to ensure privacy of the organisational data. Thus, there is need to migrate the ERP system to a mobile computing environment which would allow users to access the system from anywhere, anytime, even when there is no wireless signal. There will be automation of many organisation's activities which include sales and invoicing, logistics and materials management, inventory management and customer service management. The mobile ERP system will generate real-time reports and ensure automatic synchronisation.

4.4.3 Challenges

Many participants emphasised the challenges that are likely to be encountered in implementing mobile ERP system for Zimbabwe's healthcare sector. Majority of the participants suggested that both employees and management should take part in the adoption of change that is transpiring within the hospital. Furthermore, respondents should be present at workshops on change management so that they get an understanding on what the organisation expects from them. The hospital could quickly understand the need for implementation of mobile ERP system if the executives and employees had attended change management workshops. From the research findings presented, most of the participants highlighted several challenges encountered during implementation of the existing ERP system due to ineffective communication between management and their subordinates. Appropriate measures need to be put in place to address these challenges. Every stage of the implementation framework needs to be allocated sufficient time if the hospital needs to effectively implement a mobile ERP system that improves healthcare services.

4.5 Conclusion

Information gathering techniques, namely: interviews and questionnaires through a case study research strategy were employed in this research. Statistical software packages which include

SPSS, Stata and Microsoft Excel, were used to analyse data which was then presented in tabular form, bar graphs and pie chart graphs. The next chapter is going to draw conclusions and make recommendations on the appropriate framework for mobile ERP system implementation in the Zimbabwe's healthcare sector.

CHAPTER 5: CONCLUSION, RECOMMENDATIONS AND FUTURE WORK

5.1 Introduction

This chapter aims to discuss the findings of this research presented in Chapter four. Conclusions will be made on building up the framework for mobile ERP system implementation. This chapter also takes into consideration the significant findings concerning the features for implementation of mobile ERP system. The current research was also undertaken with a view of making recommendations on what is the most appropriate framework for mobile ERP system implementation to improve health care services in Zimbabwe.

5.2 Re-statement of the research problem and objectives

Despite the plentiful gains that can be realised through usage of mobile ERP system, there is shortage of appropriate frameworks for mobile ERP systems implementation in Zimbabwe's healthcare industry. A mobile ERP system will improve the efficiency of workflow processes which can ultimately increases organisational competitiveness of Zimbabwe's healthcare industry. The major drawback of proper implementation of mobile based ERP is the fact that there is lack of existing frameworks for mobile ERP systems adoption in Zimbabwe's healthcare industry.

5.3 Answers to the major research question

From the evidence collected from interviews and questionnaires, through participants at Chitungwiza central hospital, a proposed framework for mobile ERP system implementation to improve healthcare services in Zimbabwe is required.

5.3.1 Construction of a mobile ERP system framework

A mobile ERP system architecture is proposed for the development of a framework for mobile ERP system implementation for Chitungwiza central hospital. The proposed framework is built based on the general architecture for mobile ERP adapted from Dabkowski and Jankowska (2003), outlined in Figure 5.1 below;

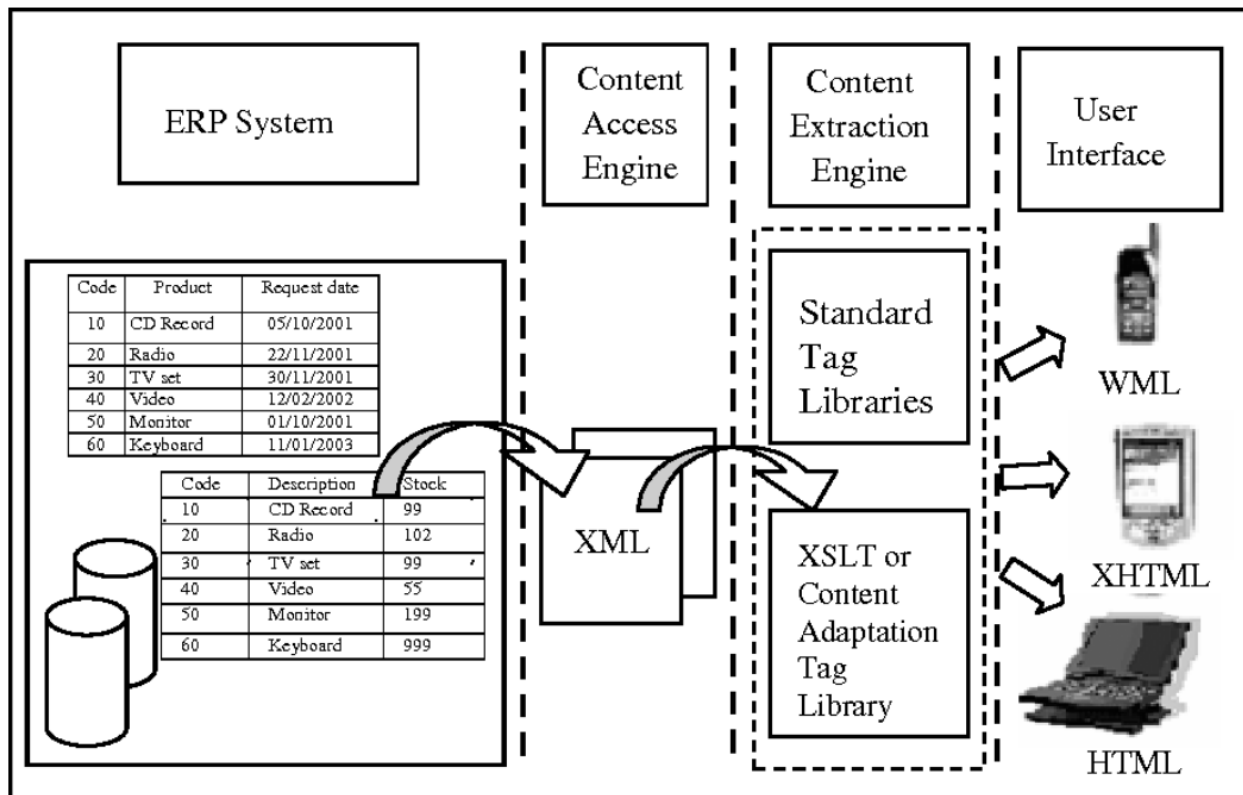


Figure 5.1: Architecture for mobile ERP

Source: Dabkowski and Jankowska (2003)

The four-tier framework shown in Figure 5.1 above is made up of database, logic, content extraction, and user interface tiers. The data tier, being the first tier, is mostly the mobile ERP system database. The second tier caters for the logic of the mobilisation process. The content extraction tier is responsible for device context aware content delivery. The presentation logic is encapsulated in the form of Content Extraction Engine. The last tier comprises various handheld mobile devices with their respective Graphical User Interfaces and browsers.

5.3.1 Proposed framework for mobile ERP system for Zimbabwe’s healthcare sector

A mobile ERP system framework made up of three-tiers with no middleware services is proposed for the Zimbabwe’s healthcare sector. The three-tier mobile ERP system increases data transfer rate and minimises the costs usually incurred in cloud-based ERP systems. An SAP ERP system is used as the rationale for developing the proposed framework. There are three major techniques needed for collecting data which include Internet Transaction Servers for Mobile Devices (ITS-Mobile), SAP console solutions, and Web Dynpro (WD). However, this research only adopted the ITS-Mobile to build up the healthcare mobile ERP system without middleware services. ITS-Mobile accelerates the data transfer rate and minimise costs incurred as in the case of the existing SAP system used at Chitungwiza Central Hospital.

At each stage of three-tier mobile ERP system framework, there are strategic, individual and corporate issues that need to be taken into consideration for successful mobile ERP system implementation. The Figure 5.2 below shows the framework for the adoption mobile ERP system to improve healthcare services in Zimbabwe.

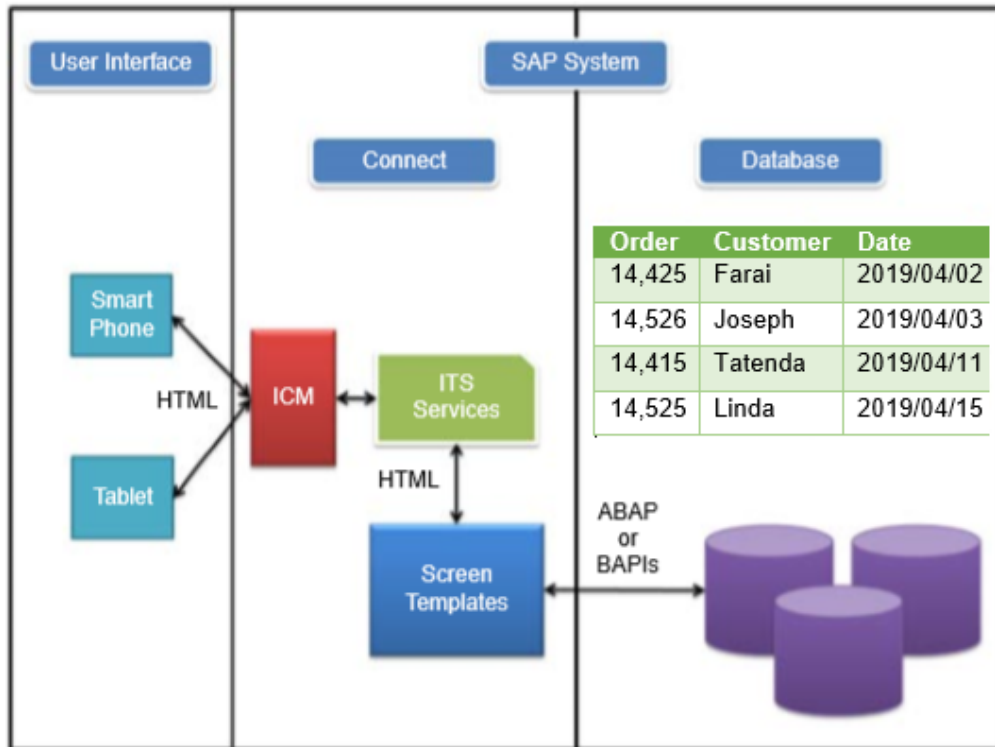


Figure 5.2: The proposed mobile ERP system framework

Figure 5.2 above shows the three-tier mobile ERP system framework made up of a data, connect, and user interface tiers.

User interface tier: - This represents an interface where users can use their handheld mobile devices such as smartphones and Tablet PCs to access mobile SAP ERP system.

Connect tier: - This tier incorporates the ITS-Mobile approach. This is where the developer sets the related connected information in Internet Communication Manager (ICM), Internet Transaction Services, and ITS-Mobile of HTTP service in SAP ERP system. The screen templates have been designed can be directly transferred to HTML format for users in the development workbench of ABAP (Advanced Business Application Programming).

Database tier: - This tier represents an ERP database with all the hospital data and information. When users get connected to the Internet Communication Manager of the SAP ERP system via their handheld mobile devices, there will be verification of the users' identities to check whether they are correct. Upon successful verification, users can proceed to ITS services in order to scrutinise the designed screen templates. Users can also carry out other crucial operations which include querying, adding, updating the database directly through SAP program code (ABAP) or Business Application Programming Interfaces (BAPIs).

In this framework, users can directly access the mobile ERP system and hence, no need for middleware services. The absence of these middleware services accelerates the data transfer rate, minimises the development costs and improves the real-time performance of the system. Furthermore, it is very cost effective to use the ITS-Mobile to customise user interfaces in an HTML environment.

Applying the three-tier mobile ERP framework illustrated in Figure 5.2 above, a hospital mobile ERP system framework is presented on a mobile device. Through the user interfaces of the mobile ERP system, Patients, pharmacists, practitioners and hospital management and subordinates can operate and access hospital information using the mobile ERP system user interfaces via their handheld mobile devices anywhere, anytime. Furthermore, the management can make reliable decisions using up-to-date information.

5.3.1.2 The proposed mobile ERP system functionalities

The mobile ERP system will help the hospital meet its goals and improve healthcare services. The system will integrate hospital workflow processes, data and organisational elements into a single mobile application. Integrating all these elements into one mobile app will help the hospital's functional areas to operate simultaneously.

The ERP information will be accessed in real-time when the practitioners would want to attend some of the patients outside the hospital. With this proposed mobile ERP system framework, pharmacists can query patient's current health status, place prescription orders and query the quotations of prices in real-time. Pharmacists can add new forecast information after having discussions with patients or customers. Moreover, pharmacists located world-wide can use their mobile devices to access analysis reports or sign/confirm the related requirements.

The mobile ERP system will integrate the various functions of Chitungwiza Central hospital which include patient scheduling, human resource management, decision making and manage workflow processes. All these functions will be mobilised and performed anywhere, anytime with the convenience of mobile devices.

The mobile ERP system will also streamline various functions involved at the hospital which include operations management, customer management, analysing reports. The top, middle and bottom of the organisational hierarchy will be empowered by the system in a more simplified approach.

The mobile ERP will integrate business processes. This business process integration (BPI) will serve the computerised process systems of the financial, administration and clinical functions.

The mobile ERP will also integrate with other non-ERP Applications which include patient relationship management systems, laboratory information systems and clinical decision support systems.

The healthcare mobile ERP system implementation will also promote reengineering of the organisational processes or applications and organisational change.

The functionalities of the proposed mobile ERP system are summarised as shown in Figure 5.3 below:

- 1) Quality management - for maintaining and querying quality information
- 2) Project management - maintaining and querying project information
- 3) Sales and invoicing query- querying sales performance achievements
- 4) Customer service management - maintaining and querying customer information
- 5) Warehouse query - querying warehouse status information
- 6) Logistics & materials management – maintaining and querying logistics & materials information
- 7) Payroll query - querying payroll information
- 8) Human resources management- maintaining and querying human resources information;
- 9) Finance and accounting query- querying financial and accounting information

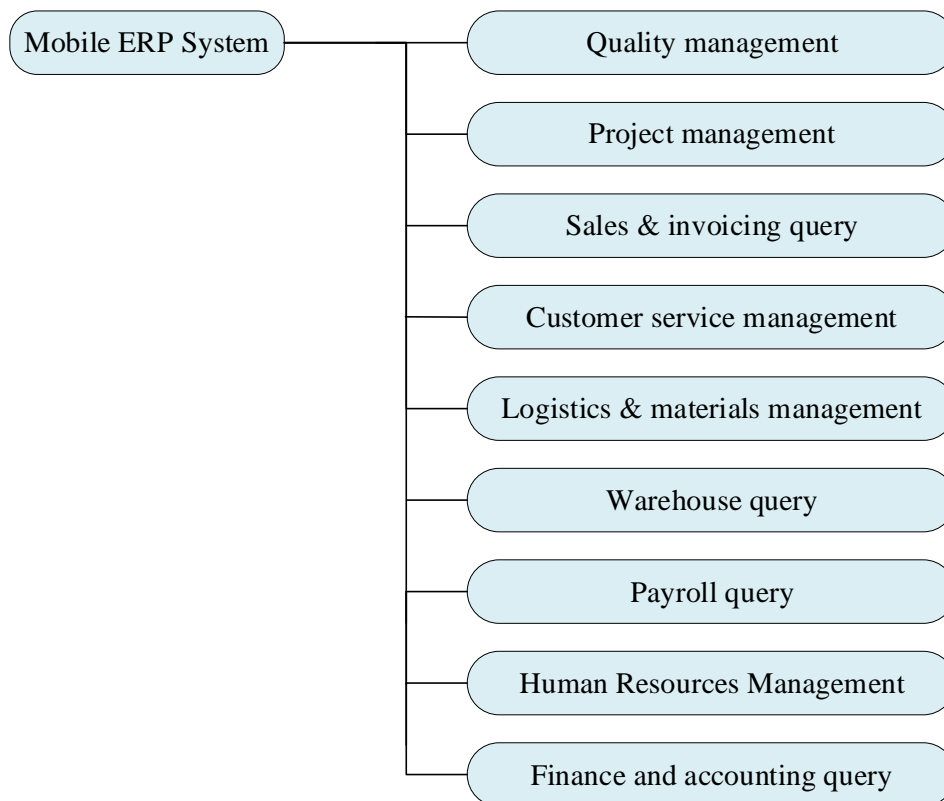


Figure 5.3: The functionality of the proposed mobile ERP system

5.3.1.3 The development of the mobile ERP system

An outline of the proposed framework is presented in order to develop the healthcare mobile ERP system. The application interface design of mobile ERP system varies depending on the

target mobile devices and their operating systems with different options for menus and interaction which include iOS, Android, Blackberry OS and Windows Mobile.

The interfaces are used as the front-end mobile devices which can easily be replaced by other mobile devices and the back-end environment is SAP ERP system.

The relationships of the proposed mobile ERP system functions and its ERP database are shown in Figure 5.4 below;

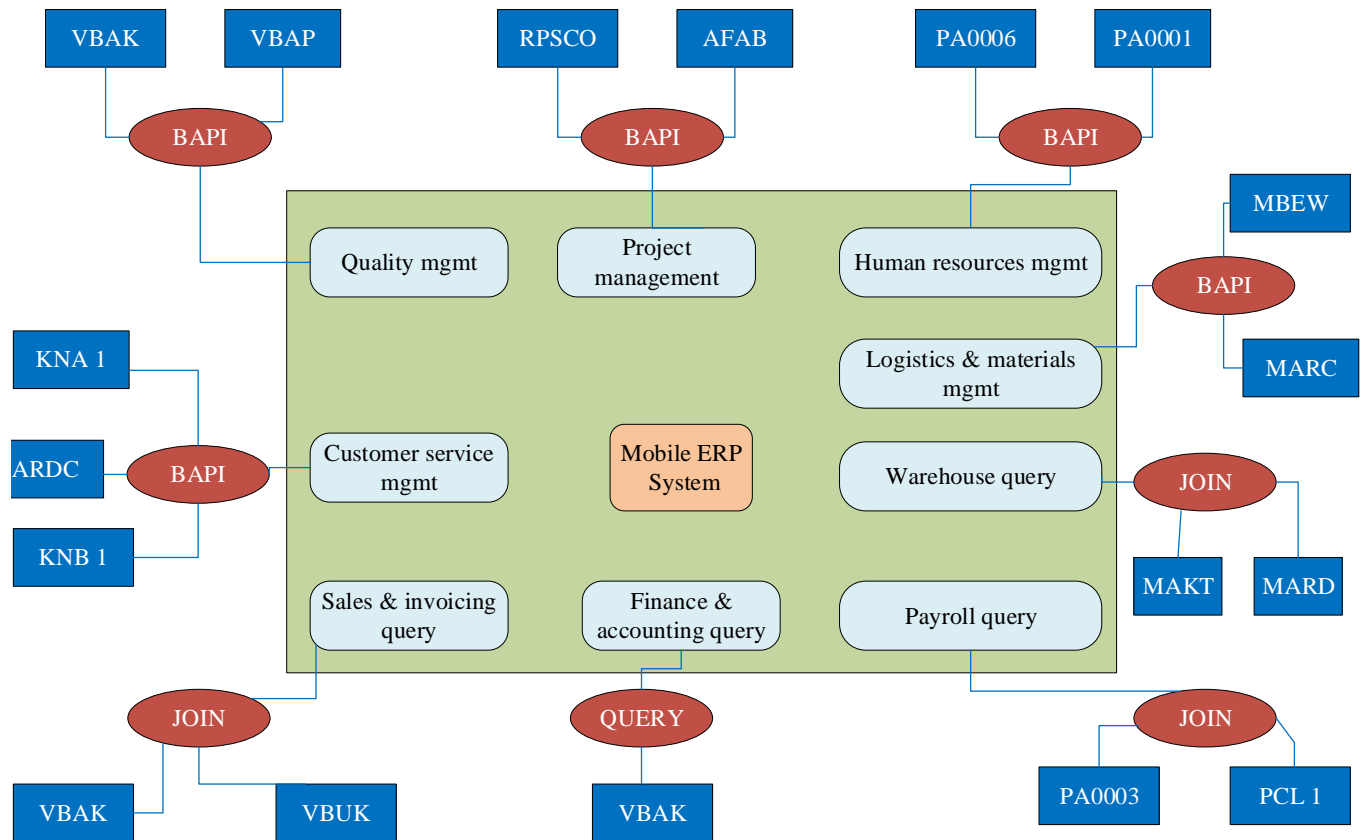


Figure 5.4: Relationships of the mobile ERP functions and ERP database

In order to use the healthcare mobile ERP system, data in the ERP database is accessed using a function module of the Business Application Programming Interface (BAPI) in Advanced Business Application Programming (ABAP). The data accessed using this BAPI technology is used for quality management, project management, logistics and materials management, human resources management and customer services management. Moreover, a JOIN technology is

applied to access the database for sales and invoicing query, payroll query and warehouse query. Lastly, the function of finance and accounting query is access data in the database by QUERY.

In Figure 5.4 above, the detailed information in the SAP ERP database for the proposed mobile ERP system is listed as follows;

- 1) VBAK – the header information of sales orders.
- 2) PA0001 – enterprise employees' information.
- 3) PA0006 – employees' contact information.
- 4) PA0003 – HR Master Record- Infotype 0003 (Payroll Status)
- 5) KNB1 – company code and related information of customer master data.
- 6) MARD – location of stock and inventory quantity.
- 7) VBUK – status of sales order.
- 8) MARA – general information of material master data
- 9) VBAP – related product information of sales orders.
- 10) KNA1 – general information of customer master data.
- 11) ADRC – related customer address information.
- 12) MAKT – product information.
- 13) MBEW – Material Valuation: Logistics - Material Master
- 14) MARC – Plant data for Material: Logistics - Material Master
- 15) PCL1 – Payroll information - HR Cluster 1
- 16) PCL2 – Payroll information - HR Cluster 2
- 17) RPSCO – Project info database: Costs, revenues, finances
- 18) AFAB – Network – Relationships in project management

In the proposed mobile ERP system, major functionalities are presented in the main screen as shown in Figure 5.5 below;

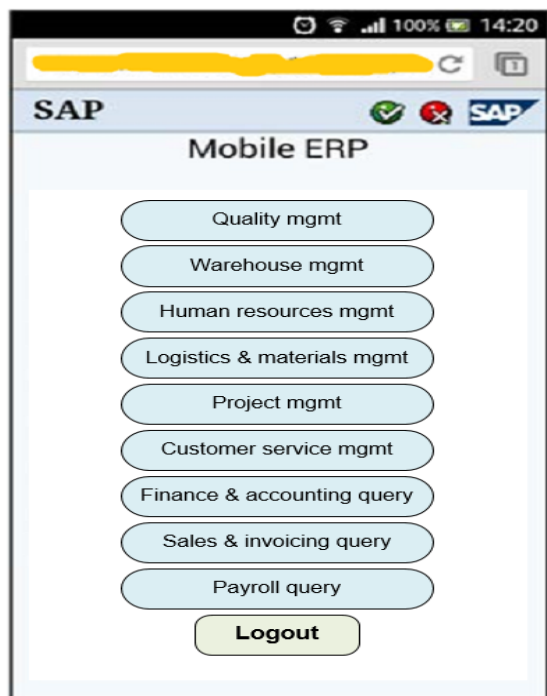


Figure 5.5: Main screen of the proposed mobile ERP system for health care sector

An effective mobile ERP system adoption needs appropriate involvement of top management. The proposed framework for mobile ERP implementation will enhance the integration of data and improve process efficiency in the Zimbabwe's healthcare sector.

Through use of the proposed system, the top management can have an appreciation of the requirements and offer their support and commitment to the project team. Management trust,

commitment and support can be achieved if four issues are addressed. These issues are strategy, security, corporate and individual issues.

Strategy Issues

Both executive and non-executive members of the organisation have to offer their support for successful implementation of the mobile ERP system. Chitungwiza central hospital will not successfully implement the proposed mobile ERP system if there is lack of management commitment, trust and funding. The management must offer all the required resources and leadership for mobile ERP system implementation. They have to provide room for staff development as well as future support for post - implementation phase. An appropriate A strategy for the implementation of mobile ERP system should be carefully adopted, with clearly redesigned procedures. An adequate workforce must be trained, and the changeover strategy must be implemented in a such a way it saves money and time for Chitungwiza central hospital.

Security Issues

Effective security strategies and mechanisms must be implemented for protecting data accessed via mobile application. Typically, the security of data is catered for by the service provider, but an unambiguous Service level Agreement (SLA) should be agreed by all concerned parties. Data and information security are of paramount importance particularly in this area where hospital information should be kept in privacy all the time. Therefore, there is need to apply extra caution when choosing a reputable ERP vendor, otherwise there may be security breaches resulting in having the organisation facing stiff penalties from the government.

Individual Issues

Operators of the mobile ERP system be involved from the project commencement so that they are involved in all the processes of defining of requirements and specifications as well as systems designing. The views and opinions of users concerning the ERP system should be taken into consideration by the project team. Employees' resistance to change has to be carefully managed at the preliminary stages of mobile ERP system implementation. Lack of understanding and awareness of mobile ERP system by the workforce will hamper the implementation process. Attitude and behavior of people towards mobile ERP system will change if they receive

sufficient training and get support from the top management. Mobile ERP system manuals will be provided to the users and the support team.

Personal information of customers, patients, employees and other organisation's stakeholders should be secured. The mobile ERP system must have effective audit trails that can identify areas of non-compliance by providing information for audit investigations. The use of mobile devices everywhere, anytime requires efficient security mechanisms as there may be loss of privacy and leaking of sensitive information.

Corporate Issues

The project team led by a project leader should be created and contribute from the beginning of project development till project completion. The project leader should have experience and knowledge of what needs to be achieved. The project team should have overall control of the project in compliance with a well-defined project plan. The mobile ERP system has an effect of reengineering of corporate procedures. Employees have to be inculcated through proper training which can ultimately bring change to the organisational culture. There must be effective communication among employees and the command structure of the organisation should be observed at each and every phase of the proposed framework. There is need to have experienced employees with relevant knowledge about ERP systems.

All the mobile ERP implementation stages are similar to those of general frameworks, except that mobile ERP system runs on mobile platform and mobile devices. The use of mobile devices everywhere, anytime causes loss of privacy for users hence adequate security mechanisms must be incorporated to secure organisational data.

5.4 Recommendations

In light of the findings from the study, the following recommendations are proffered to address the problems encountered when implementing the framework for mobile ERP system.

- ❖ Most of the respondents noted poor uptake of new technological inventions by the hospital. The IT department underpins successful implementation of the mobile ERP system as it acts as a conduit between the organisation and its clients. If the hospital is to position itself competitively against its competitors, mostly in the private healthcare

sector, there is need for it to improve uptake of trendy mobile ERP system so as to increase access to hospital services.

- ❖ There must be provision of enough resources for the mobile ERP system implementation.
- ❖ The project team must head the management of change.

Table 5.1: Recommendations from findings

Finding	Recommendation
Time Constraints	In order to successfully implement the mobile ERP system, enough time must be allocated.
Lack of support from top management	The top management must offer their support from the early stages of ERP implementation. They should be part of the committee to spearhead the project.
Training of users	User training must be allocated adequate time. Users should be trained to gain knowledge on the system works and operate it. Trainers should be people-oriented and able to appreciate the different level of understanding among users during training.
Change management	An effective change management team should be carefully chosen to address issues of resistance to change.
Lack of qualified personnel	People with relevant experience and knowledge of the mobile ERP system projects must be engaged.
Resource allocation issues	If the top management fails to support or sponsor the project, that becomes an issue in terms of resource allocation for project implementation. Mostly if the top management do not trust the vision, they may end up hesitant to allocate adequate resources towards the project. More resources must be availed towards. For

	project implementation to be successful, the management should avail more resources.
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5.5 Suggestion for future research

Although this research achieved the objectives stated, future research is still required to cover other organisations in Zimbabwe and beyond the borders. In light of healthcare institutions in Zimbabwe, there is need to come up with effective strategy that can help healthcare institutions sustain in the long run. All measures that can improve the organisation’s competitiveness must be incorporated in this strategy. In this digital era, future research can further explore on the advanced security mechanisms that protect data on mobility. The future research should also explore on the encryption and decryption of data transmitted on a mobile computing environment. This study has laid the foundation to a new research in the subject area since very limited studies have been done in this area of healthcare mobile ERP systems. Thus, further studies building upon this foundation can conduct a case study of two or more organisations and make a more rigorous investigation on the effects of mobile ERP system implementation on organisational processes and also examining the implementation projects and its effects of mobile ERP investment. More importantly, future studies should also ensure that the organisation upon which the research is being carried out, has to appoint an internal ERP champion responsible for the ERP system who must be accompanied with competent people. Schiff (2014) asserts that an organisation should try not to rely on the vendor designated project manager but must have somebody from its internal staff. The ERP champion will be responsible for gathering of all the end user requirements, taking in the new system all around each and every department, working with the ERP vendor on information processing, planning, preparing, and contacting all the other representatives (Rong, 2013). In addition, the ERP champion may, in future, conduct online surveys inside the organisation that can help in documenting some of the mobile ERP challenges ahead of time.

5.6 Conclusion

The framework for mobile ERP system was developed to improve healthcare services in Zimbabwe. There is agility with mobile ERP systems since they add an extra layer of flexibility

to existing ERP implementations, thus making the process faster and more cost effective. Migrating to mobile ERP system makes organisation gain competitive advantage through greater visibility. The mobile app makes it easy to track business operations across different work departments and locations from the comfort of users' handheld mobile devices. A mobile ERP app will collect valuable data and information from different points and provide up-to-date information to keep users informed real time.

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APPENDICES

APPENDIX A - INTERVIEW GUIDE

Introduction

My name is Kefasi Jaravaza. I’m currently studying towards a Master of Science in Information Systems Management at the Midlands State University. As part of requirements for the fulfillment of this programme, I am conducting a study titled “*A Framework for Implementing Mobile Enterprise Resource Planning (m-ERP) System to improve healthcare services in Zimbabwe*”. You have been identified as one of the respondents and therefore, ask for your cooperation in filling this questionnaire. Your participation is purely voluntary and all information gathered through this questionnaire will be treated with strict confidentiality and used purely for academic purposes only.

Name of Interviewee: _____

Position in Organisation: _____

Number of years in the organisation: _____

1. Are you able to use an ERP system?
2. When did the current ERP implemented?
3. Which SAP ERP modules have been implemented by the hospital?
4. How frequently does the ERP system upgraded?
5. What was the major drive behind the investment in SAP?
6. What devices are you using for accessing the hospital ERP system?

7. To what extent have ERP modules been customised to suit hospital needs?
8. Are there ERP performance measurement mechanisms that have been put in place by the hospital?
9. What challenges have been faced in the ERP implementation?
10. What changes can be made to improve ERP performance and efficiency?
11. There are some of the categories and business aspects usually affected by implementation of ERP as identified through literature (logistics and commodities management, information management, accounting and costs, customer relationship management, organizational culture). Within each aspect the respondent should answer the following questions according to their knowhow.
 - i. What were the expected effects of implementing the hospital ERP system?
 - ii. Which expected effects have been achieved?
 - iii. Which expected effects have not been achieved?
 - iv. Which non-planned effects have been achieved?

Thank you for your time and contribution

Ordinary Level	
Advanced Level	
National Certificate	
National Diploma	
Higher Level Diploma	
Undergraduate degree	
Post graduate degree	
Other (specify)	

5. Job level (Tick where appropriate)

Senior Management	
Middle Management	
Supervisor or foreman	
Low level worker	

6. For how long have you been working in this position? years

SECTION B: ENTERPRISE RESOURCE PLANNING (ERP) IMPLEMENTATION

An ERP system is an enterprise-wide software system which provides a comprehensive functionality and allows integration of organisation’s core business processes (Hawking et al, 2004; Klaus et al 2000; Scholtz et al 2013). The significance of understanding an ERP system is to think “integration.” ERP software connects systems across an enterprise for the purpose of streamlining the workflow, sharing of information among various departments, and providing an insight into the healthcare sector’s operations (Berry, 2016). ERP system can coordinate all the resources, information and activities needed to complete business processes such as order fulfilment and billing.

7. For how long have you been using ERP (Enterprise Resource Planning) system?

- 3 – 6 months
- 7 - 11 months
- 1 – 3 years

More than 3 years

Never used

8. Do you think there is need for improvements to the current ERP system modules?

Yes

No

9. If your answer is yes, can you please give suggestions on improvements:

.....
.....
.....
.....

11. What do you understand by the term mobile ERP system?

.....
.....
.....
.....

12. What is your view on mobile ERP system as an alternative to the cloud-based ERP system?

.....
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13. What impact do you think mobile ERP system will have on the convenience in providing services to customers?

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.....

14. How else do you think the existing ERP system could be improved?

.....
.....

15. How does it feel to use mobile ERP system at Chitungwiza central hospital today, any benefits?

.....
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.....

16. What were the reasons for introducing ERP system at the hospital?

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.....

17. Looking at the implementation of ERP system, do you have any regrets, or do you think it was the right decision, and why?

.....
.....
.....

18. What would you say are the progress and success factors in the implementation of the ERP system?

.....
.....
.....

19. What are some of the challenges or problems faced in the implementation of an ERP system? How are these problems or challenges affecting Chitungwiza central hospital?

.....
.....
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.....

20. What do you think could be done to address these challenges? Who should play a role on addressing these challenges/problems?

.....

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.....

.....

.....

21. On average how long (in minutes) did it take for you to process a client record?

Before SAP	After SAP

Please respond to the following statements by indicating the extent to which you agree or disagree as per the given choices.

		5	4	3	2	1
		Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
22	Due to ERP Implementation, my organization has					
	a. ability to produce better reports					
	b. reduced redundant tasks and enrich internal communication					
	c. improved customer relationship management					
	d. easier access to reliable information					
	f. improved standardization of processes					
	g. improved adaptability					
	h. improved supply chain management					
	i. restructured business processes					

		Not implemented	Very satisfied	Satisfied	Unsatisfied	Very unsatisfied
23	Indicate your organization level of satisfaction with modules below					
	a. Customer services management					
	b. Finance and accounting					
	c. Human resources					
	d. Payroll					
	e. Logistics and materials management					
	f. Project management					
	g. Sales and Invoicing					
	h. Warehouse management					
	i. Quality management					

SECTION C: TRAINING OF EMPLOYEES

24. What type(s) of training did you receive?

- Project team training
- Traditional training
- End user training
- Web-based training
- Did not receive training

Others please specify:

25. If you receive training, how long does it take you to master the systems?

- Master in a week
- Master in a month
- Master in 3 months
- Master in 6 months
- Still receiving training
- Did not mastered

SECTION D: SECURITY ISSUES ASSOCIATED WITH ERP IMPLEMENTATION

26. What security problems are you experiencing with the existing ERP system? (Tick all Appropriate)

- Unauthorised Access
- Denial of Service (DoS)
- Viruses
- Breach of security policies
- ERP system abuse

27. How often do you change your password?

- Every week
- Every two weeks
- Every month
- Every two months
- Do not change the password at all

25. What are the required combinations for your passwords?

- At least one capital letter
- At least be eight characters in
- At least one special character

At least one small letter

At least have a number

Thank you for your time and contributions

APPENDIX C: PATIENT QUESTIONNAIRE

Introduction

My name is Kefasi Jaravaza. I'm currently studying towards a Master of Science in Information Systems Management at the Midlands State University. As part of requirements for the fulfillment of this programme, I am conducting a study titled "*A Framework for Implementing Mobile Enterprise Resource Planning (m-ERP) System to improve healthcare services in Zimbabwe*". You have been identified as one of the respondents and therefore, ask for your cooperation in filling this questionnaire. Your participation is purely voluntary and all information gathered through this questionnaire will be treated with strict confidentiality and used purely for academic purposes only.

BACKGROUND CHARACTERISTICS

Name of Health Centre _____

Suburb _____

Date of Interview / /
Day Month Year

SECTION A: KNOWLEDGE AND PERCEPTIONS

101. Do you know ERP healthcare industry solutions introduced at this hospital?

Yes No

102. If Yes to Question 101., who informed you about the system?.....

103. Have you ever used the services at this hospital before 2014?

- Yes (If yes skip to 105) No

104. If Yes to question 103 is there an improvement in services delivery at the hospital?

.....
.....

105. What services were you seeking at the hospital?

- Health education
 Family planning
 Contraceptives
 Medical attention

Others please specify:

106. How frequent do you visit the hospital?

- Regularly
 Rarely

107. Do you find services offered at the hospital efficiently administered?

- Yes
 No

SECTION B: TIME AND CONDITION OF SERVICE

201. What time did you arrive at the hospital? _____

202. Were you served?

- Yes (If yes skip to Q. 204)
 No

203. If No, why not?

- Hospital was closed

Provider was not at the hospital

Provider had no available

Provider refused to see client

Others please specify:

204. If you were not served, were you given an appointment for later date?

Yes No

205. What procedures did you go through before receiving support?

Paperwork None Other:

206. Approximately how long did you wait from the time you arrived until you met with a provider?

Less than 5 minutes

6–15minutes

16–30minutes

More than 30 minutes

207. Do you think that your waiting time was reasonable?

Didn't wait

Reasonable/short

Too long

208. What was the length of your stay with provider?

Less than 10 minutes

11 – 30 minutes

30 – 60 minutes

More than 1 hour

209. Is there anything else you would like to add regarding your visit?

.....
.....

Thank you for your time and contribution