BRIDGING END USERS PERSPECTIVES THROUGH PAPER PROTOTYPING TECHNIQUE TO IMPROVED DESIGN AND IMPLEMENTATION OF HUMAN RESOURCE INFORMATION SYSTEMS

CASE STUDY: NATIONAL DRUG AUTHORITY

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DEDICATION

I dedicate this book to my family and many friends. A special feeling of gratitude to my loving mum, Ms. Flora Nakibuuka, words of encouragement and push for tenacity ring in my ears. My brothers Edwin, Ronald, Bata, Benon, Moses and sister Lucy have never left my side and are very special.

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LIST OF ABBREVIATIONS

DOI	Diffusion of Innovations Theory
HCM	Human Capacity Management
HR	Human Resource
HRIS	Human Resource Information Systems
HRM	Human Resource Management
HRMS	Human Resource Management Systems
ICT	Information and Communication Technology
IS	Information Systems
IT	Information Technology
NDA	National Drug Authority
TAM	Technology Acceptance Model
UCD	User Centered Design

ABSTRACT

System design techniques offer a promising approach towards improved development and implementation of Human Resource Management Systems (HRMS) in organisations. However, the development of appropriate and scalable HRM systems in Uganda has been difficult to achieve, due to 'design-reality gap', inadequate use of systems among others. The study aimed at identifying the role of paper prototyping in the design of usable Human Resource Management Systems in organisations. Paper prototyping technique was used because according to Synder, 2003, it is a quick and easy way to design and refine user interfaces while collecting continuous feedback from the users. Paper Prototyping also stimulates creative designs, which allow the developer to generate feedback on the prototypes before the application is developed. National Drug Authority was used as a case study. Combining participatory research and design science helped to grasp the inter-play between system relevance and rigor of developing the system. Further, Implementation of the HRMS was based on the Technology Acceptance Model (TAM), which is a widely used model in the design and implementation of Information systems. TAM was used to give a holistic approach to user perception of the system developed. The findings showed coherence between user requirements and the capabilities of the system developed. They also showed that the system developed was easy to use and useful in improving HR work processes. Engaging the users in the participative design sessions improved user attitude towards the system, which increased their satisfaction with the system. Furthermore, the participants were able to identify with the systems developed, which was a significant indicator of the link between paper prototyping sessions and improved design and implementation of HRMS in organisations.

CHAPTER ONE: GENERAL INTRODUCTION

1.0 Introduction

The use of Information and Communication Technology (ICT) to gain competitive advantage has pervaded many organizations. Organizations are using ICTs in management, finances and marketing. Many institutions are now shifting attention to innovative ways of managing their Human Resources (HR). Institutions are now required to embrace new technological opportunities that bridge between new ways of working to support institutional flexibility and knowledge sharing, at the same time presenting a way of managing work preferences. However, in spite the information age, there is still wide spread fragmentation of HR information, which makes quick access to complete and accurate information for planning a nightmare. Although the use of ICTs may not be the only ingredient towards improving HR processes and institutional performance, the ability for institutions to take advantage of new opportunities often depends on their ability to embrace innovative ways of carrying out routine tasks. Moreover, the rapid development of Internet and web technologies to augment and enhance Human Resource Management (HRM) processes, such as planning, recruitment, performance management, reward and retention; is propelling institutions towards new approaches.

In the study, we present a design of a Human Resource Management System that will enable organizations in Uganda achieve competitive advantage through the use of Information and Communication Technologies. In order to get a better understanding of the Human Resource (HR) function in institutions, the National Drug Authority (NDA) has been adopted as a case study. NDA is a Government institution that is responsible for availing, essential, efficacious and cost-

effective drugs to the entire population of Uganda as a means of providing satisfactory healthcare and safeguarding the appropriate use of drugs.

This chapter therefore presents the background, statement of the problem, the general objective, specific objectives, research questions, the scope, significance and justification of the study.

1.1 Background to the study

Several factors are affecting the competitiveness of organizations in Uganda such as a shrinking workforce, economic crisis and the rate of adoption of ICTs in work practices (Tumwesigye 2015; Bamel et al. 2014). This has affected the managers and their ability to deal with unexpected challenges. According to Armstrong and Taylor, 2014, the HR function has a vital role in helping institutions compete. Knowledge is the driving force behind this move in most institutions, leading to a strong dependency on experienced, qualified and motivated employees. This trend is rendering the traditional HR function inadequate in today's competitive labor market.

Human Resource Management Systems (HRMS) are thus becoming central to the current labor market, due to the ever changing and diverse career opportunities. To adequately manage the 'employee status', many institutions are transforming their Human Resource Management (HRM) practices from manual to electronic workflows (Latif et al. 2014). HRMS are management systems designed to facilitate HR functions through access to complete and accurate information for effective workforce allocation, designing employee career plans and improving services to the employees (Bhuiyan & Gani, 2015). Human Resource Management Systems are useful in turning the analyzing of large amounts of HR data into simple tasks (Jain 2013). This has a substantial impact on institutional structures, and influence working practices.

However, in spite these trends in the HR world, studies show a low adoption rate and a large number of failing HR systems (Nyeko & Angundaru, 2017 & Rahman et al. 2016). Systems failure happens when an innovation is never implemented, quickly abandoned by the users or is never operational (Heeks 2002). Globally, most HRMS challenges have been linked to system design and adoption in organizations. Krishnan and Singh, 2006 cited in Rahman et al. 2016 cite a lack of knowledge and importance in implementing HRMS from the HR department. Kangas, 2016 observes that Systems are realized in the implementation process. This implies that HRMS features must be aligned with business and user needs for them to be accepted by users. In developing countries like Uganda 70% of IS projects implemented fail (Ray, 2011 cited in Baguma and Lubega, 2013; Kinengyere et al. 2012). In a study conducted in Tanzania, Ishijima et al. 2015 identify a 'design-reality gap' as one of the factors contributing to failing HR systems.

According to Cajander, 2006; Lumsden and MacLean, 2008, system developers often ignore usability factors, which contribute to the high rate of systems failure. Ongoing debates about validity of system design approaches attempt to explain the differences in attitudes towards new information systems in organizations. Some studies have described the system design-adoption relationship in relation to flexible work solutions; effects and outcomes of system acceptance, commitment to using the system, extra-role behaviors, co-worker helping behavior and organizational performance (Achola, 2013; Dow et al. 2010 & Mossholder et al. 2011). Few studies have considered differences arising from user experiences, work processes or development stages (Vaughan, 2001; Boutelle, 2004). Notwithstanding, in the above-mentioned studies, little attention has been devoted to providing a picture of the unique role of paper prototyping in the

design and implementation of HR Management systems in institutions. This is especially relevant to institutions that are not technology oriented more so for those that are not early adopters.

Overtime, many systems development methods have been proposed to address the challenge of identifying user requirements. However, most methods focus on analysis of user requirements rather than eliciting those requirements from users (Warfel, 2009). Studies show that users cannot articulate their exact requirements unless they see them (Mugwanya & Marsden, 2010). This study proposes paper prototyping as a useful approach towards user requirements articulation. While other methods of obtaining user requirements are available, they are often already developed samples where users are asked to give feedback. Right from the start the user's needs are defined and articulated by the developers them selves rather than the users. Paper prototypes on the other hand allow the real users to interact with the paper prototype and reflect on the input actions (Hekim et al. 2011). This can be very resourceful in discovering usability issues in the early stages of the design process. If these considerations are taken into account, the design of new HR solutions should help developers easily manage user expectations and outcomes.

1.2 Statement to the Problem

HR Systems design and implementation is an area that has received a considerable amount of attention from HR researchers and practitioners with more focus on development of effective systems (Mueller et al. 2010; Al-dmour et al. 2013; Banerji 2013). However, the development of appropriate and scalable HR systems in Uganda has been difficult to achieve, due to 'design-reality gap', lack of use among others (Achola 2013; Ishijima et al, 2015). Baguma and Lubega, 2013 describe that there is a gap in the methods used in systems requirements gathering which focus less on the usability aspect towards most systems design in Uganda. Additionally, Hassan and Suratmethakul, 2005 observe that most approaches concentrate on already developed systems that do not give users the opportunity to define what the systems should do for them, which has led to the development of systems that do not speak to institutional work processes, and thus result into users quickly abandoning these systems.

Osman et al. 2009 and Chen & Zhang, 2015 demonstrate that a clearly designed HR system using paper prototyping technique will inspire users and HR managers to use the system more often to manage HR data.

Therefore, it is against this background that we proposed an innovation by designing and implementing a Human Resource Management system using paper prototyping technique

1.3 Objectives of the Study

1.3.1 General Objective

The main objective of this study is to investigate how the paper prototyping technique can improve the design and implementation of the Human Resource Management Systems in institutions.

1.3.2 Specific Objectives

1. To analyze the current HR system at the National Drug Authority and review literature related to development of Human Resource Management Systems.
2. To design an architecture for a paper prototyping technique that addresses HR challenges in order to improve implementation
3. To develop a HRMS to enable administrators in HR department manage, track employees in an efficient and effective way
4. To validate the improved implementation of HRMS to the end users including employees and the HR department.

1.4 Scope of the Study

The scope of this study is categorized into two components; the physical and content scope as described below.

1.4.1 Physical Scope

The scope of the research was limited to all the six regional offices and two National Centre Headquarter offices of National Drug Authority targeting all staff and the HR department. National Drug Authority Uganda is an Autonomous body that was established in 1993 with the responsibility of ensuring the availability of essential, efficacious and cost-effective drugs to the entire population of Uganda as a means of providing satisfactory healthcare and safeguarding the

appropriate use of drugs. The Authority currently has 200 employees that are spread out in six (6) regional offices that is; Kampala, Jinja, Mbarara, Hoima, Tororo, Arua and Lira and (2) National Centre offices in Mulago and Lumumba Avenue both in Kampala

The study involved designing a Human Resource Management system for NDA for the purpose of improving its implementation in institutions. The HR department was fully involved in the design process using participatory design approach specifically the paper prototyping technique. The system was deployed to the users to evaluate whether it meets the users' expectations.

1.4.2 Content Scope

The study focused on studying how new ICT systems have been introduced at the NDA. Specifically, the study looked at the different approaches that have been put in place to achieve seamless design and implementation of new systems in the institution. The study reviewed some of the commonly used approaches in the design of new systems to better understand their strength and weaknesses. It also reviewed implementation models to study the process of introducing new systems into an organization.

1.5 Significance of the Study

It is believed that research in information systems must make theoretical contributions as well as assist in solving current and anticipated problems (Benbasat and Zmud 1999; Iivari 2003). This research is important to organizations that plan to develop and use information systems. The HRMS developed in this study can be used to understand system design and implementation in

other institutions. Further, systems designers will benefit from this user centered approach that can be used to design new systems in institutions.

The different users of the system will benefit from this research since it helps them to understand how to use the various components of new systems and address any key use challenges. Indeed, HR Managers will be able to deal with different problems that affect the actual use of these investments.

This study is one of the few academic researches that investigate the role of paper prototyping in the design and implementation of HR management systems in a public organisation as a case study. Therefore, it extends the body of knowledge in this research area. In addition, other researchers may use the findings of this research to further study design and implementation of HRMS in other institutions.

1.6 Justification of the Study

On the global front, the importance of system design and implementation is exemplified by a series of successful information systems. However, this rate of success does not necessarily mirror design and implementation of systems in Uganda as a developing country (Kinengyere et al., 2012; Baguma et al., 2007; Asimwe & Lim 2010). Most Systems are either abandoned by users in preference to old methods of working or underutilized (Rosenbaum et al. 2005; Angelo, 2015; Hwang, 2014). With this rate of high system failure, a lot needs to be done to improve usability through better system design approaches. Further, the salience of paper prototyping during system design to improve system acceptance and usability, has not received a lot of attention in recent years (Warfel, 2009). Berskerville, 2013 contends that '…researchers ought to be (re-) developing

other historical areas of the landscape: usage, adaptation, processes, and IT itself.' Considering these aspects, there is need to investigate how HRMS design and implementation in organizations can be improved through the use of paper prototypes as a usability design approach.

1.7 Conclusion

This chapter laid a foundation for the study by giving a background of the research problem related the challenges faced by organizations in managing the HR information needs. The chapter also stated the objectives of the study and statements on the significance and justification of the study were presented. Based on this foundation, the study proceeds with a detailed review of literature.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter seeks to review the related literature available about the research problem in general. It defines the specific objectives of the research, and provides a general discussion of the literature on Human Resource Management Systems and their design. The information was used as a guide to an in-depth understanding of HRMS. It was also used in the design of a solution for an organization in Uganda. It is presented in sub-themes.

2.1. HRMS in Institutions

Owing to intensive competition globally, HR managers have moved towards redesigning most of the HRM activities. There is a shift from the traditional hierarchical structure to a networked and participative type of management (Marler, 2010). The pervasiveness of technology has led to an emerging category of HR managers that are IT savvy (Bissola & Imperatori 2014). HR related decisions are now quicker through an ICT enabled environment (Gupta 2004). Various factors have contributed to this shift in organizational dynamics such as, the need to transform the HR department from personnel management to a strategic role, the complexity of compensating staff, intricate job specifications, organization structures and multiple locations, new innovations in the field of management as well as large volumes of HR information among others (Heikkila, 2013). Not withstanding, HR managers need information for different processes of HRM on a day-to-day basis. HRMS provide an enabling environment to better plan and manage this information for quick decision-making (Obeidat, 2012). HR activities range from recruitment, management, retention, rewards and sanctions as well as storage of HR information for easy reference. It is thus very critical for both HR managers and systems developers to clearly understand the value and

significance of HR processes before the HRMS is designed (Lepak et al. 2006). Further, the strong relationship between organisations and Systems must be well understood (Shipsey, 2010). The author notes that organisation needs have an influence on the design and implementation process of Information Systems, while System use affects their value in organisations. Today, HR Systems play an important role in enhancing communications, sharing of information and automation of various tasks within the organisation (Munirat, Sanni & Kazeem 2014). Furthermore, although most organisations use HR Systems to increase efficiency and cost effectiveness, HR Systems have also become crucial for staying in business and for competiveness.

In Uganda use of ICT to manage HRM is still limited in most institutions with few Institutions using basic forms of computing (Achola 2013). Institutions however have seen a growing need for efficiency and effectiveness as a competitive advantage. Kovach et al. (2002 cited in Atsanga, 2013) observe that it is critical for management to ensure that staff adopt and use HRMS to transform their institutions. The emergency of more advanced forms HRMS such as HRIS, e-HRM and most recently Fast HRM are prompting many institutions to come on board. Ruel et al. 2011 describes HRMS as 'all IT based information systems and applications either stand alone or networked, for human resource management purposes, be it for facilitating HR practices, policies or strategies. This study breaks down this description in relation to the three forms of HRMS.

HRIS has been defined as a combination of database, hardware and software that are used to store data from all departments of the organization and produce the required information on demand to human resource managers (Broderick & Boudreau, 1992 cited in Ahmer, 2013). The components

of HRIS are mainly for data capture, management and information output. Administrators use HRIS for planning and analysis of the status of HR while HR practitioners use these tools to manage the various processes of HRM from recruitment, training, day-to-day management to rewards and compensations (Atsanga, 2013). The last category of employees is able to access the system through the self-service component and manage their benefits, leave days as well as information updates (Bartlett & Bartlett 2008). The use of HRIS has made access to accurate HR information easy and timely. Recently, the web has increased networking and HR information sharing making these systems more versatile and easier for institutions with different locations.

Electronic Human Resource Management (e-HRM) are a relatively a new term that deals with the use of web based information technologies to support of HRM (Strohmeier, 2007). Ruel et al. 2004 defined e-HRM as 'a way of implementing HR strategies, policies and practices in organisations through a conscious and directed support of and/or with full use of web-technology-based channels'. Activities conducted under e-HRM include; online job applications, online candidate screening and selection, online recruitment, trainings conducted via company intranets without the need to move to training venue (Babajee et al. 2014; Dhamija, 2012). Other activities include online performance management, e-leave modules, paperless as well as virtual offices (Choochote & Chochiang, 2015).

The use of e-HRM also leads to the flattening of structures especially in the HR department with reduction in the number of HR practitioners in the organisation. Recent trends in e-HRM involve outsourcing of HR departments. e-HRM supports business integration, increases organisational flexibility, customizes HR service delivery, improves organisational efficiency and cost

effectiveness (Deshwal, 2015). The use of e-HRMs also leads to the growth of the HR department from an administrative stand to more strategic role; where the HR department offers advise to the administrators and employees rather than a personnel management approach (Bondarouk et al. 2009). The integration of e-HRM in HRM effectively contributes to real-time access to information, which reduces processing time and increases satisfaction. The challenges that affect e-HRM are related to set up costs, unstable network infrastructure and resistance due to security concerns, poor ICT knowledge and experience among staff (Laumer et al. 2010; Baguma & Lubega, 2013; Bal et al. 2012; Bissola & Imperatori 2014 & Heikkila, 2013).

Emerging trend in HRMS are advancing HRM approaches towards fast information processing, swift employee communication and internal policy alignment (Bamel et al., 2014). Welbourne (2010) contends that there has been an information overload, which has led to complexities, slowness and less better decision making in the HR departments. The Author therefore argues that new HRM systems should be fast and light so as to transform the HR function into a strategic role. 'Fast HRM' involves turning web based HRM into more innovative technologies that can transform core HR practices. Areas of development and research in 'Fast HRM' are directed towards more agile and extreme programing to speed up HRM. Research work is being done to alter HRM strategy making processes; employee surveys and applying new theories to deploy role based feed back tools (Welbourne, 2010). Other emerging trends in Fast HRM are using social networks to achieve real-time decision-making (Babajee et al. 2014).

2.2 Importance of HRMS in Institutions

Human Resources Management Systems are usually deployed in organisation as a solution to an existing problem. Many organisations however, regardless of their size, recognize the benefits of using HRMS solutions, to improve the efficiency in the organization.

HRMS have been said to improve the strategic influence of the HR department and increase its importance with in the organisation through informed planning and forecasting decision (Ball, 2001). Kovach et al. 2002, contends that HRMS are useful in improving HR administration by reducing time and operating costs, which allows for better control of budgets. Further, HRMS support data analysis that informs strategic decision-making, evaluation programs or polices, or support day-to-day activities that increase efficiency (Kundu et al., 2007).

HRMS lead to sophistication of HR work process and generation of information for recruitment and selection, training and development, HR planning and performance appraisal (Martinsons, 1997). They facilitate competitiveness through improved accuracy, timely and quick access to information (Ngai and Wat, 2006). (Beadles, et al, 2005 and Beckers and Bsat, 2002) highlight increased competitiveness by developing and enhancing HR activities, generation of a variety of HRM reports and reengineering of the entire HR department. They also offer adequate, comprehensive and ongoing information about the staff and the work processes through easy to store, retrieve, update, classify, analyze and secure functionalities (Karikari et al. 2015). Other benefits of HRMS include, business transparency, possession of single database, real-time updates and standardization of business processes.

2.3 Review of Human Resource Management Systems

Human Resource Management Systems are concerned with easy management of Human Resources and HR information or data. They are an overlap between Information Technology and HRM, embedding components of HR data capture, storage, analysis and sharing with different users of HR information (Ruel, Bondarouk and Velde, 2007). Today, Most of HR systems have moved from single task handling and are able to capture the various tasks under HR management. The HR systems are commonly categorized in three forms: Human Resource Information System (HRIS), Human Capital management (HCM) and Human Resource Management systems (HRMS). Although they are sometimes confused and used interchangeably, difference in the types of HR systems is usually in the components covered under each solution. Mike Maiorino gives a description of the differences between the three categories

2.3.1 Human Resource Information Systems (HRIS)

The HRIS systems are designed to manage people, policies and procedures. They are centered around management of HR work and the employees such as recruitment, core HR activities, benefits management, absence management, compensation, training, workflow, self-service and reporting. According to Iwu & Benedict, 2013 HRIS systems are used to publish HR information, automate transactions, and transform the human resources function. Ahmer, 2013 contends that HRIS largely contribute towards cost efficiency, customer satisfaction and innovation. They make storage, updating, classification and analysis easier which improves decision making in the HR department.

2.3.1.1 Components of HRIS

1. Recruitment / Applicant tracking system: The recruitment function supports the recruitment process. It enables the organisation to display career opportunities on their websites or job portals for potential hiring. This component is also used to manage large volumes of applicants to quickly identify, track and hire the right staff within the organisation. It helps the recruitment team to identify and manage talent, skills and abilities, which is useful during salary negotiations, training, task scheduling and benefits management.
2. Core HR activities: The HRIS is mainly used for the day-to-day HR work and employee management. It helps the HR managers to oversee HR operations such as employee tracking, payroll and benefits processing. The core HR processes module also helps to manage private and sensitive employee information. It automates the payroll, which is usually linked to a financial system. This component is very useful in large organisations where management of payrolls, benefits and tracking of employees using paper work is close to impossible. The collected data on employee time spent at work and attendance or absence, and performance is also used to calculate deductions and to generate periodic reports used to improve management of employee salaries, bonus and health insurance packages. Navaz et al. 2013 describes the features of HRIS in organisation.
3. Benefits management: This component deals with tracking of the different forms of employee benefits such as health insurance, paid time-off, and retirement benefits. The primary function of this module is to monitor all benefit programs and identify any potential deficiencies
4. Absence/Attendance management: The Absence/Attendance module holds information that is used to manage attendance to duty, paid leave time, vacations and sick days.

5. Compensation: Compensation deals with managing the compensation of employees in form of bonuses, incentives and commissions, and salary planning.
6. Training: This module is used to manage in-service employee development and training aspects. This function also improves formal learning in the workplace and contributes to improving workplace performance (Lee, Owens, & Benson, 2002). Organisations that offer training and courses can also use this component to train employees with the ability to test, score, track progress and award certifications.
7. Workflow: This functionality oversees the process of passing information, documents, and tasks from one employee or machine within the organization to another. Through the proper use of this function, each of these employees or machines will pass the work on according to a predetermined procedure.
8. Self-service: Self service function combines technology and organization change by enabling users to interact directly with their human resource data to inquire, review and act upon transactions under the supervision of a manager. With the right permission employees/managers/applicants can access their data and upload or update information, which helps to improve information update and verification in the HRIS.
9. Reporting: Reporting involves a number of HR reports that can be printed out as a combination of the employee data entered into the system. It also allows for data analysis functionality. HRIS enables standardization of data that inform the various reports generated from the system.

2.3.1.2 Strengths and weaknesses of HRIS

Kovach et al. 2002 observes that HRIS increases competitiveness by improving the HR operations. It enables management to make informed decisions, reduce costs, allows for clear and transparent form of hiring and general management. The HR department also benefits by having a single database where they can access in real-time HR information, reduced paper work, minimal errors and standardized data as well as increased employee satisfaction from improved services. The employees also are allowed access and update to their data, which saves time, allows them to make informed decisions and improves morale and satisfaction.

According to Dery et al. 2006 and Kagehi, 2015, HRIS challenges have been associated to the desired change in terms of ICT knowledge, experiences and innovativeness, complexity of managing people and managing user acceptance. Dorel and Bradic-Martinovic, 2011, also contend that requirements for additional training for the HR staff to adequately exploit the potentials of these systems are a key challenge. This also extends to the employees who have to receive additional training for the self-service module and in some cases may not be accepted by the employees as a use feature if the employees have other sources of their own data (Laumer et al. 2012). The other challenge relates to privacy issues, systems upgrade or change where compatibility issues may arise and replacement process may take much longer. According to Gupta, 2013, human error during information input, high costs in acquiring and maintaining these systems and, a need for a computer and technology specialists with human resources functional area knowledge can be key challenges to the many organisation. According to Bondarouk, 2014, HRIS focuses more on departmental goals rather than long term organisational goals such as

onboarding, succession and salary planning, which may affect organisational productivity, employee engagement and retention.

2.3.2 Human Capital Management (HCM)

HCM is concerned with collecting, analysing and reporting data that informs the direction of value adding employee management, strategic investments and operational decisions at both top management and line-managers level (Kearns, 2005). It emphasizes an approach that manages employees as an asset and a competitive advantage once invested into through employee engagement, talent management and learning and development (Hendrickson, 2003; Nalbantian et al., 2004). It involves how the employee is hired right through their exit from the organisation. The HCM include all the elements of the HRIS but also add components such as onboarding, performance management, position control, Talent management, succession planning, salary planning, global capabilities as well as Analytics. Workday, 2016 describes key features found in a typical HCM

2.3.2.1 Components of HCM

1. HRIS: Includes all the components of HRIS as discussed in previous section.
2. Onboarding: Onboarding involves managing all forms of onboarding experiences for newly recruited employees such as functionality training, induction and inculcating them into organisation culture and brand.
3. Performance: This module helps to track, measure, or reward employee performance. They automate and standardize processes for recognizing high-achieving employees through nominations, rewards points or goal tracking. The employer is also able to track and manage

employee reviews and support for learning and development plans as well as compensation plans.

4. Position control: It is used to manage the positions in the organisations in regards to transfers, promotions and filling open positions. It also allows for standardized procedures for separation of work tasks, recruitment screening, promotion management, which are useful in improving employee retention, create opportunities for all employees and reduce overhead costs.
5. Talent management: This module largely focuses on managing employee skills and capabilities at recruitment, and within their stay in the organisation. It focuses on employee performance, recognition, rewards, performance appraisal and training and career development.
6. Succession: The succession module is used to manage succession planning and knowledge transfer programs. It focuses on HR managers being able to identify key members of the staff as possible future managers who can make decisions, which makes supervision, and management processes more straight forward and improves forward planning.
7. Salary Planning: This module is used for comprehensive compensation planning for attractive packages, payroll management, and managing pays in form of direct deposits, checks, taxes, and printing financial related forms.
8. Global: The Global functionality relates to managing globally related aspects such as multi-lingual functions, multi-currency, country specific formatting and localization
9. Analytics: This deals with collecting, analysis and evaluation of HR workforce metrics to identify gaps, support HR planning and inform decision-making processes. Analytics provide complete view of HRM aspects that impact entire organisation.

2.3.2.2 Strengths and weaknesses of HCM

Human Capital Management views employees as an asset that add a collective value in form of capabilities; knowledge, skills, life experiences and motivation while the other approaches regard them as costs (Mayo, 2001). According to (Boroujerdi et al. 2014; Grant,1991), HCM focuses on training, development and expertise of employees to determine skills available in the organisation, adaptability of employees to determine the strategic flexibility of the organisation, employee commitment and loyalty which determine the organisation's ability to maintain it competitive advantage. It also looks at Globalization, HR strategic change management, HR knowledge management, HR Planning consequences. It reinforces the need to be strategic and pays attention yielding motivated and productive staff working towards a shared goal and adds value to the organisation. In HCM each employee is considered as an individual with independent strength and weaknesses. It believes that lack of Knowledge is a result of lack of training. It allows for a more effective and efficient use of resource, provides realistic staffing projections for budget purposes, offer clear rationale for linking expenditures for training and retraining, development, career counseling, and recruiting efforts, helps maintain or improve a diversified Human Capital and prepare for restructuring, reducing, or expanding its Human Capital (Gopala, 2005; CIPD, 2017).

However, HCM tends to be less concerned with administrative tasks and HR service delivery by focusing on a more on a happy and productive team, which may run short in alignment with organisational strategies and objectives. According to Gopala (2005) HCM may have performance advantage challenges faced by the directors and managers such as extracting more work from the existing work force, sustaining employee satisfaction, reducing the risk of change and optimizing processes as well as progressing simultaneously and optimally.

2.3.3 Human Resource Management Systems (HRMS)

The HRMS solutions cover elements of HRIS and may include the capabilities of HCM with emphasis on payroll as well as Time and labor aspects. They are usually deployed in large organisations with vast HRM processes and also, to cover a wide range of employee size and functional requirements. However not all HRMS have progressive talent management. Capabilities. According to Sharma & Shakur , 2013), HRMS help in generating critical reports on the demographics profile, performance on an individual basis, team performance, which help the organisations deep dive into analysis, especially while planning and reallocating resources. While Some HRMS are composed of HRIS coupled with Payroll, and Time and Labor Management, others include of HCM coupled with payroll, plus Time and Labor Management. What is most common with HRMS is the payroll, and Time and Labor management (TLM) functionality.

2.3.3.1 Components of HRMS

1. HRIS & HCM: Includes components of HRIS and/or HCM as discussed earlier.
2. Payroll Management: This functionality deals with employee headcount and employee Specific Payroll Data. It involves calculation of employee salaries, tax deductions, administrating retirement benefits and disbursements of salaries to employees (Sharma &Shakur 2013).
3. Time and Labor management: Focused on employee engagement, which includes staffing assignments, grievance data, employee scheduling in regards to part time or working in shifts, easily track, assign, reassign, employees schedules, report over time and trading shifts. It also looks at time and expense tracking of employees pay, billable hours, project time and manage expenses like travel receipts.

2.3.3.2 Strength and weaknesses of HRMS

HRMS quicken and enable payroll management through flexible features such as simplified pay processing, comprehensive reporting, check printing, direct Deposit, tax Management which is cost-effective for payroll management especially in large organisation. (Sharma & Shakur 2013)
They revolutionize the work place through automation of repetitive and time consuming tasks associated with HRM. They free up valuable resources to focus on shift of culture, retention and highly impactful areas. They reinforce the employees' confidence because of standardized with procedures, which partly influences individual and collective performance at work.

On the other hand, challenges of HRMS start with the fact that they are built for large organisations and come with huge set-up costs. They also tend to focus more on operational cost savings, efficiency and effectiveness gains rather than HR service improvements, relationship

management and HR status. According to Varma 2010, HRMS are characterized with huge data generation, which require data mining processing to understand patterns such as workforce utilization levels, employee attrition rates among others. The Author also notes that there is a tendency to lose 'human touch' because of the large reliance to the technology and neglect face-to-face employee administration, which may affect employee engagement levels.

2.3.4 Review of Some Existing HR Systems in Uganda

Several efforts have been made to automate HR processes in Uganda. The Government of Uganda through its Public Service Reforms Program in 2011 introduced the use of an automated HR system. The decentralization program dictates that HR functions aligned in IPPS system contained the necessary modules that included development and maintenance of organizational structures, the personnel cost planning and control, monitoring of expenditures against approved personal budgets, personnel and payroll management and so many other processes (Munyambonera & Lwanga 2015). This process has led to the automation of HR process in both public and private institutions across the country and the region.

In government institutions, fewer systems are built in house while most systems are usually enterprise systems that are procured and are customized to suit organisation specific processes. These projects are often implemented as pilots or in a phased approach as the organisation becomes acquainted with the new system with most of the implementation processes usually long extending into several years (Kinyenki, 2015). The systems require patience as the projects go through the complete life cycle from requirements definition, system procurement, coding or configuration, testing, pilot installation and rollout. The long durations tend to take a toll on the

quality and implementation of these systems within public organisations. Take an example of the introduction of the Integrated Payroll and Pension System (IPPS) implemented at the Ministry of Public Service (MoPS).

The Integrated Payroll and Pension System installed at MoPS

The Integrated Payroll and Personnel System (IPPS) was first introduced at Ministry of Public Service (MoPS) in 2008 (Kinyeki, 2015). The Ministry of Public Service is responsible for all staff that work in Government institutions. These include Government Ministries, Departments, Agencies (MDAs) as well as District Local Governments and Municipalities; The IPPS was intended to strengthen accountability, improve management of the public service workforce and enhance payroll and pension controls; improve the quality of human resource information available for decision making; HR processing, reporting and standardize pay and benefits business processes; and reduce duplication (MoPS, 2011).

The implementation was done by a team of experts who had initially analyzed the then old paper form systems at MoPS. The Old system was characterized by delayed payments, double payments, payment of non-existent workers commonly referred to as "Ghost Workers", and so many other inconsistencies. The system was implemented in a phased approach starting with the Ministry in 2009 with the main functionality of managing payment of employee salaries. Employees would be verified through the IPPS and then submitted to the Integrated Financial management System (IFMS) that is managed by the Ministry of Finance and Economic Development (MoFED) for payment (WP, 2013). By June 2015, sixty-six MDAs, forty-two Districts and twenty-one municipalities were connected to IPPS to improve and accelerate salary

payment and payroll processing, quickly detect errors and omissions in the payroll, and strengthen the control measures of the data contained in the IPPS (Munyambonera & Lwanga, 2015). The IPPS was able to streamline and ease some of the payroll management components within MoPS.

However, despite the noted benefits, the IPPs has encountered some major challenges:

The Oracle database, licenses and operating system that where installed in 2009 had never been updated until a recent review in 2015 (Kinyeki, 2015). Results from the review indicated that the system data is incomplete; there were inaccuracies between actual payroll data and the data in the Intergrated Finance Management System (IFMS) used by Ministry of Finance. Human Resource Officers (HRO) were not aware of actual payments made and whether they tallied with the figures computed in the IPPS Payroll. By June 2015, IPPS currently had no alternative Business Continuity & Disaster Recovery Capability; DRS Server had no functional storage as it was taken to replace storage at the production site which had crushed with no replacement as yet, the DRS was not connected to the network therefore replication was not working and no back-ups were stored in an offsite location (Uganda IPPS, 2015).

The Expert developing team did not adequately build capacity on ground to manage any inconsistencies and technicalities concerning the IPPS. When the system had technical issues, an expatriate was summoned to fix the problem and the expenses where covered by the MoPS. Capacity gaps were also existent within the different MDAs and local governments where this system had been deployed.

However, Munyambonera & Lwanga, 2015 observe that the migration from the old system created problems such as omission of some employees from the payroll or some employee names sent to other districts where they were deleted as ghost workers etc. Some of these problems have not yet been rectified leading to staff missing salaries and accumulated arrears. The authors also note that it is difficult to manage salary loan deductions because this may require additional costs to facilitate the implementation of these deductions through the system. In addition, some functionality in the IPPS are still underutilized and a seamless integration with other system platforms is yet to be achieved.

Recently, MoPS implementing a new Oracle system to manage payroll and pension processing in place of the IPPS. It may be too early to determine if the new system it will succeed or produce the same results as the IPPS it is replacing.

The Paper form HR System at National Drug Authority

The National Drug Authority Uganda is an Autonomous body that was established in 1993 with the responsibility of ensuring the availability of essential, efficacious and cost-effective drugs to the entire population of Uganda as a means of providing satisfactory healthcare and safeguarding the appropriate use of drugs.

The National Drugs Authority was previously using a manual system of HR processing to manage the routine HR duties. Employee information was stored in the paper files and any data collection and analysis was dependent on these paper files. If someone needed to look at an employee file, he would either have to travel to come to the NDA main office to access it from the registry where it

has to be identified from series of other files. Thus the manual process had high chances for data errors, staff dissatisfaction and non-compliance to set rules and guidelines. Processing of employee payroll and records was very taxing and much time was spend on processing monthly payroll rather than more strategic goals like talent management and employee engagement.

Review of employee performance was very difficult because the appraisal forms are captured and stored in paper form. It was also difficult for line managers to specify employee objectives in regards to their work and deliverables especially when it came to performance management. During performance review, managers will come up with suitable objectives and deliverables to review against. This also meant that staff were not being managed to desired outcomes for a largest part of the year since appraisals are conducted once a year. It also implied that line managers and staff forget their objectives in the subsequent months after the review with performance management season characterized by anxiety, panic and scramble to ensure the objectives are identified and completed in time for the review. In cases where performance reviews precede staff promotions, it implies there are inaccuracies in the actual performance of the staff under promotion. It also means that the HR office will suffer during the high pick review seasons where each manager and staff need to access their files.

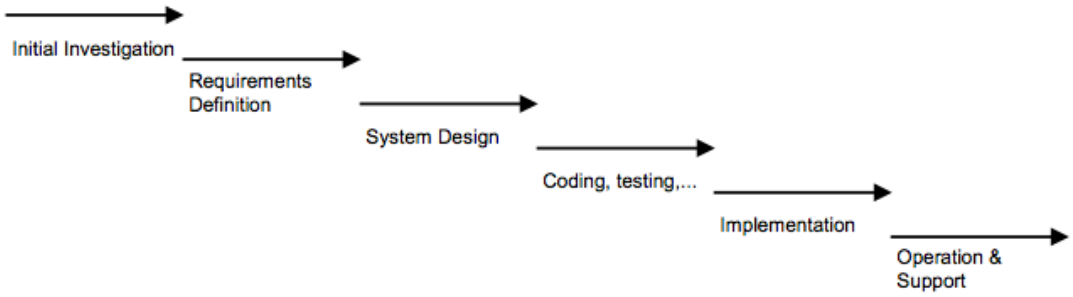
The HR department often spent most of their time on administrative work, by reviewing the list of employees they have and compiling the needed data for the different routine needs. This process was also categorized with staff working overtime during peak periods and in extreme cases may be compensated for this time.

2.4 Systems Development Methods

Systems design methods are frameworks that are used by developers to plan and structure the process of developing a system. Varieties of such frameworks are available and can be implemented based on their suitability. One system design technique may not be suitable for all design projects. It is therefore important that a systems developer identifies the most suited approach based on organisational, technical and team considerations

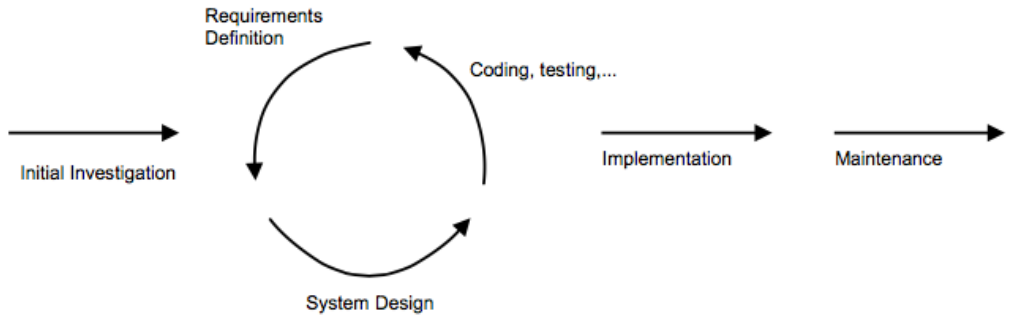
2.4.1 Waterfall system design approach

The Waterfall system design approach is a linear method that is divided into phases with some of the phases overlapping other phases. It places emphasis on planning, schedules, targets, budgets and implementation of an entire system at one time. This approach also maintains control over the project life and documentation of the different phases and outcomes. The waterfall design approach is usually composed of six phases that include; initial investigation, requirements definition, system design, coding and testing, implementation, operation and support. The completion of one phase leads to a start of a new phase.



2.4.2 Prototyping

Prototyping is an iterative system design approach that is composed of six main stages; Initial Investigation, Requirements Definition, System Design, Coding, testing, Implementation and Maintenance. Prototyping is often used as part of another development methodology to improve requirements gathering and build better systems by breaking the project into smaller segments that ease system development processes. Prototyping is user centered involving the end user through the development process, which increases acceptance of systems at implementation. It involves use of mock-ups or simulations of the system that are developed in an iterative process to meet the user requirements and allow adjustments to fit different scenarios. Prototyping focuses on addressing the right problem with most of the accepted prototype evolving into working systems. Prototyping is very useful in large projects with many users, interrelationships, and functions, to clearly define project objectives and needs.



Prototypes are a key aspect in better application design and development. They improve design outcomes by in cooperating an interactive environment and various design activities. Simulating design through prototypes can reduce the risk of design without committing resources such as time and cost to a complete system. Prototypes can answer most of the usability, functionality and

system appeal questions through comparison of alternatives and concepts that are developed during these design activities.

Characteristics of Prototypes

Prototypes are usually categorized in terms of their purpose, function and stage of application development (Ullman, 2003). Thus a choice of prototyping will be chosen based on suitability for the application to be developed. According to Yang 2005, prototypes can be categorized into three categories;

a. Proof-of-Concept prototype– usually used at the initial stages of systems design. It can be used to identify functional performance.
b. Proof-of-Product prototype – Clarifies the physical design and production feasibility
c. Proof-of-Production – demonstrates if the complete development process is effective.

However its always best for system designers to choose the most effective prototype that can provide information needed by the designer, quick to build but inexpensive (Dijk et al. 1998). For example using paper prototype mockups can be used to elicit valuable user feedback compared to developing a fully functional software program to test design issues.

The body of research is increasingly correlating factors in the system design with design outcome (Yang, 2005). The cycle of building entire systems and later working out inconsistencies and functionality in the design and implementation has been proven to be expensive in times of time and financial apsects which makes the software costs very high. Observations from these studies highlight the value of prototyping to system design outcomes.

Types of Prototyping

Prototypes are usually classified into three categories; throwaway, evolutionary or incremental and extreme prototyping (Sommerville, 1995).

Throwaway prototypes are usually rough and are built with an intention of being discarded as the design process develops the final application to be used. They are built in the early stage of production for requirements gathering and to clarify system requirements. After the requirements have been established, a simple working model of the application is developed for the users to identify if their requirements have been well implemented in the new application, to what is referred to as Rapid Prototyping. As discussed earlier, Rapid prototyping is usually an informal process where the application developers building working parts of system to test its functionality with the users.

The basic principle about throwaway prototypes is that they are developed quickly and with the users active involvement. Users are able to get feedback about the system design in the early stages and they help to refine it to suit their needs. This is a less costly process since this prevents the risk of time and cost on an application with changes done before the final system is developed. Once the users refine the prototype, later changes are usually minimal and less costly. The throwaway prototypes also allow the users to actively interact with the system design, test the interfaces, which later improves their ability to grasp the functionality and ownership of the system. Once the system requirements are identified, simulated and tested it improves accuracy of system requirements and building of systems that are usable and user oriented compared to other system development models.

Throwaway prototypes are usually categorized defined by level of fidelity or realism. Fidelity refers to the look and feel of system with similar appearance and interactions as the system under design. Low-fidelity are usually in paper form and high-fidelity prototypes that developed by a software or User Interface builder. Paper Prototypes are developed using paper and pencil to mimic the appearance and functionality of the actual system. High-fidelity prototypes on the other hand are usually dummy or non-functional software developed applications that look like the system. Storyboards are also an example of throw-away prototypes that animate the look and functioning of the system

Evolutionary prototypes are different from throwaway prototypes because they are build to be robust, are structured and continuously refined. They undergo different iterative processes, involving continual design and evaluation to test their feasibility. Evolutionary prototypes are built with the intention of becoming the core or heart of the system where improvements are continuously rebuilt and refined to improve the functionality of the application. This also allows the development team to add features and make changes to the system that was not identified in the initial stages of development. Evolutionary prototypes thus allow the developers to build more usable systems whose capability is increasingly improved. The advantage that evolutionary prototypes have over throwaway prototypes is that they are functional and reduce the risk of developers implementing systems whose features are not well understood.

Incremental prototypes involve modification of already built applications or prototypes (final system). Prototypes are built separately the later merged as a final and overall design. Thus the developers spend less time on application development

2.4.3 Rapid Application Development (RAD)

RAD is a fast iterative system development approach. It focuses on delivery of quality systems at lower costs allowing for changes during system development by breaking the project into small segments. RAD uses computerized development tools that may include Graphical User Interface (GUI) builders, Computer Aided Software Engineering (CASE) tools with active user involvement. Key emphasis is on fulfilling the business need within defined delivery deadlines. Design process may in cooperate Joint Application Development (JAD), where users are intensely involved in system design or consensus building through st to facilitate future development and maintenance processes. RAD projects are usually suitable for small and medium range projects where scope is narrow and well defined. They require active participation of the users with detailed knowledge area and management commitment and defined technical area.

System Design Approach	Waterfall	Prototyping	Rapid Application Development
Strengths	- Ideal for less experienced and small project teams - The development steps and strict controls allow for adequate documentation, design reviews and ensure the quality, reliability, and maintenance of the system - Progress is measurable. - Allows to conserve resources	- Allows users to specify their needs during the prototyping process by providing tentative system design for experiment during the early stages. - "Can be used to realistically model important aspects of a system during each phase of the traditional life cycle." (Huffaker, 1986) - Involves users in system development and useful in resolving unclear objectives and user requirements. - Allows for comparisons with various design solutions and testing system	- A working version of the system can be availed in earlier stages. - Systems are less costly because of the quick production. - Creates commitment from all stakeholders, creating a sense of ownership and satisfaction among users. - Concentrates on system from user viewpoint. - Allows for rapid system design change when needed. - Bridges user requirements and

		performance and user interface. - Knowledge gained in early iterations can be used to improve later development. - Useful in identifying difficult or complicated functions and missing functionality. - Allows user requirements to be built into system capabilities - May be useful in identifying specifications for another application. - Allows for flexible system designs and innovativeness. - Allowance for quick implementation especially for incomplete, but functional systems.	system capabilities

Weaknesses	- Inflexible, slow and costly due to structure and tight controls. - Less iterative, which can be difficult to manage - Dependent upon early identification and specification of requirements, yet users may not be able to clearly define needs early in the project. - System performance and issues cannot be discovered and tested until the system is fully developed - Difficult to identify and respond to unexpected needs and changes	- Can lead to incomplete or inadequate problem analysis where only obvious needs are addressed. - Requirements may frequently change significantly. - Difficult to document non function components. - Designers may rush to prototype, which may affect future needs. - Can lead to false user expectations, accepting the prototype as "finished" when not fully functional. - Iterations may affect project budgets and schedules, thus the added costs.	- Speedy development may affect overall system quality. - Risk of misaligning developed system with business goals. - Project may end up with more requirements than needed. - Potential of more features added to system over the course of development. - Potential for inconsistent designs within and across systems. - Potential for violation of programming standards and inconsistent documentation. - Difficulty to reuse design for

	that occur later in the life cycle. - Produces excessive documentation and is time-consuming to keep updated. - Set specifications can be difficult for users to completely appreciate. - Creates a gap between users and developers.		future systems. - Designed system may lack scalability. - High cost of commitment on the part of key user personnel. - Tendency to push difficult problems to demonstrate early successes. - Requires well-defined interfaces.

2.4.4 Paper Prototyping in systems design

Paper prototyping is a widely used technique used by system developers for exploring, testing and evaluating early application designs. It is used to design and validate usable applications that meet user needs and expectations through interactive design and user generation of feedback before the application itself is tested (Mugwanya & Marsden, 2010; Tam, 2006; Grady, 2000). Snyder 2003, defines 'Paper prototyping as a variation of usability testing where representative users perform realistic tasks by interacting with a paper version of the interface that is manipulated by a person "playing computer," who doesn't explain how the interface is intended to work.' The cycle is usually repeated until a satisfactory system is achieved.

Prototypes are typically created using paper to represent application interface screens, overlays and sticky notes to represent results from user interaction, colored pens and pencils to sketch content, draw interface structures etc. Paper prototyping has many benefits during the design process such as allowing rapid externalization of design ideas at a low cost. It also allows generation of numerous alternative interfaces that are tested early in the application design process. Paper Prototyping is usually conducted in a participative process with the end users of the application, which enables the users to design and test usability of systems. Involving end users in design thus facilitates the elicitation of system and user requirements as well as their refinement improving to user acceptance and ownership of systems. User acceptability of applications has become a critical factor in their design and implementation. Thus success of the entire systems development project may depend upon the perception of the end-user and the quality of their interaction with the interface (Weichbroth & Sirorski 2015). Involving all stakeholders in the project is important by providing them with the tools and knowledge of system programming.

Paper prototyping is a rapid and iterative process that allows for usability issues to be explored from various angles. It is an important tool in the field of Information Systems because it focuses on the interaction between the user and the actual system under development. It is a simple method, quick and centers on design aspects that are usually ignored by other system design methods (Sharp et al. 2007). Working with the entire user interface on paper enables the participants and designers to consider the flow of functions as well as layout details such as menus, sub-menus and links. Further, paper prototyping is able to generate various ideas that identify with and lead to user satisfaction. Paper prototypes are usually hand-drawn sketches or simple wireframes of the user interface (Nissinen 2014). Their key strength is simplicity of design materials such as pens and paper to draw the user experience regardless one's skill-set (Sharp et al. 2007)**.**

2.4.4.1 Benefits of Paper Prototyping

Paper prototyping has many benefits, which include;

Lower development costs: Paper prototypes use inexpensive raw materials such as paper, wood, cardboard and do not require technical skills.

Design testing: Owing to the simplicity of a paper prototype, it is easy for participants to make instant changes to the prototype. Testing the design allows for easy adaptation from the user to the context of the design and from user expectations to actual design. Further, the user is able to define and identify the menus and clickable elements on the paper prototype.

Ability to evaluate multiple design concepts: Paper prototyping involves the process of designing repeated system sketches and sharing feedback until a single design is obtained.

Improves communication between the end users and system developers: It enables systems developers and users to brain storm and understand how the system will feel and look. System developers are able to observe the users and appreciate their viewpoint and can incorporate their suggestions to their product design. The paper prototype resulting from the brainstorming exercise is used as visual specification of the system developed.

User oriented and Usability Testing: The users are able to perform realistic tasks as the prototype is manipulated to represent the application's response to user inputs. This method has demonstrated to be successful in identifying usability issues in the design process. The involvement of end users early in the product lifecycle creates a sense of ownership and later acceptance of the system. In addition, system designers are able to modify and develop the system based on feedback from the target users.

Rapid Prototyping: This involves a number of designers who each create a paper prototype that is tested on a single user. The designers them meet and discuss feedback from the users. Further, a computer-based prototype similar to the final product is developed. The process of testing and sharing feedback is repeated and software prototypes are obtained as a result.

2.4.5 The Paper prototyping Process

Paper prototypes can be used to test usability for any user interface for example they a new website, mobile application or system. The prototyping process is composed of Four main roles.

Users:

The users or end users of the system play a large role in the design of the interfaces. They should be able to identify the largest number of all usability problems. The users will interact with a paper version of the user interface that is being designed and tested.

Facilitator:

The facilitator is usually a skilled person or professional who records the issues raised during the design sessions. The facilitator may probe where necessary to issues raised so as to well document the discussions. The facilitator will also work as a mediator during conflicting time between the parties and during disagreements.

Human Computer:

The person who plays the role of the human computer is usually someone who iw knowledgeable about how the system works. This can be a developer or a more knowledgeable member of the team; who manipulates the prototype to make it more interactive with the users as they give feedback on suitability of the actions of the interaction. The human computer is expected to act as a “dummy” or non-functional interface who cannot give hints or think for the users interaction with the prototype.

Observers:

The last category is that of the observers who are usually members of the development team. They observer and interpret the users' interactions with the paper prototype.

The paper prototype activities start with a description of user characteristics, tasks and organizational environment (Dix et al., 2004). The aim of describing behavior is to document this process for reference by developers or other stakeholders (Myers et al., 2008). To create a paper prototype, different items may be required: Paper, sticky papers, Glue, Scissors, Colored pens and pencils.

After requirements gathering, the system needs are tested and organized in a collaborative process that includes the developers and end users. Designing of the paper prototypes then follows this process. Wireframes of the user interface of a software product or website are drawn on paper. These can be at any level of detail (high fidelity or low fidelity) and may even show where links will be placed on the page. These can be hand-drawn or by using simulations of graphics software to make screen shots of the interfaces, frames and buttons (Gawin & Marcinkowski, 2013).

A background is thereafter created with a cardboard, which in the system represents the browser. Features of the prototype, which may include navigation bars; text boxes, pop-up screens, buttons and hyperlinks are created. During usability testing, a participant is shown the paper wireframes or human computer and starts identifying the objects of the prototype. If the tester points to a link item, and shows the team how the relevant page to simulate how this would happen show on the screen. This process is repeated until satisfactory designs are developed and then tested by the users for functionality issues and a moderator who observes and documents in the background.

2.5. Approaches to System Design

The increasing use of ICTs has pushed the application of Information Systems into multiple domains, making it appropriate to practice reflective methods (De Villiers 2005). In addition, researchers are using specific strategies to study Information Systems and to generate knowledge in response to specific problems (Chiasson et al. 2008; Orlikowski and Baroudi 1991). Thus, different research strategies are based on varying foundations and concepts of the reality where each strategy is implemented by associated methodology approaches (Nabukenya, 2012).

2.5.1 User Centered Design Approach

User centered Design (UCD) is a design philosophy and approach that is used in the field of Information Systems to develop user-oriented systems. It is a collaborative concept that requires that the user be brought on board through consultations during requirements gathering to understand their needs, implementation and at usability testing (Hjalmarsson et al. 2015). According to Gulliksen et al. 1999, User Centered Design should be integrated in all design processes; but how this is done depends on the type of project and product. Norman, 1998 cited in Abras et al. 2004, notes that system designers are to ensure the systems are designed for a specific and intended purpose based on users requests, which minimize efforts in learning how to use the system. The involvement of users in the development process leads to more effective, efficient and safer products, consequently acceptance and success. User Centered Design is composed of four core stages of product development.

Requirements Analysis and Specification

Requirements analysis and specification is the initial stage involves understanding the business objectives and identifying all factors that contribute to the need of solution (Johnson et al. 2005; Baek et

al. na). This is usually done through, field studies, interviews & questionnaires, scenarios, task analysis and requirements specification. In this stage, it is important to carefully identify the user and how the user will be involved in the design process. Eason, 1987 identified three categories of users; Primary users are usually the groups that use the final product to accomplish a task. Secondary users are the persons who use the system through an intermediary such as the people who manage the actual users. Tertiary users are persons who will be affected by the use of the system. A successful design must put into consideration the different kinds of stakeholders.

Design

According to Gulliksen et al. 1999 parallel design and iterative systems development are very essential in User Centered Design. It is key to involve the user in the actual design processes. Users evaluate the design and redesign through the use of brain storming, participatory designs, conceptual models, mock-ups and scenarios, storyboards, interaction models and visual design with high levels of detail that promote discussions (Vilpola, 2008). Designs can range from simple paper drawings in the initial phases. Listening to the user discuss alternative designs can help the user provide information that does not come out of the initial interviews, observations and needs analysis. This is an important step in identifying measurable usability criteria, which address things like effectiveness, efficiency, safety, utility, learnability and memorability of the system and user satisfaction (Abras et al. 2004). This is an iterative process that helps the designers to collect feedback from users as they refine the design and development of the artifact.

Prototyping

According to Tam, 2006, Prototypes concretize and embody ideas, hereby having the chance to detect problems with the ideas. Users get hands-on experience and evaluate system concepts and ideas. Prototypes in User Centered Design facilitate in designing tasks and create better understanding of users responses. It is therefore important to use the appropriate prototype to construct conceptual designs and well-engineered products. Prototypes can be in form of sketches, storyboards, power point slide shows, video simulations of systems, cardboard mock-ups or software with limited functionality (Nissinen, 2014).

Evaluation

Evaluation is usually done in relation to either an earlier version or competitor system to identify usability problems and obtain measures of usability as an input to usability requirements (Bevan 2003). Evaluation draws from traditional methods such as usability testing, heuristic evaluation, cognitive walkthrough and task analysis (Abras et al. 2004).

2.5.2 Participatory Design Approach

Participatory design emphasizes involving users as an important part of iterative approach to system design to enable equal contribution and mutual learning (Roberston & Simonson, 2012). In information system research, participatory design is used to develop systems that are usable and meet user requirements. In participatory Design, users are involved in the development of the systems as co-designers to propose and generate their own designs (Bowen 2010). Core methods involve the use of workshops, ethnography and design sessions where users are encouraged to think creatively and come

out with unique ideas. Spinuzzi (2005) gives a methodology to participatory design that contains three basic stages;

1) Initial exploration of work, 2) Discovery process and 3) Prototyping

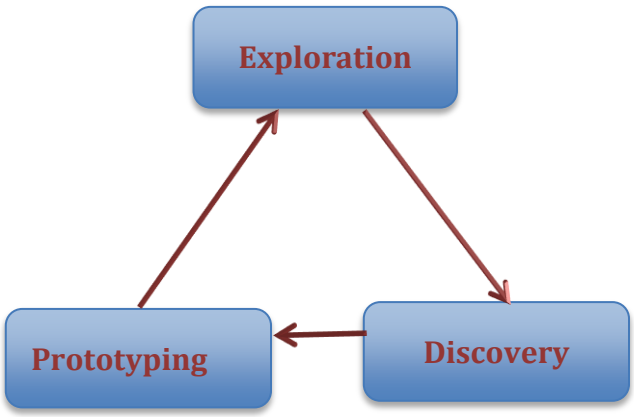


Figure 1: Processes of Participatory Design

Exploration:

This is the initial stage that involves designers getting to know the users, their environments and their routines (Spinuzzi, 2005). It encourages "co-investigatory relationships" between researchers and participants (Muller et al., 1997). Exploration involves defining the problem and generating ideas of possible solutions. This phase provides both the designers and users with an understanding of the work activities that a system under design is intended to support. The designers attempt to understand what the users do as opposed to what the users say they do through observation, interviews and ethnography (Robertson & Simonson, 2012). It is important to find mutual representation of what the users say and what the designers learn from the work practices.

Discovery:

According to Spinuzzi, 2005, The discovery stage involves the designers and users working together to prioritize the work organisation, clarify goals and values of the project in relation to the future of the work place. The designers and users are able to draw their understanding of the current workplace and potential future technology through an envisioning process. They team also envisions possible future work as well as the future workplace environment and context. It may involve using sketches and storyboards to capture user requirements; tasks and processes to generate realistic plans on how these visions could be realized (Kortbeek 2015; Nielsen & Molich, 1990).

Prototyping:

Participatory design supports user interface design by turning the proposed system and its features into tangible and concrete artifacts. This is usually done in multiple iterations in which the design is created, analyzed and improved to enable the developers cut down on the complexity of the system implementation (Kortbeek, 2015). Users and system developers can elaborate system requirements, tasks, and activities using visual objects usually low-tech prototyping such as paper prototypes, video prototypes or mock-ups for users to easily articulate how the system should work through different forms (spinuzzi, 2005).

2.5.6 Design Science Approach

Design is central to many applied disciplines such as engineering, psychology, education, architecture and fine arts. Information Technology borrows ideas, concepts and methods of design Science from these disciplines (Hevner and Chatterjee, 2010). Design science also known as the 'science of the artificial' is relevant to the field of Information Systems because it involves the creation of new

knowledge through design of innovative artifacts, analysis of use and performance of these artifacts to improve or understand the behavior of Information Systems (Vaishnavi & Kuechler, 2005; Simon, 1996). Thus design science combines a focus on the ICT artifacts and their relevance in the application domain (Hevner and Chatterjee, 2010).

Vaishnavi and Kuechler, 2008 observe that typically, research is conducted within a defined phenomenon with a set of behaviors of some entities that a researcher finds interesting. Owing to the nature of Design science research, all parts of the phenomenon may be created as opposed to them occurring naturally. It aims at providing relevant solution to an unsolved or important business problem where its quality and efficacy are rigorously evaluated both at development and evaluation stages. Takeda, et al. 1990 and Peffers et al. 2007 observe that research in design science involves the contribution of new and true knowledge; to determine the missing knowledge in a new design area, attempts are made to carry out designs using existing knowledge and theories to better understand the extent of the missing knowledge and how to solve the defined problem. The research is there after effectively communicated to appropriate audiences.

Design Science is relevant because of its practical organising orientation and its ability to expand on scientific knowledge. In practice, Design science is a choice framework because of its ability to contribute towards solving of organisational problems through invention, design and development of new ideas and useful solutions (Mutenda 2014). Hevner et al. 2004 contends that Design Science is an appropriate method for designing artifacts that support participation.

2.6 Evaluating Design Solutions

Different Systems design evaluation methods include Usability testing, Heuristic evaluation, User testing, Task analysis and Paper prototyping. Kusunoki & Sarcevic, 2013 observe that evaluation involves carefully integrating selected methods into the system design process. The author notes that during evaluation, it is important to carefully select a design evaluation method that applies to the context, allows the participating team to reach mutual understanding, enables communication with and elicits feedback from the users and can be integrated in the system design process. A good evaluation processes includes;

Requirements Analysis:

This involves studying the project to determine whether the outcomes of the project have matched the initial goals and minimum requirements. Measurement and relevance here deals with ensuring that the evaluation techniques and instruments are accurately capturing the most important aspects of the system such as the quality of the information elicited through interviews, survey questions and observations. The questions must balance between the intention of the researcher and the understanding and attitude of the users (Abras et al., 2004). Further, it is key to manage the context by understanding the categories of various backgrounds, environments and relationships.

Functionality:

Evaluation of system functionality is be done by comparing potential System and current systems to illustrate the system strengths as well as opportunities for further development. Design and evaluation should be done within the context of use to clearly spell out what functionality should be evaluated and how is this to will be carried out.

User involvement:

Kusunoki & Sarcevic, 2013 suggest that understanding the users, identifying assumptions made by the users, and involving the user in evaluating the design may minimize bias. It is important to manage conflicting ideas by identifying and negotiating differences in expectations, priorities, and use practices to reach a mutual understanding. Users are key informants during evaluation, although most times they do not know how to articulate or conceptualize their knowledge. This can be managed by ensuring the interpretations and meanings of the users and facilitators match.

User acceptance:

This involves the presentation of the product to the potential target users by development team to solicit advice and suggestions from final system enhancements. The evaluation process should not be separated from the design process to risk missing the key points and call for re-designing the system. Thus evaluation is iteratively refined before finalizing the design.

2.6 THEORIES AND MODELS OF INFORMATION SYSTEMS

This section identifies some of the theories and models that are commonly used during systems design and implementation.

2.6.1 Diffusion of Innovation Theory (DOI)

Rogers, 1983, 1995 study the effect of individual behavior on the innovation diffusion process. The author also addresses diffusion of innovations within organizations. This theory describes innovation as "an idea, practice, or project that is perceived as new by an individual or other unit of adoption"

(Rogers, 2003). Diffusion of Innovation, according to Rogers, 1995, is the process by which an innovation is communicated among the members of a social system through certain channels over time. Rogers (1995, 2003) categorize the innovation process into two main stages: initiation and implementation. These are further broken down into five sub-stages, where the initiation stage includes; (1) Agenda- Setting and (2) Matching; while the implementation stage, includes (3) Redefining/Restructuring, (4) Clarifying and (5) Routinizing.

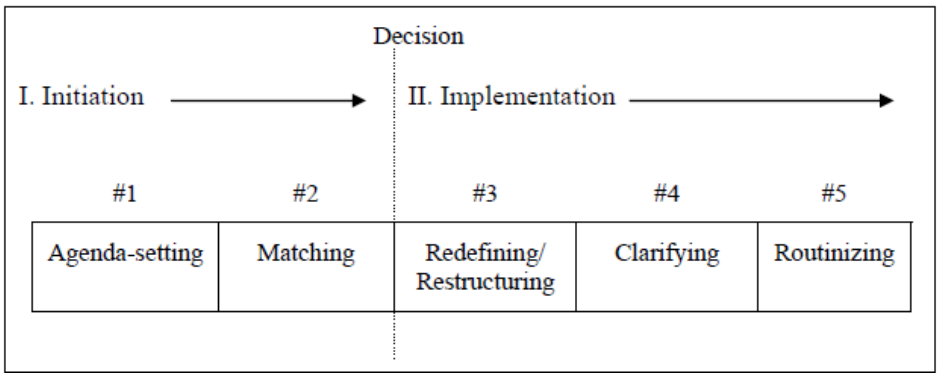


Figure 2: Roger's Five Stages in the Innovation Process

Source: Rogers (2003)

In the initiation stage, the organization's problem is defined and the need for the innovation is identified (Agenda-Setting). Then, the fit and feasibility of the innovation is explored in relation to the organization's problem (Matching). In the implementation stage, the technology is altered to accommodate the organization's need and structure (Redefining/Restructuring), followed by clarifying where the innovation is explained to organizational members to promote use. In the final stage, (routinizing), the innovation is incorporated into the daily activities of the organization (Rogers, 2003).

2.6.2 Technology Acceptance Model (TAM)

Many studies that deal with IT acceptance in organisation use the Technology Acceptance Model (TAM) designed by Davis (1989). TAM has its origins mainly from the Theory of Reasoned Action, which explains behavior and behavioral intentions. The Technology Acceptance Model examines how human behavioral factors affect the acceptance and use of information technologies (IT) in organisations (Raza, 2011; Davis, 1989). TAM highlights three major areas that influence system use: perceived usefulness, perceived ease of use and Behavioral Intention. According to Davis, 1989, Perceived usefulness is "the degree to which a person believes that using a particular system would enhance his or her job performance" and perceived ease of use, as "the degree to which a person believes that using a particular system would be free of effort". Davis also suggests that behavior intention influences technology use. Intention to use is also influenced by user attitude and their view of technology.

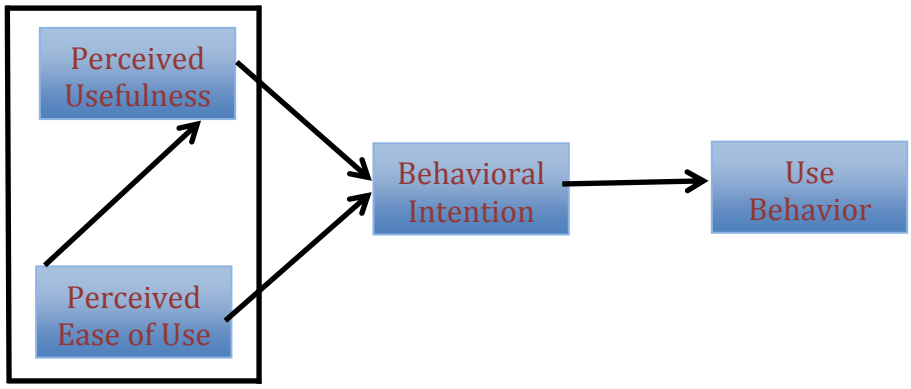


Figure 3: The Technology Acceptance Model

Venkatesh et al. 2003 observe that the TAM is tailored towards IS contexts and is designed to predict Information Technology acceptance and use in work places. Research on TAM extensively examines users perceptions, attitudes, motivations, towards implemented Information Systems and Technologies

(Davis 1989; Venkatesh et al. 2003). The authors show that system design and user interaction with Information Systems decide the acceptance or abandonment of systems and technologies implemented. The TAM approach argues that perceived usefulness and perceived ease of use dictate the process of systems development.

The Technology Acceptance Model is the choice model for this study because it's a useful measurement for information systems for many academicians and that it has the ability to guide on intention to use and actual use of new innovations. The reason for opting for TAM as the systems implementation process is justified by its simplicity and its focus on the key activities required in transforming a project (Paper, et al., 2000). It is useful towards mixed teams, (facilitators and users) by keeping them informed regarding projects progress (Kettinger et al., 1997).

2.7. Conclusions

This chapter presented a review of the literature in relation to Design and implementation of HRMS in organisations. It begins with an in-depth description of the different types of HRMS and how they are used in organisations. Literature shows that HRMS are used for various processes in the organisations. This is followed by an examination of existing approaches that have been used to design systems different contexts. The researcher found that various approaches are being used to design and implement systems in organisations as individual approaches or combined so as to create seamless design sessions and systems. It further examines in detail the paper prototyping technique, its benefits and process. The chapter then identifies some of the models that have been used in different studies to implement new innovations in the organisations. Towards the end, the study identifies TAM as a choice model that was used in the study to implement the new innovation. The researcher also learnt that TAM is consistent

with Rogers (1983)'s theory on diffusion where technology adoption is a function of a various factors such as usefulness and ease of use.

CHAPTER 3: METHODOLOGY

3.0 Introduction

This chapter highlights the study design and approaches that were used. It gives an in-depth description of the research design, study population, sample size and selection, sampling techniques and procedure, data collection methods, data collection instruments, pre-testing, procedure of data collection and data analysis, ethical considerations and limitations to the study.

3.1 Research Design

This study adopted the critical realism philosophy because it is well suited for clearly bounded but complex phenomenon such as organizations (Easton, 2009). A single-case study strategy was used to gain a holistic view of the case study in complete breadth and width (Yin, 2003; Oso and Onen, 2005), with the unit of analysis being each point of usage. In this study, the National Drugs Authority was used to understand the role of paper prototyping in the design and implementation of HRMS process in organizations. A qualitative methodology was used to allow observation and study of the context in order to evaluate the complexity of unique and general factors and their validity to the study (Choy, 2014). Qualitative methodology is also suitable for conducting empirical research with specific approaches.

3.2 Study Population

The study population mainly comprised of seven (7) participants who were considered suitable for the study because of their role in the implementation and use of Human Resource Management System. The HR department at National Drugs Authority consists of one (1) Head of department, three (3) HR managers and two (2) Records officers who were interested in participatory systems design and new

system installations to improve their work processes. One (1) ICT officer was added to the team since he would be the one managing the HRMS server. This audience was informed that they were going to design a HRMS for their department and were a key asset when exploring innovative ways of improving HR work practices.

3.3 Design Process

Paper Prototyping was also used as an interface design technique to capture the underlying principles and practices of the HR department during requirements gathering, product design and development. This study then used a design science approach (Peffers et al. 2007) combined with participatory design research.

3.3.1 Design Science Methodology

The study adopted the design science methodology. Design science approach has been used in various studies to design, develop and test different software artifacts. It focuses on developing solutions for specific problems (Van Aken, 2004). According to Hevner and Chatterjee (2010), Design Science research must produce a viable artifact in the form of a construct, a model, a method, or an instantiation. Hevner, 2007 identified three main cycles of design science research. The study developed a Human Resource Management system as an artifact for the HR department at National Drugs Authority.

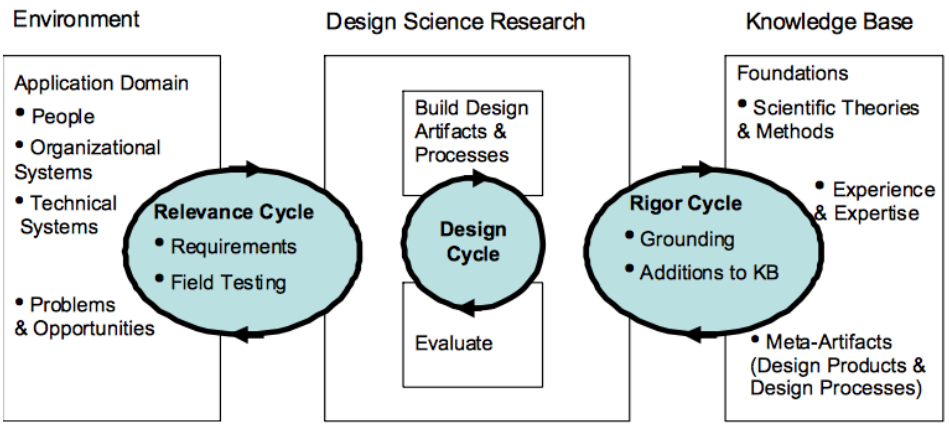


Figure 4: The three cycles of IS research framework (Hevner 2007)

The Environment

The environment or application domain in this research was the National Drug Authority. The entities affected by the design of a new HRMS included the Human Resource Managers and Records Officers and their routine HR processes and management practices at NDA. The system developers to identify the challenges affecting that the HR department had conducted an initial assessment. It was established that the HR department was using a paper-based system to manage the current work force, which was slow and tiresome due to the large number of employees. The relevance cycle guided the designer to identify the desire and motivation of the HR department in improving their work environment through the introduction of new and innovative artifacts (Simon, 1996 cited in Hevner 2007). The opportunities were identified, as NDA did not have any system to manage the HR and required a Human Resource Management System to improve HR management within the organization. Paper prototypes were used to gather requirements on the nature of the system required for this purpose.

Design Science Research

Designing the HRMS for the current HR processes involved developing the right HR system for the HR department. HR managers and records officers were involved in a collaborative and participative design approach. A Human Resource Management System was developed for the HR department to improve management of HR at the National Drugs Authority. The main reason of using a participative approach was to develop ownership and improve acceptance of the final system developed. To add rigor to the design process, iterations of the system design (core HR activities and processes) were done and the feedback obtained from the target users, was useful in refining the design of the system.

The Knowledge Base

The Knowledge base stage was useful in communicating the findings of the research to the public after evaluating the new artifact to ascertain that the use of the system was satisfactory in improving HR management practices.

3.3.2 Participatory Research Approach

Participatory research is a design and testing approach that is crucial in paper prototyping and widely used in IT projects. Using this approach, focus was placed on the users' participation as design partners in the design process. Participatory design allows for obtaining and refining system requirements (Mugwanya & Mardsen, 2010). Dix et al, 2004 note that Participatory design research must involve the users in the design process as equal participants to create a system that satisfies their needs while at the same time respecting the practitioner's tacit skills and knowledge. Participatory design is generally a qualitative process. The design approach used was chosen from the wide range of design techniques

(Muller et al., 1992) due to its suitability for use, based on Work context, practitioner availability and timeline limitations for prototype development.

Design activities were completed in-situ, to reveal how the participants were able to interact with the system in actual work environment, and to observe any challenges or opportunities to the design. The facilitator set-up design activities at NDA to maximize the use of participants' time, avoid any inconveniences as well as allow the participants to stay in a familiar and comfortable design environment. Other considerations were made with particular regard to busy and active participants so as to assure practitioners engagement. However, Brandt and Grunnet, 2000 observe that on-site design should not replace the work of the system designer. The system design process also involved external facilitator help with continued practitioner involvement

Exploration:

This phase started with discussions involving the HR managers and Records officers to understand the existing work practices. In appreciation of the participants' time, specific themed events were organized to coordinate and meet with the practitioners, to allow effective use of their time and collaboration process. The users were able to discuss their needs and desired future state. Different viewpoints were discussed between the participants and facilitator, to come up with possible solutions. Spinuzzi, 2005 highlights the need to understand the users through a collaborative process that involves the designers getting to know the users, their environments and their routines.

Discovery:

The discovery stage involved the designer and the users working together to, clarify and set goals as well as values of the project in relation to the desired future state of the work environment. The team embedded mock-ups and paper prototypes to better understand users' needs and envision the system design. This stage also involved using sketches and task flow diagrams to clearly capture user requirements, tasks and processes and generate realistic plans on how the participants' visions could be realized.

Prototyping:

Using prototypes within the user environment allows for 'realistic' visualization and evaluation of prototypes (Ahmed et al, 2006). The participatory design process was conducted in a series of design workshops with the researcher taking on various roles such as facilitator, designer and developer. The design process used paper prototypes to draw the system interfaces and illustrate how the system will look like once developed. The data collection methods used here involved observation and workshops.

3.3.3 Paper Prototyping Design Technique

Paper prototyping is a widely used technique for exploring; communicating and evaluating early interface design (Mugwanya & Marsden, 2010). Paper prototyping is introduced in this research as part of the Participatory design process, and has been used in different studies as a usability testing of systems design (Tam 2006). The prototypes were developed in three stages of basic activities with a series of variations using pen and pencils to draw sketches of the various interfaces. This was done in an iterative format until a desired result was achieved. The first mock up was a rough copy of each of the participants drawing a layout of the system screens on paper. The second mockup was a more clear copy

of the combined visuals and thoughts of the team illustrating the different layout possibilities and navigations between the various possible pages. The third and final mock-up was agreed upon (participants and facilitator) paper mock-up illustrating how the actual product may look like after it's developed.

Design:

This was the conception stage where the main goal and decisions concerning of product design was specified. The initial design concept was to be named as the first iteration to the intended design. During the development process paper prototypes were used as a tool for communicating and testing in a collaborative team of users and the systems developer.

Prototyping:

This focused on developing the artifacts. The participants focused on creating mock-ups of how the user would interact with the application. Drawing the interface and illustrating the process flow and outcome, a use profile was created is based on what the users made concessions on. It involved use of pencil, pen and paper mock-ups, to generate paper-sketched versions of all the components of the Interfaces.

Evaluation:

This phase focused on generated feedback about the qualities of the relationship users established with the creative design. It helped to understand or appreciate the simulated performance of the product by participants through proper interpretation of roles according to the elements already in the system concept and with help of the mock-up elements. The point of view in product design was its focus on the

usability of the application to enable evaluation of the application as experience emerging and not the product support itself.

The benefits of using Paper prototyping in the product design allowed for quick design generation and less costly development of product simulations that were detailed and easy to test in the early stages of system design. It was also useful in system evaluation to test usability and user satisfaction. Use of traditional testing and evaluations methods such as observations and briefings to were explored to manage the design process.

3.5 Quality Control Methods (Validity and Reliability)

In order to address the content validity of the instrument in this study, the design of the paper prototyping sessions were based on literature from previous similar studies and pre-existing experiences that were modified to suite the study. Hyman et al. (2006) observe that using pre-existing studies and guides provide accurate measures, as they are pre-tested before first usage. This means that the degree of validity and the quality of data are likely to be high.

3.6 Data Analysis

Data was analyzed using a qualitative data analysis procedure. Paulson (2009) observe that qualitative data is interactive and is formed by the subject and the social role of the researcher such as experience, age, gender, social class, biases and ethnicity. The researcher then proceeded to analyze data in terms of what worked and what didn't work, to identify the advantages and potential challenges to suite the study and ensure that the degree of validity and the quality of data associated with each tool is high. The tools

were then categorized according to the paper prototype process from existing literature. The analysis then studied the design process as a whole to map the tools to the activities that they enabled.

Complete understanding of the context was done at the beginning of the study. After The researcher used individual analysis of field data acquired through observations to add interpretation of what had happened or what someone might have been thinking. Finally researcher developed themes from the data to help understand overall what was taking place. These themes were partially biased in order to look for evidence of events such as a demonstration of a shared understanding, but also new and relevant themes would reveal themselves in what occurred, such as the importance of the user. Taking into account the phenomena observed at different stages of system development, the study concluded by sharing the new knowledge obtained from the research.

3.7 Ethical Considerations

The researcher obtained permission to conduct the study from the management of National Drug Authority (see appendix 1). Before conducting the study, the purpose of the study was clearly explained to the stakeholders and consent for participating in the study was sought from them. Emphasis was made on the fact the information collected would be handled with confidentiality and that it would be used for academic purposes only. Participation was voluntary and no force was used.

3.8 Challenges/Limitations to the Study

This study had few limitations that future studies should take into consideration. The participants had busy schedules and it was difficult to get them to commit time, which made the design process quite lengthy. However the participants eventually managed to allocate some time with interest and care. The

researcher is certain to claim that the findings are a true overall reflection of what transpired with regard to the design and implementation of the HRIS. The participants selected for this study were a general representation of the target population.

Another limitation was that the case was limited to one particular implementation in one type of organization. IS design and implementation research is usually sensitive to the context in which it occurs, which usually is the subject of concern to generalizability (Trochim, 2001).

3.9 Conclusion

This chapter described the methodology that was used in this study. It gave a detailed description of the research design and the reasons for the choice of that approach. It also reported on the study population, sampling techniques and procedures used plus the sample size. A description of how data was collected and analyzed was given together with the justification of the techniques that were used. Further, the chapter stated the ethical considerations and challenges/limitations to the study.

CHAPTER 4: RESEARCH FINDINGS AND PROCEDURE

4.0 Introduction

This chapter presents the findings of the study based to objectives that guided the study, data collected and analysis conducted. IT also describes the design process and procedure. The findings of the study are based on observations and paper prototyping exercise of which 7 participants were involved.

4.1 The Respondents

The study involved seven respondents who were the total number of HR staff in the department and 1 ICT Officer at NDA. The HR department is based at the main branch in Kampala and is managed by; one (1) Head of Department who supervises and ensures the efficient running of the HR office at NDA, three (3) HR managers who are responsible for day-to-day HR operations and decision making; and two (2) Records officers who manage the filing and retrieval of HR records. The ICT officer supports the Authority in ICT related issues. The study chose the four categories of respondents because they were thought to have a good understanding of the HRM processes including the strengths and weaknesses. The study also assumed that these three HR categories were the target users of the HRIS when developed. The ICT officer was also added to the team of respondents because he was thought to be knowledgeable about the implementation process of Information Systems at the Authority.

Table 1: Categories of Respondents for the Study (Source: Field Findings)

Categories	**Frequency**
Head of Department	1
HR Managers	2
Records Officers	3
ICT Officer	1
Total	**7**

4.3 The Human Resource Department at NDA

The initial baseline study was conducted to assess and understand the current working context at NDA with focus on the HR department before an intervention was proposed. The National Drug Authority had been selected because it's a Government agency that is believed to have a busy work environment because of the continuous services it offers to the public. The Authority is currently employing a total of 200 employees within its 6 branches countrywide. The HR department has three (3) core functions that guide management of HR management within the organisation. These include HR planning, Recruitment and HR management.

1.3.1 Revisiting the Challenges Identified in the HR department

To better understand the quality of routine HR data management, a case-by-case detection was performed. The department seemed to have limited to no form of standardization and non-evidence based decisions being quite common. For instance, data capture and filing was flowing through three different reporting channels, with no horizontal linkages.

In regards to management practices, the study found that functionality of the HR department is still paper based with all operations submitted through paper work where they are either received or filed for action or storage. Employee data was compiled using excel-sheets. The study observed that staff data gathered about current staff from the branch offices were managed in two different sheets from the main staff list and contained significant inconsistencies. Some of the staff on the lists had either left the organization or were at different branch offices. This implied that available was not reliable and comprised of inaccuracy issues. The HR staff agreed that managing the file system was very hectic and tiresome.

HR management was also characterized with redundancies, which remitted into late reporting of occurrences such as movement and transfer of staff within the different branches. According to the current Head of HR department, the Authority has a high staff attrition rate, which makes general management of Human Resources very complex. Managerial practices tend to be reactive especially when events occur rather than forward looking and anticipating needs. This has made it difficult to establish rules and guidelines because of amount of work within the department. HR staff concentrates more on compiling and submitting monthly lists for salary payments, managing queries and pay issues, managing transfers, benefits and recruited staff. Each staff in the HR department tends to develop their own approach towards accomplishing their work, which has left the HR department in a very devastating state.

The study also found that in spite the high attrition rate, there are poor HR planning and performance management practices which make it one of the most difficult tasks because it is difficult to clearly see the gaps, anticipate movement or manage the staff turnover rates. The head of HR, noted that they have

been having limited resources to support planning and recruiting but also to motivate and reward the existing staff. In general the HR aspects are not well planned, poorly executed and thus cause problems in early, mid-term and long term management of the HR aspect.

The other challenge identified was poor capacity building practices with limited training sessions, which was evident in the unclear approach towards certain management issues and 'work around' solutions put in place. Most HR cases and complaints remain mostly unresolved. When asked if they felt an automation of the current system would help improve their work, the respondents noted that the financial systems that had been installed in the accounts department had in their view improved processes and efficiency. Taken together, the findings of the initial study sum up to help address the overall research objectives.

4.4. Moving from Requirements to Design

This section presents the design phases of the HRMS. The HRMS was designed under the guidance of the HR processes to enable the HR department have a centralized information database for all employees including the branch offices in the various regions across the country. The primary role of the HRMS was to improve management of staff and decision making through evidence based planning.

Six participatory design sessions were conducted at different intervals at the NDA. They involved the designing of the different stages and interfaces of the HRMS. The design process involved grouping the seven participants into three groups of two and one with three members.

Figure 5: Picture of design team during one of the design sessions

The Design sessions started with gathering of the participants in a workshop were they were briefed in detail about what the design process involved. The research followed the paper prototyping process illustrated by Snyder (2003). It involved the following activities:

1. Introducing paper prototyping, its history, relevancy and how it relates to participatory design
2. Participants were also informed that there is no right or wrong answer during paper prototyping and were encouraged to be as creative as possible.
3. Participants were organized in groups of three and assigned materials to start development. The facilitator also showed examples of paper prototypes to stimulate the design process. Each member collaboratively contributed to the development process. At the end of each session, different requirements were obtained.
4. The benefits of paper prototyping were highlighted in the briefing session and continually emphasized in the design sessions in order to obtain the participants' commitment to the design process and objective of the research

The first session started with the facilitator listing the objective of the activities. The users were clearly taken through a step-by-step approach to understand that they were the target group of the study and therefore knew the specific needs in regards to routine work and activities. They were asked to identify the areas that were important to day-to-day management of HR, needed improvement and automation. These were listed on the flip chart. Next, they identified the HR related terms and established a list of the functionalities and navigations. They were also asked to categorize the activities in regards to most common uses, priority and functions. They were then asked to organize them on how they would occur from the beginning to the end. The facilitator then presented the ideas in a storyboard to stimulate their thoughts about the session. A walk through activity was conducted after each session to identify any issues, justify actions and refine how the activities would inter relate. This session also led to the development of a flow chart diagram (Figure 7 below) that illustrated flow of activities as defined in the design process. After the participants understood how the different processes inter-relate, the started to develop the prototypes in the allocated groups under the guidance of the facilitator. Because of the busy schedules of the HR department, the participants were able to design various creative prototypes with each session taking approximately 2 hours. These sessions were very important in identifying system requirements and user goals for the system that was developed.

4.4.1 The Leave Module

The discussions that aspired throughout the sessions clearly brought out designing a leave module that was interactive with the staff themselves, the team agreed that the leave module should be developed so as to calculate the number of days accumulated per person at a rate of 2.1 days per month.

They also requested that the module should start by an employee seeing how many days have been accumulated, then use this to request for leave, send to the Head of department who then reviews approves or rejects and then send to the Human Resource Officer then later on to the Head of HR

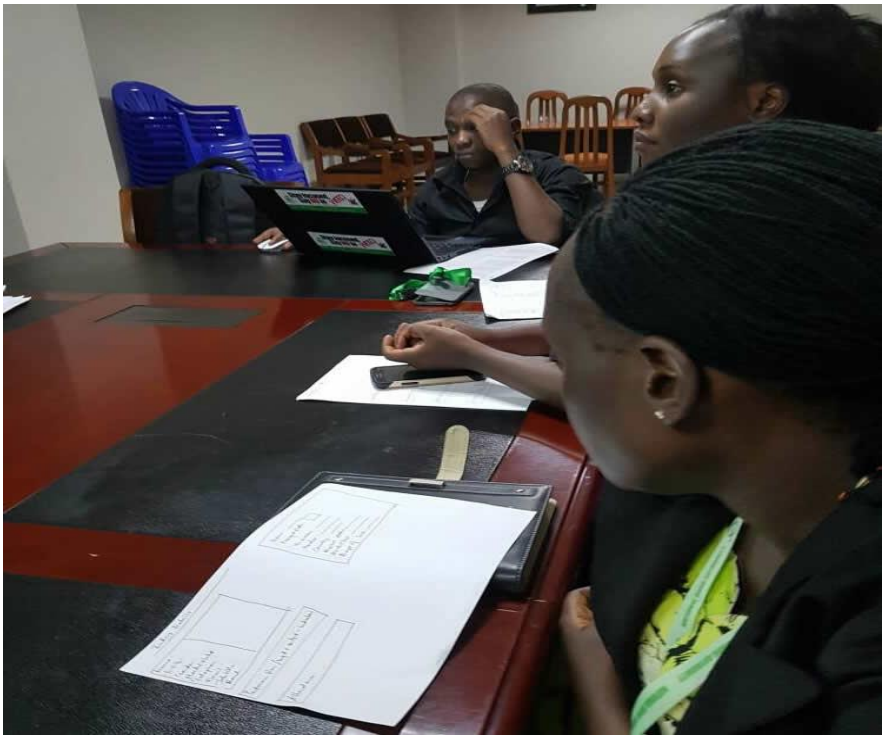


Figure 6: Picture of the design team in another design session.

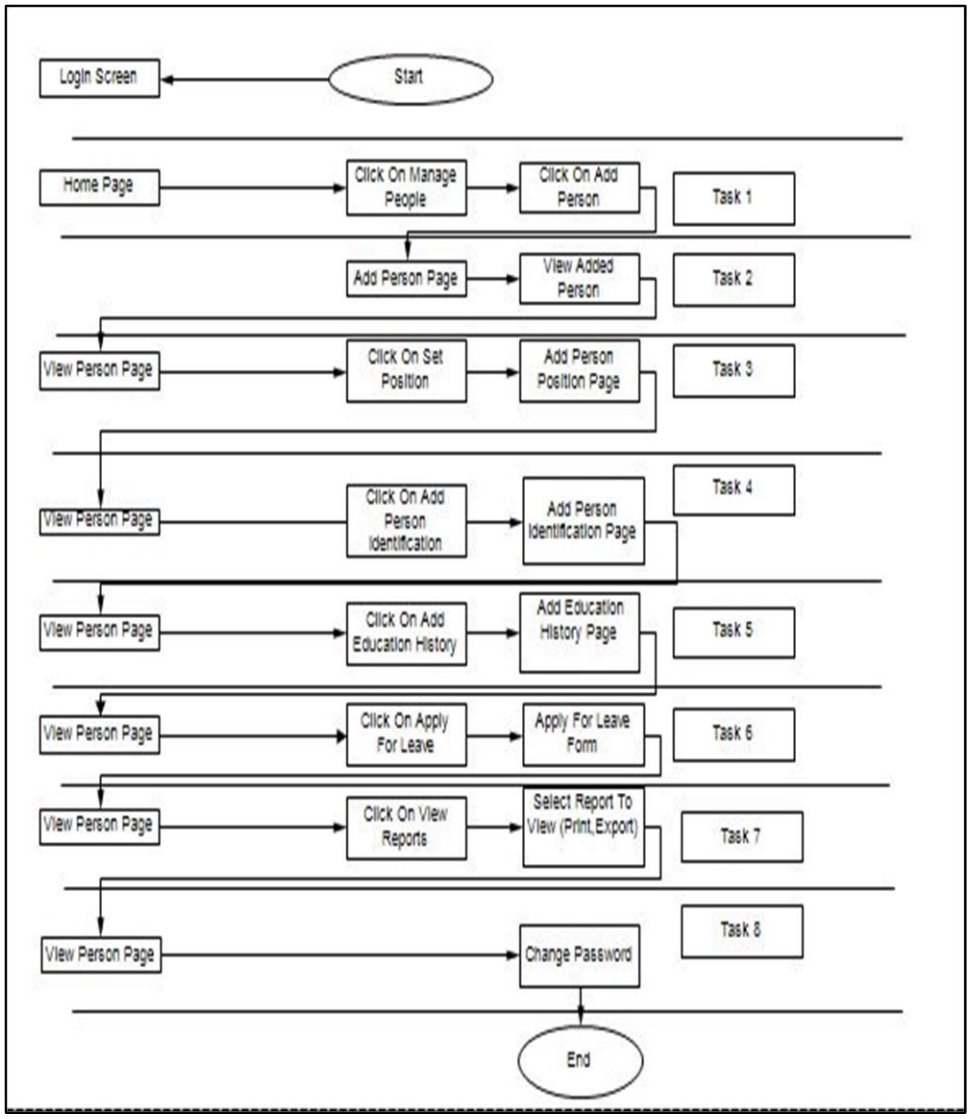


Figure 7: Flow chart diagram illustrating system activities from start to end

4.5 Conclusion

Chapter 5 describes the findings and procedure of the design process at NDA. It shows the nature of respondents and participants involved in the study. It goes ahead to give a detailed description of the Case study and a view of the HR department. It also describes the challenges that the HR department was experiencing that justify the cause of the study and solution offered. It then gives a description of the design procedure. Chapter four proceeds give the results of the design process

CHAPTER 5: RESULTS FROM DESIGN SESSION

The researcher reviewed the results from the paper prototype sessions by comparing the participants' ability to successfully complete tasks assigned to them and the number of issues identified. Although several issues were identified with the prototypes such as, incomplete screens, missing links and buttons as well as inability to generate tasks, the research did not focus on the severity of the errors because the system under design was expected to have less complicated design. Some of the participants' tools were incomplete but the facilitator called for responses, reactions and suggestion in contributory discussion to uncover some of the key requirements. The interface designs were simple and needed to improvements here and there to balance between functionality and the steps needed to accomplish an HR related task. Figure 7 and 8 shows some of the unrefined and refined prototype created by the participants.

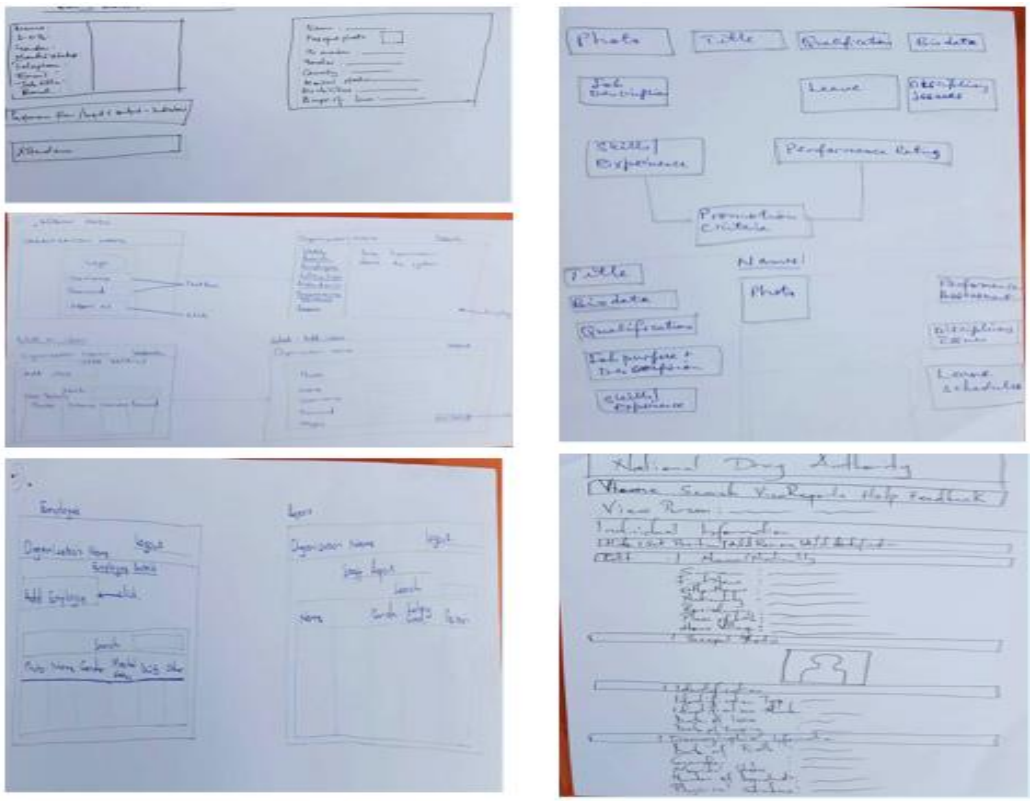


Figure 8: Sample of unrefined prototypes created by the participants

Figure 9: Some of the refined paper prototype developed in the design sessions

Initially, the participants were not sure on how to make the interfaces look genuine and they did struggle in the first session. They requested to be guided on how they would draw these interfaces using the simple tools they were assigned. However, after a few failed attempts, they started to get the gist and draw better tables and usable interfaces. Later they were thankful for the paper tools because it allowed them to make mistakes and yet giving them space to refine the concepts they had in mind. Therefore, instead of adding other materials like sticky papers, they used plain papers through out. All clickable elements according to the agreed upon design opened in a new window and thus had an interface in its self. Thus all editing and refinement were paper based. The design of the system was such that it would

be web-based as one of the key functionalities and thus it opens in a browser. This was to allow accessibility of the HR information anywhere. It would be installed on a server procured by the management and it was to be networked. Therefore, some of the features added in the interfaces to support this functionality were login in authentication using a user account and password, which would all be in one database as an integration component. The participants also felt there would be a need for integration with some other systems in the near future. They therefore refined some of the areas that would need integration such as employee Bio data as an extension to a familiar application. To enable this kind of integration, MySQL database environment was used and the scripting languages included HTML, XML, and java script. Php was used to link the interface to the database and to validate the server with client side. The development tools are all open source tools and they were used because they do not require licensing and are compatible on different machines and browsers. The participants seemed to be happy about this option because their concern initially was a limited budget and having licensing software would be difficult to sustain. The participants also seemed to be satisfied with the output of the designs. Having refined the designs, the facilitator then took the refined designs for development.

5.2 Sample of Functionalities developed in the HRMS

5.2.1 User Access management

The user management function was added to the help to create and manage password-protected user accounts as measure to control access to the system. This required the using the username and password. Owing to the fact that HR information is sensitive, the participants felt that a functionality to limit user activities based on the various roles should be added to the HRMS. Accounts were set as role-based with users accessing certain fields so that user actions and data is hidden from non-authorized users to enhance data quality and security.

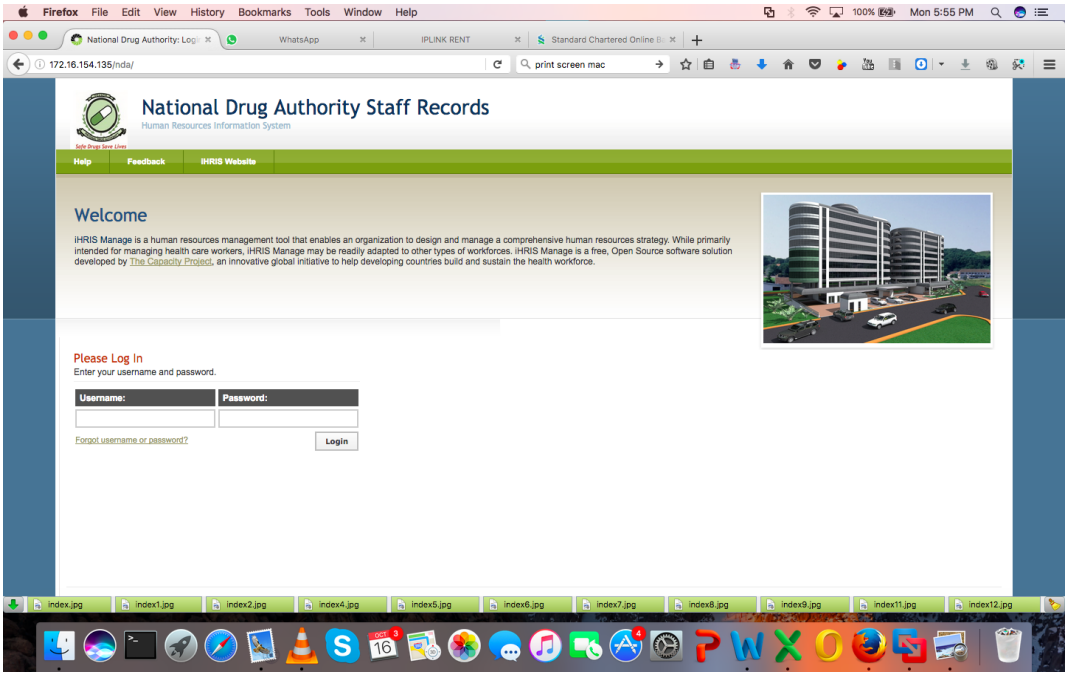


Figure 10: Screen showing user login

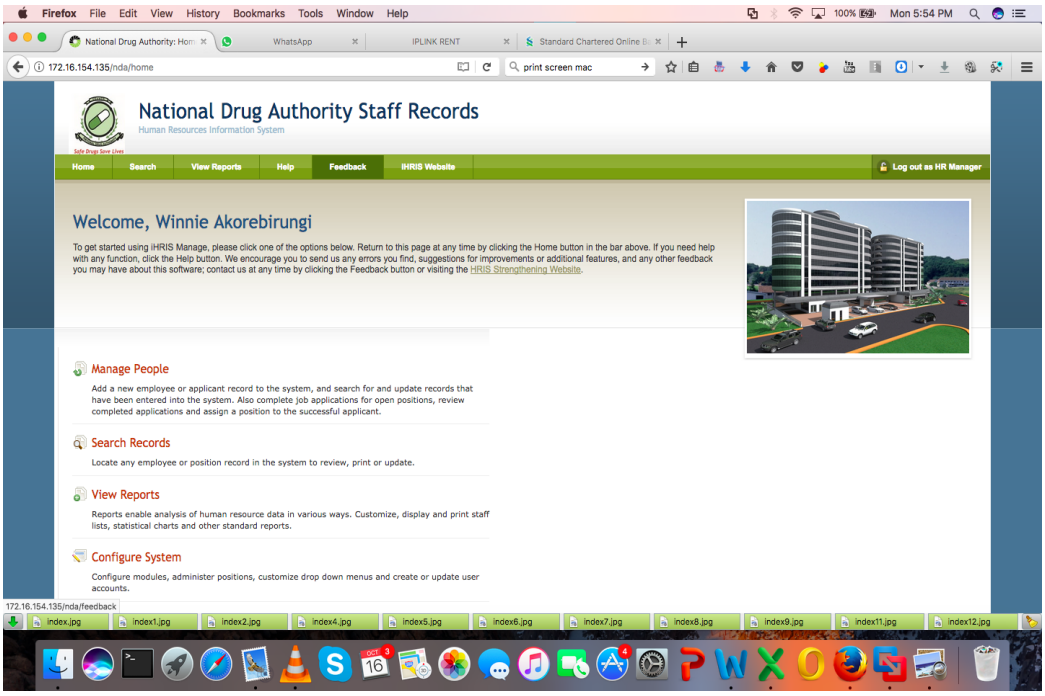


Figure 11: Screen showing a User Access page

5.2.2 Employee Management

This function was added to the HRMS to capture employee information and maintain a complete record. A record of employee bio data, position information, performance information, work history, salary and benefits, trainings, workplace incidents resulting in disciplinary action and much more can be captured using this function and later accessed when needed.

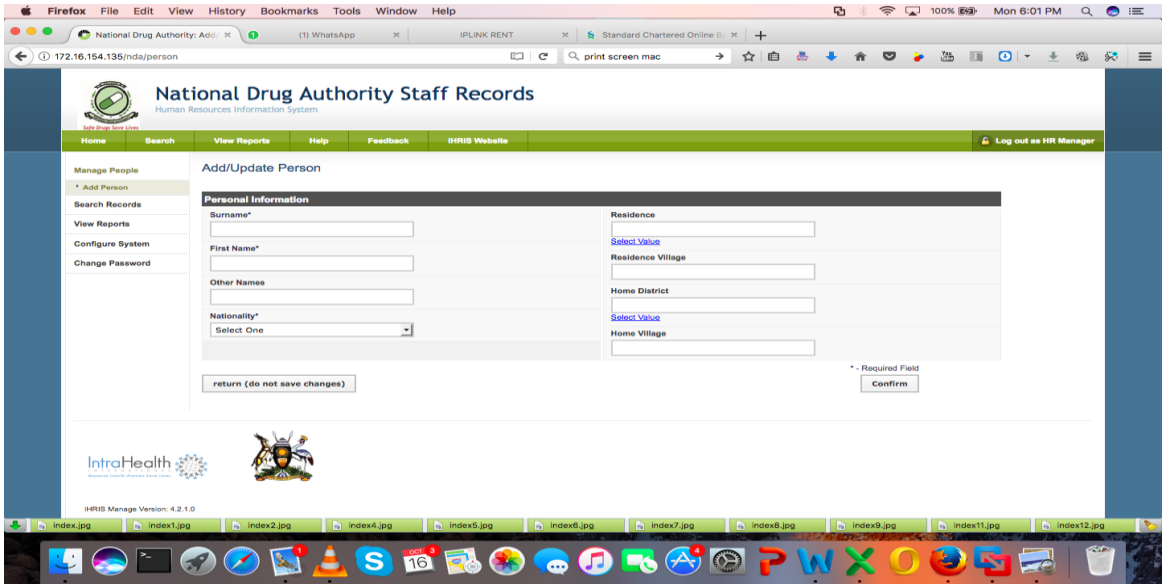


Figure 12: Creating an employee record in HRMS

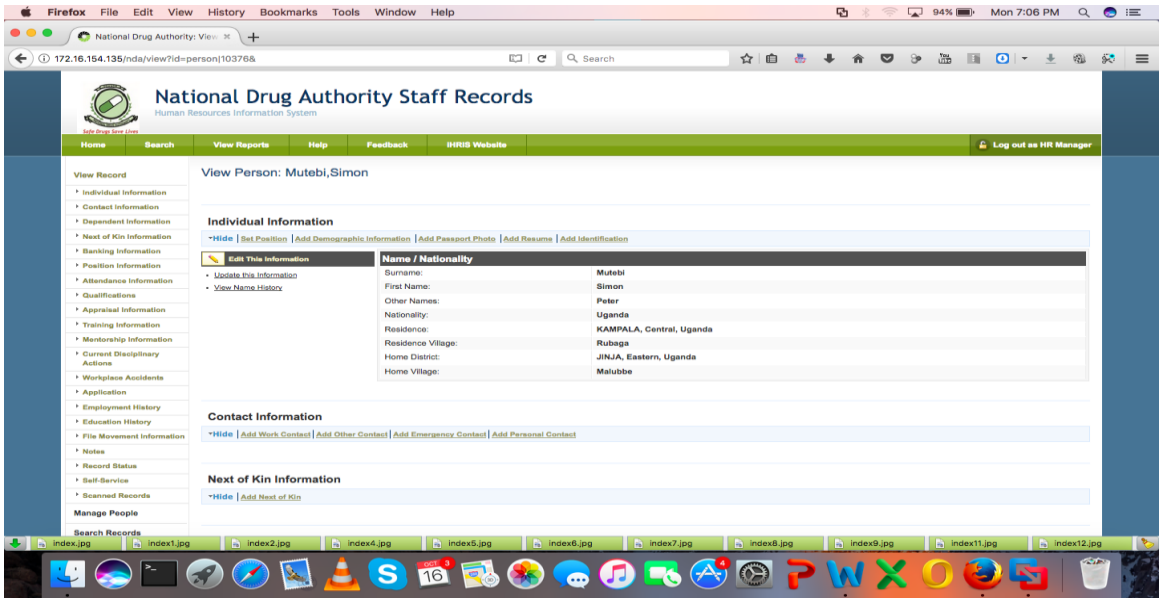


Figure 13: Screen showing employee record in the HRMS

5.2.3 Search Functionality

The search function was added to help locate the records that are available in the database whenever needed. It also had capabilities to limit the search by category or functionality such as such actual employee list, search by position, search recent changes etc. The setup was mainly to quicken retrieve employee related information.

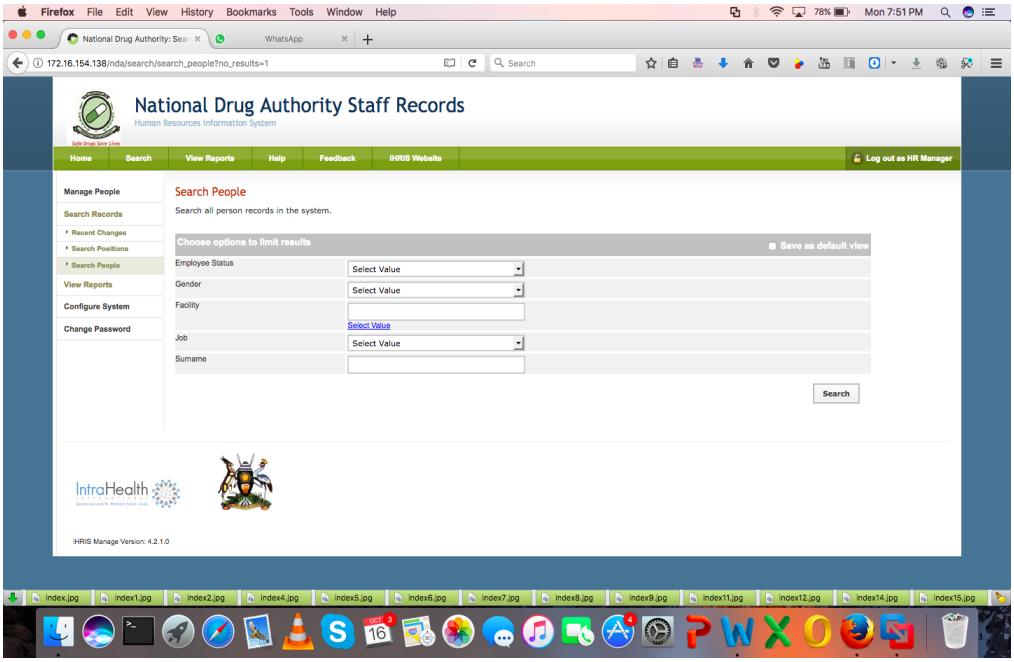


Figure 14: Screen showing search function in HRMS

5.2.4 Self-Service Module

The self-service function was created in the system to allow the employee access their records and either updates a field or request for leave. Each employee whose details have been entered into the system is assigned an account where they can login to view their details or edit certain fields with the HR managers validating the changes before they are saved on the employee's record. The employees can also access any of their information such as contact number, bank details, Tax Identification Number etc. The self-service functionality was mostly created to enable staff to apply for leave and improve the HR managers quickly track this HR component.

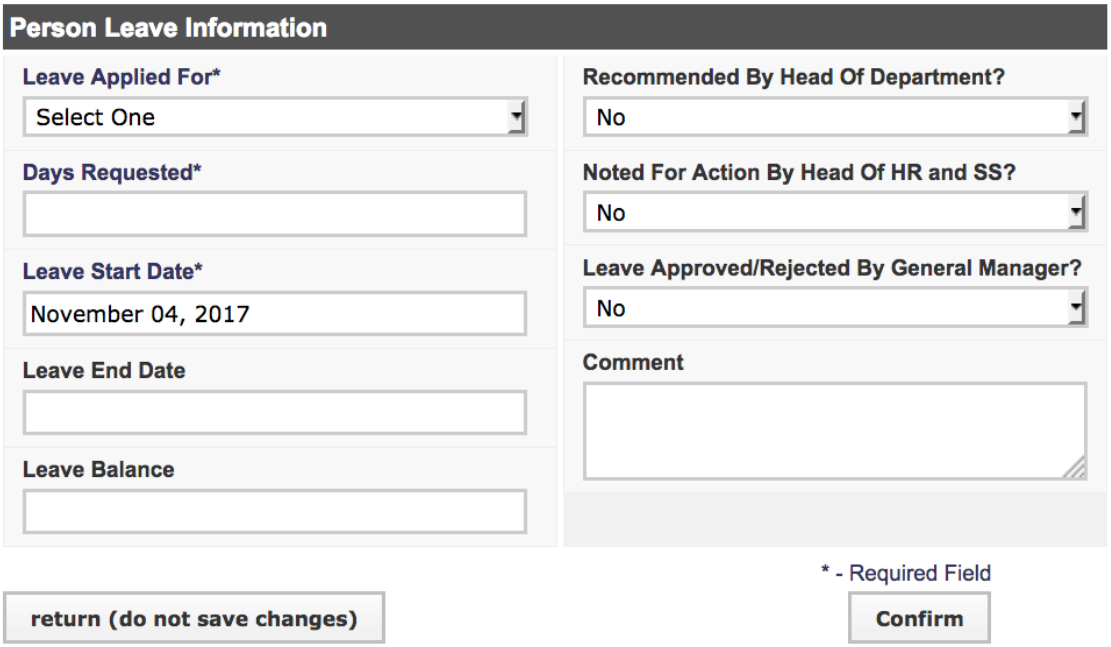


Figure 15: Screen showing Self-service module for Leave application and management

5.2.5 Leave Management

Leave management is was one of the reports urgently needed in the HR department and to track employee leave days and enable leave scheduling and management. Through the self-service module, employees are able to apply online and the HR managers to approve their leave days immediately and online. The approvals are then saved on the employee record.

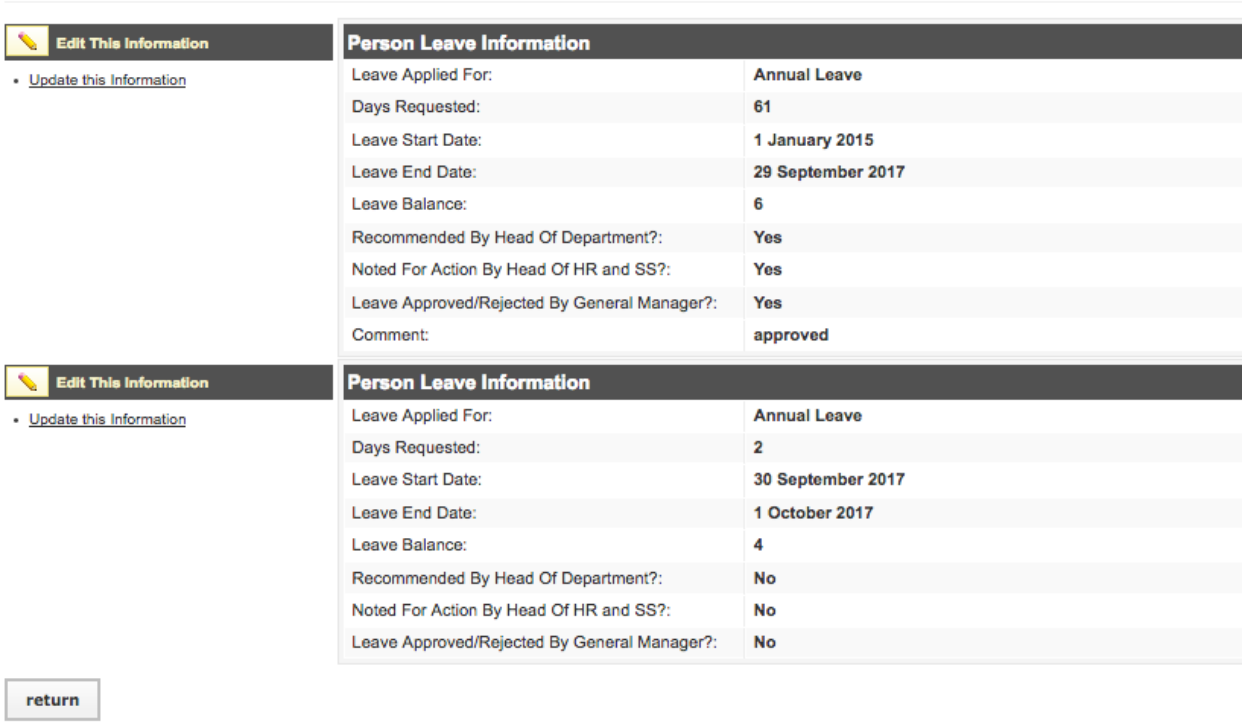


Figure 16: Screen showing Leave management tracking in the HRMS

5.2.6 The Leave module PHP Code

```
$old_leaveRequested = I2CE_FormStorage::listFields('personleave', array('days_requested') ,$form->getParent() ,$where,'-start_date',1);

        $id = key($old_leaveRequested);

        $old_leaveRequested = $old_leaveRequested[$id];

        $old_remaining_days = I2CE_FormStorage::listFields('personleave', array('remaining_days') ,$form->getParent() ,$where, '-start_date',1);

        $days_id = key($old_remaining_days);

        $old_remaining_days = $old_remaining_days[$days_id];



          if( $form->remaining_days != $old_remaining_days['remaining_days']){

             I2CE::raiseError($form->remaining_days);

                I2CE::raiseError($old_leaveRequested['days_requested']);
```

```
                $days = $form->remaining_days + $old_leaveRequested['days_requested'];

                $form->remaining_days = $days - $form->days_requested;
            }else{

        //$days = $days + $old_leaveRequested['days_requested'];

    }

}
```

The code above calculates the number of leave days remaining for a given staff depending on how many days they have accumulated and how many days were taken before.

5.2.7 Reporting

Reporting involves accessing the different reports created in the system as per the interest of the users. Several reports can be created and customized eliminate data redundancy, enable centralized and uniform view of available employee data for HR reporting and planning. This functionality was very helpful in improving the overall quality of data in the HR department, better representation. Since, this process had been automated, data for completeness, validity and integrity were enhance. It also quickened process of detecting and correcting errors in a short period of time. It therefore allowed data Relevancy, completeness, consistent, timely, accurate, secure, transparency and information-driven decision making. Some of the reports include Staff List, position list, Retention Report, Salary Report,

Retirement Planning, Age Distribution, Disciplinary Action, Trainings and Mentorship etc.

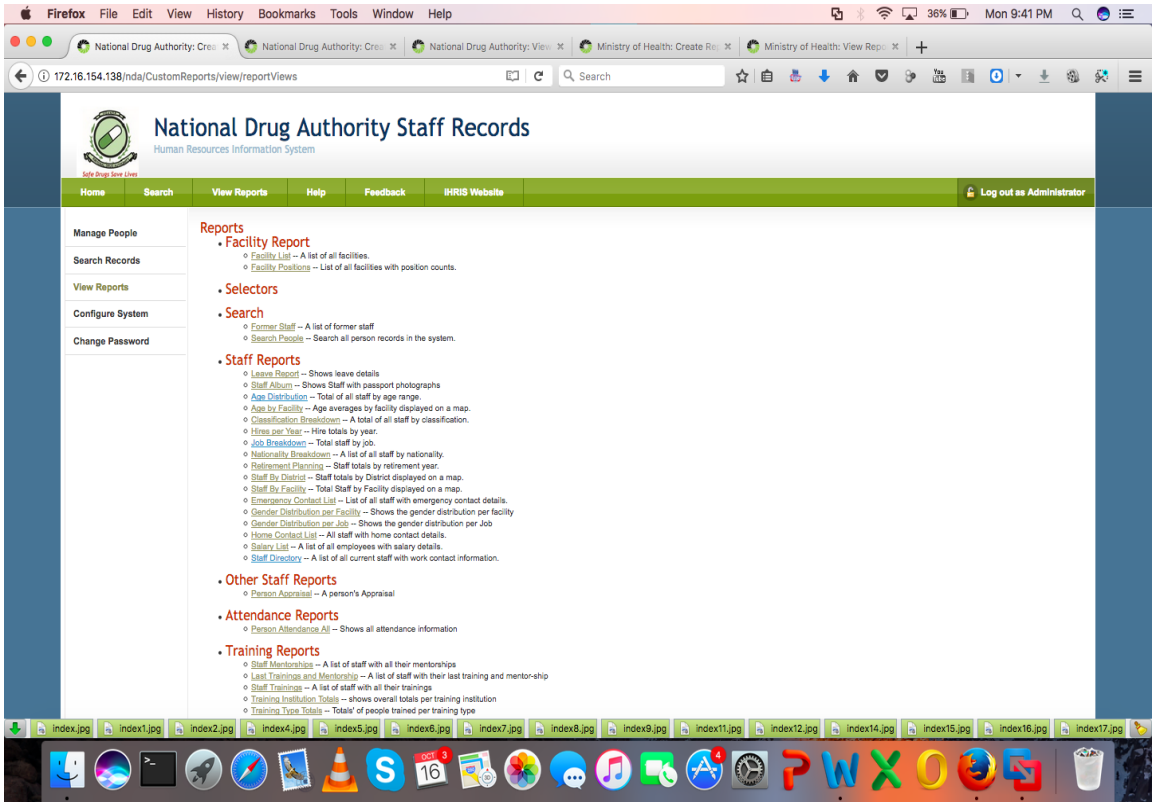


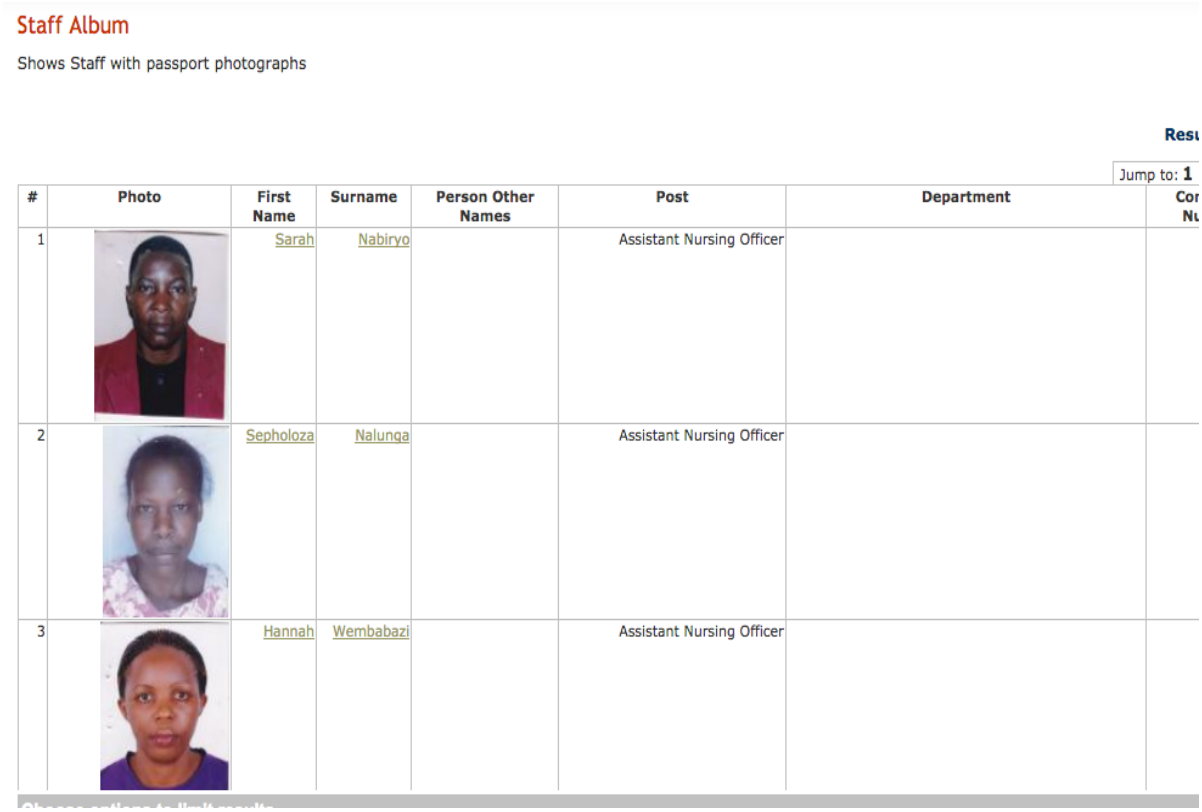
Figure 17: Sample of Reports available in HRMS

Position	Salary Scale	Establishment	Filled Positions	Vacancy/Excess	Surname	Firstname	Othername	Gender	Birth Date	Open File No.	IPPS No	National ID Number
Enrolled Nurse	U7U	1	1	0	Obwogi	Patrick		Male	29 November 1986		853085	CM86022101JMCL
Health Assistant	U7U	1	1	0	Awany	Jimmy		Male	29 January 1980	LG/057/0011		CM8005710145FD
Nursing Assistant	U8U	2	1	1	Okada	Francis		Male	28 July 1968		735896	CM68057101NTPL
Porter	U8L	2	1	1	Odoch	Tonny		Male	15 June 1975	LG/057/0060	735917	CM750571012EOH
Enrolled Nurse	U7U	1	1	0	Okwir	James	Bifra	Male	30 December 1967			CM67088102W6kk
Health Assistant	U7U	1	1	0	Ochom	Sam		Male	9 November 1982	LG/057/0130		
Nursing Assistant	U8U	2	2	0	Achola	Hellen	Rose	Female	16 December 1962	LG/057/0110	735884	
Nursing Assistant	U8U	2	2	0	Ayuku	Yuventino		Male	4 June 1962	LG/005/129	837121	
Assistant District Health	U1E(SC)	1	1	0	Ogwal	Alex	Gwom	Male	27 April 1968	LG/057/0148	820707	

Sorting by: Facility (Increasing),Salary Scale (Increasing),Position (Increasing),Surname (Increasing),Firstname (Increasing)

Figure 18: Report showing staff List

The Staff list is a very useful report in the day-to-day management HR records. It gives a holistic view of the number of employee currently deployed in the organization. It is used to quickly analyze the number of employees under each cadre or specialty, where they are posted and any quick description about the employee such as their file number, identification number, and position as well as salary details.



Staff Album

Shows Staff with passport photographs

Jump to: 1

#	Photo	First Name	Surname	Person Other Names	Post	Department	Cor Nu
1		Sarah	Nabiryo		Assistant Nursing Officer		
2		Sepholoza	Nalunga		Assistant Nursing Officer		
3		Hannah	Wembabazi		Assistant Nursing Officer		

Figure 19: Report showing the staff Album

The staff album is derived from the staff list to give a pictorial description of the employee. It is very useful when identifying employees with similar names. The staff album will also have a some of the employee details such as file number, identification number position and department. Further, the staff album is also separated from the actual staff list because the NDA staff list is a standardized list developed by the Ministry of Public Service to guide the format of staff lists in government institutions.

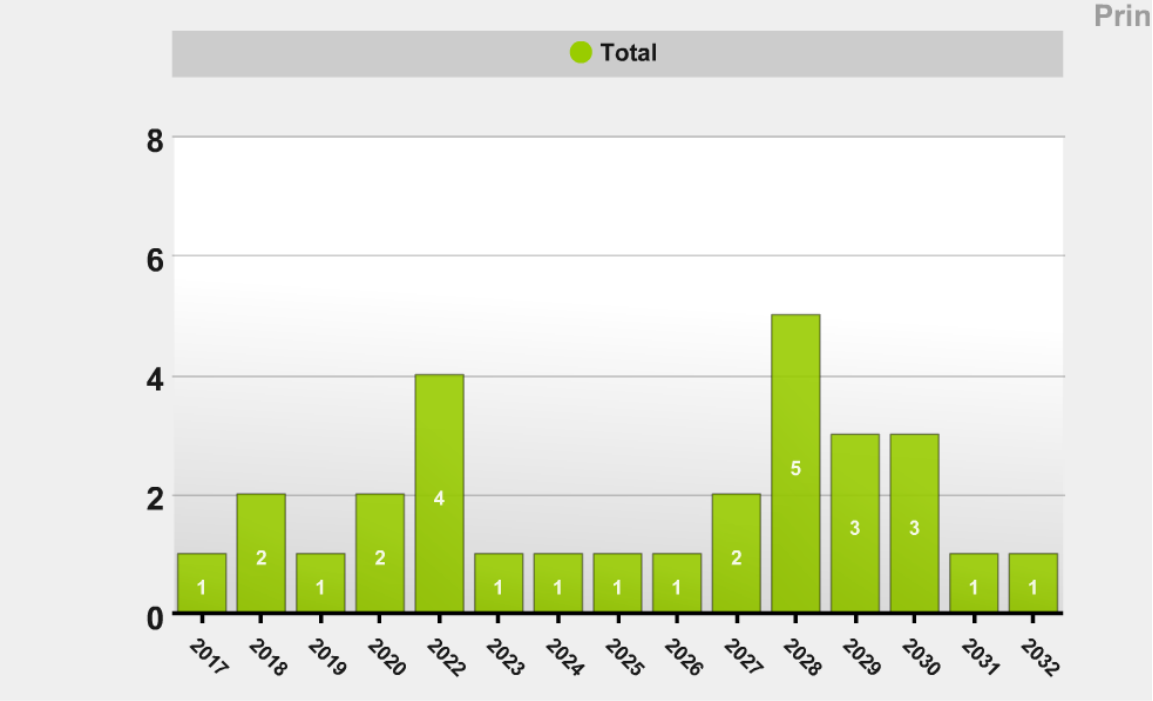


Figure 20: Graph showing Retirement planning report for the next 15 years

The retirement planning reports help the HR department to know how many employees are due to retire each year and adequately plan for recruitment, retirement benefits and other needs. For instance graph above shows that in 2017 one staff will be retiring, 2 employees will be retiring next year. The HR managers are able to inform the staff yet to retire up to two or three years ahead their retirement due date so that they can prepare.

5.2.8 Data analysis functions in HRIS

Data analysis addresses the process of translating data into information that can be utilized for a specific purpose. It involved developing various possible appropriate data analysis elements like Graphs, maps, cross tabulation and tables that reflect the level of detail of the data captured. E.g. an age distribution report spiking to the right may result into immediate action to plan for adequate recruitment funds for

the staff that may retire soon and may have an impact on long-range planning. The analysis reports therefore show comparisons, relationships, and linkages that are appropriate for timely data analysis in the HR department to avoid adverse impacts.

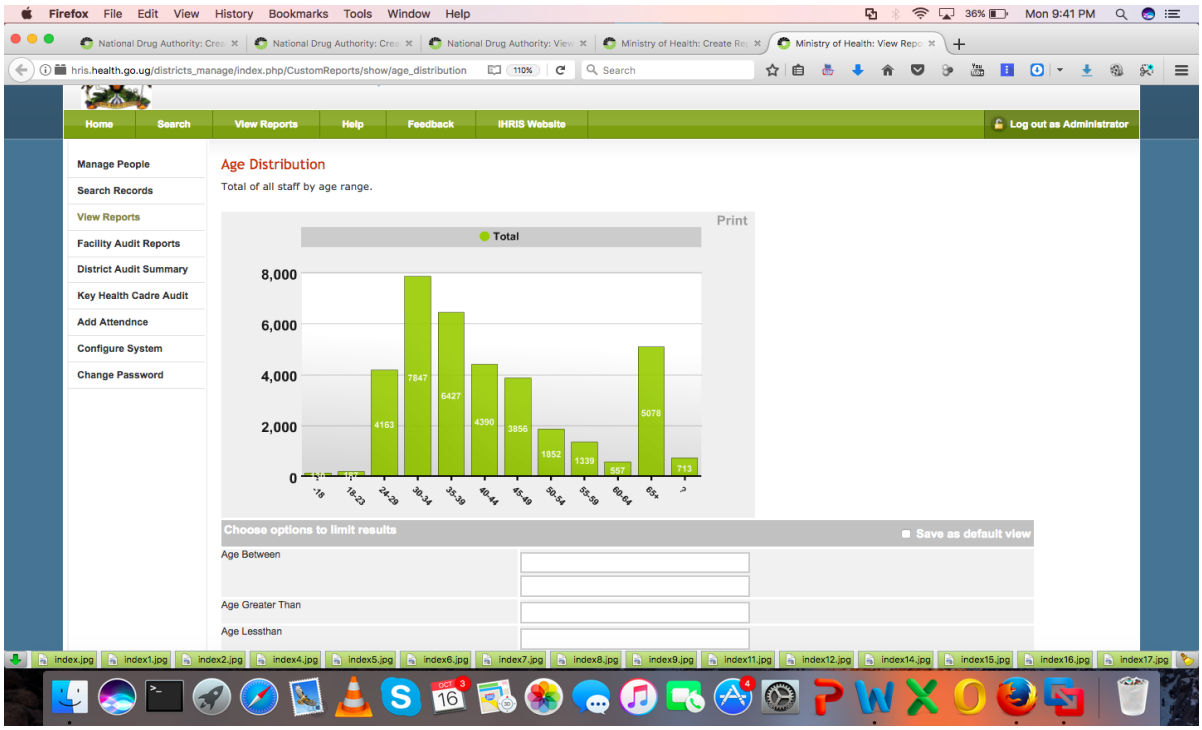


Figure 21: Graph showing employee age distribution at NDA

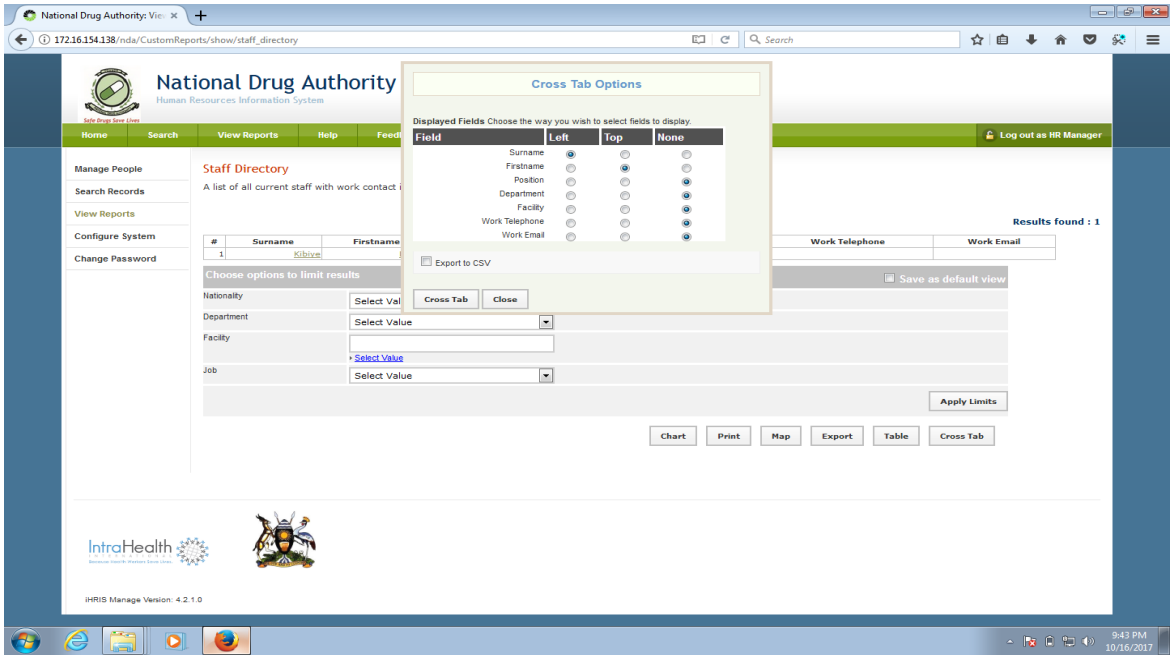


Figure 22: Screen showing cross tabulation function in HRMS

5.2.9 Changing Password

According to (Killmeyer, 2006), Users who do not periodically change passwords risk unauthorized persons gaining access to the organization systems because passwords tend to lose their integrity (e.g., become discovered or guessed) over time. The change password function was added to each role to allow frequent password change as a security check for the system. Other security measures included audit trails that could be monitored by the administrator.

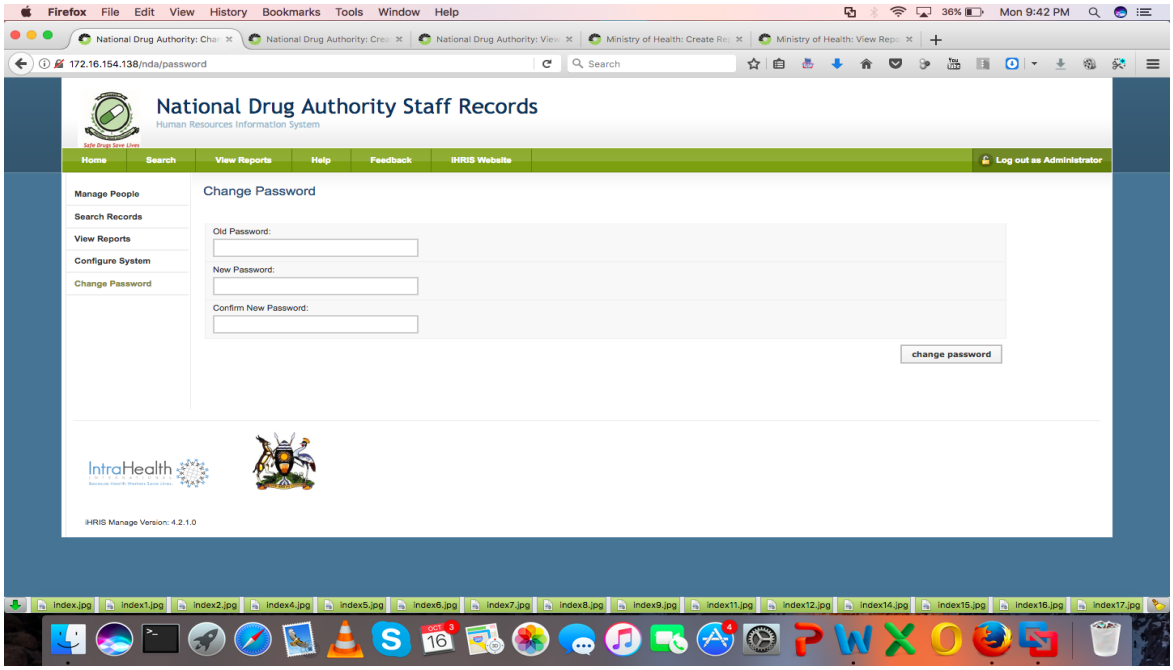


Figure 23: Change Password function available in HRMS

5.2.10 Data Upload

The users observed that initial data capture would be tiresome and thus requested for a method to upload more records at a time. A data upload function and template were developed to allow one to enter more than one user into the system. To ensure the consistency and reduce possibilities of duplication of the datasets, the data template had standardized data formats and lists of relevant data to be capture in the

system

Surname	Firstnames	Othernames	Gender	Date of Birt	Marital Status	Position	Facility	Residence Distri	Home Distric	FileNumber	Er
OBOKE	ROBERT		Male	29-Mar-72		Accountant	NDA MAIN	KAMPALA	KAMPALA	CR/ABM/0016/OR	
OWILLI	JAMES	OBONYO	Male			Accounts Assistant	NDA MAIN	KAMPALA	KAMPALA	CR/ABM/0088/OJO	
ACHENG	DOREEN		Female			Accounts Assistant	NDA MAIN	KAMPALA	KAMPALA	CR/ABM/0094/AD	
AKECH	BEATRICE					Accounts Assistant	NDA MAIN	KAMPALA	KAMPALA	CR/ABM/0106/AB	
NAKIGUDDE	FLAVIA			8-Mar-77		Accounts Assistant	NDA MAIN	KAMPALA	KAMPALA	CR/ABM/0025/NF	
AKELLO	LILLY					Accounts Assistant	NDA MAIN	KAMPALA	KAMPALA	CR/ABM/0026/AL	
OCHEN	CLEMENT					Accounts Assistant	NDA MAIN	KAMPALA	KAMPALA	CR/ABM/0027/OC	
ACHENG	HOPESTER	SALLY				Accounts Assistant	NDA MAIN	KAMPALA	KAMPALA	CR/ATC/0122/AHS	
OKUDA	ROBERT	KENEDY		23-Sep-73		Agriculture Officer	NDA MAIN	KAMPALA	KAMPALA	CR/ABM/0998ORK	
OJOK	ANJELLO			11-May-55		Assistant Agricultural Officer	NDA MAIN	ABIM	ABIM	CR/ABM/0038/OA	

Figure 24: Data upload Template

5.3 The Evaluation of Successful Design of HRMS

The study conducted a formative evaluation with the aim of answering the research objectives and to understand user perceptions on the usefulness, ease of use and satisfaction with the system (Boehner et al. 2007). The paper prototypes were evaluated for their effectiveness in informing the design process. Then the system designed was evaluated for performance, usability, usefulness and user satisfaction. Feedback was obtained through these evaluations, which was used to improve and refine the features of the system under development. In order to achieve this, the participants all took on the role of users. The participants were briefed about the refined prototypes and the features in the system, their objectives for the system and the requirements that were initially obtained in the design sessions. The evaluation then used scenarios to attempt tasks in the system e.g. " *Using the newly developed HRMS, find the total number of female employees that work in the medicines store and are between the age of 30 and 45*". Such scenarios were given to the team to taste system usefulness and usability. The study also employed a wizard of Oz as a controlled testing tool where the participants were observed as they used the system.

The improvements were made from one design interaction to the next, identifying issues that are expected to remain even when the system is eventually launched.

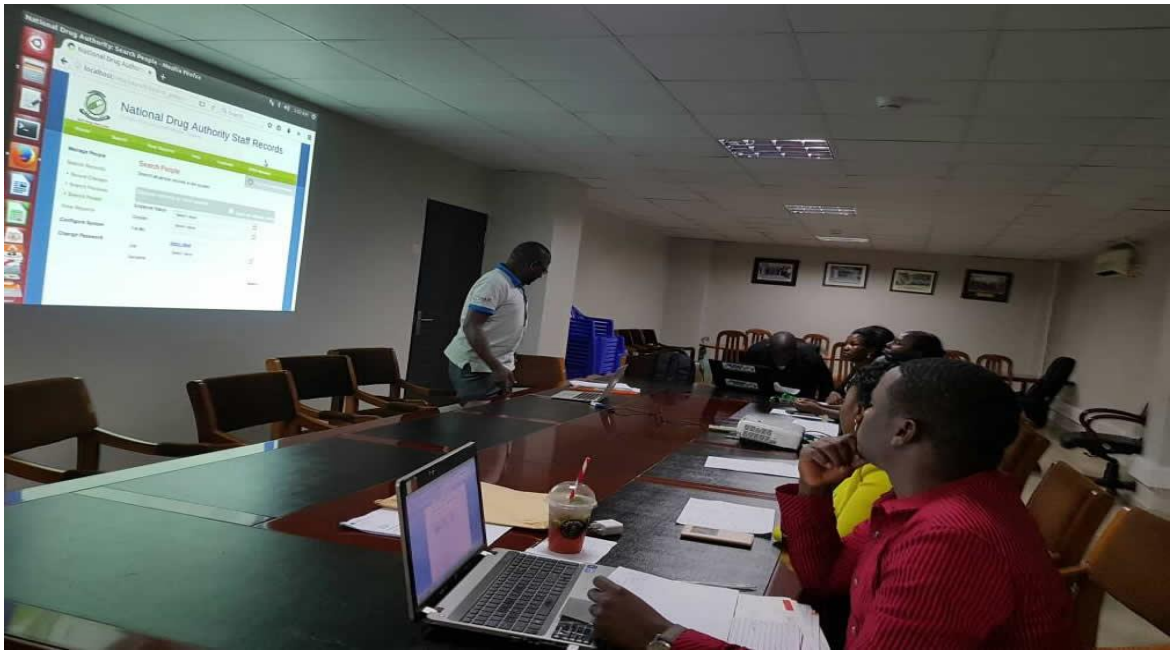


Figure 25: Participants during an evaluation session

In order to obtain information on the users perception on the usefulness and ease of use of the implemented HRMS, the study makes use of the measurement items in the different literature (Davis 1989, Davis et al. 1989; Taylor and Todd, 1995) where the scales were modified to fit the context. The participants were able to give their consent based on a Likert scale guided by Strongly Disagree, Disagree, Agree, and Strongly Agree with the system developed.

5.3.1 Perceived usefulness

To understand the quality of system functionality, the study first inquired about the extent to which the system enabled the participants to complete their tasks and the users willingness to use the system for these tasks.

Table 2: User perception of HRMS Usefulness

Perceived Usefulness	Strongly Agree	Agree	Disagree	Strongly Disagree
1. I find the HRMS useful in my day-to-day work	86%		14%	
2. The HRMS does sufficiently capture all the data I need for my work				100%
3. The Modules in the HRMS are Suitable for the HR department	100%			
4. HRMS enables me to accomplish tasks more quickly		86%	14%	
5. The HRMS has helped organize HR data and be more productive	86%	14%		

The findings indicate that 86% of the respondents strongly agreed the HRMS is useful to their day-to-day work, while 14% of respondent disagreed with the usefulness of the HRMS in their work. Users who perceive the system as useful are expected to use the system to a greater extent, Gupta (2004). It was also assumed the 14% of the respondents may have been the ICT officer who does not work in the HR department. In regards to the systems insufficiency to capture all the data they need for their work, 100% of the respondents strongly disagreed. Hence it was translated that the system was able to capture all the data they needed to use in their work. 100% of the respondents strongly agreed that the system was suitable for their work place for the different roles 86% of respondents agreed that the human resource management information system enables them perform their tasks quickly, 14% of the respondents disagreed. 86% of respondents strongly agreed that the HRMS helps to organize HR data and they are more productive, 14% respondent also agreed that the system improved data organization and made them efficient. Majority of the respondents' agree that the HRMS developed is useful. This principle refers to the degree to which one believes that using human resource management information

system would enhance his or her performance within an organizational setting (Davis, 1989). The findings indicate that, most of the respondents had confidence in the usefulness of the system,

5.3.2 Perceived ease of use

The study also studied system usability by investigating its ease of use in the HR department to achieve their routine tasks.

Table 3: User Perception of HRMS Ease of Use

Perceived Ease of use	Strongly Agree	Agree	Disagree	Strongly Disagree
1. Learning to use the HRMS is not easy for me.				100%
2. I can not easily navigate through the HRMS		14%	86%	
3. The HRMS is enjoyable to use	100%			
4. I am comfortable using the HRMS	57%	29%	14%	

The findings indicate that 100% of the respondents strongly disagreed that the system was not easy to use, which was interpreted that it was an easy system to use for all the respondents. 86% of respondents disagreed that they could not easily navigate the HRMS, while 14% of the respondents agreed that they could not easily navigate through the system. From the findings, we can be interpreted that while most of the respondents found it easy to navigate, one of the respondents struggled to use the system and needed more training sessions to adjust. 100% of the respondents strongly agreed that the system was enjoyable to use. In regards to their confidence to independently use the system, 57% of the respondents strongly agreed that they were comfortable using the system, 29% of respondents agreed that they were comfortable using the system, which implied they needed more time to adjust to the system. 14% of the respondents disagreed that they were not comfortable in using the HRMS. Perceived ease of use is the

degree to which a person believes that using a human resource information system will be free a mental effort (Davis, 1989). From the findings majority of the respondents felt the system was easy to use with confidence levels of 'strongly agree' while a considerable portion consisting respondents felt the system was not easy to use.

5.3.3 User Satisfaction with HRMS

Table 4: User Satisfaction with the new HRMS

User Satisfaction	Strongly Agree	Agree	Disagree	Strongly Disagree
1.I can get all the reports I need in the HRMS		86%	14%	
2. I like the over all presentation of the data in the HRMS	100%			
3. I am satisfied with the way I work at the moment (without HRMS)				100%
4. Anyone can use HRMS even if they are not trained		57%	43%	

In regard to user satisfaction with the system the findings indicate 86% of the respondents agreed that the HRMS enabled them to print out all the reports they need for the HRMS, while 14% of the respondents disagreed. 100% of the respondents strongly agreed that they are satisfied with the overall presentation of the data in the HRMS. 100% of the respondents strongly disagreed with their satisfaction with the way they were working before the introduction of the HRMS. 57% of the respondents agreed that anyone can use the system if they were not trained, while 43% of the respondents disagreed. The totality of the findings indicates that the majority of the respondents were satisfied with the HRMS in

regards to increased efficiency within the HR department and work processes. User satisfaction is often used as a measure of information system effectiveness. An effective system is defined as one that adds value to the organization and must have a positive influence on the user behavior, which translates into improved productivity and decision-making, (Gatian, 1994).

Comparisons between the old HR System and the new HRMS

	Paper form HR System	**Automated HRMS**
Human Resource Planning	Was done manually depending on the gaps identified	Improved HR planning using accurate data to analyse and project HR trends
Recruitment and Selection	Was done manually depending on the gaps identified	Improved applicant management since gaps can be clearly identified
Training and Development:	Not conducted	Automated training module which captures trainings completed by each staff.
Employee File management	In paper form and only accessible from the Registry at the main NDA office	Improved access to electronic employee files. Can be accessed anytime when needed
Salaries and Benefits Management	Salary lists Manually compiled and submitted every month	Improved management because of access to all employee data.
Performance Management: (Efficiency and reward)	Unspecified objectives, inaccurate assessments, and highly busy season for HR office	Improved efficiency and reward management because of automated performance objective and outputs.
Employee Relations: (Disciplinary-action, employee safety, conflict Management, Compensation)	Was handled manually by the HR managers.	Automated Disciplinary cases capture and tracking.

4.6 Conclusion

This chapter described the results obtained from the design sessions of the new HRMS at NDA. It also evaluated the processes of the system that was designed. It revealed that the HRMS enhanced information quality and found that HR staff had a positive perception on HRMS quality. The study also revealed that the managers were satisfied with the system and perceived the HRMS as easy to use and useful.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.0: Introduction

This chapter presents the conclusions and recommendations, which are based on the findings of the study in line with the research objectives. It briefly revisits the research objectives giving a summary of what was covered under each objective. Conclusions are then made giving a summary of the most significant issues and perceived implications identified in the study. Recommendations highlighted here with aim at improving information systems design and implementation in organizations.

6.1 Revisiting the Research Objectives

The study was focused on the design of effective HR systems that are usable and can be easily implemented in the organization setting. Attention was drawn to the numerous HR systems that are currently implemented with the expectation of revolutionizing HR departments from recruitment, management, retention, rewards as well as storage of HR information. However, the reality is that this expectation has not been realized because of a design-reality gap of these systems. (Marler, (2010); Bissola & Imperatori (2014). To address this challenge, the study sought to employee paper prototyping as a participative design technique. The purpose was to study how this technique can improve the systems developed for the HR department, increase acceptance and address the usability challenges that impede these systems. In order to achieve this, the study was guided by the following objectives.

6.1.1. Research Objective 1:

To analyze the current HR system at the NDA and review literature related to the existing Human Resource Management Systems.

The study analyzed the HR system at the National Drugs Authority to understand the nature of HR processes and activities. The research conducted a thorough assessment and discovered that the HR department was struggling to manage the HR processes starting with recruitment, employee management, managing leave days and employee rewards among others. Numerous inconsistencies were identified in the available HR information, which were a resulting from use of paper work and employee files to manage employees. This process was very tiresome and prone to error. The study also reviewed existing literature on different Human Resource systems, their functionalities, current trends, strength and weaknesses. The reviewed literature illustrated a pervasive growth in the nature of HR systems with their capabilities ranging from stand-alone systems to web based systems. The studies also demonstrated that the Internet was transforming the HR systems with current trends of web based systems employing cloud storage services, online application services, such as e-recruitment, e-selection, e-payment, e-performance management and so on. Solutions such as Fast HRM were found to be turning web based HR systems into more innovative technologies. They transform core HR practices through fast information processing, swift employee communication and internal policy alignment (Bamel et al., 2014). Other benefits of using these HR systems were related to improved efficiency through informed planning and forecasting, cost effectiveness and sophistication of HR work process. HR departments were able to quickly generate HR information, improve transparency and to standardize HR processes.

A Review of the Human Resource Systems identified three categories, which was composed of the HRIS, HCM and HRMS. The HRIS systems are composed of components that manage people, policies and procedures. They center on management of HR work and employee details such as recruitment, benefits management, absence management, compensation, training, workflow, self-service and reporting. Their strengths are in enabling the management of core HR activities to inform decisions. However, they are still underutilized and have not yet realized the desired change in terms of ICT knowledge, experiences and innovativeness; productivity, employee engagement and retention.

Human Capital Management (HCM) are concerned with value adding employee management, strategic investments and operational decisions. Although they have an aspect of HRIS components, their approach is more focused on employees as a competitive advantage through employee engagement, talent management, learning and development. The strength of these systems is they approach employees as assets that add a collective value. If employees are managed as an asset, it is easy to determine the strategic flexibility of the organization, employee commitment, loyalty and ultimately competitive advantage. However, the challenge identified with HCM is the tendency to be less concerned with administrative tasks and HR service delivery, which may run short in alignment with organizational strategies and objectives.

The HRMS category is composed of components from HRIS and in other cases may include the capabilities of HCM. For instance HRMS = (HRIS + [payroll + Time and Labor management]) or HRMS = (HCM + [payroll + Time and Labor management]). From the above illustration, the study noted that HRMS are more focused on payroll as well as time and labor aspects. Their strength is versatility, because they are developed for large organizations that deal with vast HRM processes.

HRMS enable quick payroll management, generation of critical reports on the demographics profiles, as well as individual and team performance. They are allow the organization to dive into analysis, especially when planning and re-allocating resources. However, the challenge associated with HRMS is that HR managers tend to lose 'human touch' with the employees because of the large reliance on technology, which can affect employee engagement levels.

The study also reviewed some system implementation approaches such as Rogers' Diffusion of Innovation Theory and the Technology Acceptance Model. The Diffusion of Innovation theory was identifies two phases; initiation and implementation. Literature showed that the initiation phase involves agenda-setting and matching aspects. On the other hand, the Implementation phase deals with redefining/restructuring, clarifying and routinizing. Literature on the Technology Acceptance Model was also reviewed. TAM highlighted three major areas that influence system use: perceived usefulness, perceived ease of use and Behavioral Intention. After studying both implementation approaches, the study decided to use the Technology Acceptance Model because of its simplicity and its focus on the key activities required in transforming a project.

6.1.2 Research Objective 2:

To design an architecture for a paper prototyping technique that addresses HR challenges

The study approached system design from the paper prototyping perspective as a component of participative research method. The Participatory research approach emphasizes the need to involve users as an important part of an iterative approach to system design, which enables equal contribution and mutual learning (Roberston & Simonson, 2012). Core methods involve the use of workshops, ethnography and design sessions where users are encouraged to think creatively and develop with

unique ideas. Thus, paper prototyping was a choice design technique for the HRMS. Paper prototyping is widely used to design and validate technological applications through interactive design and quickly generating feedback from users. It is an important technique because of its focus on the interaction between the user and the actual system under development. It is simple, allows for quick designs and centers on design aspects that are usually ignored by other system design methods such as user feedback in early system design. The design process involved the use of hand-drawn sketches in a workshop setting, which was inexpensive, allowed for immediate design testing and evaluation. It also enabled usability testing and improved communication between the participants and facilitator/designer. The participative design method enabled the participants to create a system that captures their work processes as closely as possible. The system was also designed in such a way that it would address the challenges they were experiencing such as; inconsistent data, huge workload, a lot of paper work and many face-to-face employee interaction sessions. The paper prototypes were developed in an iterative process where they were frequently evaluated and refined until the final and agreed prototypes were selected.

6.1.3 Research Objective 3:

To develop a HRMS to enable administrators in HR department manage, track employees in an efficient and effective way

The HRMS was developed from the refined paper prototypes that helped in gathering system requirements. The study employed design science methodology to develop the HRMS. Design science emphasizes generation of new knowledge through design of innovative artifacts to solve specific challenges in organizations. The HRMS solution developed was relevant to the HR department because it was able address existing challenges. During system development, the changes and specific requests

regarding the core HR activities and processes were added in an iterative process were feedback was continuously obtained from the users. This helped in refining the components of the system. After the system was developed, it was installed in the HR department for one month before it was evaluated. The researcher was able to carry out an assessment to determine its usefulness, ease of use and user satisfaction with the HRMS.

6.1.4 Research Objective 4:

To investigate the usefulness of HRMS to the end users including employees and the HR department

Through a formative evaluation processes, the study was able to employ the elements of the Technology Acceptance Model to understand the users perception on the usefulness, ease of use and satisfaction with the system. Aspects evaluated included performance, usability, usefulness and user satisfaction. The evaluation also used scenarios and wizard of Oz testing tools to obtain feedback about the system. Feedback obtained through these evaluations, was used to identify new user needs such as training, as well as improve and refine some of the features in the system. Results from the evaluation showed that majority of the respondents' found the HRMS developed to be useful, easy to use with confidence levels of up to 86%. The totality of the findings indicated that the majority of the respondents were satisfied with the HRMS in regards to increased efficiency within the HR department and work processes. The findings also showed improved HR management and decision-making.

6.2. Conclusions

Within this study selected issues relevant to HRMS design were derived to hopefully stimulate future research regarding the design, development and implementation of HRMS. The study illustrated that paper prototyping technique, as an element of participatory research is critical for developing easy to use systems. Paper prototyping was used to evaluate the preliminary ideas for the type of interfaces the users wanted for the system. It was very useful in capturing the changing needs of the end users based on their feedback. The prototyping sessions provided insights for the user interface, system interactions, information architecture, content and overall flow of tasks as well as improved user experience. Involving the target users in the design process was very critical in increasing acceptance and use of the system. The users were eager and willing to engage in system design, which allowed them to visualize how the system will look, feel and appreciate the system designed according to their needs. As a result, usability issues were well handled during the initial design stages where all the user and system requirements were captured, hence improving functionality and congruence with actual work process. The design sessions helped the developers to better understand the different types of users, preferred content, task flows and ideal functionality. The HR department demonstrated enthusiasm to use the system especially when they found that it had been developed as initially designed by them. The HRMS developed showed faster work processes in completing HR tasks, improved HR decision making thus, transforming the HR department. This highlights the importance of participative system design approaches in improving implementation and ownership of systems in organisations. The study demonstrated that paper prototyping is effective when designing system features and functionality. It provides better understanding of how people use systems and how applications can evolve from a concept or idea to complete and usable systems

The study also found that the HRMS was very useful to the HR department because it had been customized to the work processes within the HR context. Taylor and Todd (1995) observe that an individual develops an attitude towards the HRMS based upon their evaluation of its perceived usefulness and ease of use. The employees considered the implementation of the HRMS useful and easy to use, the HRMS was perceived positively. According to Kossek et al. (1994) and Tansley et al. (2001) using a HRMS improves the support of information across several hierarchical levels and assists an organization's management in a wide variety of decisions (Zahid et al., 2007). The HRMS was able to save organization time, for example, when compiling lists for recruitment and payments, this was significantly faster. Notable was that staff only perceived the HRMS positively if they were comfortable in their skills and knowledge to use it easily. However, Lukaszewski et al., (2008) notes that these critical factors often do not exist to the desired degree. Thus, additional effort in the form of training is usually needed.

6.3 Recommendations and Suggestions for Further Research

The HR department at NDA experienced improved HR management and decision making after the design and installation of the HRMS. This study therefore recommends that organizations should adopt HRMS to improve HR management, information update and quality. The study also recommends that there is need for HR departments to invest in training to enhance adoption of HRMS.

The study confirmed that paper prototyping is a useful technique to designing and development of usable HRMS. The use of paper prototyping as a design technique still offers room for future research to find answers as to why system developers are reluctant to commit time and resources to engage the users in initial system design.

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APPENDIX 1: REQUEST TO CONDUCT RESEARCH AT NATIONAL DRUG

DENNIS KIBIYE
UGANDA MARTRYS UNIVERSITY
P.O BOX 5498
1st September 2017

HEAD OF HUMAN RESOURCE
NATIONAL DRUG AUTHORITY, UGANDA
Plot 19, Lumumba Avenue
P. O Box 23096 Kampala

REQUEST TO DESIGN AND IMPLEMENT A HUMAN RESOURSE INFROMATION SYSTEM AT NATIONAL DRUG AUTHORITY

Dear Sir or Madam:

My name is Dennis Kibiye, a student at Uganda Martyrs university pursuing a masters degree in information systems. As part of my final assessment for my research thesis, I wish to conduct a study involving "the role of paper prototyping in design and implementation of human resource information systems". This project will be conducted under the supervision of Dr Richard Ssembatya contacted on Tel: +256774475212 or email richssembatya@gmail.com

Prior to undertaking the study we hereby seek your agreement/consent to approach the following, a team of at least 4 staff from your organisation who interact with HR department to take part in the study.

I can assure you that I will make every effort to ensure the study does not disrupt the working environment in any way and any data collected will remain confidential.

Upon completion of the study, I undertake to provide the HR department with a bound copy of the full report. Your approval to conduct this study will be greatly appreciated. If you require any further information, please do not hesitate to contact me on +256773003113 or kibsden@gmail.com. Thank you for your time and consideration in this matter.

Yours sincerely,

Dennis Kibiye
Uganda Martyrs University

AUTHORITY

APPENDIX2: RESEARCH AUTHORIZATION LETTER

DRUG

NATIONAL AUTHORITY

Safe Drugs Save Lives

Our Ref: 420/NDA/ADMIN/10/2017 **3rd October 2017**

Mr. Dennis Kibiye,
Informatics Developer
Intrahealth International

AUTHORIZATION TO CONDUCT STUDY AT NATIONAL DRUG AUTHORITY

Dear Dennis,

As per your request, you have been authorised to conduct the study entitled *"the role of paper prototyping in design and implementation of Human Resource Information Systems"* at National Drug Authority Head Office.

The Organization acknowledges that it has reviewed the protocol which you presented for your research as well as the associated risks to the Organization and authorizes the study to proceed.

Yours sincerely,

Paddy Lutalo
Head Human Resource and Administration

HEAD OFFICE
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Facebook: Uganda National Drug authority
Twitter: @UNDAuthority

OUR MISSION
To ensure access to quality, safe and Efficacious human and veterinary medicines And other healthcare products through the Regulation and control of their production, importation, distribution and use.

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Western Nile Region, Arua – Tel: +256 372 260 085/7,
South western Region, Mbarara – Tel: +256 485 421 008,
South Eastern Region, Jinja – Tel/Fax: +256 434122 176,
Eastern Region, Tororo –Tel: +256 454 445 195,
Western Region, Hoima – Tel:/Fax +256 465 440 688,
Northern Region, Lira – Tel/Fax +256 473 420 652