DESIGN AND IMPLEMENTATION OF A MOBILE APPLICATION SYSTEM FOR DISSEMINATION OF NATIONAL IMMUNIZATION INFORMATION OF GITARAMA HEALTH CENTRE, RWANDA

A Thesis

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In Partial Fulfillment of the Requirements for the Degree of

Master of Information System

By:

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DECLARATION A

I MASENGESHO PONTIEN declare to the best of my knowledge that this this thesis is my original work and has never been submitted to any university or any other institution of learning.
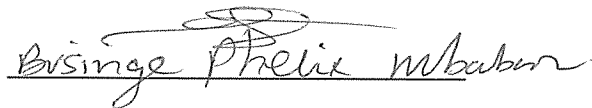
MASENGESHO   Pontien

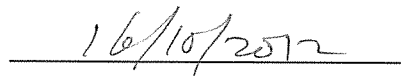Name and Signature of Candidate

_16/10/2012_

Date

DECLARATION B

The following thesis by MASENGESHO PONTIEN has been carried out under my supervision and is ready for submission to the College of Higher Degrees and Research, Kampala International University.

Businge Phelix Mbabazi

Name and Sign of Supervisor

16/10/2012

Date

APPROVAL SHEET

This thesis entitled "Design and Implementation of a Mobile Application System for Dissemination of National Immunization Information in Gitarama Health Centres,Rwanda", prepared and submitted by **MASENGESHO Pontien** in partial fulfillment of the requirements for the degree of a Master of Information system; has been examined and approved by the panel on oral examination with a grade of PASSED

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Name and Sig. of Chairman

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Name and Sig of Supervisor

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Date of Comprehensive Examination: _____

Grade: _____

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Name and Sig of Director, CHDR

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Name and Sig of DVC, CHD

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DEDICATION

This thesis is lovingly dedicated to my friends and family who have been my constant source of inspiration. They have given me the drive and discipline to tackle any task with enthusiasm and determination. Without their love and support this project would not have been made possible.

Both of you have been my best cheerleaders.

ACKNOWLEDGEMENTS

ACRONYMS AND ABBREVIATIONS

API:	Application Programming Language
ASP:	Active Server Pages
CGI:	The Common Gateway Interface
CSS:	Cascading Style Sheets
CHDR	College of Higher Degrees and Research
DBMS:	Data Base Management System
HTML:	HyperTextMarkup Language
ICT:	Information and Communications Technology
IS:	Information System
IIS:	Immunization Information System
IT:	Information Technology
LAN:	Local Area Network
MASDNII:	Mobile Application for Dissemination of National Immunization Information
PC:	Personal Computer
PHP:	Hypertext Preprocessor
RDBMS:	Relational Database Management System
SCD:	System Context Diagram
SMS:	Short message service
SPSS	Statistical Package for Social Science
SQL:	Structured Query Language
TAM:	Technology Acceptance Model
URL:	Uniform Resource Locator
WAN:	Wide Area Network
WWW:	World Wide Web

ABSTRACT

This study is a result of an academic research entitled "Design and Implementation of a Mobile Application System for Dissemination of National Immunization Information in Gitarama Health centres, Rwanda". The purpose of this study was to test the null hypothesis of no significant difference between the existing and the proposed system for dissemination of national immunization information in Gitarama health centre, Rwanda; to generate new information from the existing data and to validate the concept of Technology Acceptance Model (TAM).The objectives of this study are i) to identify the profile of the respondents in terms of gender, age, education level and category. ii) To determine the level of performance and efficiency of the present dissemination of national immunization information in Gitarama Health Centre, Rwanda iii) To establish the level of performance of proposed mobile application system for dissemination of national immunization information.iv) To determinate if there is a significant difference on the level of performance and efficiency between the existing dissemination of national immunization information and the proposed mobile application system for dissemination of national immunization information. The study population comprised of 51 peoples with 18 staff members and 33 parents of children from Gitarama health centres. Questionnaire was used in collecting both primary and secondary data. SPSS was used to analyze all data. The data were processed using frequency distribution, mean, and Pearson's linear correlation coefficient. The findings of the study revealed that the null hypothesis has been rejected and affirmed that there is a difference between the existing systems of disseminate of national immunization information and the proposed mobile application system for dissemination of national immunization information in Gitarama Health centre. It is recommended that the ministry of health has to implement this system to test the benefit of it within health centres.

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CHAPTER ONE

THE PROBLEM AND ITS SCOPE

Background of the Study

In this age of globalization, Modern information technology (IT) in Health sector is understood to be the result of a convergence between modern health services and communication technologies. The importance of IT is the core of an 'Information System' which consists of a series of interactions between people, data, hardware and software, organizations and their social environment. Communication and information technologies altered both the way data is transmitted and the way organizations function. Mobile communications have become a part of every day's life. One wonders how we ever managed without them and he offer many facilities to its users such as make voice call, send text message using SMS (Short Message Service) from almost anywhere and at any time.

According to Grace (2001) the availability, portability, and mobility of Mobile device, can help in different services that any one needed for day to day. In addition to send, receive or share information between mobile device, the mobile device can be used in advanced technology like getting or receiving information from an information server and getting response directly to the Mobile device.This technology increases the quality of services offered to customers to access information easily and quickly for anywhere at any time and have the potential to impact almost every aspect of the health sector and are delivering better and more efficient healthcare services especially in children Immunization services.

Rwanda Health centres are responsible of children immunization. Two health centre can cover around one sectors in the same district. All children under one year old have to be fully immunized and receive a complete series of each vaccine according to the ministry of health's calendar. The following are the recommended vaccines for children: 1st visit (birth): BCG + Polio0;2nd visit (one month and half): Penta1 + Polio1 + Pneumo;3rd visit (two months and half): Penta2 + Polio2 + Pneumo;4th visit (three month and half):Penta3 + Polio3 + Pneumo,5th visit (six month): Vitamin A;6th visit (nine month): Measles + Supanet;7th visit (one year + each six month until five years): Vitamin A + Vermox.For the first visit, a child will be registered in his (her) health centre, receive vaccines recommended for the first visit and his (her) weight will be recorded. Then the parent of the child or a responsible person will have an appointment for the next visit.

However, Rwandan hospitals, Health centres are still facing a lot of problems such as using manual work in their daily activities because of our country is still far behind in the process of computerizing services that is mostly required by a big number of people, due either to the poor computer equipment or lack of some applications for making decision.

Mobile application for dissemination of national Immunization Information is computerized information system that collects vaccination records, generate reports from immunization data and help ensure correct and timely immunizations, especially for children by using mobile phone.

Statement of the Problem

Despite the efforts of the Ministry of Health to protect all children against killer diseases in providing the most important vaccines for children, there are still many problems in the health centres such as:

Poor monitoring of children who began to take vaccines; the management of vaccination schedule is challenging; a significant number of children who drop out of vaccines for lack of monitoring; parents of the children waste a lot of time in queues waiting for vaccines.

Those problems harm the quality of immunization service and it is therefore intending that, this study shall design and Implement a mobile Application that will improve the existing services immunization and resolve the above problems.

Purpose of the Study

The following are the reason why this study is proposed :(1) to test the hypothesis of no significant relationship the existing dissemination of national immunization information and the proposed mobile application system for dissemination of national immunization information. (2) To validate existing information related to the theory to which the study is based ;(3)to generate new information based on the findings of the study;(4) to bridge the gaps identified in the previous studies.

Objectives of the Project.

To design and implement a mobile application system for dissemination of national immunization information in Gitarama health centre,Rwanda

Specific objectives

i. To identify the profile of the respondents in terms of gender, age, education level, category.

ii. To determine the level of performance and efficiency of the present dissemination of national immunization information in Gitarama Health Centre, Rwanda

iii. To establish the level of performance and efficiency of proposed mobile application system for dissemination of national immunization information.

iv. To determinate if there is a significant difference on the level of performance and efficiency between the existing dissemination of national immunization information and the proposed mobile application system for dissemination of national immunization information.

Research Questions

i. What is the profile of the respondents in terms of gender, age, education level and category?

ii. What is the level of performance and efficiency of the present dissemination of national immunization information?

iii. What is the level of performance and efficiency of proposed mobile application system for dissemination of national immunization information?

iv. Is there any significant difference on the level of performance and efficiency between the existing dissemination of national immunization information and the proposed mobile application system for dissemination of national immunization information?

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Null Hypothesis

There are no significant differences between the existing dissemination of national immunization information and the proposed mobile application system for dissemination of national immunization information.

Scope

Geographical Scope

The study was conducted at Gitarama Health Centre located in Muhanga District, southern province in Rwanda and provides information about the current system of processing Immunization information.

Content scope

This study intends to design and Implement a system which is enabling the parents of children to access the Immunization information on mobile phone by using the SMS.

Theoretical Scope

The theoretical scope for the study was Technology Acceptance Model (TAM) which is an information system theory that models how users come to accept and use a technology. Additionally, the model suggests that when users are presented with a new technology, numerous factors influence their decision on how and when they will use it. These are Perceived usefulness (PU) which was defined by Davis to be the degree to which a person believes that using a particular system would enhance their relevant performance and Perceived Ease-of-use (PEOU) which Davis also defined as the degree to which a person believes that using a particular system would be free from effort .(Davis ,1986)

Time scope

This study was conducted within a period of seven months (April. 2012 to Oct. 2012).

Significance of the Study

For Government, this study is of great priority to the government as a whole given the fact that effective mobile application systems are very important. The findings are therefore beneficial to health centres in Rwanda In order to improve on the quality of information technology used in the institution.

The researcher acquire more skills while designing mobile application Systems practice and compares what we have thought in class and the practices done in institutions, The research is one of the requirements for attaining the Masters degree in information systems since its a prerequisite for the award.

The future researchers, the final work serves as tool of reference to the future research and advanced studies and the community by taking into account findings, results and recommendations that contribute to the thinking of the community

Operational Definitions of Key Terms

Design is the act of drawing something which will be later built.

System is a group of things worked together for common goal or even we can say process of things that happen together.

System Implementation is the act of creating computer programs.

Mobile Application is the application where user sends SMS to retrieve information on demand is defined as Mobile Originated or Pull Application.

Dissemination is the act of spreading or giving out something, especially news, information, ideas to a lot of people.

Immunization information system is confidential, population-based, computerized information system that attempt to collect vaccination data about all children within a geographic area. The Immunization information system simplifies immunization record keeping, provides quicker access to immunization records, and helps you keep track of a patient's immunization .

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Concepts, Opinions, Ideas from Authors/ Experts

Automated information system

Javed, (2008) defines an automated information system as simply a system by which information is processed for collection and distribution through a series of automated processes. The system often requires very little human interaction other than setup and maintenance. The automated information system is often used to access information and send it out to individuals. Those using automated information systems include governments, libraries, and private businesses.

The use of an automated information system, also known as an automated information management system, can be of great benefit both to government institutions and private companies. The process of quickly disseminating information through an automated system can save many hours of tedious labor, thus providing a cost savings for the entity needing to get that information distributed. This type of system can do everything from reminding people when a bill is due to warning about a potentially serious situation.

One example of an automated information system many in the United States are familiar with is the Amber Alert system. This system is a nationwide network that is automated to alert individuals of a possible abducted child. The system can be fine tuned so that information is sent out to a limited geographic area where the child is likely to be.

Within minutes, it can be displayed or broadcasted on traffic signs, television and radio, e-mails, phone calls, and even text messaged to cell phones. Using individuals to distribute this information would not only be very costly, but also waste valuable time, allowing a possible perpetrator to escape with the child.

Mobile phone system

Ellis, (2002) a mobile phone is a device that can make and receive telephone calls over a radio link whilst moving around a wide geographic area. It does so by connecting to a cellular network provided by a mobile phone operator, allowing access to the public telephone network. By contrast, a cordless telephone is used only within the short range of a single, private base station.

In addition to telephony, modern mobile phones also support a wide variety of other services such as text messaging, MMS, email, Internet access, short-range wireless communications (infrared, Bluetooth), business applications, gaming and photography. Mobile phones that offer these and more general computing capabilities are referred to as smartphones.

Use of mobile phones

Mobile phones are used for a variety of purposes, including keeping in touch with family members, conducting business, and having access to a telephone in the event of an emergency. Some people carry more than one cell phone for different purposes, such as for business and personal use.

Multiple SIM cards may also be used to take advantage of the benefits of different calling plans—a particular plan might provide cheaper local calls, long-distance calls, international calls, or roaming. The mobile phone has also been used in a variety of diverse contexts in society. (Andrew, 2010)

Mobile phones And Health Care

It is because of this that cell phones and mobile technology have been utilized to deliver basic human needs such as health care. For one, health care and the prompt delivery of its services is indicative of how and to what extent countries and nations are abreast with the latest developments toward the sustenance of human life. The use of simple cell phones is one way to make health care available and more reachable even in the most remote of villages (Shawn,2005)

Cell Phones and Various Ways to Improve Health Care

Shawn, (2005) the importance of cell phones in the pursuit and improvement of total health care has been widely acknowledged in recent years. Just some of the ways that cell phones have become essential in improving health care are the following:

i. Saves the lives of mothers during childbirth by helping to summon Medical care.

ii. Patients are easily checked and their conditions easily monitored Via cell phones with remote diagnostic devices.

iii. Record keeping becomes easier and hassle-free

iv. Improved diagnosis and consequent better treatment

v. Referral of patients to hospitals especially in emergency cases

These and a lot more are just some of the ways that best explain the necessity and growing demand of cell phone usage in the field of health care. In fact, more efforts have recently been undertaken to further enhance and seek worldwide support towards the indispensable advantage of mobile technology in health care. According to statistics almost 90% of the world's population has access to wireless phone signals therefore it is not surprising at all why cell phones and mobile technology has been tapped to its full advantage.

Usage of mobile phone in healthcare in Rwanda

In many countries, Mobile phones are used for a variety of purposes, including keeping in touch with family members, Mobile banking and payments, Tracking and privacy and health services.

However in Rwandan health centres, this mobile application is still under used that is why I suggest this new application in order to improve the quality of information technology used in Rwandan health centres.

Mobile application for dissemination of national Immunization Information

Mobile application system for dissemination of national Immunization Information is a system that uses mobile technology and is made of several components that function together and produce useful information. The main components of Mobile application for dissemination of national Immunization Information that based on mobile technology can be mobile devices and mobile networks.

Mobile device

A mobile device is a pocket-sized computing device, typically having a display screen with touch input or a miniature keyboard. There are many types of mobile devices such as Personal Digital Assistant, Smartphone, mobile phones and so on.

Mobile networks

Mobile networks are differentiated form each other by the word generation such as first generation, second generation etc. This is quite appropriate because there is a big generation gap between the technologies (Heeks, 2008).

Mobile network evolution

According to Jerome and Roland, (2000) Mobile network evolution has been categorized into generations as shown in the following figure (Figure 1). A brief overview on each generation is given below.

Future

4th Generation

3rd Generation

CSM+EDCE

CSM+GPRS

CSM+VAS

2nd Generation(Digital)

1st Generation(Analogue)
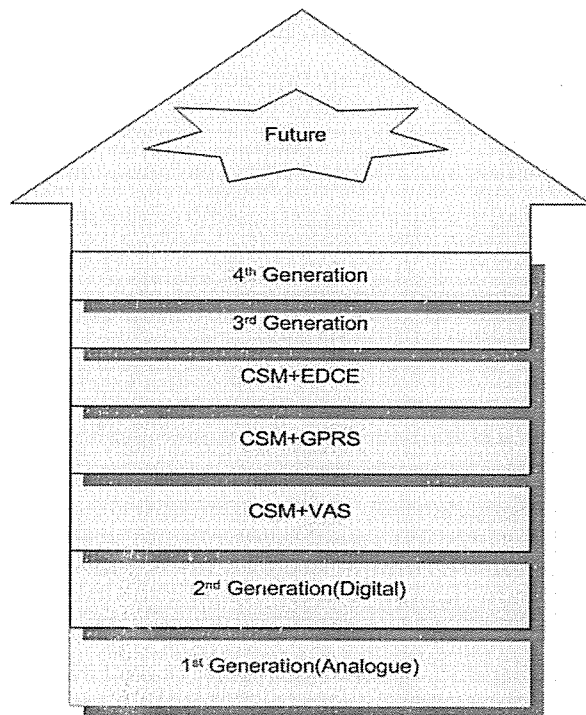
Figure 1:Evolution of mobile networks

Connectivity

According to Ronarnald,(2003) The way a Mobile phone can communicate with other devices is important as the Mobile phone might need to transfer data for example to and from a Personal Computer (PC), synchronize a Mobile phone with a PC, install application and so on. There are different technologies used to connect a Mobile Phone to a PC. The following are some of them:

Data cable

Even in this era of wireless communications, cables are still the most used method to connect computers and peripherals. Data cables are used to connect mobile phones with PC using serial port or USB port (William, 2003).

Bluetooth

According to Newton,(2007) Bluetooth is a telecommunications industry specification that describes how mobile phones, computers, and personal digital assistants (PDAs) can be easily interconnected using a short range wireless connection. Bluetooth technology lets us connect computers, mobile phones, and handheld devices to each other and to the Internet. Bluetooth technology eliminates the need for the cables that connect devices together.

Infrared

It is a type light energy or radiation Infrared (IR) Radiation is electromagnetic radiation whose wavelength is longer than that of visible light but shorter than that of terahertz radiation and microwaves. Infrared, related to mobile phones is a short beam of radiation used to send, receive and make connections between mobile phones (William, 1999)

According to James, (2009) compared with Bluetooth, Infrared will take a back seat in the mobile technology as it's very limited. The distance that is needed to connect to a device is too short compared to Bluetooth. If you think about, Bluetooth is a more convenient Infrared, as it offers a larger proximity and the connection is more stable

Use of Mobile Technology in Information Dissemination

Ellis, (2004) states that worldwide expansion of mobile networks has put mobile technology into the hands of millions of people who do not have access to desktop computers or reliable landline connections to the Internet. Innovative programs have been put in place to disseminate crucial health, social and political data over mobile devices and to use them to collect eyewitness reports and personal health information.

Networks and Mechanisms

Mobile phones can communicate across a variety of online platforms and networks, with high-end phones replicating the capabilities of desktop computers. But when you are designing a system for mass outreach, it is necessary to write to the lowest common denominator technology, to ensure that programs can reach those who use older, cheaper handsets and those whose carrier networks cannot handle recent advances in communications and bandwidth.

Many outreach programs, therefore, rely on Short Message Service (SMS), better known as text messaging, as SMS availability and compatibility is nearly ubiquitous across all cellular phones and networks. SMS messages are limited to 160 characters, but they can convey a great deal of information with the use of prearranged codes between the sponsor organization and the recipients.

SMS has the added advantage of real-time delivery of messages, which allows them to be used to support compliance procedures with health programs and other initiatives in which participants must be reached at specific times of the day, or with immediacy.

SMS, however, can be expensive to deliver, depending upon the terms of the carrier; the limitation of 160 characters makes this mechanism prohibitively expensive when larger amounts of information must be transmitted.

Organizations can migrate their outreach programs to cellular data platforms such as GPRS to accomplish this, and send information either to embed cellular web browsers, or to custom applications written for the phone. Care must be taken to ensure that such programs do not exclude would-be participants who cannot afford handsets capable of these features, or the network fees to connect them (Javed, 2008).

Dissemination and Data Collection

According to Ellis (2004) the primary advantage of mobile data dissemination is in using handheld technology to directly reach the intended recipients. Consider an announcement mechanism implemented by the World Food Program in support of distributing food and supplies to refugees. Traditional broadcast mechanisms, such as radio and television, alert not only the program participants, but also everyone else within range, which can hamper distribution of relief to only those parties who were eligible recipients. Bulk SMS messages, on the other hand, directed exactly the right number of people to each distribution center and ensured that the information was transmitted in an orderly manner.

SMS is also used to collect data from a population by allowing individuals to reach support services directly. In one public health initiative, young people could sign up for various health information messages and are given numbers to contact for direct one-on-one information about sexually transmitted diseases and other health issues. Such data can be correlated for public health purposes, without necessarily infringing upon the privacy of the users.

Architecture

There are some basic or architecture used. The following figure shows a typical architecture of Mobile application system for dissemination of national immunization information. Components that any Immunization information through SMS must have regardless of the underlying technology
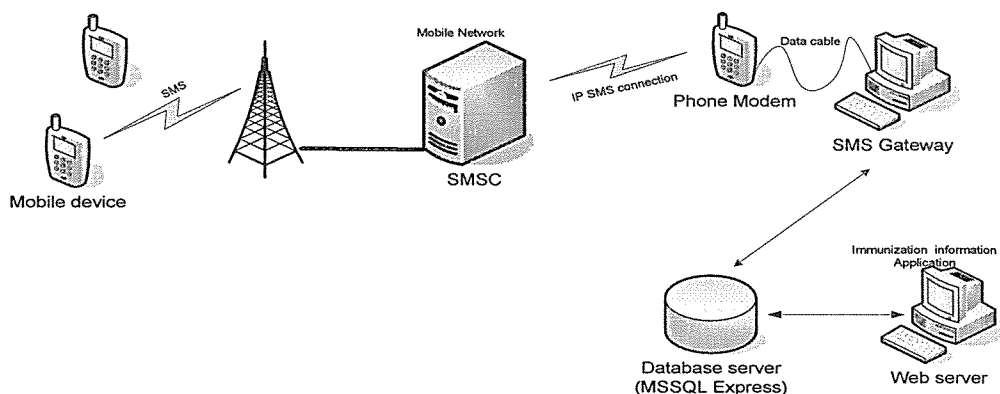
Figure 2: General overview on Mobile application system for dissemination of national immunization information
Source: Own drawing

Theoretical Perspectives

The theoretical scope for the study was Technology Acceptance Model (TAM) which is an information system theory that models how users come to accept and use a technology. Additionally, the model suggests that when users are presented with a new technology, numerous factors influence their decision on how and when they will use it. These are Perceived usefulness (PU) which was defined by Davis to be the degree to which a person believes that using a particular system would enhance their relevant performance and Perceived Ease-of-use (PEOU) which Davis also defined as the degree to which a person believes that using a particular system would be free from effort, Davis (1986). The figure shown below illustrates TAM
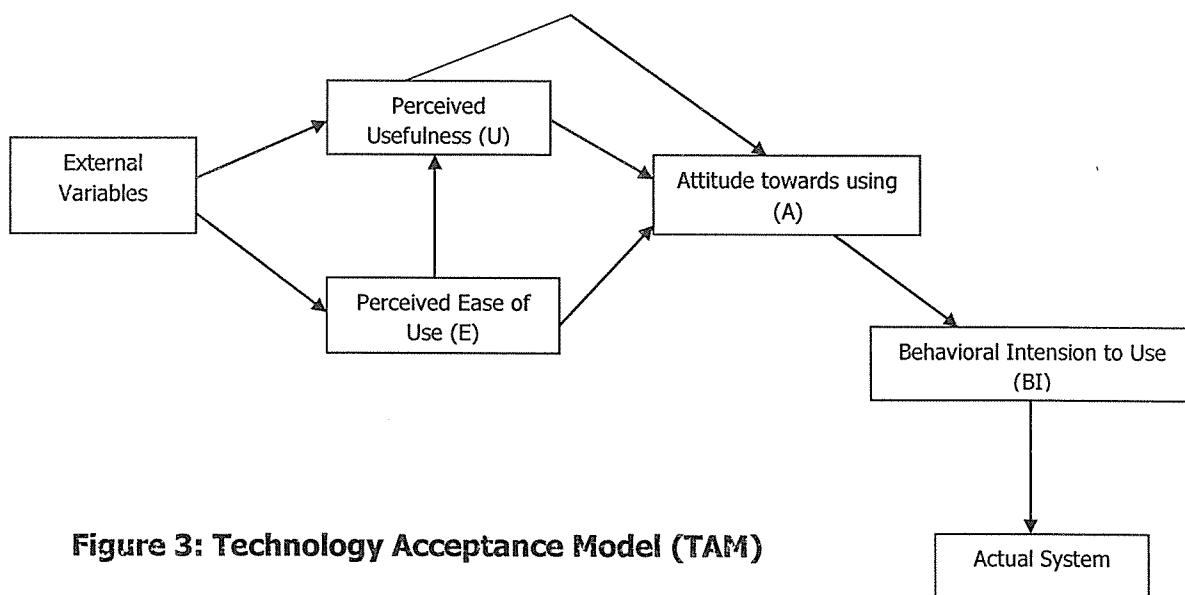
Figure 3: Technology Acceptance Model (TAM)

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Related Studies

Harrington, (2003) conducted a study on Seasonal influenza vaccination reminders for children with high-risk conditions: a registry-based randomized trial. The findings indicated that the study was conducted in a population of 3618 children aged 24-60 months with a high-risk condition residing in three Michigan counties. Children were identified using a statewide IIS in October 2008. Children were randomized to intervention (reminder) or control (no reminder) groups. Reminders for seasonal influenza vaccination were mailed by LHDs in November 2008.

The result was among 3618 children with a high-risk condition, 2730 (75.5%) had not received a 2008-2009 influenza vaccination and were eligible at the time of notification. Among children assigned to the reminder group (n=1374), 42.6% had an address determined to be either invalid, undeliverable, or both. Among those with valid addresses (n=2001), a greater percentage of children with deliverable reminders received at least one influenza vaccination (30.8%) during the outcome observation period than did children assigned to no reminder (24.3%, OR=1.39, 95% CI=1.13, 1.72); children with an undeliverable reminder had an influenza vaccination rate (22.8%) similar to children assigned to no reminder.

At the end many children with high-risk conditions do not receive seasonal influenza vaccination.

Although it was found that mailed reminders encouraging influenza vaccination among children with high-risk conditions were modestly effective, efforts to improve the accuracy of parent contact information could maximize the effect of influenza vaccine reminders. Future studies should explore mechanisms to improve the timeliness and accuracy of parent contact information in statewide IIS.

Khumphicha,(2011) conducted a study on Information Dissemination for Farming Communities in Thailand. The findings indicated that the use of information and communication technology tools has been applied in many disciplines, including agricultural sectors. It may be applied in many modules such as data gathering, data processing, and information management and information dissemination. The number of mobile phone users in Thailand has rapidly increased from 52.8% in 2008 to be 56.8% in 2009 (NSO, 2010). In other words, more than a half of the Thai population has a mobile phone whereas the number of landline telephone users has gradually decreased from 23.5% in 2008 to be 22.4% in 2009 (NSO, 2010). The telephone system is not only a fundamental communication infrastructure but also a basic facility which supports the use of other technologies.

Mobile communication technologies have become gradually more important in many parts of the world, especially in improving the delivery of information (Jensen, 2008). These communication devices present several advantages such as portability, wide range of coverage and instantaneous two-way communications. For instance, mobile phones were used to communicate among Ghanaian. Mobile telephones have been used by farmers for a variety of purposes. For example, Jensen and Thysen (2003) reported that short message service (SMS) was used to acquire required information, such as weather information and suitable time to spray pesticides. Besides information delivery, the mobile phones can be applied to specific other purposes such as transferring money from one bank account to another for labour payments and input purchases in Kenya (Hafkin & Odame, 2002 cited in Munyua, Adera & Jensen, 2008). Moreover, market information in voice mail formats is delivered to Kenyan farmers (Munyua, Adera & Jensen, 2008)

Sarah(2000) conducted Parents' Experiences With and Preferences for Immunization Reminder/Recall Technologies, The findings indicated In Michigan A cross-sectional, Internet-based survey of a nationally representative sample of parents of children 0 to 06 years of age was performed. Survey items included questions regarding previous receipt of reminder/recall notices; preferences for how to receive notices in the future; recentness of changes to home address, home telephone, cell phone, and e-mail information; child's usual site for immunization; and willingness to register cell phone numbers with the child's immunization provider to receive future cell phone or text messages about immunization.

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Overall, 71% of parents had received an immunization reminder/recall notice, usually by phones. For future immunization messages, approximately one-third of parents preferred mail or calls to the home telephone, 16% preferred e-mail, and 8% preferred reminder by e-mail. More than one-half of parents had maintained the same home address, home telephone number, cell phone number, or e-mail address for the previous 3 years.

Although most parents continue to prefer preferred new technologies for immunization reminder/recall, messages parents' e-mail and cell phone, 1 in 4 preferred to prefer the traditional modes for immunization reminder/recall messages.

Ivana (2004) conducted a study on service architecture for content dissemination to mobile users. The findings indicated that the Mobile People Architecture is a solution for personal mobility that aims at enabling person-to-person communication while preserving mobile person's privacy and communication preferences. It proposes a person layer on top of the application layer found in traditional networks by adding a new entity to the network, a personal proxy. Personal proxy tracks current application and the means for user reachability, intercepts incoming communication sessions and data, and directs and adjusts them to currently used application. In addition, Short Message Service (SMS)and Multimedia Message Service (MMS),the prominent services from the telecommunications domain, are inherently push-based SMS delivers text messages directly to mobile phones, while MMS can first push the notification about the receipt of a new multimedia message, and let a user request the message in the second step.

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Gaps in related studies

Several factors undermine the effective delivery of information dissemination in institutions, these include: the way of disseminating of immunization information is neither efficient nor effective however the immunization information management system is efficient in recording and storing the immunization data but the mothers cannot receive their appointment wherever they are then they are obliged to go back at the health centre in order to get their appointment for next visit. The old system cannot dispatch the immunization services on time and at any place because the system is enabling person-to-person communication this means that the system is manual. There is a need of an online system which is able to send the appointment for next vaccines visit to every mother wherever she is. This project will develop an on line system.

CHAPTER THREE

METHODOLOGY

Research Design

This study used the quasi-experiment which was an empirical study used to estimate the causal impact of an intervention on its target population. Quasi-experimental research designs share many similarities with the traditional experimental design or randomized controlled trial, but they specifically lack the element of random assignment to treatment or control. Instead, quasi-experimental designs typically allow the researcher to control the assignment to the treatment condition, but using pre test and post tests some criterion other than random assignment

Research Population

The target population was a total of 51 peoples with 18 staff members and 33 parents of children from Gitarama health centres.

Sampling Procedure

The researcher used simple random sampling which is a type of sampling technique that allows researchers to collect data in which each element in the population has a known and equal probability of selection. This technique was convenient to achieve the research objectives because the respondents had the same chance to be in sample; the respondents consisted of staff member and the parents of children; the information obtained from these respondents who treated as representative of the entire public sector.

The above respondents were chosen because of their vast knowledge and familiarization with the situation on ground in the area of study.

Research Instrument

The main method of data collection the researcher used was questionnaire. *(1) Face sheet* to gather data on the respondents' demographic characteristics such as gender, age, level of education and categories (2) *Researcher devised questionnaires* to determine the level of performance and efficiency of the present dissemination of national immunization information in Gitarama Health Centre, Rwanda

(3) Researcher *devised questionnaire* to establish the level of performance and efficiency of proposed mobile application system for dissemination of national immunization information

The scoring system of these instruments were based on four Likert Scale, ranging from one to four where strongly agree (4); agree (3); disagree (2); strongly disagree (1).

Validity and Reliability of the Instrument

The research instrument that the researcher intended to use was questionnaire. Before carrying out the study, the researcher consulted the supervisor to make sure that the instrument generated relevant information during the study. After consultation, the approval was given to go to field by supervisor. To ensure the reliability of the research instrument, the research proposal was examined by Ethics Committee of gitarama health centre, Rwanda to ensure that the study can be applied to the organization and the approval was given to conduct the research

The content validity index was calculated and obtained 0.9, were above the required 0.7 scores. Hence, the instrument used was valid.

The research also used SPSS output for Cronbach's alpha to test the reliability of the questionnaire to come up with the result as show in the following table.

Table1

A representation of cronbach's alpha reliability statistic

Cronbach's alpha	Cronbach's alpha based On standardized item	Not item
0.805	.796	9

According to above table the alpha coefficient for nine items was .839 suggesting that item in the questionnaire had relatively high reliability

Data Gathering Procedures

After attaining a letter from CHDR to go and collect data, a formal request to collect data was obtained from Gitarama health centre.

Upon acceptance, the researcher was make appointment to meet with the respondents to individually get their consent and inform them that a research is being conducted for academic purposes and that their time is needed to fill in the questionnaires. Then the questionnaires distributed and later on picked from the respondents for analysis.

Before the administration of the questionnaires

1. After attaining a letter from the school of Postgraduate studies, Research and Evaluation to go and collect data, a formal request to collect data was obtained from Gitarama health centre.

2. When approved, the researcher secured a list of the qualified respondents from Gitarama Health centre and select through simple random sampling from this list to arrive at the minimum sample size.

3. The respondents were explained about the research study and enough questionnaires will be reproduced for distribution.

During the administration of the questionnaires

1. The respondents were requested to answer the questions completely.

2. The researcher emphasized retrieval of the questionnaires within ten days from the date of distribution.

3. On retrieval, all returned questionnaires were checked if all are answered.

After the administration of the questionnaires

The data gathered was collected, encoded into the computer and statistically treated using the Statistical Package Software

Data Analysis

The frequency and percentage distribution were used to determine the demographic characteristics of the respondents.

The mean were applied for the levels of accounting information systems and financial performance.

SPSS software is used as a tool for data analysis. The findings were presented in form of tables.

To interpret the responses of the respondents, the following values and Interpretation were used:

Mean Range	Response Mode	Interpretation
3.26 – 4.00	Strongly Agree	High
2.51 – 3.25	Agree	Moderate
1.76 – 2.50	Disagree	Low
1.00 – 1.75	Strongly Disagree	Very low

Ethical Considerations

To ensure that ethics is practiced in this study as well as utmost confidentially for the respondents and the data provided by them, the following were done: (1) coding of all questionnaires; (2) the respondents were requested to sign the informed consent; (3) authors mentioned in this study were acknowledged within the text; (4) findings were presented in a generalized manner.

Limitations of the Study

The anticipated threats to validity in this study were as follows:

Intervening or confounding variables which were beyond the researchers control such as honesty of the respondents and personal biases. To minimize such conditions, the researcher requested the respondents to be as honest as possible and to be impartial / unbiased when answering the questionnaires.

The research environments was classified as uncontrolled settings where extraneous variables may influence on data gathered such as comments from other respondents, anxiety, stress, motivation on the part of the respondents while on the process of answering the questionnaires.

Testing: The use of research assistants may render inconsistencies such as difference in conditions and time when the data was obtained from respondents. This was minimized by orienting and briefing the research assistants on the data gathering procedures.

Instrumentation: the research tools are non-standardized hence a validity and reliability test was done to arrive at a reasonable measuring tool.

Attrition: A representative sample may not be reached as computed due to circumstances within the respondents and beyond the minimum sample size was done by the researcher to avoid this situation.

CHAPTER FOUR

PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

Demographic identification of respondents

The demographical identification of respondents consisted gender, age, educational level and categories. The results of profile of respondents were presented in the following table:

Table 2:

Profile of Respondents

n=51

Profile of respondents	Category	Frequency	Percentage
Gender	Female	38	75.5
	Male	13	25.5
	Total	**51**	**100**
Age	Below – 20	6	11.8
	20 – 25	26	51.8
	25 – 30	14	27.5
	30 – 35	4	7.8
	35 – Above	1	2.0
	Total	**51**	**100**
Academic level	Master's degree	1	2.0
	Bachelor's degree	3	5.9
	Undergraduate diplo.	15	29.4
	Secondary	25	49.0
	Primary	5	9.8
	others	2	3.9
	Total	**51**	**100**
Categories	Doctors	2	3.9
	Nurses	14	27.5
	Mothers	33	64.7
	IT Manager	2	3.9
	Total	**51**	**100**

The system targeted users who were asked to indicate their gender. The researcher wanted to know the appropriate number of male and female who support the use of mobile application system for dissemination of immunization information. As indicated in Table 1 above, 25.5% of respondents were male while 75.5% of respondents were female.

The results above show that the large numbers of the respondents were between 20 – 25 years which constitute 51.8% followed by those between 25 – 30 years constituting 27.5% of respondents, the 30-35 years constituting 7.8 of respondents, the less than 20 years group was 11.8%, the age group between 35 – above was 4.3%. Most of the respondents are younger which is good because they are the one who suppose to bring their children for Immunization.

From distribution of education level, majority of respondents were diploma represented 49.0% against 29.4% of undergraduate diploma; 9.8% of primary; 5.9% of Bachelor's degree; 3.9% of others; finally 2.0% of Master's degree. This indicates that only the educated could be better understanding of design and implementation of mobile application for dissemination of national immunization system.

The system targeted users who were asked to indicate their category of respondents.The researcher wanted to know the kind of category of each respondent, who supports the use of a web based database system. As the table above shown, the respondents were in majority of the mothers (64.7%).

THE LEVEL OF PERFORMANCE AND EFFIENCY OF THE PRESENT DISSEMINATION OF IMMUNIZATION INFORMATION SYSTEM

In order to determine the second objective this is to determine the level of performance and efficiency of the present dissemination of national immunization information in Gitarama Health Centre, Rwanda. It is important to take that the opinions of all categories converge for the aspects mentioned in the table 2 below:

Table 4:

THE LEVEL OF PERFORMANCE AND EFFIENCY OF THE PRESENT DISSEMINATION OF IMMUNIZATION INFORMATION SYSTEM IN GITARAMA HEALTH CENTRE

n=51

LEVEL OF PERFORMANCE AND EFFIENCY OF THE PRESENT DISSEMINATION INFORMATION SYSTEM	Mean	Interpretation	Rank
It is ease for the health centre to store its immunization information data.	2.23	Low	1
The present process of immunization information recording works Effectively.	1.60	Very low	2
With the present system, the Parents of children get all immunization information easily.	1.74	Very low	3
The present dissemination of immunization information system are efficient,effective.	1.53	Very low	4
The immunization information is delivered in good way and on time.	1.72	Very low	5
The present system requires less man power	1.74	Very low	6
The existing system for dissemination f immunization information is flexible	1.50	Very low	7
The present system is reliable	1.60	Very low	8
The existing system is well protected	1.40	Very low	9
You meet the problem by using the present system of disseminates immunization information.	2.60	Moderate	10
There is need of database for the health centre to store its immunization information data.	2.96	Moderate	11
There is need of new system for disseminates immunization system(mobile application system)	3.21	Moderate	12
There is benefit to use mobile application for Dissemination immunization information.	3.31	High	13
TOTAL	2.18	Low	

As shown in table 2 above, the respondents stated that the level of performance and efficient of the present dissemination of immunization information is low (mean=2.42). The health centre store its immunization information data at very low level (mean=1.60), and the respondents stated that the present process of immunization information recording works effectively at very low level (mean=2.27), the respondent rates to very low level with the present dissemination of national immunization information in Gitarama Health centre (mean=2.45). the respondents rated to be very low the immunization services that the Health centre offer are efficient, effective (mean=3.63),derivability of The immunization information coted to very low level as rated by the respondents with a mean=1.84

The respondents ranked with a moderate level (mean 2.60) that they meet the problem by using the present system of disseminates immunization information and they were also agree (mean=2.96) that they need of database for the health centre to store its immunization information data. The respondents of Gitarama health centre agree (mean=3.21) with that there is need of new system for disseminates immunization system by using mobile application system and they stated that there is benefit to use mobile application for Dissemination immunization information at a moderate level which is equal to (mean=3.31).

THE LEVEL OF PERFORMANCE AND EFFECIENCY OF THE PROPOSED MOBILE APPLICATION FOR DISSEMINATION OF IMMUNIZATION INFORMATION AFTER ITS IMPLEMENTATION.

To achieve the third objective this was to establish the level of performance of the proposed mobile application for dissemination of immunization information after its implementation. The respondents were asked to rate the questions using Likert scaled between one to four, where 4 = strongly agree; 3= agree; 2 = disagree; and 1 = strongly disagree. Their responses were analyzed using SPSS's summary statistics showing the mean as

Table 4:

THE LEVEL OF PERFORMANCE ANF EFFECIENCY OF THE PROPOSED MOBILE APPLICATION FOR DISSEMINATION OF IMMUNIZATION INFORMATION AFTER ITS IMPLEMENTATION.

n=51

THE LEVEL OF PERFORMANCE OF THE PROPOSED MOBILE DISSEMINATION INFORMATION	Mean	Interpretation	Rank
The information is effective in helping me complete the tasks and scenarios.	4.00	High	1
MASDNII gives error messages that clearly tell me how to fix Problems.	4.00	High	2
The information provided for the system is easy to understand.	3.96	High	3
It was simple to use this MASDNII.	3.92	High	4
MASDNII has all the functions and capabilities I expect it to have.	3.88	High	5
Overall, I am satisfied with this system.	3.80	High	6
I am able to efficiently complete my work using this MASDNII.	3.80	High	7
I am able to complete my work quickly using this MASDNII.	3.79	High	8
I feel comfortable using this MASDNII.	3.27	Moderate	9
I can effectively complete my work using this MASDNII.	3.21	Moderate	10
Overall, I am satisfied with how easy it is to use MASDNII.	3.17	Moderate	11
I like using the interface of using MASDNII.	3.05	Moderate	12
The information (such as help, on-screen messages, and other documentation) provided with this system is clear.	3.05	Moderate	13
It is easy to find the information I needed.	3.01	Moderate	14
It was easy to learn to use this MASDNII.	3.01	Moderate	15
I believe I became productive quickly using this MASDNII.	3.03	Moderate	16
The interface of using MASDNII is pleasant.	3.00	Moderate	17
Whenever I make a mistake using MASDNII, I recover easily and Quickly.	2.96	Moderate	18
TOTAL	3.43	High	

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As shown in table 3, the respondents were ranked at high level by the information is effective in helping me complete the tasks and scenarios. (Mean: 4.00); the new system gives error messages that clearly tell me how to fix Problems. (Mean: 4.00); the information provided for the system is easy to understand. (Mean: 3.96); it was simple to use this new mobile application for disseminate immunization information (mean: 3.92); MASDNII has all the functions and capabilities I expect it to have (mean: 3.88); I am satisfied with this system (mean: 3.80); I am able to efficiently complete my work using this MASDNII (mean: 3.80); I am able to complete my work quickly using this MASDNII (mean: 3.79).

On the other hand, the respondents were agreed that the following aspects motivate them for good performance at moderate level:

I feel comfortable using this new system (mean: 3.27); I can effectively complete my work using this MASDNII(mean: 3.21); Overall, I am satisfied with how easy it is to use MASDNII(mean: 3.17); I like using the interface of using MASDNII(mean: 3.05); The information (such as recommended vaccines, on-screen messages, and other documentation) provided with this system is clear(mean: 3.05); It is easy to find the information I needed(mean: 3.01); It was easy to learn to use this MASDNII(mean: 3.01); I believe I became productive quickly using this MASDNII(mean: 3.03); The interface of using MASDNII is pleasant(mean: 3.00); Whenever I make a mistake using MASDNII, I recover easily and Quickly(mean: 2.96).

Difference between the level of performance and efficiency the existing dissemination of national immunization information and the proposed mobile application system for dissemination of national immunization information.

The last objective in this study was to determine if there is no significant difference on the level of performance and efficiency between the existing systems of disseminate of national immunization information and the proposed mobile application system for dissemination of national immunization information.

To test this statement, Pearson's Linear Correlation Coefficient (PLCC) was used. The summary of correlation between the existing and proposed system is demonstrated in table below.

Table 5:

Pearson's Linear Correlation Coefficient for the existing system for dissemination of immunization information and the proposed mobile application system dissemination of immunization information.

		The existing system	The proposed system	Interpretation	Decision on Ho
The existing system	Pearson Correlation	1	.980	Positive and significant	Rejected
	Sig.		.000		
	N	7	7		
The proposed system	Pearson Correlation	.980	1		
	Sig.	.000			
	N	7	15		

The results in table 4 above show that there is a positive significant difference between the level of performance and efficiency of the existing system and the proposed system for disseminating immunization information in Gitarama Health centre. For instance the level of performance of the existing system is positively and significantly correlated with the proposed system performance (r=0.980, sig. =.000), The researcher rejected the null hypothesis and affirmed that there is a significant difference between the existing system of disseminate of national immunization information and the proposed mobile application system for dissemination of national immunization information in Gitarama Health centre.

CHAPTER FIVE

THE DEVELOPMENT AND IMPLEMENTATION OF THE SYSTEM

SYSTEM ANALYSIS

The requirements for the software were gathered mainly through the respondents by answering questionnaires. Preliminary investigation of the problem domain indicated the presence of well-established and mature principles. Mobile application system is based on well-founded principles and there is load of literature on the subject.

Usability and Requirement gathering

Whereas the principles and concepts within the domain of interest were well founded and mature with the result that a proper implementation would translate to system software that would manage the library more efficiently, there was need for identifying the expectations of the future users of the software.

The major thrust of mobile application System was summarized as below:

1. What were the challenges of mobile application System as perceived by the users?

2. What were some of the features the users would expect in the future system?

The major focus here was not to understand the percentage of users having problems with mobile application System concepts, but to understand the problems they experienced in handling the daily duties in the library especially being a public offering service center.

Requirement Analysis

With the domain investigation and the usability requirement gathering done, the next step was analysis of the requirement for the software. Preliminary investigation of the system revealed that there was a variance between the envisaged and the achieved goals in current immunization services. For Mobile application system, this variance stemmed partly from poor requirement capture and system design. Implementation also played a part with the developers simplifying their coding to the detriment of the functionality of the finished software. This in effect has led to software that is not user friendly.

Since the objective was to develop a software that will help the immunization services in Gitarama health centre that seems to be traditional basing on the fact that it's too manual by use of too much paper work to electronic by being computerized thus all duties being done on a mouse click.

System software requirements

> **Internet Access:** Since MASDNII is a web-based mobile application system, you will need reliable internet access, preferably with a dedicated connection, to access MASDNII.

> **Hardware requirements:** The following are minimum hardware requirements for accessing MASDNIIS:
> - 32MB RAM (64 MB or higher recommended).
> - 500 MB free space.
> - Screen display set at a minimum of 800*600 resolution

> **Software requirements:**
> - Internet Browser software
> - Microsoft Windows versions or Linux

System actors

System actor is any person who will use or affected by an information system on a regular basis-capturing, validating, entering, responding to, storing and exchanging data and information. The MASDNII has three categories of the system users:

> Country administrator (known as a power user)
> Local administrator
> Health worker

Table 6: Actor glossary

Term	Description
Country Administrator	An individual that manage health centres, manage local administrator by creating their accounts and assigning their security roles,manage vaccines and manage vaccines schedule.
Local Administrator	An individual that manage health workers by creating their accounts.
Health worker	An individual that manage children by adding children with their mother or responsible person into the system, manage immunization by adding child immunization, scheduling an appointment for the next vaccine visit, viewing child history and manage immunization monthly immunization reports.

Source: Own drawing

SYSTEM DESIGN

Data flow diagrams

Data Flow Diagram (DFD) is a structured analysis technique that graphically characterizes data processes and flows in a business system. Data flow diagrams give an overview of the system inputs, processes, and outputs. Data flow approach emphasizes the logic underlying the system.

Dataflow notations

A DFD is composed of four following components:

External entity: An external entity can send or receive data from the system. It can be a business, a person, or a machine. An external entity is also called a source or a destination of data, and is considered to be external to the study.

Process: Processes always denote a change or transformation of data. It is represented by a rectangle with rounded corners to show the occurrence of transforming process
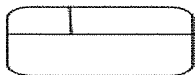
Figure 4:Process

Source: Own drawing

Data store: A data store is simply showing a repository for data that allows addition and retrieval of data. It is represented by an open-ended rectangle, with two parallel lines, which are closed by a short line on the left and open-ended on the right

Figure 5:Data store

Source: Own drawing

Data flow: A data flow is an arrow that shows movement of data from one point to another, with the head of the arrow pointing toward the data destination. Each arrow is labeled with an appropriate data flow name.
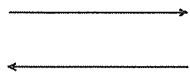
————————————→

←————————————

Figure 6: Data flow

Source: Own drawing

MASDNII context diagram

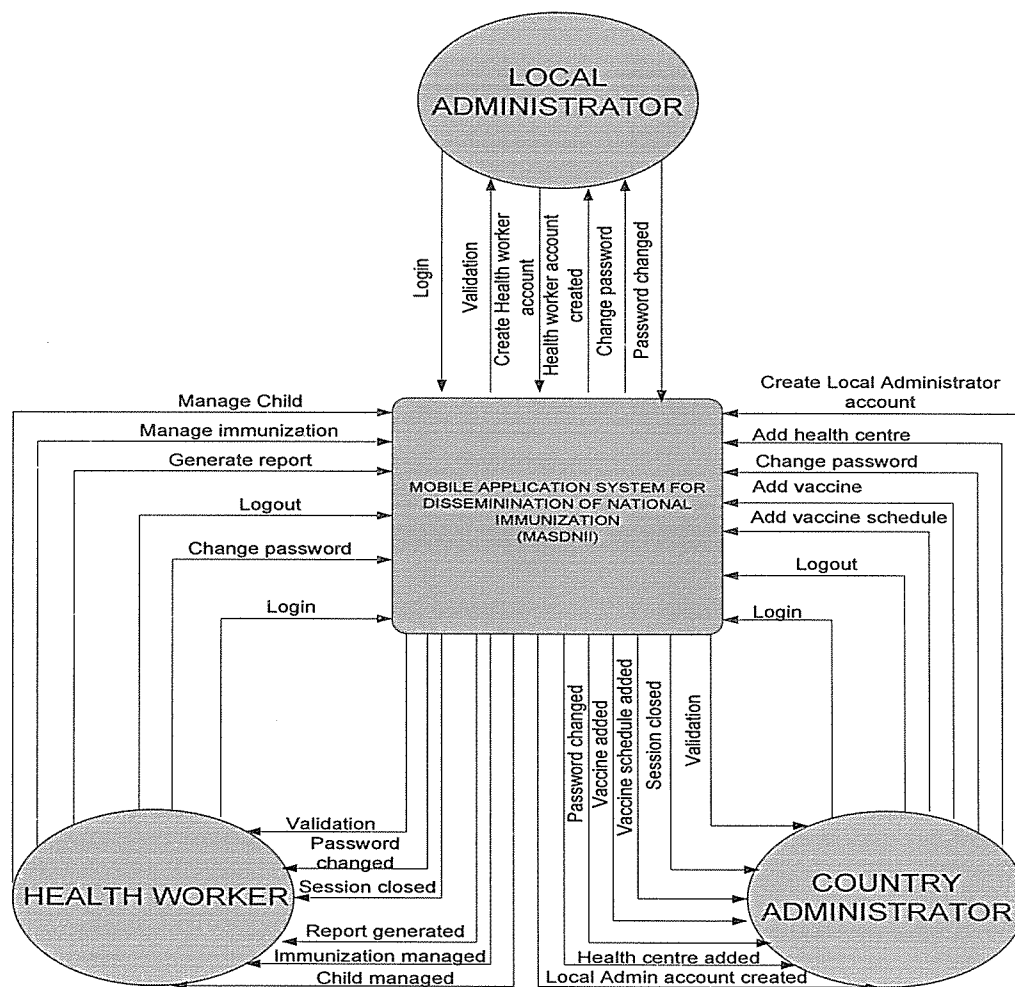A context diagram shows the system boundaries, external entities that interact with the system, and the relevant information flows between these external entities and the system

Figure 7: The MASDNII context diagram

Source: Own drawing from MASDNII

Dataflow diagrams

The following DFDs illustrate the flow of data through various processes in the logical representation of a web-based application of the national information system.
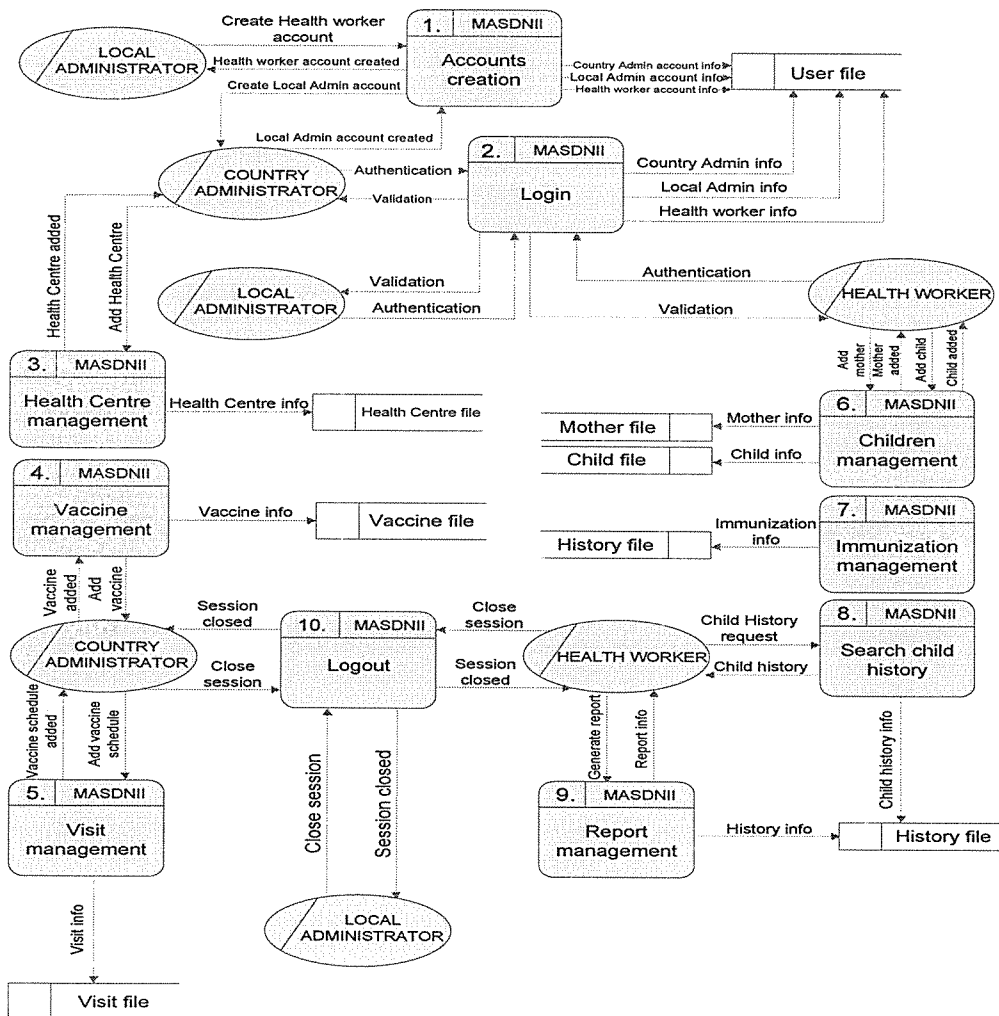

Figure 8: Main Dataflow diagram

Source: Own drawing

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The above main dataflow diagram illustrates the flow of data through various processes in the logical representation of a mobile applicationsystem for dissemination of national immunization information.
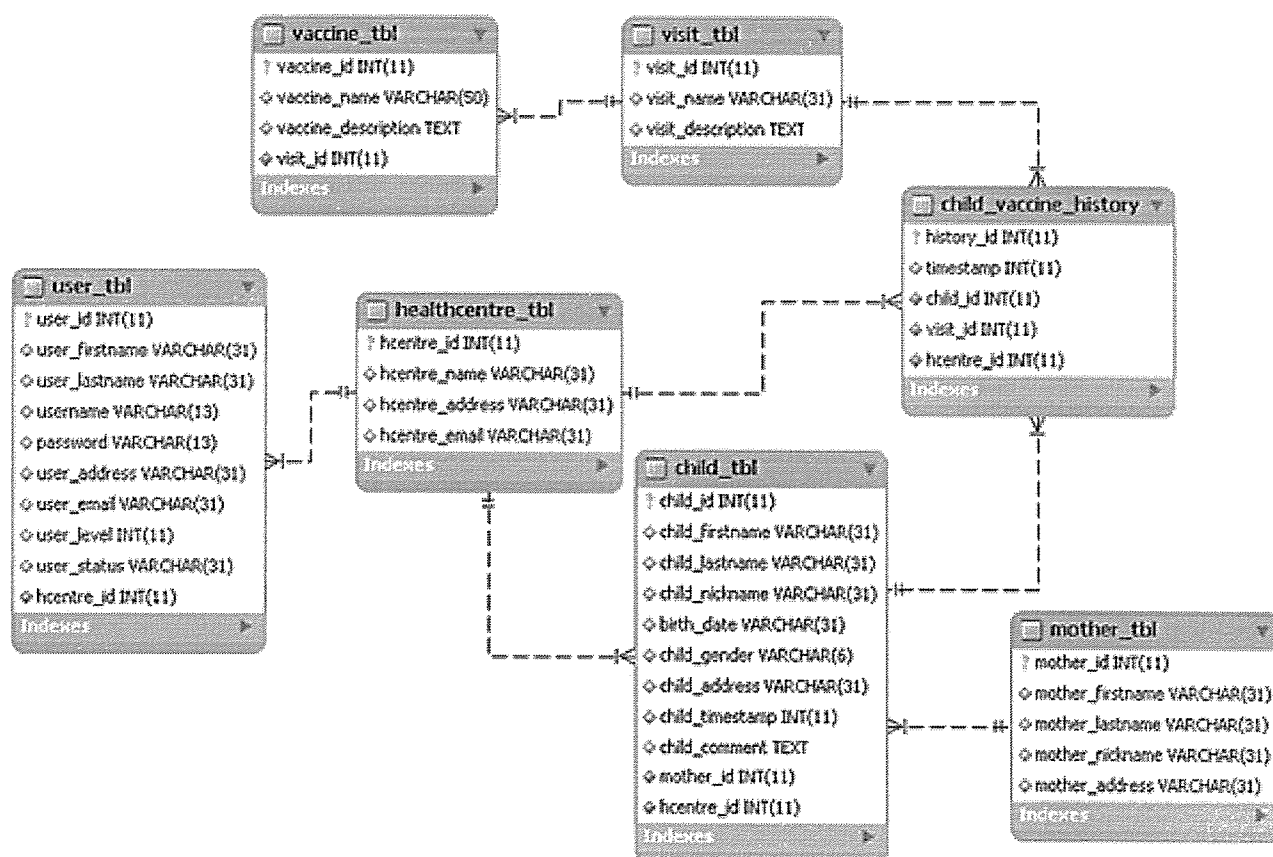
Data modeling of MASDNII

Figure 9: Data modeling of MASDNII

Source: Own drawing

Data Dictionary

A **data dictionary,** as defined as centralized repository of information about data such as meaning, relationships to other data, origin, usage, and format.

Table 7: Data Dictionaries table

Entity	Attributes	Types	Occurrence
1. healthcentre_tbl	Hcentre_id	Int(11)	Unique
	Hcentre_name	Varchar(31)	Multiple values
	Hcentre_address	Varchar(31)	Multiple values
	Hcentre_email	Varchar(31)	Multiple values

Entity	Attributes	Types	Occurrence
2. user_tbl	user_id	Int(11)	Unique
	user_firstname	Varchar(31)	Multiple values
	user_lastname	Varchar(31)	Multiple values
	Username	Varchar(13)	Unique
	Password	Varchar(13)	Multiple values
	user_address	Varchar(31)	Multiple values
	user_email	Varchar(31)	Unique
	user_level	Int(11)	Multiple values
	user_status	Varchar(31)	Multiple values
	Hcentre_id	Int(11)	Multiple values

Entity	Attributes	Types	Occurrence
3. mother_tbl	Mother_id	Int(11)	Unique

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Entity	Attributes	Types	Occurrence
	vaccine_name	Varchar(31)	Unique
	vaccine_description	Text	Unique
	visit_id	Int(11)	Multiple values
Entity	**Attributes**	**Types**	**Occurrence**
7.child_vaccine_history	history_id	Int(11)	Unique
	Timestamp	Int(11)	Multiple values
	child_id	Int(11)	Multiple values
	visit_id	Int(11)	Multiple values
	hcentre_id	Int(11)	Multiple values
Entity	**Attributes**	**Types**	**Occurrence**
8. news	news_id	Int(11)	Unique
	news_title	Varchar(31)	Unique
	news_content	Text	Multiple values
	Timestamp	Int(11)	Multiple values
Entity	**Attributes**	**Attributes**	**Occurrence**
9. announcements	announcement_id	Int(11)	Unique
	announcement_title	Varchar(31)	Unique
	announcement_content	Text	Multiple values
	Timestamp	Int(11)	Multiple values
Entity	**Attributes**	**Attributes**	**Occurrence**
10.messages	Messages_id	Int(11)	Unique
	announcement_title	Text	Unique
	announcement_content	Int(11)	Multiple values

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USER GUIDE

Public site home page

The below screenshot illustrates the homepage of the public site where anyone can navigate into without any privilege, this homepage displays also some important links such as news, announcements, about MASDNII, immunization calendar contact us link where you can send your feedback and also a link "private area" to login to the private area with some privileges.
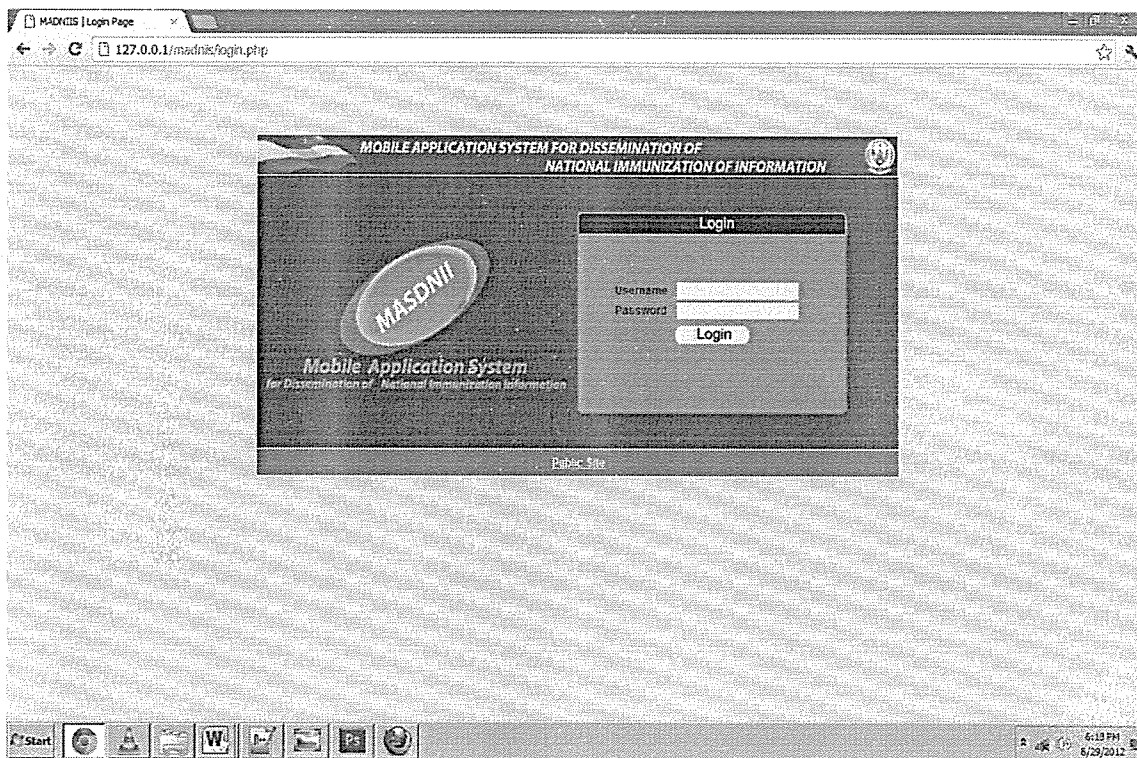
Figure 10: Homepage of the public site of MASDNII
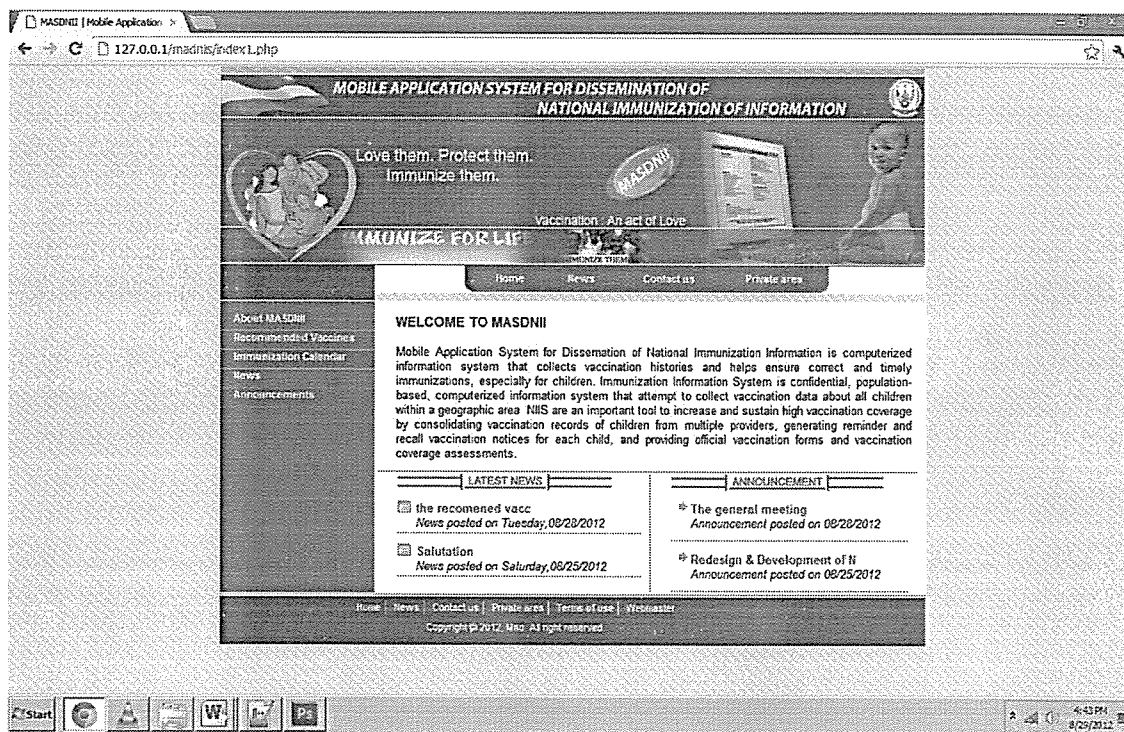
Login page

The above screenshot illustrates the login page which is used to login to private area using the "username" and "password". This page has also a link "Public site" which is used to back to the public site.

Figure 11:login page

Administrator home page

The below screenshot illustrates the administrator interface, where he can manage users, manage health centres, manage vaccines, post news and announcements.

Figure 12: Administrator home page
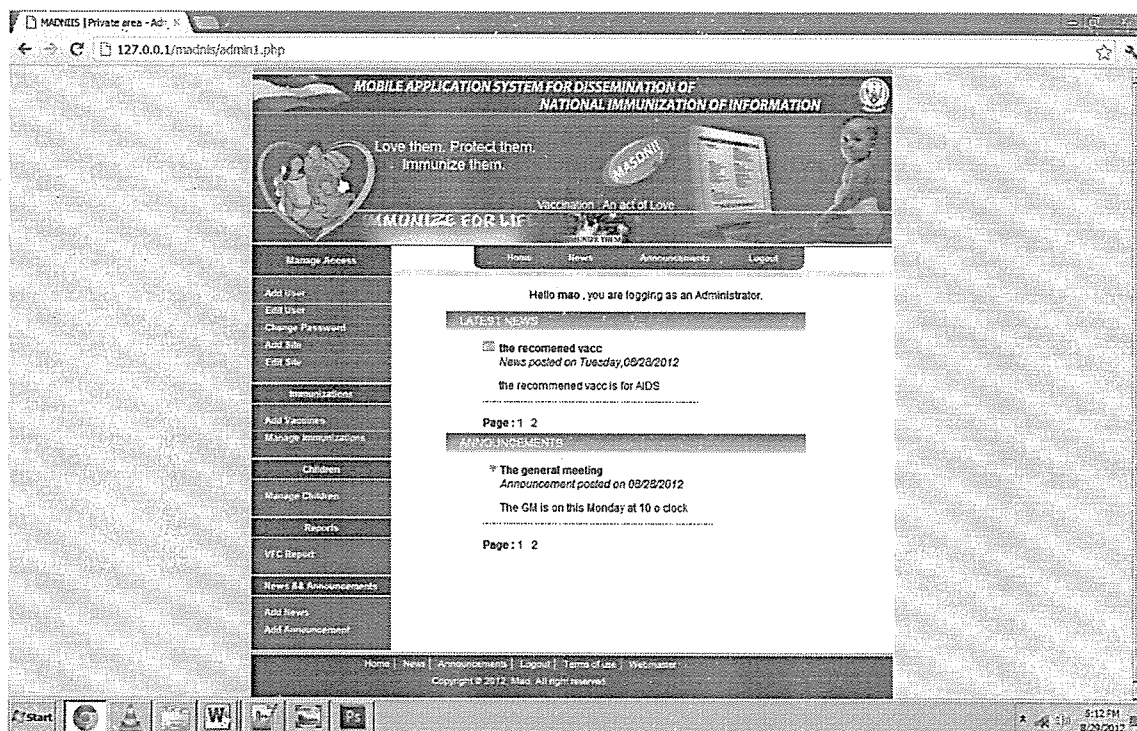
Manage children page

The below screenshot illustrates different screen where a Health Worker will manage children. When the health worker click to Manage Children link to the top, he (she) can add a mother using textfields mother first name, mother last name, mother nickname, home address; When he (she) clicks to Add child link to the top, he (she) can add a child using textfields child first name, child last name, child nickname, birth date, gender, mother nickname, home address. The health worker can also edit information regarding to a mother and a child using Edit mother form, Edit child form by clicking to edit mother and edit child links.
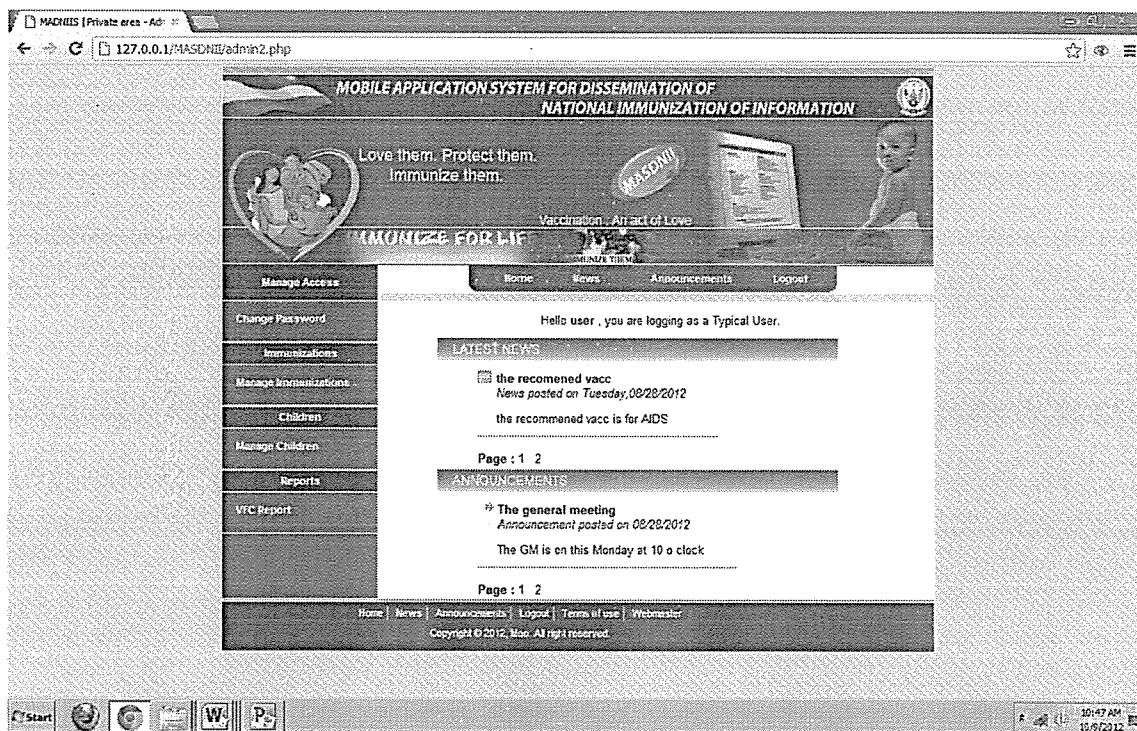
Figure 13: Manage children page
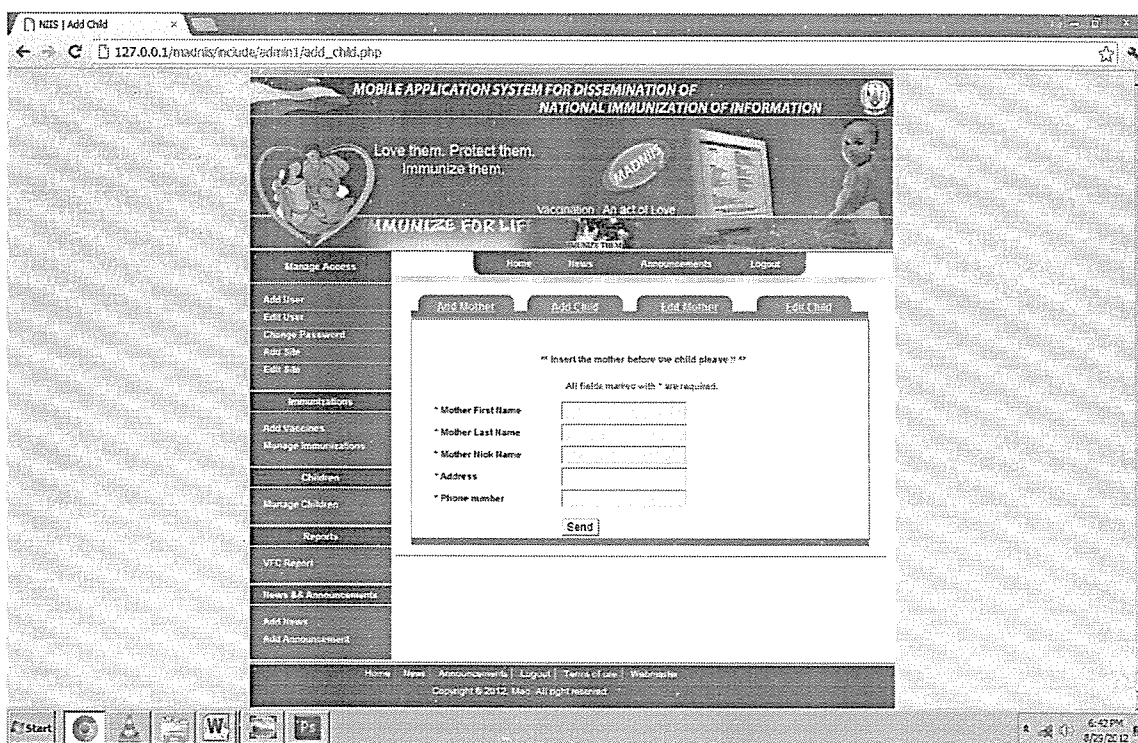
Health worker interface

The below screenshot illustrates the Health worker interface where he (she) can change his password, manage child immunization, manage children and manage vaccination for children reports (VFC) and viewing some news and announcements.

Figure 14: Health worker interface

Manage child immunization

The below screenshot illustrates a child immunization history, using this interface a health worker will be able to view recommended vaccines with earlier date and recommended date, view child history (vaccines which was given to that child), his (her) personal information such as first name, last name, birth date, child number, health centre, mother name and also some comments. A health worker will be able to schedule an appointment for a next vaccine visit.

Figure 15: Manage child immunization

Make an appointment pages

The below screenshot illustrates page where the health worker or administrator can make an appointment for next vaccine visit by using SMS.

Figure 16: Make an appointment page

The received SMS from database

The below figure shows the received SMS from database by the by mother after Make an appointment for a next vaccine visit.

Figure 17: Received SMS from database

SYSTEM IMPLEMENTATION AND TESTING

System conversion means changing from the previous method to the current method. There are various methods that are used to carry out system changeover which includes:-

1. Phased Conversion that involves implementing a new system in parts.

2. Direct Conversion that involves removing the old system and the new one put into place.

The method is not suitable because it may have negative consequences in case the new system fails to perform to its expectations.

1. Pilot Conversion whose technique works with the principle of doubt that the new system may not function as desired. Parts of the system are used while working with the old system

2. Parallel Conversion whereby both the old and the new systems are used and run simultaneously. However it has the disadvantage that it leads to increased in duties, as the user will have to work with both the systems. This causes the user to work under supervision.

The proposed system was implemented using a phased system conversion which involves implementation of a new system in parts.

Testing

An Exhaustive testing of the developed software was done with the intent of making sure that the software conforms to the specification established in the requirement capture stage and that the software perform within the scope established.

Whereas the algorithms used were tested and their correct implementation translated to concept capture of the problem domain, the issue of user friendliness and integrity were subjective.

To test the software performance it was built in terms of response time and bandwidth consumption.

Implementation

The object-Oriented (O-O) style according toLarman (2005) it is a natural way of implementing UML designs, the implementation of the Software was done using the O-O style. The programming language of choice is php and the database used is mysql. The detailed documentation obtained at the detailed design stage was translated into forms and database tables of the target programming language.

After the testing of individual functions and objects, integration with the graphical user interface classes was done. More emphasis was put on separating the graphical user interface (GUI) and the functionality but still there are cases where GUI management was done within the flow of the algorithms that defined the domain logic.

CHAPTER SIX

FINDINGS, CONCLUSIONS, RECOMMENDATIONS

FINDINGS

This study was set to establish the difference between the existing and proposed system for dissemination of national immunization information in Gitarama Health centre, which was guided by the following objectives; To identify the profile of the respondents in terms of gender, age, education level, category;To determine the level of performance and efficiency of the present dissemination of national immunization information in Gitarama Health Centre, Rwanda;To establish the level of performance and efficiency of proposed mobile application system for dissemination of national immunization information;To determinate if there is a significant difference on the level of performance and efficiency between the existing dissemination of national immunization information and the proposed mobile application system for dissemination of national immunization information.

To determine the profile of respondents

The first objective of this study was to identify the profile of the respondents in terms of gender, age, education level, and categories. The results on demographic profile indicated that the respondents were in majority the mothers and the great number is female. It is also shown that the majority of respondents were younger than 30 years.

The level of performance and effiency of the present dissemination of immunization information system in Gitarama Health centre,Rwanda

Immunization Information System is a confidential, population-based, computerized information system that attempt to collect vaccination data about all children within a geographic area. The Immunization information system simplifies immunization record keeping, provides quicker access to immunization records, and helps you keep track of a patient's immunization status, (Armstrong, and Murlis, 2007).

The results related toeffiency and performances of the existing system were not remarkable in Gitarama health centre because majority of respondents disagree it at low level.It represents (mean: 3.11) for effiency of the existing system(mean: 1.53) for performance of the present system (mean: 1.84).

The findings concluded that the performance and effiency of the existing system are not effective in Gitarama Health centres. On the other hand, the respondents of Gitarama health centre agree (mean=3.21) with that there is need of new system for disseminates immunization system by using mobile application system and they stated that there is benefit to use mobile application for Dissemination immunization information at a moderate level which is equal to (mean=3.31). Thus this indicates that most respondents appreciated the design and implementation of a mobile application system for dissemination of national immunization which has contributed to accomplishing their duty effectively.

The level of performance of the proposed mobile application for dissemination of immunization information after its implementation in Gitarama Health Centre, Rwanda.

Based on the results of the survey, the selected participants were able to identify the specific attributes that contribute to the systems usability and reliability. The findings indicated that among the given factors, the respondents believe that the system is usable and reliable in terms of its ability to allow easy personality interpretation as well as being user friendly. This identified feature of the system is probably attributed to its developed standards that were used for designing the system.

The research participants also agreed that the system helps in improving the performance and output of their respective tasks. Considering that the respondents agreed to the ability of the system to provide accurate and objective results, there is a greater opportunity for the health centre to develop and modernise mobile application system since the management of immunization data is well handled.

Based on the overall results given by the respondents, the proposed system is a useful and reliable tool for management of Immunization in gitarama health centre and employee appraisal. Not only does this mobile application system support fast and easy management and appraisal procedures, but it also enables the human resource staff to make objective results interpretation.

The respondents agreed that the computerised system allows employers to make effective decisions. This is very much related to another advantage indicated by the respondents, which allows the employees to effectively complete work using this system. This in turn leads to the reduction of costs in terms of management.

Difference between the level of performance and efficiency the existing dissemination of national immunization information and the proposed mobile application system for dissemination of national immunization information.

The findings of the study show that there is a correlation between the level of performance and efficiency of the existing system and the proposed system for disseminating immunization information; that there is a positive relationship among the level of performance and efficiency of the existing system and the proposed system for disseminating immunization information. It was found out that since the significant value (0.980) was greater than 0.05 (or 5%) which is the required level of significance. The null hypothesis was rejected and affirmed that there is a significant difference between the existing systems of disseminate of national immunization information and the proposed mobile application system for dissemination of national immunization information in Gitarama Health centre.

CONCLUSION

The purpose of this study was to test the hypothesis of no significant difference between the existing system for dissemination of national immunization information and the proposed mobile application system for dissemination of national immunization information; To validate Technology Acceptance Model (TAM); to generate new information based on the findings of the study;to bridge the gaps identified in the previous studies.

Considering the results, they indicate that the null hypothesis has been rejected and the results affirmed that there is positivedifference between the existing systems of disseminate of national immunization information and the proposed mobile application system for dissemination of national immunization information in Gitarama Health centre.

The findings have proved that the level of performance for the existing Systems is significantly correlated with the level of performance of new mobile application system in Gitarama Health centre.

The literature study and the results of the analysis of the findings have proved that Technology Acceptance Model are useful tools that can be used to improve the existing immunization services.

RECOMMENDATIONS

With regards to the practical development of MASDNII there are important principles to follow especially if the designer intends to use the mobile application system, web-page database the design approach should be participatory for communication system requirement, involvement of the system users for evaluation as well as their various suggestions for the benefit of system improvement, system security being of essence should be considered which can be done using both password and username as well as biometric approach.

While designing a mobile application system the following should be put into consideration:-

i. Web based and webpage database development depending on the programming language for example the researcher used photoshop and PHP MySql.

ii. The system requirement needs to be participatory as regarding communication by the users.

iii. During evaluation always involve the system users for verification as well as understanding the needs for development purposes.

iv. Include users suggestions for the purposes of system improvement if need be.

v. System security should be considered which can be done using both password and biometrics approach since technology is growing at a fast rate.

We are suggesting adding module in Mobile application system for dissemination of national immunization information like Integrate MASDNII with electronic medical chart systems

We recommend the ministry of health to implement this system to test the benefit of it within health centres.

Future works

There was lack of enough knowledge about Photoshop and Macromedia Fireworks. This needed a lot of reading and understanding before using them for designing the system thus limiting the project's exhaustion. Having people with practical knowledge and skills incorporated in the school program and also having more practical in database will enhance the confidence of those who are yet to finish when they face a similar project or when they go out to the field.

In addition the help fields was not to the satisfactory due to the reasons mentioned earlier therefore it is subject to be developed further.

With regards to maintenance the challenge will be how often will MML upgrade the system in question since Technology is developing at a very fast and massive rate? Additionally, on issue of training the related MML staff who are working with the system so as to be enormous with it hence increase efficacy in relation to its use.

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APPENDIX I

TRANSMITTAL LETTER

KAMPALA INTERNATIONAL UNIVERSITY

Ggaba Road, Kansanga
P.O. BOX 20000 · Kampala, Uganda
Mobile: +256782823607 ·
E-mail: mphelix@gmail.com

COLLEGE OF HIGHER DEGREES AND RESEARCH (CHDR)
OFFICE OF THE HEAD OF DEPARTMENT, APPLIED SCIENCE AND TECHNOLOGY

Date: 12th June 2012

Dear Sir/Madam,

RE: REQUEST FOR MASENGESHO PONTIEN MIS/31207/102/DF TO CONDUCT RESEARCH IN YOUR INSTITUTION

The above mentioned is a bonafide student of Kampala International University pursuing **Masters of Science in Information System.**

He is currently conducting a research entitled **"Design and Implementation of a Mobile Application System for Dissemination of National Immunization Information, A case of Gitarama Health Centre, Rwanda"**

Your Institution has been identified as a valuable source of information pertaining to his research project. The purpose of this letter is to request you to avail him with the pertinent information he may need.

Any information shared with him from your Institution shall be treated with utmost confidentiality.

Any assistance rendered to him will be highly appreciated.

Yours truly,

Businge Phelix Mbabazi
Head of Department, Applied Science and Technology

NOTED BY:
Dr. Sofia Sol T. Gaite
Principal-CHDR

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APPENDIX II

CLEARANCE FROM ETHICS COMMITTEE

Date_____

Candidate's Data

Name_____

Reg. # _____

Course _____

Title of Study _____

Ethical Review Checklist

The study reviewed considered the following:

____ Physical Safety of Human Subjects

____ Psychological Safety

____ Emotional Security

____ Privacy

____ Written Request for Author of Standardized Instrument

____ Coding of Questionnaires/Anonymity/Confidentiality

____ Permission to Conduct the Study

____ Informed Consent

____ Citations/Authors Recognized

Results of Ethical Review

____ Approved

____ Conditional (to provide the Ethics Committee with corrections)

____ Disapproved/ Resubmit Proposal

Ethics Committee (Name and Signature)

Chairperson _____

Members' _____

APPENDIX III

INFORMED CONSENT

REPUBLIC OF RWANDA

SOUTHERN PROVINCE

MUHANGA DISTRICT

GITARAMA HEALTH CENTRE

MUHANGA,**29**/..**07**.../2012

TO: The coordinator computer studies school of postgraduate studies and Research

RE: PERMISSION LETTER FOR DATA COLLECTION FOR RESEARCH PURPOSE

Dear Sir,

With reference to your request to conduct research, I have the pleasure to announce that your student Mr. MASENGESHO Pontien of **Masters of Science in Information system,(CHDR)** is permitted to collect data in our institution(Gitarama health centre)to this topic entintled:"**Design and Implementation of Mobile Application System for Dissemination of National Immunization,A Case of Gitarama health centre,Rwanda**"

Data collected is confidential under supervision of Gitarama health centre,basing upon out institution requirement regarding permission of data collection.

Yours sincerely

TWAGIRAMARIYA Pélagie

Titular of Gitarama health centre

APPENDIX IV

RESEARCH INSTRUMENT

TRANSMITTAL LETTER FOR THE RESPONDENTS

Dear Sir/ Madam,

Subject: Thesis Questionnaire

I am currently undertaking a Master's Degree of Information system course at Kampala International University. As part of the final stage of the course we are carrying out a research for the purpose collecting primary data to complete our thesis.

The theme of my thesis is "*Design and Implementation of a Mobile Application System for Dissemination of National Immunization Information in Gitarama Health centres,Rwanda*". The purpose of this letter is to respectively request you to complete and return the attached questionnaire.

The information requested will be treated as strictly confidential and will only be used for the purpose of this thesis.

I would like to thank you in advance for taking your time to complete this questionnaire.

Yours faithfully,

MASENGESHO Pontien

APPENDIX VA

QUESTIONNAIRES

FACE SHEET: DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

Direction:Please tick the appropriate box or elaborate where applicable.

a) Gender
   - ☐ Female
   - ☐ Male

b) Age
   - ☐ Below -20
   - ☐ 20 - 25
   - ☐ 25 – 30
   - ☐ 30 – 35
   - ☐ 35 – above

c) Level of education
   - ☐ Master's degree
   - ☐ Bachelor's degree
   - ☐ Undergraduate diploma
   - ☐ Secondary
   - ☐ Primary
   - ☐ Other specify

d) Categories of respondents
   - ☐ Doctor
   - ☐ Nurse
   - ☐ Mother
   - ☐ IT Manager

APPENDIX VB

QUESTIONNAIRE TO DETERMINE THE LEVEL OF PERFORMANCE AND EFFIENCY OF THE PRESENT DISSEMINATION OF IMMUNIZATION INFORMATION SYSTEM

Direction: please respond to the questions flowing with your choice. Kindly use the written guide as;

Response ModeRating		Description
Strongly Agree	(4)	You agree with no doubt at all
Agree	(3)	You agree with some doubt
Disagree	(2)	You disagree with some doubt
Strongly disagree	(1)	You disagree with no doubt at all

_____ 1. It is ease for the health centre to store its immunization InformationData.

_____ 2. The present process of immunization information recording works Effectively.

_____ 3. With the present system, the Parents of children get all Immunization information easily.

_____ 4. The present dissemination of immunization information system is Efficient.

_____ 5. The immunization information is delivered in good way and on Time.

_____ 6. The present system requires less than power

_____ 7. The existing system for dissemination of immunization information Flexible

_____ 8. The present system is flexible

_____ 9. The present system is well protected

_____ 10.You meet the problem by using the current system of disseminatesImmunization information.

_____ 11.There is need of database for the health centre to store its Immunization information data.

_____ 12.There is need of new system for disseminates immunization system(mobile application system)

_____ 13.There is benefit to use mobile application for immunization Dissemination information

APPENDIX VC

QUESTIONNAIRE TO DETERMINE THE LEVEL OF PERFORMANCE OF THE PROPOSED MOBILE APPLICATION FOR DISSEMINATION OF IMMUNIZATION INFORMATION AFTER ITS IMPLEMENTATION.

Direction: On the space provided before each option, indicate your best choice by using the rating system below:

Response Mode	Rating	Description
Strongly Agree	(4)	You agree with no doubt at all
Agree	(3)	You agree with some doubt
Disagree	(2)	You disagree with some doubt
Strongly disagree	(1)	you disagree with no doubt at all

_____1. Overall, I am satisfied with how easy it is to use MASDNII

_____2. It was simple to use this MASDNII

_____3. I can effectively complete my work using this MASDNII

_____4. I am able to complete my work quickly using this MASDNII

_____5. I am able to efficiently complete my work using this MASDNII

_____6. I feel comfortable using this MASDNII

_____7. It was easy to learn to use this MASDNII

_____8. I believe I became productive quickly using this MASDNII

_____9. MASDNII gives error messages that clearly tell me how to fix Problems

_____10. Whenever I make a mistake using MASDNII, I recover easily and Quickly

_____11. The information (such as help, on-screen messages, and other documentation) provided with this system is clear

_____12. It is easy to find the information I needed

_____13. The information provided for the system is easy to understand

_____14. The information is effective in helping me complete the tasks and

Scenarios

_____15. The interface of using MASDNII is pleasant

_____16. I like using the interface of using MASDNII

_____17. MASDNII has all the functions and capabilities I expect it to have

_____18. Overall, I am satisfied with this system

Thanks for your cooperation

APPENDIX VI

PROPOSED BUDGET

ITEM	AMOUNT
Internet usage	250,000
Typing and printing	400,000
Transport	120,000
Stationery	450,000
Miscellaneous	250,000
Total	**1,470,000**

APPENDIX VII

VALIDITY AND RELIABILITY OF THE INSTRUMENT

$CVI = n/N$

Where CVI: Content Validity Index

N: Total number of items in questionnaire

n: Number of relevant items in the questionnaire

$n = 25$

$N = 27$

$CVI = 25/27 = 0.9$

APPENDIX VIII

TIME FRAME

ACTIVITIES	APRIL 2012	MAY 2012	JUNE 2012	JULY 2012	AUGUST 2012	SEPTEMBER 2012
Proposal writing	X					
Pretesting research Instrumental		X				
Data Collection			X			
Data Analysis				X		
Compilation of report/ finding					X	
Presentation of report for examination						X

RESEARCHER'S CURRICULUM VITAE

To document the details of the researcher, his competency in writing a research and to recognize his efforts and qualifications, this part of the research report is thus meant.

Personal Profile

Name: MASENGESHO Pontien

Gender: Male

Nationality: Rwandese

Educational Background

Master of Science in Information System (K.I.U) (2012)

Bachelor of Science in Computer Engineering (NUR) (2009)

Advanced Level of Secondary Education   (GSK) (2004)

Work Experiences

2 years in 5G Technologies as IT Manager