INTEGRATION OF IQ-CARE WITH AFYA-IT TO INCREASE UTILISATION OF INFORMATION SYSTEMS AT MALINDI SUB-COUNTY HOSPITAL THROUGH THE CONNECTED HEALTH APPROACH

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DECLARATION

This project report is my original work and has not been presented for a degree in any other University.

Signature...…… Date……...

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W82/89453/2016

Supervisor's Approval

This project report has been submitted for examination with my approval as the University supervisor.

Signature…… Date……...

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DEDICATION

I dedicate this project to my parents, siblings and friends for their continued support, prayers and concern during the period of study and implementation.

ACKNOWLEDGEMENTS

I'm grateful for having completed this project. It wouldn’t have been made possible without the effort and cooperation of staff members at Malindi Sub-County Hospital and Kilifi County General Hospital.

I also want to thank the University of Nairobi's Institute of Tropical and Infectious Diseases (UNITID) for the guidance and encouragement in finishing this assignment.

Finally, I give thanks to the Almighty, God. To friends and family for their constant source of inspiration.

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ABBREVIATIONS AND ACRONYMS

AIDS	–	Acquired Immunodeficiency Syndrome
ART	–	Antiretroviral Therapy
AFYA-IT	–	Hospital software billing Information System
APP	–	Software Application
CASCO	–	County AIDS & STI Coordinator
CCC	–	Comprehensive Care Center
CDC	–	Centers for Disease Control and Prevention
CEC	–	County Executive Commissioner
DB	–	Database
DHIS	–	District Health Information System
EMR	–	Electronic Medical Record
HIV	–	Human Immunodeficiency Virus
ICT	–	Information Communication and Technology
IS	–	Information System
IT	–	Information Technology
LIMS	–	Laboratory Information Management System
MSCH	–	Malindi Sub County Hospital
MTP	–	Medium Term Plan
NASCOP	-	National AIDS and STD Control Program
OCA	–	Organisational Capacity Assessment report
TB	-	Tuberculosis
UHIV	–	University of Nairobi HIV Program
UML	–	Unified Modelling Language

ABSTRACT

The aim of this implementation research project was to address the following objectives: To develop a mobile web software application that will lead to the integration of databases from two information systems namely the IQ-Care and AFYA-IT at MSCH; To create seamless flow of information and reporting between different existing Information System within MSCH and other health facilities in Kenya and the world; To count the number of Health Management team members who have been trained on the integrated systems and ensure consistent increase in the number yearly; To do an assessment of the people who have been trained on the system to gauge their level of understanding and confidence.

SCRUM, an agile methodology was adopted as the software methodology for development of the application.

After implementation of this project it is expected that there will be improvement in operational efficiency and standardization of data collection/reporting within different existing IS's. This will aid in dispensing timely and up to date information for decision making.

A comprehensive investigation on integration of systems locally and around the world was performed. Data collection instruments such as interviews and observations were performed to collect information. This included both qualitative and quantitative methods of data analysis. Results of data analysis aided in informing system requirements and design of the software application. System testing was performed to ensure usability, reliability, completeness and correctness of the developed application.

The project budget summed up to USD 3,500 and was undertaken over a period of 7 months.

CHAPTER 1: INTRODUCTION

1.1. Background to the Study

The essence of integrated healthcare delivery is to link multiple levels of care management, harmonize services and embolden professional collaboration across a range of care delivery. Integrated healthcare therefore encompasses departmental/ organizational networks and connections focusing the continuum of healthcare delivery around patients and populations (Accenture, 2012).

Different models and approaches of integrated healthcare that vary in emphasis and focus are used by many countries. Common among these approaches are initiatives to share information based on cost, quality and outcomes across healthcare delivery, the core to connected health.

Connected health is an approach to healthcare delivery leveraging on the systematic application of healthcare IT to facilitate accessing and sharing of information. Also, to allow subsequent analysis of health data across healthcare systems (Accenture, 2012). Other than management of patients' clinical data connected health facilitates collaboration among various stakeholders involved in a patient's health. This is achieved with a range of information and collaborative technologies including Electronic Medical Records (EMR), data repositories, analytical tools, clinical applications, connected biomedical devices and tele-health collaboration technologies. However, these solutions must rest on principals of technology, security and data standards to ensure confidentiality of personal health information.

The goal of connected health is to connect all parts of a healthcare delivery system seamlessly through interoperable technologies and health information processes to enable availability of critical health information when needed. Through structuring and exchanging healthcare information to focus care delivery around a patient or defined population, connected health facilitates disease management, improved care coordination and the use of clinical practice guidance to reduce errors and improve care (Accenture, 2012). Integrated healthcare delivery is therefore highly affected and vested by Connected Healthcare.

Below is a diagram representing the connected health eco-system at MSCH.

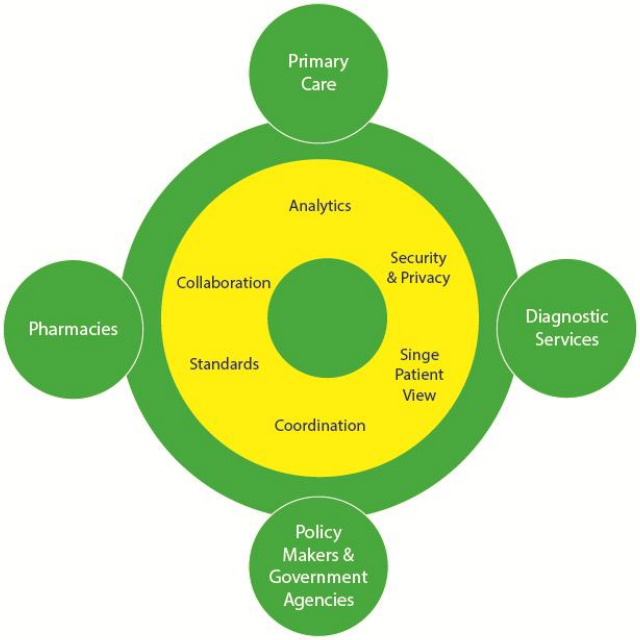


Figure 1.1-1: Connected Health Ecosystem

1.2. Statement of the Problem

The existence of multiple information systems in many organizations was perceived as a positive move towards digitization. Government institutions, organisations, hospitals and MSCH as such had incorporated information systems to ease their daily workflow. At MSCH IS's had greatly upgraded its image as an organization adhering towards digitization but had greatly failed in addressing core functional procedures. Some of the gaps identified at MSCH after implementation of multiple IS's were:

1. Most staff were well acquainted in using IQ-Care's IS as it was the only IS used in most departments. The CCC and PMTCT departments entirely relied on IQ-Care for automated processes in patient registration and HIV care & treatment through ART. However, utilization of other modules residing in the IQ-Care in these departments was still minimal.
2. A redundant work procedure. Data entry was done on IQ-Care IS and reporting automated through submission of queries through its database. However, the IS

frequently encountered technical hiccups attributed to loss of power and network failures. CCC therefore reverted to manual data entry into the DHIS2 to provide national government with the MOH 731 report rendering the entire IS unreliable.

3. DHIS was rolled out by the national government to support national health services. DHIS was therefore capable of supporting all departments within MSCH if fully adopted. However, DHIS was only used within the Finance and Records departments. Its percentage of use at MSCH was lower than IQ-Care. Utilization of DHIS at MSCH was below 10%. Most staff were therefore not well acquainted in its use contributing to lack of motivation in uptake of information systems.
4. Reports from either system weren't directly accessed by senior MSCH management such as the Medical Superintendent and other HMT members.

There was therefore the need to fill the gaps as mentioned above. Integration of the AFYA-IT and IQ-Care will not only make information readily available to senior and subordinate staff but will create a venue for training on how to use the systems.

1.3. Purpose of the Study

The main aim of this study was to establish seamless flow of information and reporting between different existing Information System within MSCH and other health facilities in Kenya and the world.

1.4. Research Objectives

Objectives of this research were used to instruct the researcher on the anticipated achievement at the end of the study. They provided the researcher with a clear sense of purpose and direction with greater detail than the research question. Objectives of the research were as follows: -

1. To determine the extent to which MSCH uses existing ICT tools in reporting of health care activities.
2. To develop a software application that will lead to the integration of two information systems namely the IQ-Care and AFYA-IT at MSCH.

3. To test the effectiveness and efficiency of the developed application.

1.5. Research Questions

1. What is the extent to which Malindi Sub-County Hospital uses existing ICT tools in reporting of health care activities?
2. How can a mobile web-based application be used to integrate existing information systems at Malindi Sub County Hospital?
3. What are the findings of testing and evaluation of the developed application?

1.6. Significance of the Study

The significance of this project was to solve a real-life problem. Existence of different and independently working Information systems at MSCH greatly contributed to repulsive employee behavior in tolerating the use of information technology. This was a major hindrance to Kenya's ICT 2017 Master plan envisioned in the 2030 ICT goals. Lack of efficient interdepartmental workflow characterized by existence of autonomous information systems was also been hampered. The problem of accurate, timely reporting and efficient communication between information systems at MSCH needed to be addressed.

It was mandatory that a solution be found to allow for effective dissemination of data in all departments at MSCH for use by the County and National Governments. Development of a software application was the best solution to aid in seamless integration of existing information systems at MSCH.

Secondary benefits of the solution were;

1. Empowerment of staff to adopt and use the information systems in running daily activities.
2. Ensuring efficient flow of information between two or more information systems existing at MSCH.

1.7. Delimitation of the Study

These were boundaries with which the researcher set to control the objectives of the implementation science project. The delimitations set were as follows: -

The implementation science study was carried out at MSCH, Kilifi County. Results from the study were aimed at finding a solution to the gap existing within the PLP. Results were later to be replicated to other existing PLP's within and outside of the county.

The study population consisted of 26 staff members of the Health Management Team of MSCH. They were the chosen study population because their direct influence in decision making and buy in to IQ-Care and AFYA-IT as core shareholders of the implementation science project.

The research study was implemented for a period of not more than two years. Extension of the timeframe would have affected innovation to the solution in place. The researcher intended to take advantage of problem solving before other parties showed interested in it.

1.8. Limitations of the Study

The study offered an evaluative perspective on an important national development strategy in the integration of information systems for easy dissemination of data and information. This has been achieved technologically by development of a mobile and web-based application that integrates two information systems, AFYA-IT and IQ-Care. Although this research was carefully prepared, limitations were encountered and have been highlighted below.

1. The application relied entirely on internet connectivity to fetch the most current data which was mainly attributed to the nature of the client server relationship. This negatively affected accurate responses in cases where there was no connectivity.
2. Availability of funds to carry out the study was not on a timely manner. This led to abrupt breaks which extended completion of the project from its stipulated timeline.

1.9. Assumptions of the Study

The researcher made suggestions that were considered in eliminating the area of study. Some of the assumptions made by the researcher were:

1. Assumption that the project was to be completed within the stipulated time of 9 months.
2. Assumption that funding of the entire program was to be made available until its stipulated time.
3. Assumption that data collected during the pre and post implementation processes was unbiased.
4. Assumption that the budget would be more than enough to organize and implement the project to completion.
5. Assumption that there would be buy-in to support implementation of the project by stakeholders.

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

This section gives a review of similar literature concerned with the integration of Information Systems in Kenya and the world. It also gives an analogy of existing systems showcasing challenges faced by those systems. The conceptual and theoretical frameworks used are also explained.

2.2. Health Information Systems Globally

Keystones for decision making in the health sector are provided by health information systems. Four key functions contribute to decision making which are; communication and use, compilation, analysis and synthesis and data generation (World Health Organisation, 2008).

Ideally data from health facilities is collected by health information systems which then analyse the data ensuring that standards are met. Data is later converted to information for decision making that is health related (World Health Organisation, 2012). For information to be valuable it should meet the needs of multiple users. Such users include communities, policymakers, planners and health-care providers. It is mandatory that dissemination and communication as essential attributes of health information systems.

Different levels of the health care system contribute to the generation of data from different sources. Some of the core data levels are:

1. *Individual;* This is patient level data attributed to a patient's profile. This is data for treatment and healthcare needs used basically for clinical decision making.
2. *Health facility;* this is mostly aggregate data of records from administrative sources e.g. drug procurement records to enable health management teams determine and guide purchasing decisions for equipment supplies and development of community outreach programs.

3. *Population;* this is data essential for public health decision making. This is inclusive of household surveys done especially in developing countries where statistical data from facilities is limited.
4. *Surveillance in Public Health;* this is a conglomeration of data from communities and facilities. Its focus is to define problems and provide timely action points. Cases here involve making quick decisions especially when there's a disease epidemic.

Countries all over the world experience decentralization and healthcare reforms brought about by changing peripheral levels. This in turn contribute to new information needs and structures with changing requirements for data collection, processing, analysis and dissemination.

Global bodies such as the US Presidents Emergency Plan for AIDS Relief (PEPFAR), the Roll Back Malaria (RBM) partnership, the GAVI alliance and the Global Fund to fight AIDS, Tuberculosis and Malaria (GFATM) continuously push organisations and governments to improve on performance and demonstrate tangible results to stakeholders.

For continuous health care information needs to be shared across existing systems within facilities. Inadequate data flow is the main symptom of lack of integration of systems (Robbins, et al., 2005). It has been noted that Integrated Health Information Systems provide higher performance on safety and quality of information (Gray, 2005).

2.3. Health Information Systems in Kenya

The Kenya ICT Master plan of 2008-2012 stipulates the incorporation of integrated information infrastructure aiming to improve the quality of e-government services propelling the country to a knowledge-based society. Public information therefore needs to be made readily available through portals in an affordable and secure way (Ministry of Information Communications and Technology, 2017).

Kenya's vision 2030 is its national long-term development blue-print that aims to transform the country into a modern, globally competitive, middle income country offering high quality of life for its citizen by the year 2030 (Ministry of Information Communications and Technology,

2017). The ICT theme sits as one of the foundations for national transformation in the first medium term plan (MTP) (2008-2012). Under the ICT master plan stands three pillars. Key among these is the third pillar, Integrated Information Infrastructure, which aims at improving the quality of e-Government services enabling the country to transition to a knowledge-based society of which this project seeks to address. To achieve this there needs to be access to information held by public authorities to accredited individuals within the populace. Public information should also be made readily available through consolidated portals in an affordable and secure way (Ministry of Information Communications and Technology, 2017, pp. 12-13).

2.4. Health Information Systems at Malindi Sub-County Hospital

Malindi Sub County hospital in its quest to keeping in line with the ICT Master Plan of 2017 has seen the implementation of various information systems to aid in management, information dissemination and efficient running of tasks within its departments. Information systems currently in use at Malindi Sub County Hospital are; LIMS – Laboratory Information Management System, IQ-CARE (a robust electronic medical records (EMR) package that is flexible and scalable with features to create multiple departments and forms; set up facility and patient home page reports and queries.), DHIS2 (a health management information system used by governments and health organizations to manage their operations more effectively, monitor processes and improve communication.), TB-App and 'AFYA-IT'. This project seeks to develop a software application to aid in the integration of two existing and mostly used systems in use at Malindi Sub-County Hospital namely IQ-CARE and the AFYA-IT.

2.5. Theoretical Framework

Implications of research theories and how they can be applied in the implementation and adoption of ICT in the area of management and business is paramount. This is because inadequate ability to learn and use system can impede adoption and implementation of hypothetically productive systems. According to Bagozzi (2007), ICT systems need to be better understood in the whole adoption process as is the role of learning their use (Bagozzi, 2007).

Information Communication and Technology (ICT) systems have largely been developed with partiality towards societal aspects. This has hampered the learning process of using such systems (Damsgaard & Lyytinen, 2010). Advanced skills and proficiency during implementation, operation and adoption is often a necessity (Korpelainen, 2011).

This implementation research project was supported by two theoretical review approaches. The Theory of Reasoned Action (TRA) and the Technology Acceptance Model (TAM) Theory.

2.5.1 Technology Acceptance Model

The Technology Acceptance Model focuses on ICT usage behaviour and what causes potential adopters to reject or accept use of information technology (Davis, Bagozzi, & Warshaw, 1989). Two theoretical constructs are used based on the Theory of Reasoned Action: -

1. *Perceived Ease;* this refers to the degree with which users perceive a system to be free of effort.
2. *Perceived Usefulness;* this refers to the degree with which users believe that using a system will enhance job performance.

2.5.2 Theory of Reasoned Action

An assumption is made on this theory that user behaviour is determined by the intention to perform an action. Other than that, the intention is further determined by the user's perception and attitude other than him/her towards the user's behaviour (Fishbein & Ajzen, 1975).

2.6. Conclusions

The existence of multiple information systems at MSCH depicts its urgency in grasping benefits associated with implementation of Information Technology tools and services, as outlined in Kenya's visions 2030 ICT goals. However, a problem exists when such systems work independently as is the case at MSCH and in many other facilities. Efficient flow of information

and communication between departments is hampered. There is also duplication of reports by different systems leading to low or no data integrity.

Following the OCA report submitted by the UHIV secretariat, coexistence of multiple and independent health information systems majorly leading to inaccurate reporting of data is one of the gaps that require urgent consideration at MSCH.

The theoretical approaches mentioned above justify this solution which is to integrate the IQ-Care with AFYA-IT. In the long run the solution will lead to increased utilization of information systems at MSCH.

CHAPTER 3: RESEARCH METHODOLOGY

3.1. Introduction

This section is concerned with the methodology of the software in development process of the prototype. The section is made up of key areas namely; Business Study, Feasibility Study, System Analysis and Design Methods, Implementation Methods, Testing and Evaluation Methods.

3.2. Software Methodology

The System Design method implemented was SCRUM which is an AGILE methodology. The nature of this study is highly emergent with a large populace. The methodology allows for flexibility in incorporating changing user requirements due to its incremental and iterative nature. Additionally, Design, Implementation and Testing can be done throughout the project lifecycle (Scrum, 2015).

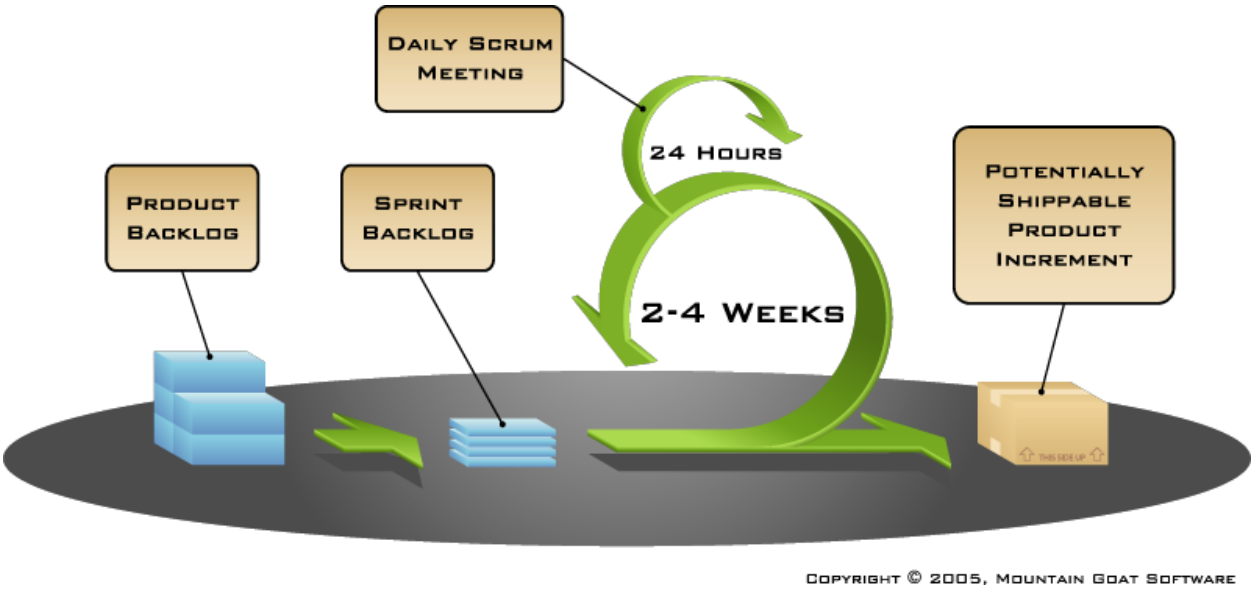


Figure 3.2-1: Scrum Methodology Process

3.2.1 Feasibility Study

This is a trivial study done to aid in designing a further confirmatory study (Arnold, et al., 2009). A feasibility study was done through reviews of relevant literature on existing systems related to identification and verification of counterfeit drug items. The study was performed to analyse and evaluate the impending solution of the proposed system.

3.2.2 Business Study

Research Design

To capture the full perspective of the research study a Descriptive research and Qualitative Research was done.

a. *Descriptive Research;* this research type helped the researcher define the characteristics of the population in study. This provided a deeper understanding of interactions between the populace, drug items and the ability of the populace in identification of counterfeit drug items. The information acquired greatly influenced the decision on the technology to be adopted.

b. *Qualitative Research;* this research type was used to gain an understanding on views of the populace of the study in context to the area of study. The results from this research aided in guaranteeing user satisfaction of functional and non-functional requirements of the application.

Location of Study

The selected area of study was Malindi Sub-County Hospital located in Kilifi County. The area was selected for study due to high prevalence in HIV. As it stands new infections in Kenya among children and adults originate from Kilifi County accounting to 3% and 2% of the national prevalence respectively.

Target Population

The target population was drawn from the Health Management Team at MSCH and County Health Management Team at Kilifi County. These were among key stakeholders of the project.

Sampling Strategy

The researcher used Stratified Sampling technique. The stratum consisted of County and Hospital Management teams. These groups were chosen as subjects to be interviewed for the study. This technique aided in focusing on the population that was most expected to interact with the proposed application.

Sample Size

25 respondents were interviewed daily for a span of 2 weeks from MSCH. 6 individuals were interviewed in a span of a week from Kilifi County Hospital. The total number of respondents interviewed was 31. This sample size also comprised of mixed gender, age, educational level. The sample size was deemed appropriate as it consisted of individuals that were highly likely to interact with the data in either facilities in one way or another.

Data Collection Procedure

Different analytical tools were used to collect and analyse interviews and questionnaires namely: SurveyMonkey Analytical Tool for analyzing online questionnaires. Charts and bar graphs were used to provide clear visual presentations of responses. Below is a list of data collection methods that the researcher used to get feedback from the population of study.

1. *Questionnaires;* an online survey consisting of open and close ended questionnaires was administered to a targeted number of respondents. This was done as a Pre-Test analysis of the study to gain an understanding of how knowledgeable the study population was with regards to awareness of the existence of information systems within health facilities. The exercise was done through posting a set of questionnaires online. This enabled the researcher to know whether the population was in contact with other technologies used to collect and analyse data. Data gathered was used to formulate requirements specifications.
2. *Oral Interviews;* Oral interview consisted of a set of questions that were performed individually to respondents to acquire user feedback on the developed prototype. Results were used to further refine the prototype.

3. Review of existing documentation; this involved the process of reviewing data by evaluating and analyzing existing documents. Documents reviewed consisted of hard copy and electronic; reports, journals, newsletters, magazines, books, academic articles, texts and marketing materials.

3.3. System Analysis and Design

System analysis and design methods gave guidance in understanding what was needed to analyse data flow systematically, process data, store data and output information in context of the study (Kendall & Kendall, 2013).

In selecting an appropriate methodology, one on one interviews were performed using pre-defined questions that sought to understand the workings of current systems. Consideration was made on limitations of the system at the time of study to identify key user requirements. Outcomes from the interview greatly influenced results of the system analysis and design process. Through the concept of Object Orientation Analysis was done to ensure user requirements were modelled and analysed profoundly. Relationships of real-world Objects were also identified.

Unified Modelling Language (UML) was used as the modelling language. This aided in modelling analysis and design diagrams. Other than that, the UML notation offered clarification to user requirements. Use - Case descriptions and diagrams were used to model system functionality. The System Sequence Diagram modelled the System Flow showing data passing between main entities of the system. Various entities with corresponding attributes and methods of implementation were modelled using Class diagrams. The Entity Relationship Diagram was used to model the database. This showed the tables, attributes and relationships. The Database Schema modelled the table structure showing fields, data types and descriptions.

Wireframes were later used to illustrate process flows of both the web and mobile applications. In both systems flow Adobe Illustrator CS6 was used as the designing tool.

3.4. Prototype Implementation

The prototype comprised of development of a mobile and web application connected to a central database. Below are approaches employed in the development of the applications:

1. Web Application; the web-based application was developed using Hypertext Preprocessor (PHP). The website was hosted on an online Apache HTTP server. Reasons for using PHP were; it is an Open Source platform; it is platform independent; it supports all major webservers and databases; it has multiple layers of security to prevent threats and malicious attacks.
2. Database; databases used by two information systems IQ-Care and AFYA-IT were developed from the MySQL platform. Querying of data was therefore done using PHP.

3.5. Evaluation of the Prototype

The prototype underwent the following tests to find out whether it was in tandem with the specified goals of this dissertation:

1. Functional Tests; functional and non-functional tests were performed on the prototype.
2. Compatibility Tests; a compatibility test was performed on different mobile web-based applications and browsers respectively.
3. User Tests; this test was done on the developed application to measure user satisfaction and collect feedback for refining the prototype.

3.6. Ethical issues

Key ethical issues that were addressed in the project were as follows: -

1. Privacy and Confidentiality of patient's data.
2. Data sharing.
3. Obligations and standards for systems developers and maintainers.
4. Appointment of appropriate users and educational standards.

CHAPTER 4: SYSTEMS ANALYSIS

4.1. Introduction

This section is concerned with research findings of the study. Results from the findings contributed to the design of the application.

4.2. Demographics

4.2.1 Age Distribution of users

The ages of users were recorded to find out age groups that would interact with the web application. This aided in development of aesthetics customized for the group in study.

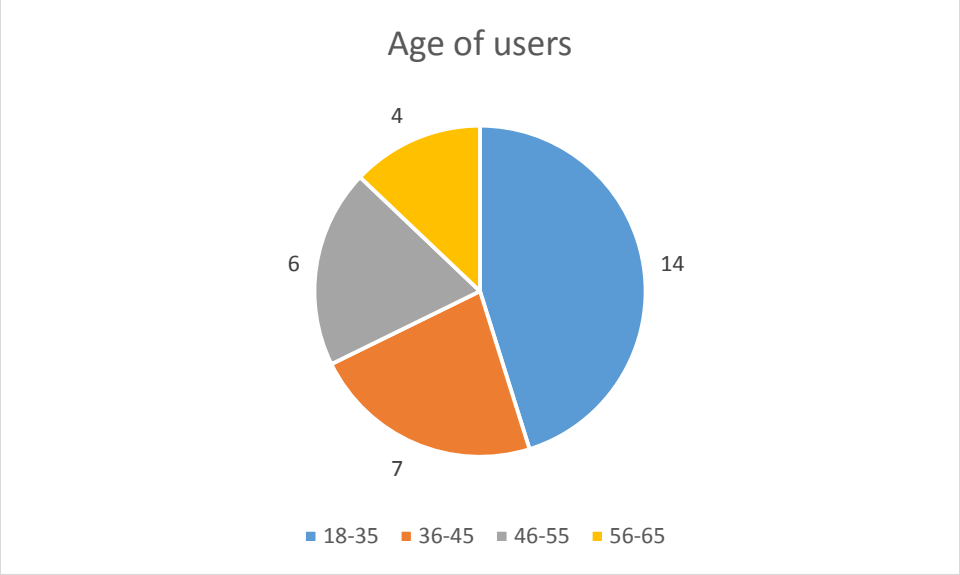


Figure 4.2-1: Age Distribution of users

Figure 3.2-1 above shows variations of different age groups of the study group. The results aided in customizing the developed application to cater for users with the age groups represented. The findings indicated that majority of the users were youths. (18-25) years old with a representation

of 14 users. (36-45) years old with a representation of 14 users. (46-55) years old were 6 and (56+) years old were 4.

4.2.3 Educational Disparities of the users

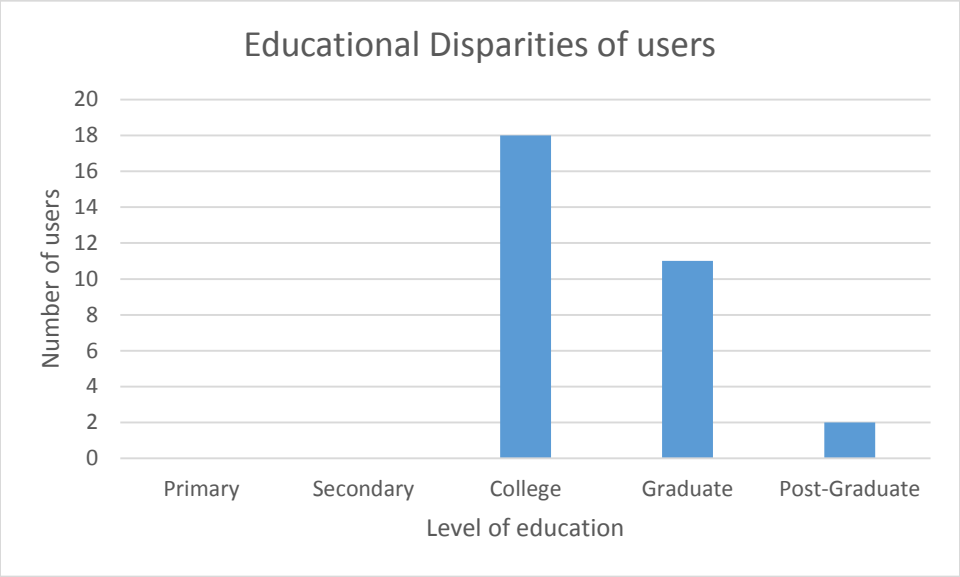


Figure 4.2-2: Educational Disparities of users

Figure 3.2-2 above shows education levels of the study population. The findings aided in determining the level of complexity in giving instructions and following simple gestures while using the developed application. The ability to comprehend gestures and associating them with functionality and text was important especially in cases where there was no human assistance to users. Majority of the users were educated. All were above secondary school level.

4.2.4 Use and ownership of mobile device

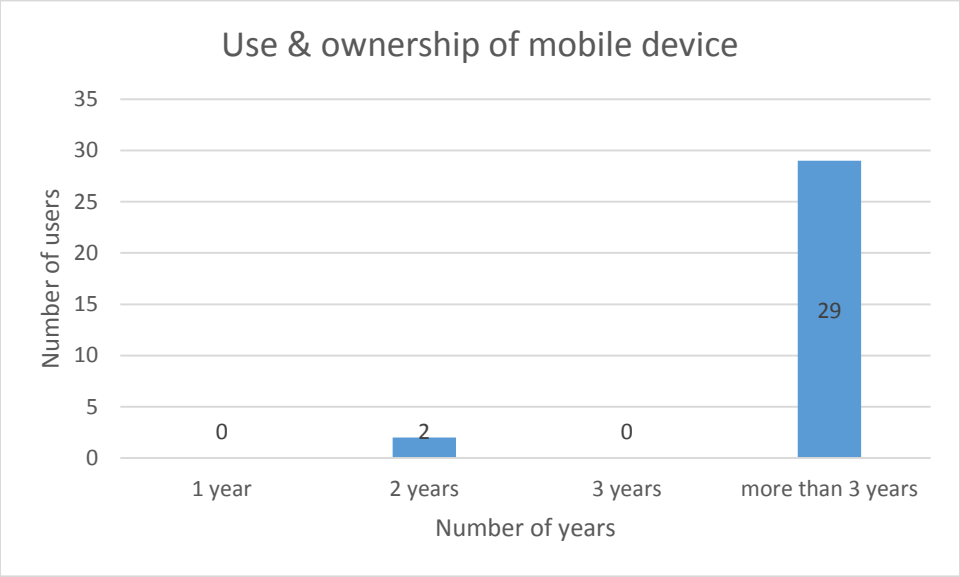


Figure 4.2-3: Use and Ownership of device

Figure 3.2-3 above shows the extent to which the target group have used and owned mobile devices. Results from this aided in finding out how well conversant the study population was with the use of mobile devices. Majority of the users had used and owned phones for a span of more than 3 years. This contributed in strengthening the goal of the project. The use of mobile devices was not a foreign environment to the users.

4.3. Results from data Collection and Analysis

Following data collection and analysis the information below was concluded:

1. The proposed solution was feasible in aiding with seamless flow of information through integration of IQ-Care and AFYA-IT at Malindi Sub-County Hospital.
2. It was evident that majority of the users in the target population owned and use mobile devices daily. Minimal training would therefore be required getting users to use the web application comfortably.
3. Few users had interacted with the either information systems even though the systems had been in existence in the hospital for a long time.

4.4. System Requirements

4.4.1 Requirements Analysis

This section will focus on functional and non-functional based on user feedback accumulated.

4.4.2 Functional Requirements

These include a set of behaviour, inputs and outputs synonymous to objectives of the study. These were:

1. Login/Logout; to gain access to the extra services such as viewing a history of activities defined by the users from the existing database.
2. Modify User details; an administrator with super user rights can add and delete users from accessing the system.
3. View reports; a user can view a report through querying the database. Data can then be manipulated visually to display graphs and charts.
4. Comment; Users can comment on reports that can be viewed by other users.

4.4.3 Non-Functional Requirements

These requirements specified the criteria used to judge operation of the system. Functional requirements were compared to these as they defined specific behaviors or functions. They included:

1. Usability; interface design of the system was to be easily used.
2. Security; only authorized personnel were to access the systems core features.
3. Reliability and availability; reliability and availability of the system was paramount. This was to enables users perform tasks at their will.
4. Scalability; the system was adoptive in nature. This meant that it was to allow modification or additional functionality.
5. Performance; the response time for performing functions was to be acceptable.

6. Integrity; data analysed and stored was to be protected from alterations by third party entities.

CHAPTER 5: SYSTEMS DESIGN AND ARCHITECTURE

5.1. Introduction

This section will provide a detailed explanation of the Design and Architecture of the proposed solution. Design diagrams were drawn under the unified Modelling Language (UML).

5.2. Systems Architecture

The developed application implemented the Client Server Architecture. The client side consisted the mobile optimized web application that interacted with MySQL databases from IQ-Care and AFYA-IT. Health management team members interacted with the application by login in and viewing reports via a dashboard presented on their mobile devices of on a computer screen. Through a secured local area network connection, the web application links to IQ-Care and AFYA-IT databases, retrieves data. Data is then manipulated to pictorial presentation for viewing by the user. The diagram below represents the systems architecture. Figure 4.2-1 below is a networks architecture of the description above.

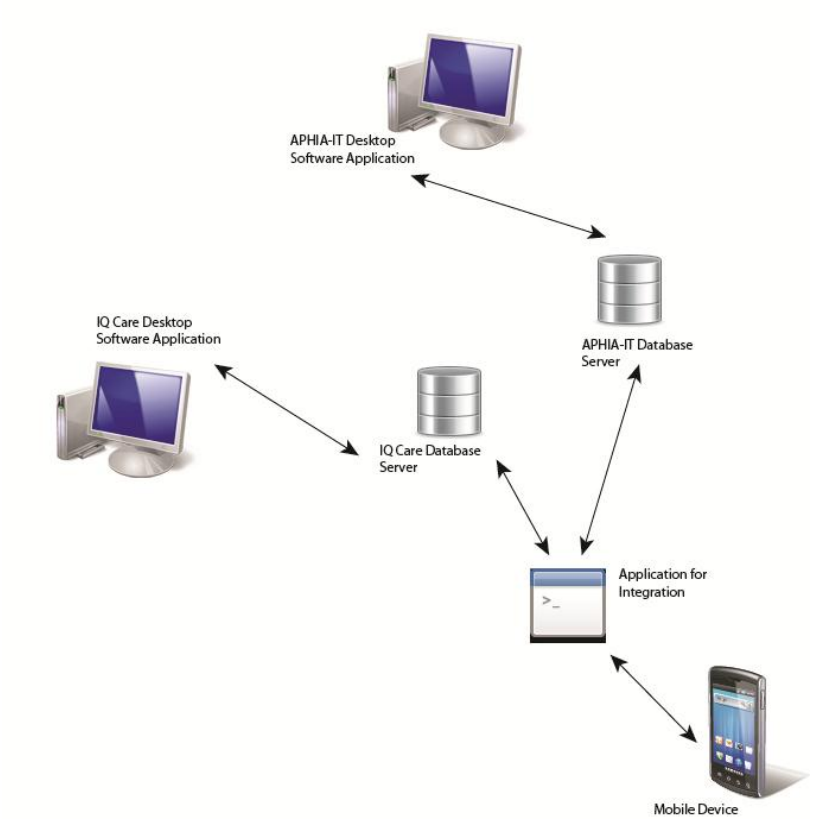


Figure 5.2-1: Hardware Systems Architecture

5.3. Systems Design

The system Design presented the proposed solution in a logical manner using different design diagrams. It consisted of six components:

1. User Interface Flow Diagram
2. Use Case Diagrams and Descriptions
3. Sequence Diagrams
4. Context Diagram
5. Level 0 Data Flow Diagram

5.3.1 User Interface Flow Diagram

This section dealt with the flow of screen presentation of the developed application. On the applications first run a splash screen appears followed by the main menu screen. The main menu screen or home screen displays shortcuts to all functionalities of the application including a help menu button and login button.

5.3.2 Use Case Diagram and Descriptions

This is a behavioral diagram that shows the functionality provided by a system in terms of actors, their goals as represented by use cases and any dependencies on those use cases. The main actors of the system are the Health Management Team members. The main processes in this application are:

1. User verification; Primary actor is a Health Management Team member who authenticates him/herself through a login process.
2. View report; Primary actor is a Health Management Team member who views specific reports via a dashboard after login.
3. Modify user details; A systems administrator is the primary actor who adds, edits or deletes users and grants permission to view specific reports.

Table 5.3-1: Use Case Diagram & Descriptions

Use - Case	Description
UC 1 – Verify User	i) Primary Actor; HMT at MSCH or CHMT member at Kilifi County. ii) Stakeholders; - MSCH - HMT/CHMT members - Palladium - AFYA iii) Pre-Conditions;

	- User must be member of HMT at MSCH or CHMT at Kilifi County. - User must have login credentials iv) Success Scenario; - User can successfully log into the system. v) Frequency of occurrence; - Process occurs often
UC 2 – View Report	i) Primary Actor; HMT at MSCH or CHMT member at Kilifi. County. ii) Stakeholders; - MSCH - HMT/CHMT members - Palladium - AFYA iii) Pre-Conditions; - User must select specific datasets to view on the dashboard - User must have logged into the system - User must be member of HMT at MSCH or CHMT at Kilifi County. iv) Success Scenario - User can view graphical/Chart representations of specific

	datasets chosen on the dashboard. v) Frequency of occurrence; - Process occurs often
UC 3 – Modify User Details	i) Primary Actor; System Administrator. ii) Stakeholders; - MSCH - HMT/CHMT members - Palladium - AFYA iii) Pre-Conditions; - No pre-conditions iv) Success Scenario - User can be modified/edited. v) Frequency of occurrence; - Process rarely occurs

Table 4.3-1 above shows the Use Case Description of the proposed web application. It comprises of the following major Use Cases; Verify User, View Report, Modify User Details.

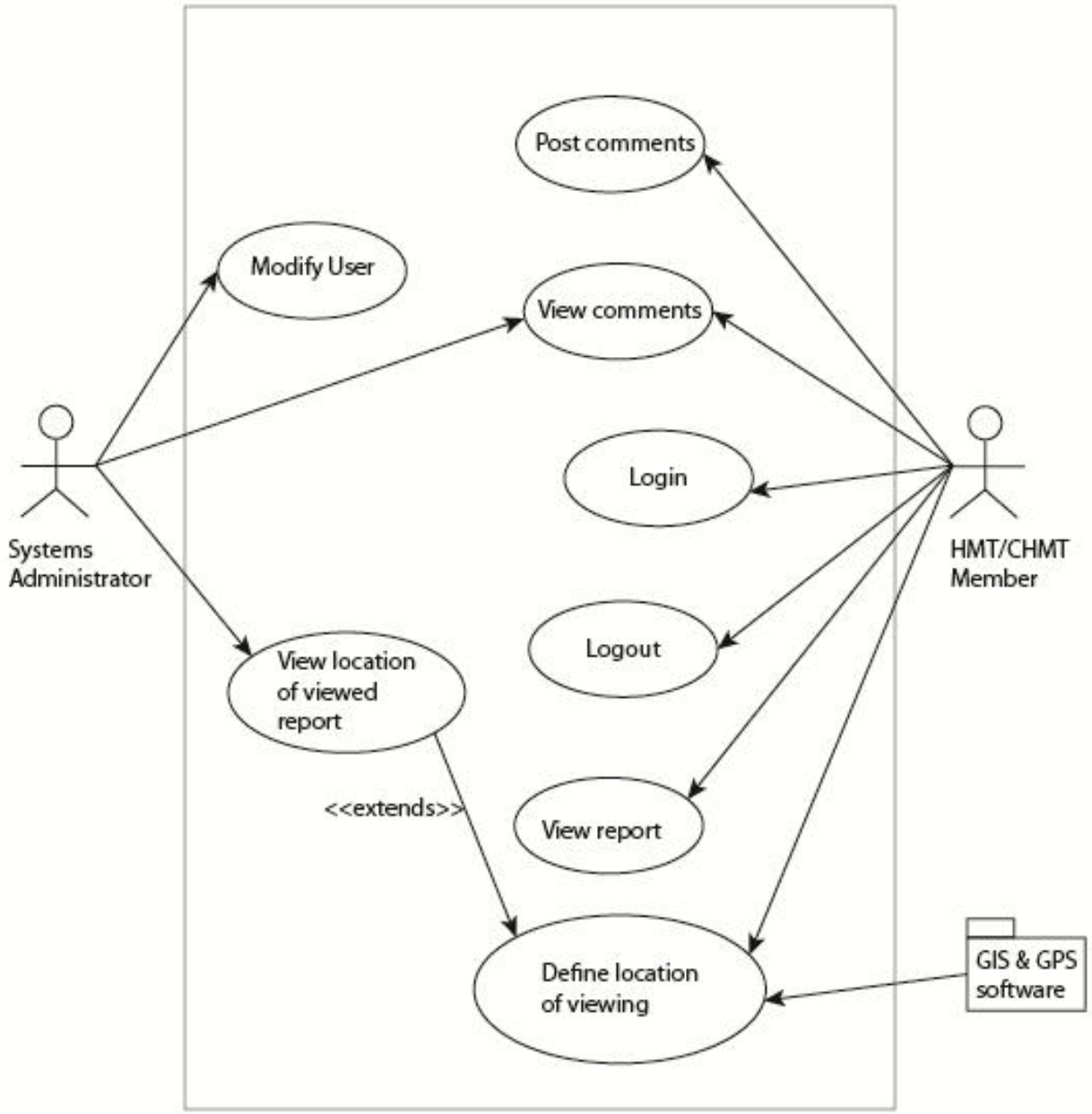


Figure 5.3-1: USE CASE Diagram

Figure 4.3-1 above shows an illustration of the Use Case Diagram with all Use Cases. The Use Case describe sequences of actions providing some value to the actor and is represented as a horizontal ellipse. An actor is a person or am external entity, in this case, a person and a GPS server. Associations between the Actors and Use Cases are indicated by use of solid lines with

arrow heads pointing towards the direction of initial invocation of the relationship (Cambridge University Press, 2004).

5.3.3 System sequence Diagram

The system sequence diagram shows how users interact and receive feedback and messages to and from the system. It also shows how other activities in the system communicate i.e. from the applications interface and the database where information is retrieved. The diagram also shows how users receive feedback messages from the system. Major entities of the system sequence diagram were:

i) HMT/CHMT members: after logging into the system a user is presented with a dashboard with different datasets retrieved from specific tables of IQ-Care and AFYA-IT. On clicking a dataset, the user is issued with a visual presentation in Graphical or Chart format for easy interpretation.

ii) The systems administrator: the primary role of the systems administrator is to manage users through adding, deleting and modifying user roles and accounts.

iii) Software Application: Both systems administrator and customer interact with the application.

Figure 4.3-2 below shows major entities communicating with each other in the systems sequence diagram. The system sequence diagram is used to show interactions between objects in the sequential order that interactions occur (Bell, 2004).

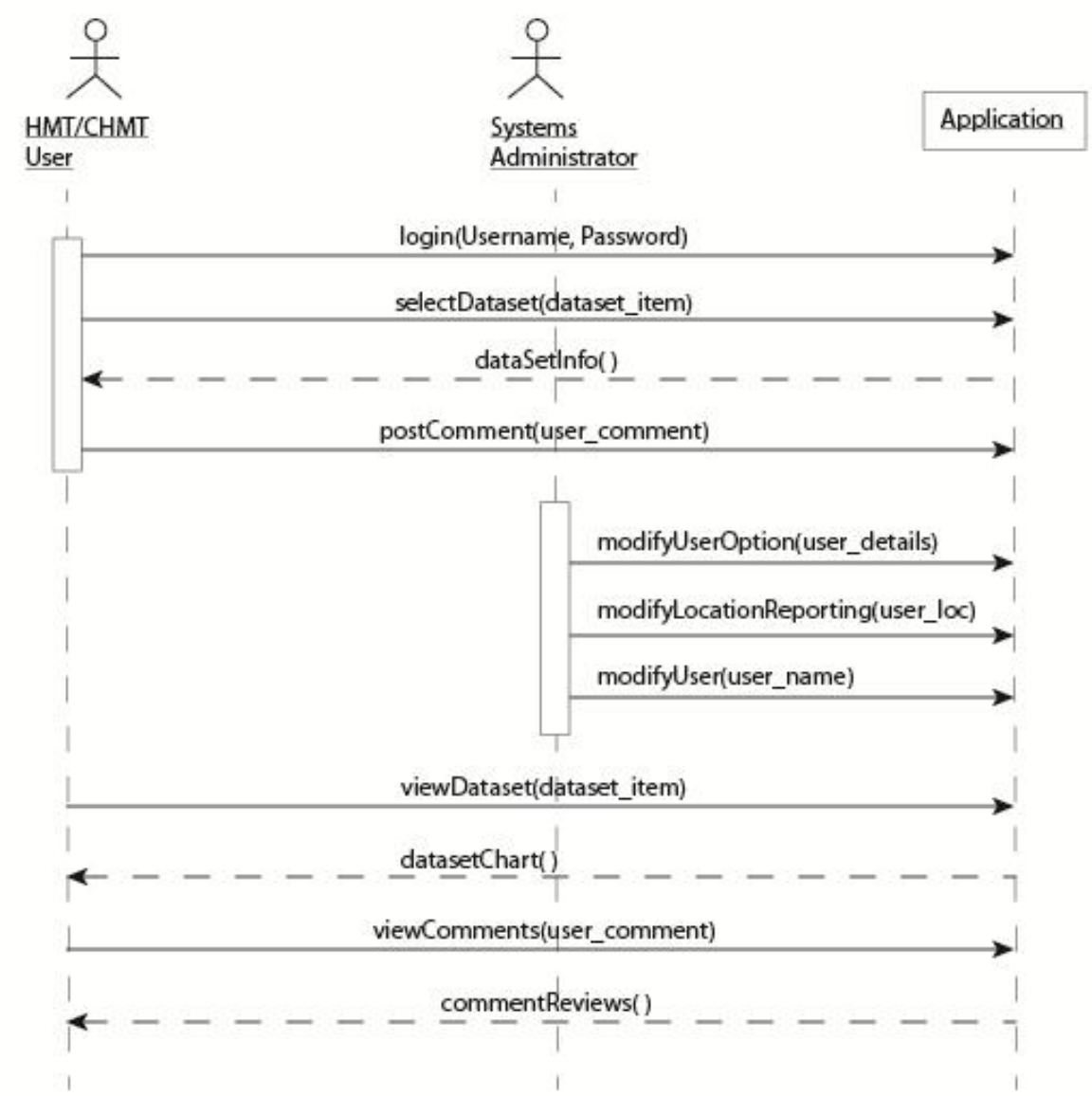


Figure 5.3-2: Systems Sequence Diagram

5.3.4 Context Diagram

This is a component of Functional Modelling that stands out on its own as a valuable tool. This allows to produce a high-level model of an existing/planned system defining the boundary of the system of interest and interactions with critical elements in its surroundings (Burge, 2011). A context diagram was used to represent actors outside of the system that directly interacted with

the mobile application. They consisted of entities and relationships. Entities represented the main system while multiple external entities represented external actors.

Entities of the application are:

1. HMT/CHMT members: these were direct users of the developed application
2. Systems administrator: this was the person responsible for management of user accounts and issuing out rights of access to the different users.

Figure 4.3-3 below shows relationships between entities representing flow of information through a context diagram

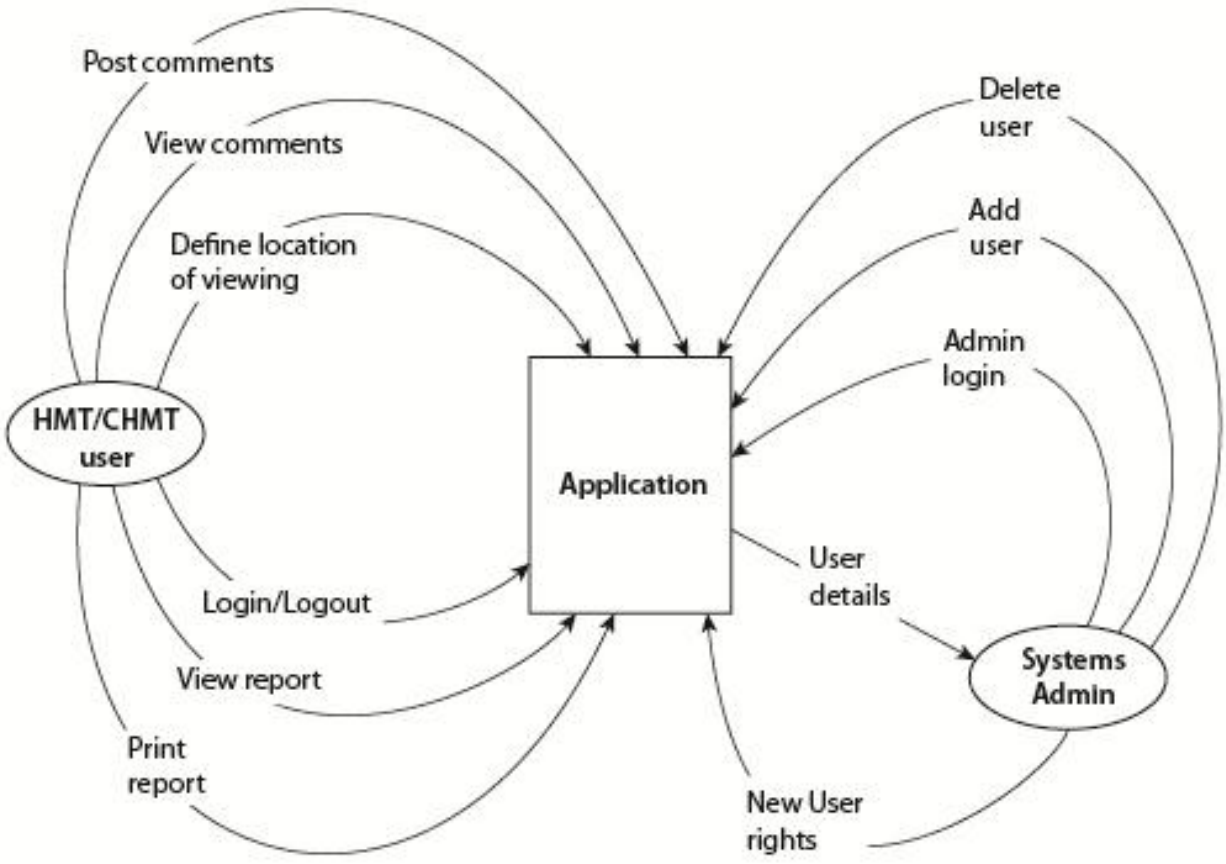


Figure 5.3-3: Context Diagram

5.3.5 Level 0 Data Flow Diagram

Figure 4.3-4 below shows a data flow diagram shows the interaction between external entities and processes of the system. It also shows what kind of information will be input to and output from the system, data stores and where data will come from and go to (Burge, 2011).

External entities of the system included:

1. **The Medical Superintendent:** the medical superintendent receives patient information from either systems, IQ-Care or AFYA-IT. This is made possible by querying for information from either database. Data can be manipulated by for comparison and summarization depending on requirements of the medical superintendent.
2. **HMT member:** like the Medical Superintendent an HMT member can request for data from either systems, IQ-Care or AFYA-IT. This is also made possible by querying for information from either database.

Processes through which external entities interact include:

1. **View Report**: information of patient based on facility can be viewed by HMT/CHMT users of the application.
2. **Post Comments**: Feedback can be given from viewing of reports from either AFYA-IT or IQ-Care systems by the HMT/CHMT users.
3. **View User Information**: provides detailed information of HMT/CHMT member authorized to use the system.
4. **Post Location:** provides location of the facility providing information on GPS coordinates of the user accessing the information.

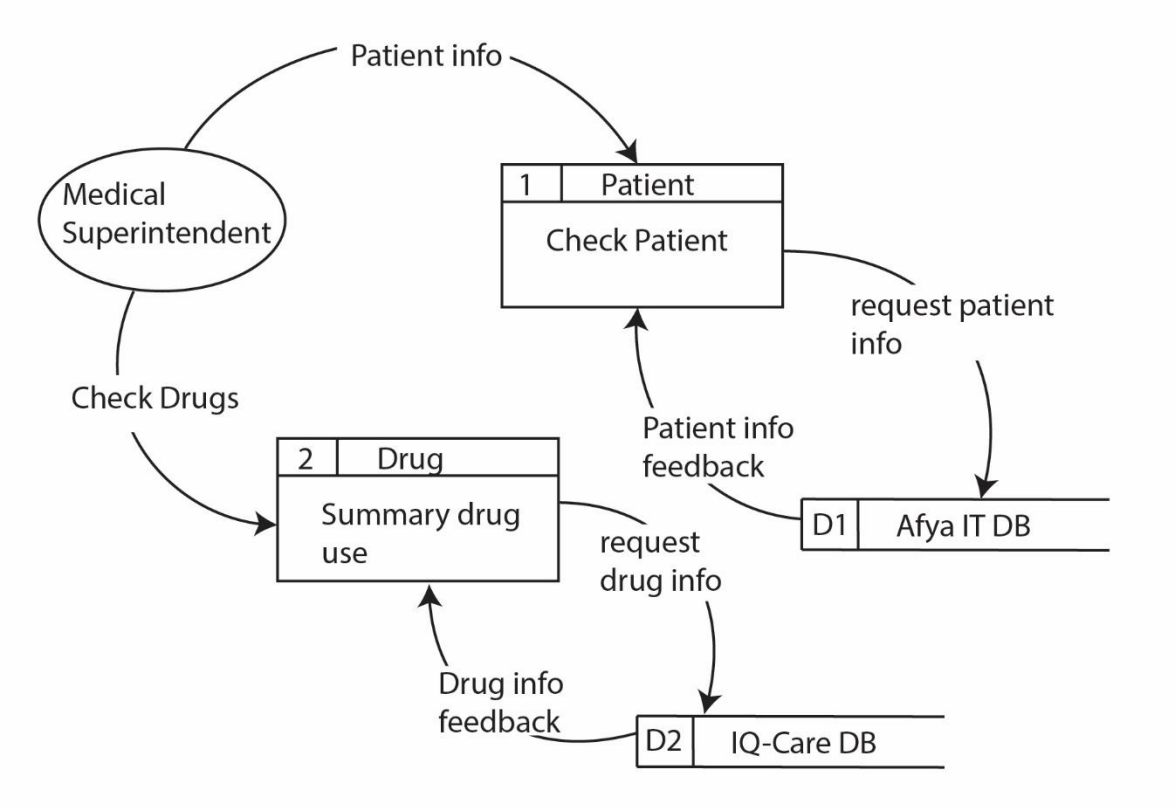


Figure 5.3-4: Level 0 Data Flow Diagram

CHAPTER 6: SYSTEM IMPLEMENTATION AND TESTING

6.1. Introduction

This chapter focuses on the implementation of the prototype application. It will give a clear understanding of the actual implementation of the prototype including the implementation environment for the database, web and mobile application.

The system testing procedure is also provided in this chapter. Test performed were as follows:

1. Usability testing; feedback was collected and analysed by potential users of the system.
2. Compatibility testing; different browsers were used to test on the application
3. Functional testing; system functionality was tested against functional requirements.

6.2. Implementation Environment

6.2.1 Web Application

The web-based application was developed using Hypertext Preprocessor (PHP). An online Apache HTTP server was used to host the website. Reasons for using PHP were: -

1. Malicious attacks and threats are prevented by its multiple layers of security.
2. It is platform independent.
3. The platform is Open Source.

6.2.2 Database

The database was developed using the MySQL database. The reasons for using MySQL were; it is an open source platform; it is fully compatible with PHP and other platforms; it is secure in that all passwords are encrypted before storage restricting unauthorized access to the database.

6.3. Implementation Details

6.3.1 The Web Application Prototype

The developed application implemented the Client Server Architecture. The client side consisted the mobile optimized web application that interacted with MySQL databases from IQ-Care and AFYA-IT. Health management team members interacted with the application by login in and viewing reports via a dashboard presented on their mobile devices of on a computer screen. Through a secured local area network connection, the web application links to IQ-Care and AFYA-IT databases, retrieves data. Data is then manipulated to pictorial presentation for viewing by the user. The diagram below represents the systems architecture.

Components of the system

Components represented by the systems were derived from the monthly MOH 731 reporting tool physically submitted to NASCOP at the end of every month by the records clerk.

Figure 5.3-1 below shows real time information on patients who underwent HIV Counseling and testing between different age sets from the IQ-Care database. There is also information of gender disparities between males and females who underwent HIV counseling and testing. Patients that visited the CCC for pre-exposure prophylaxis are also represented with reasons for taking the drug.

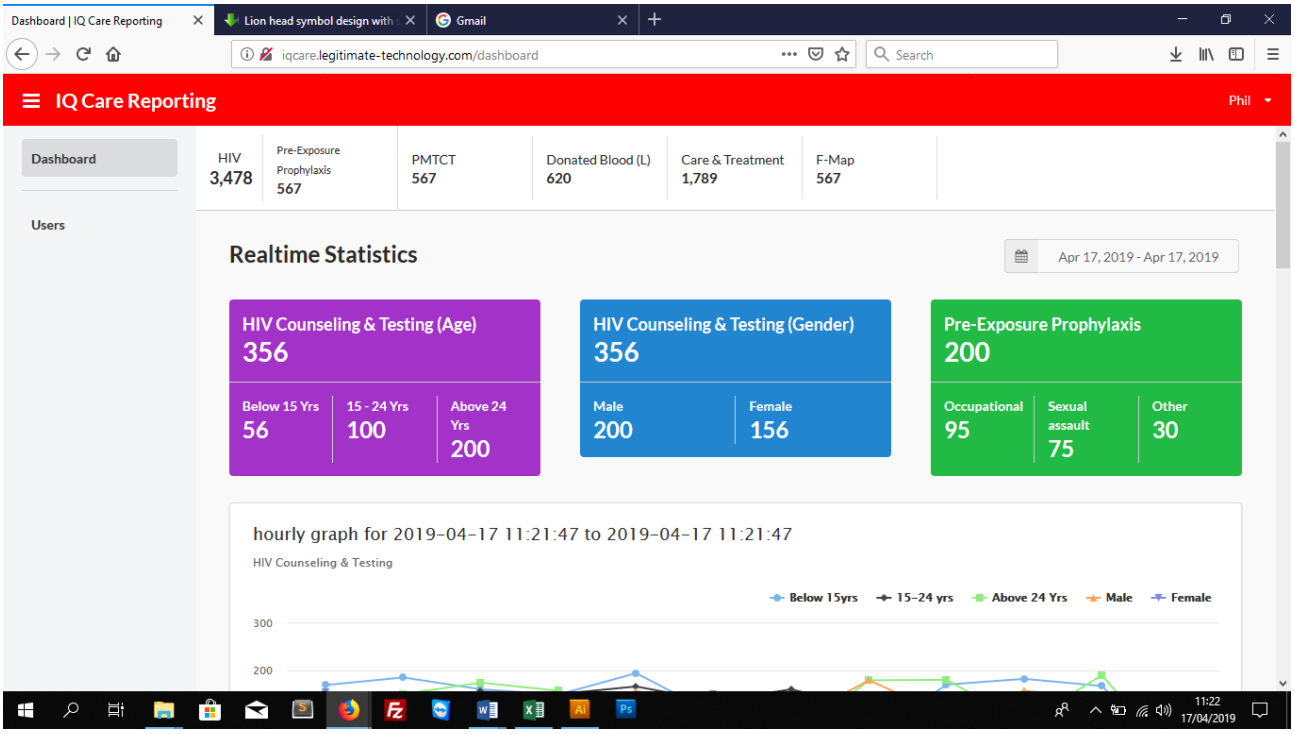


Figure 6.3-1:Screenshot 1

Figure 5.3-2 below shows a line graph and histogram of comparisons of age and number of patients that visited the facility at a given time span.

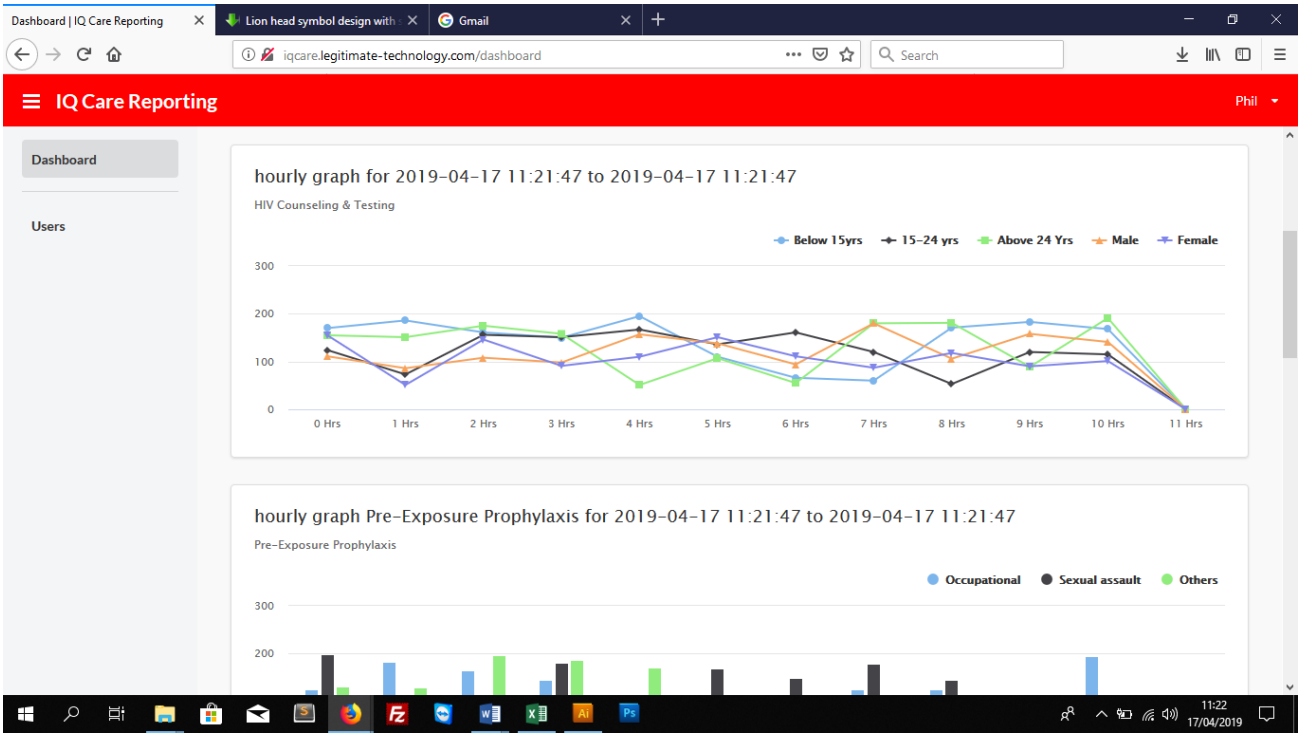


Figure 6.3-2: Screenshot 2

Figure 5.3-3 below shows a comparison of the number patients that visited the facility for consumption of the drug pre-exposure prophylaxis over a given period of time.

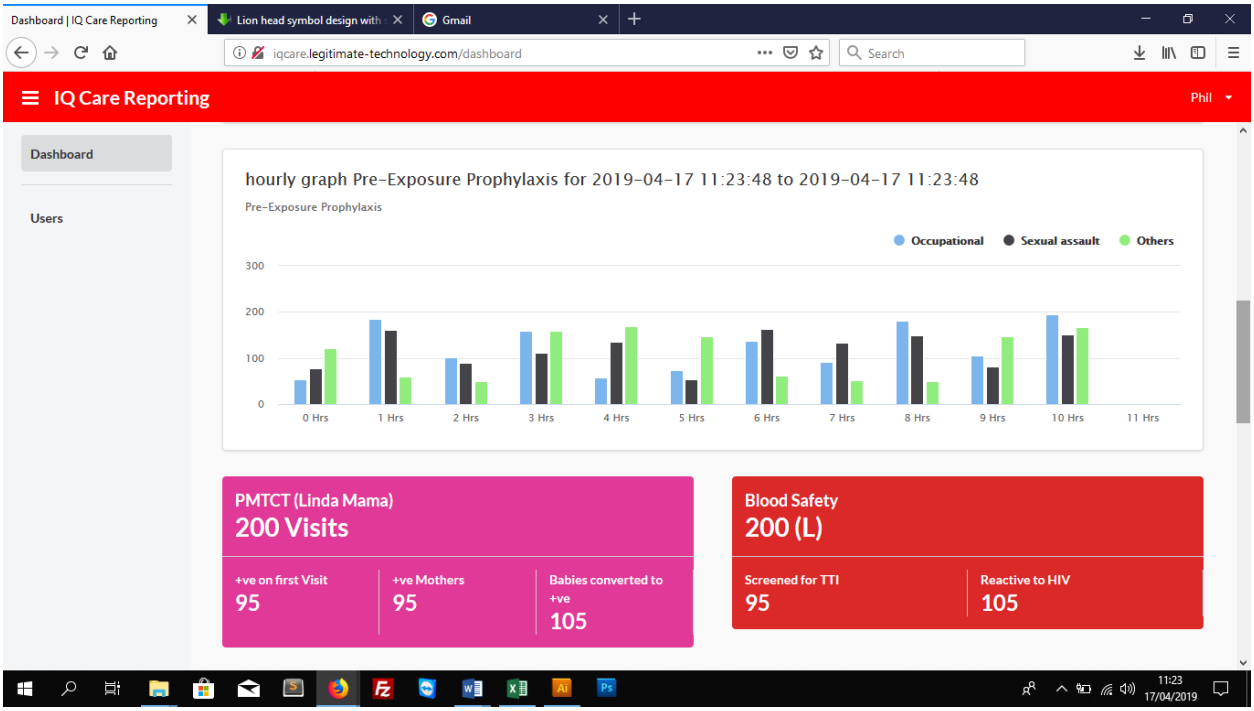


Figure 6.3-3: Screenshot 3

Figure 5.3-4 below gives a summary of the number and age by gender of patients that are on care and treatment. It also gives information on patients that were screened for TTI and acquired the HIV virus.

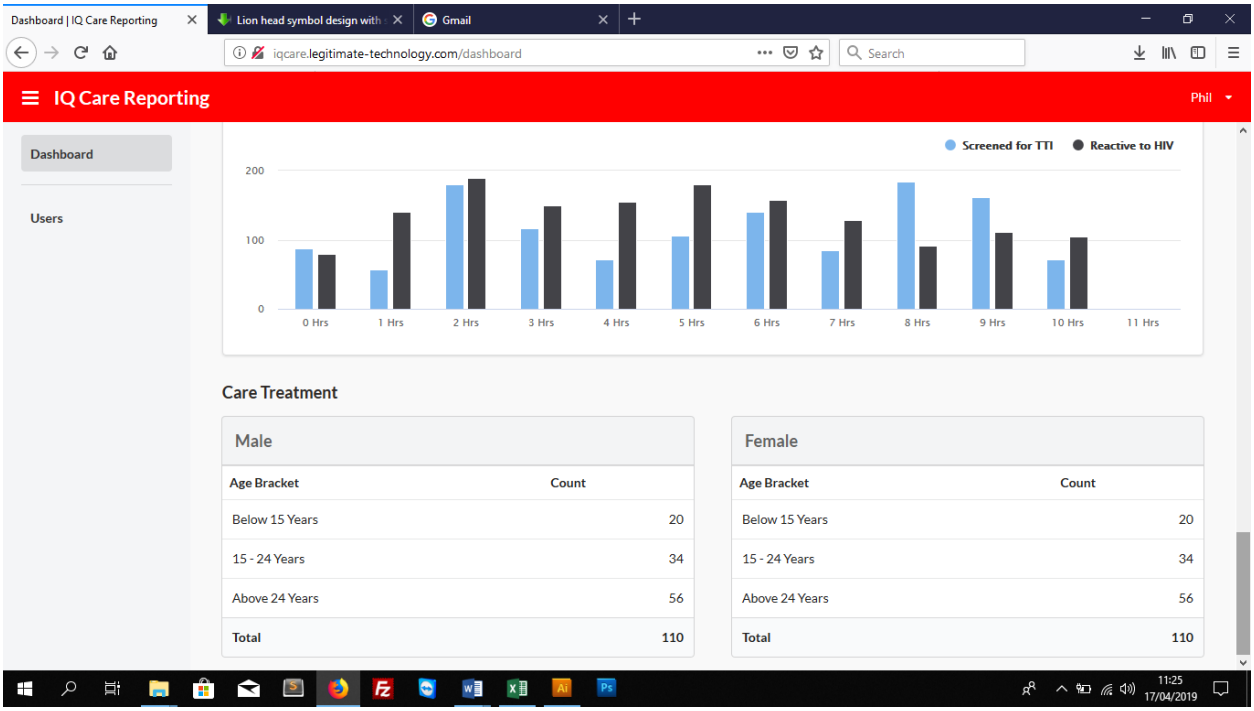


Figure 6.3-4: Screenshot 4

6.4. System Testing

6.4.1 Introduction

Tests performed on the web application are described in this section. Functional and non-functional test requirements were performed on the application.

6.4.2 Functional Testing

Use cases pre-determined success or failure of the system implementation and design. Functional tests were therefore done to gauge this. Testing measures were set with results being considered successful or unsuccessful for each case. Some major use case results are shown below.

Test Identifier 1: To Login or Logout

Table 5.6.4-1: Test Identifier 1 (To Login or Logout)

Utilised Use Case	Logging in or out of the system
Test Parameters	Login with correct username and password pair/Logout
Expected Behavior	Successful login and access granted/ Successful logout
Observed Behavior	Successful login and access granted / Successful logout
Test Outcome	Pass

Table 5.5.4-1 above shows results of the Matron as a test identifier whose main assessment was to check for correct login and logout functionalities the web application. The observed and expected behaviour were consistent. Test Identifier one passed the trial and outcome was deemed successful.

Test identifier 2: To view a list of patients that visited the facility

Table 5.6.4-2: Test Identifier 3 (View History)

Utilised Use Case	View Patients
Test Parameters	Lists of patients registered can be viewed by the Med-Sup.
Expected Behavior	Successfully print a list of registered patients
Observed Behavior	Successfully viewed a history of registered patients
Test Outcome	Pass

Table 5.5.4-2 shows results of the Med-Sup as a test identifier three who's main assessment was to view a list of patients registered in the system. The observed and expected behaviour were consistent. Test Identifier passed the trial and outcome was deemed successful.

Test identifier 5: To Edit Users and User profiles

Table 5.6.4-3: Test Identifier 5 (To Edit Users and User profiles)

Utilised Use Case	Edit Profiles
Test Parameters	Edit user profiles by administrator only
Expected Behavior	Successful modification of user profiles by administrator
Observed Behavior	Successfully modified user profiles by administrator
Test Outcome	Pass

Table 5.5.5-3 shows results of test identifier five who's main assessment was to edit users and user profiles by adding and removing. Observed and expected behaviour were consistent. Test Identifier five passed the trial and outcome was deemed successful.

Test identifier 7: Modify the location name of coordinates picked from access by a user

Table 5.6.4-4: Test Identifier 7 (Modify Location)

Utilised Use Case	Modify Scanned location name
Test Parameters	Location name from coordinates can only be modified by a system administrator
Expected Behavior	Successful modification of location name picked from scan coordinates modified by a system administrator
Observed Behavior	Location name from a scan coordinate modified by the system administrator only
Test Outcome	Pass

Table 5.5.4-4 shows results of the systems administrator as the test identifier who's main assessment was to modify the location name of coordinates picked from a user's scan location. The observed and expected behaviour were consistent. Test Identifier seven passed the trial and outcome was deemed successful.

6.4.3 Compatibility Testing

To test whether the web application was compatible with available browsers a compatibility test was done. Table 5.5.4-5 below shows testing done on available and commonly used web browsers.

Table 5.6.4-5: Test done on Available Browsers

Browser types	Compatibility
INTERNET Explorer (versions 4 and above)	Yes
Firefox (version 8.0 and above)	Yes
Chrome (All versions)	Yes

6.4.4 Usability Testing

Usability testing was done by end users of the application. The target population to use the system was defined by this group. 28 participants gave feedback after carrying out the user

testing practice. Due to the sensitive nature of data only 28 participants were chosen to conduct the test. The participants consisted of systems administrators of IQ-Care and AFYA-IT; members of HMT MSCH; members of the County Executive Committee, Kilifi County. User testing was done to achieve the following objectives:

- User friendliness
- Functionality
- Aesthetics
- Acceptance

This section will focus on each of the mentioned objectives in detail. The findings will be presented graphically for an elaborative visual presentation.

User friendliness

Ease of use and learning how to use the application was indicated by 80% of the potential users. This number consisted of users that managed to use the application without prior training. 15% of the respondents found the application to be neither easy nor hard to use. A trainer was made available to guide them on what they didn't understand. 5% of the respondents found the application difficult to use.

Figure 5.4-1 shows a summary of the results.

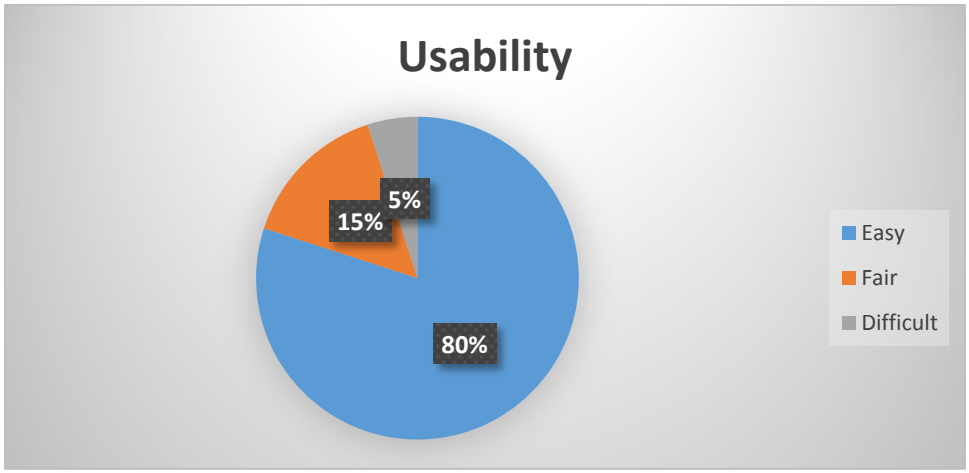


Figure 6.4-1: Usability

Functionality

In response to meeting the application meeting expectations of the users a system functionality test was done. 68% of the respondents found the applications functionality to be commendable. 21% of the respondents indicated that the functionality was average. 11% of the respondents weren't satisfied by the applications functionality. The overall result collected was used to fine tune the application up to a level of acceptance. A summary of the result can be viewed in Figure 5.4-2.

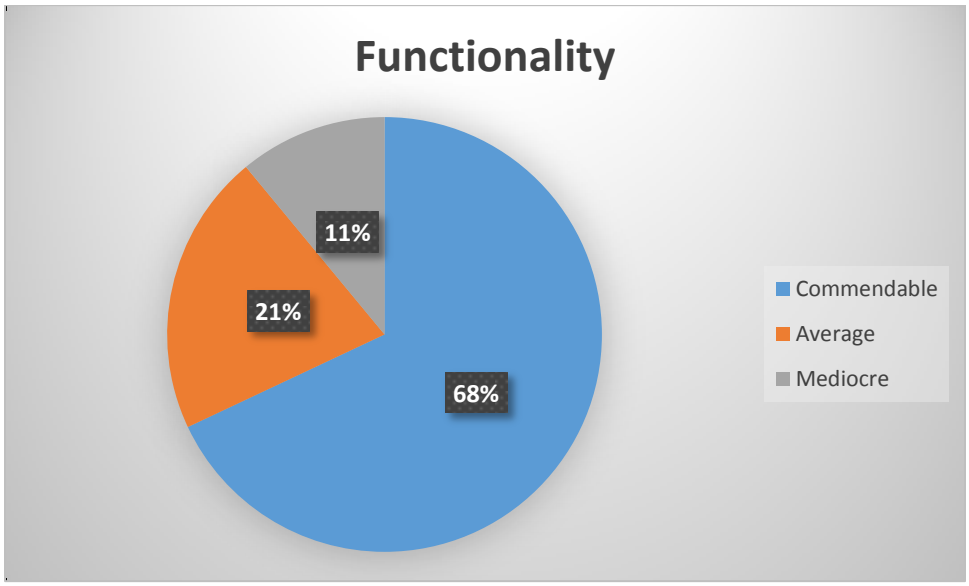


Figure 6.4-2: Functionality

Aesthetics

Users perceive aesthetics as the look and feel of an applications design and flow. 76% of the respondents approved that the applications flow and presentation was perfect. 18% of the respondent indicated that the presentation was fair while the remaining 6% found difficulty in understanding the flow. A summary of the results can be viewed in Figure 5.4-3.

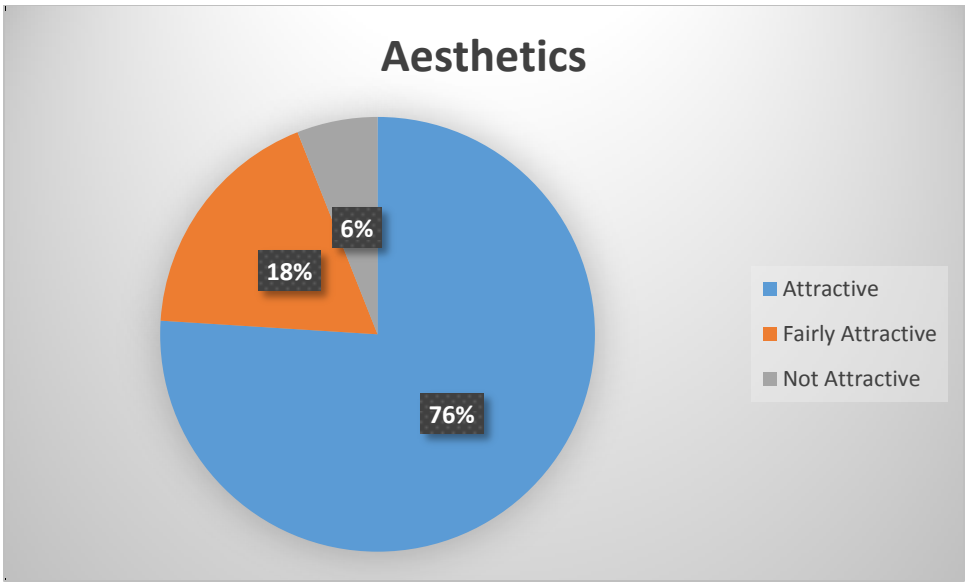


Figure 6.4-3: Aesthetics

Acceptance

To find out whether the application would be incorporated by the target users an acceptance test was done. 74% of the respondents found the application useful. 10% of the respondents were reluctant in accepting the application while the remaining 13% would not use the application. A summary of the result can be viewed in Figure 5.4-4.

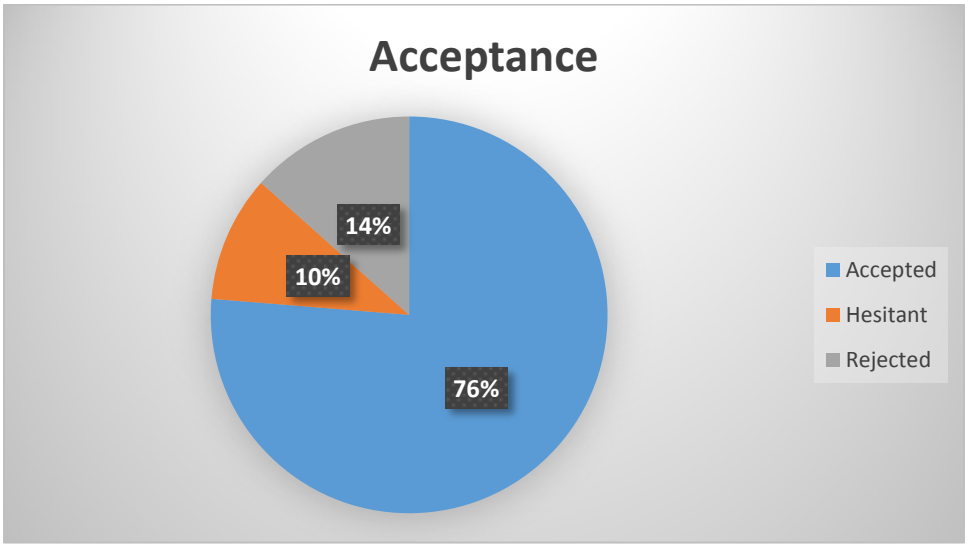


Figure 6.4-4: Acceptance

6.5. Summary

Requirements gathering and analysis provided by systems requirements created fundamental data and information used in the system implementation stage. System testing was done in three phases: Compatibility Testing; was done to test the web application against existing web browsers, Functionality Testing; was done to ensure end user requirements were met, User Testing; was done to test User Acceptance, Application Functionality, User Friendliness and Interface Aesthetics of the prototype.

CHAPTER 7: SUMMARY OF FINDINGS CONCLUSION AND RECOMMENDATIONS

7.1. Introduction

This research was done with the aim of integrating existing information systems at Malindi Sub-County Hospital. An appropriate technology for integration was identified and developed to assist in the research findings. A web-based application was developed. The web application was developed for use by HMT and CHMT members of Kilifi County. Access to the web application was made possible using mobile devices such as personal mobile phones or tablets. This chapter describes research findings and achievements and provides a review of the application developed citing its advantages and how its objectives were determined.

7.2. Findings and Achievements

Malindi Sub-County Hospital serves a larger population of patients than it was meant to serve. Located along Casuarina road in Malindi town the hospital serves patients as far as Tana River, Marafa surrounding areas. The hospital wasn't well-equipped with IT tools and services however some departments have Information Systems collecting and managing data. Prior to this research there had not been any history of integration of information systems within the facility.

The target population for this study were HMT members of MSCH and CHMT members of Kilifi County Hospital. A total of 25 respondents were interviewed daily for a span of 2 weeks from MSCH. 6 individuals were interviewed in a span of a week from Kilifi County Hospital. The total number of respondents interviewed was 31. This sample size also comprised of mixed gender, age, educational level. The sample size was deemed appropriate as it consisted of individuals that were highly likely to interact with the data in either facilities in one way or another.

Findings indicated that a large number of the users were youthful. Those between the ages 18-35 were 14 in number. Those of the ages between 36-45 were 7. 46-55 years of age were 6 and 56-55 years of age were at a meager number of 4. A high number of respondents were learned in

that their educational levels were past college certification level. Moreover, most users had owned and used a mobile device for more than 3 years. They were pretty much comfortable in using mobile devices.

Cumulative research findings indicated that the web application was ideal for its intended use. The usability test showed that 80% of the respondents found the web application user friendly. 68% of the respondents indicated that the functionality of the web application was commendable. 76% of the respondents found the web application to be attractive in terms of aesthetics. 76% of the respondents found the web application to acceptable for use within the facility.

7.3. Review of Research Objectives in Relation to the Mobile Application

Research objective one was to find out the extent to which MSCH was using existing ICT tools in reporting of health care activities. The study showed that MSCH had a network structure though not robust. Internet connectivity was also available but limited to few departments. There existed information systems by the time the research began. Two major information systems in use were AFYA-IT and IQ-Care. Few users within MSCH were able to effectively use either of the IS's.

Research objective two was to develop a software application leading to the integration of two information systems IQ-Care and AFYA-IT at MSCH. This was achieved through developing and implementation of a mobile optimized web application. the web-based application was developed using Hypertext Preprocessor (PHP). The website was hosted on an online Apache HTTP server. Data would be fetched from the existing databases, IQ-Care or AFYA-IT through PHP and MySQL. Data would then be modified into graphs and pie charts using JavaScript and CSS specifically chart.js

Research objective three was to test the effectiveness and efficiency of the developed web application against pre-determined goals. Usability testing was done to confirm on user friendliness, acceptance, functionality and aesthetics. Functional testing was done to test on operability of the system. Compatibility testing was done to ensure that the web application operated at its optimum on a variety of web browsers.

7.3.1 Advantages of the web application

Advantages of the web application in relation to the integration of AFYA-IT and IQ-Care at Malindi Sub-County Hospital. Key advantages were as follows:

1. The application operated in real-time scenario. information retrieved was up to date.
2. Activities on the application were tracked and recorded for future reference.
3. Data manipulation into graphical representation was made possible by incorporating chart.js. This was a plus to the users of the application.
4. Information could be retrieved by users at any location.

CHAPTER 8: CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE WORK

Conclusions of the research described in this dissertation are presented in this chapter. Objectives and aims of this research outlined in Chapter 1 are addressed with the achievements. Suggestions for future work have also been indicated.

8.1. Conclusions

This implementation research project was performed to help increase the uptake of ICT through the integration of information systems. A mobile optimized web application was developed for integration of AFYA-IT and IQ-Care at MSCH. This research also wanted to find out whether the developed application would be efficient in solving the problem as stated in the research questions. The research work was successful in the conclusive implementation of ICT to help in making health care services efficient. Specifically integrating two key information systems at MSCH.

8.2. Recommendations for Future Work

Limitations and weaknesses of the solution in this implementation research study indicated the following areas as recommendations for further study.

1. There should be more awareness and training on ICT tools within the facilities in the coastal region.
2. The application should be developed further to run on other platforms e.g. Android, IOS and Windows.
3. There should be more investment in IT infrastructure especially at MSCH to help support proper implantation and running of ICT services.

REFERENCES

Accenture. (2012). Research Gate. (Researchgate, Ed.) *Connected Health: The Drive to Integrated Healthcare Delivery*, 280. Retrieved March 18, 2018, from Researchgate: https://www.researchgate.net/file.PostFileLoader.html?id=565ee35064e9b2bf9f8b45a4&assetKey=AS:302190135054339@1449059151267

Arnold, D. M., Burns, K. E., Adhikari, K. N., Khoe, E. M., Cook, D. J., & Meade, M. O. (2009). The Design and Interpretation of Pilot Trials. *Med*, 69-74.

Bagozzi, R. P. (2007). The legacy of technology acceptance model and a proposal for a paradigm shift. *Journal of the Association for Information Systems*, 244–254.

Bell, D. (2004, February 16). *The Sequence Diagram*. Retrieved November 18, 2018, from IBM Developer: https://developer.ibm.com/articles/the-sequence-diagram/

Burge, S. (2011). *The Systems Engineering Tool Box*. Retrieved from Context Diagram: http://www.burgehugheswalsh.co.uk/.../cd-tool

Cambridge University Press. (2004, April 04). *The Object Primer 3rd Edition*. Retrieved May 18, 2019, from Agile Model Driven Development with UML 2: http://www.ambysoft.com/books/theObjectPrimer.html

Damsgaard, J., & Lyytinen, K. (2010). Inter-organizational information systems adoption – a configuration analysis approach. *European Journal of Information Systems*, 496-509. doi:10.1057/ejis.2010.71

Davis, F., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology:A comparison of two theoretical models. In *Management Science* (Vol. 35, pp. 982–1003). PubsOnLine. doi:10.1287/mnsc.35.8.982

dhis2.org. (n.d.). *Collect, manage, visualize and explore your data*. Retrieved January 24, 2018, from dhis2.org: https://www.dhis2.org/

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behaviour: An introduction to theory and research* (Vol. 27). Addison-Wesley.

Gray, P. (2005). *Manager's Guide to Making Decisions About Information Systems.* New York: Chichester.

Kendall, K. E., & Kendall, J. E. (2013). Need for System Analysis and Design. Prentice Hall.

Korpelainen, E. (2011). *Information and communication technology adoption at work.* Helsinki, Finland: Aalto University, School of Science.

Ministry of Information Communications and Technology. (2017). *The Kenya National Master ICT Plan 2014-2017*. Retrieved January 23, 2018, from ICT Authority: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwinupH_x-zYAhXB8RQKHbP8BS0QFgglMAA&url=http%3A%2F%2Ficta.go.ke%2Fpdf%2FTHE%2520NATIONAL%2520ICT%2520MASTERPLAN%25202017.pdf&usg=AOvVaw27YyWI9Jr1IVeqZg2ySu8H

Moulton, J. D., Heroux, M., Mclnnes, L. C., Willenbring, J., Johnson, J., Coon, E. T., . . . Condon, L. (2017, February - March). Accelerating Application Software Development through Software. *IDEAS Productivity*, 1. Retrieved February 18, 2018, from figshare.com: https://figshare.com/articles/IDEAS_Software_Productivity_and_Sustainability_Improvement_Plans/4726279

Robbins, J., P, B., MC, L., M, M., Lai, F., Spitz, G., & Sandberg, W. (2005). Integration of Hospital Information Systems, Operative and Peri-operative Information Systems, and Operative Equiptment into a Single Information Display. *Annual Symposium Proceedings, 2005* (pp. 1096-1097). Tehran, Iran: Iran J Public Health.

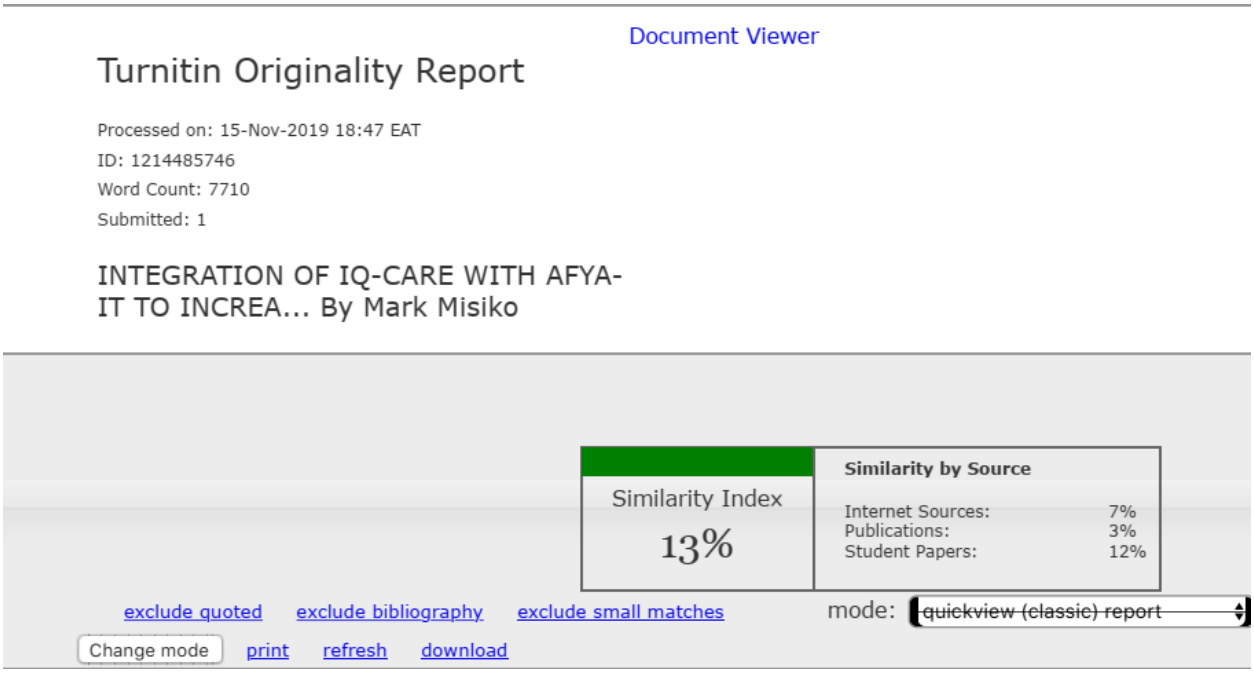
sberlow. (2015, March 31). *IQCare*. Retrieved January 24, 2018, from codeplex: https://fgiqcare.codeplex.com/

World Health Organisation. (2008, June). Toolkit on monitoring health systems strengthening. *HEALTH INFORMATION SYSTEMS*, 2-5. Retrieved 11 17, 2019, from https://www.who.int/healthinfo/statistics/toolkit_hss/EN_PDF_Toolkit_HSS_InformationSystems.pdf

World Health Organisation. (2012). Framework and Standards for Country Health Information Systems. *Health metrics network*, 21-25. Retrieved November 8, 2019, from http://www.healthmetricsnetwork.org/

APPENDICES

TURNITIN REPORT



INTERVIEW QUESTIONS

1. What is your age group? Choose one.
   □ 18 – 35 years old
   □ 36 – 45 years old
   □ 46 – 55 years old
   □ 56 – 55 years old
2. What is your level of education? Choose one.
   □ Primary School
   □ Secondary School
   □ College
   □ Graduate
   □ Post-graduate
3. How long have you owned a mobile phone? Please choose one.
   □ 1 year
   □ 2 years
   □ 3 years
   □ More than 3 years
4. Do you use any data enabled services? Choose one.
   □ Yes
   □ No
5. What Information System have you interacted with at your facility? Choose one or all below.
   □ IQ-Care
   □ AFYA-IT
   □ Other. Please Specify _____
6. For how long have you interacted with the Information System?
   □ 1 year
   □ 2 years
   □ 3 years

□ more than 3 years

7. What is your current employment position at the facility?

_____

MOH 731 MONTHLY REPORT

National AIDS & STI Control Programme

MOH 731- Comprehensive HIV/AIDS Facility Reporting Form - NASCOP [MOH731]

District:_____ County:_____ Facility:_____ Month:_____ Year:_____ MFL Code:_____

1 HIV Counselling and Testing

1.1 Testing

		Value
First	HV01-01	
Repeat	HV01-02	
Total Tested (HV01-01 plus HV01-02)	HV01-03	
Couples	HV01-05	
Static [Facility]	HV01-06	
Outreach	HV01-07	

1.2 Receiving Results - (*Couples only*)

Cocordant Couples	HV01-08	
Discordant Couples	HV01-09	

1.3 Receiving Positive Results

Males - Below 15 years	HV01-10	
Females - Below 15 years	HV01-11	
Males - 15 to 24 years	HV01-12	
Female - 15 to 24 years	HV01-13	
Males - 25 years & older	HV01-14	
Female -25 years & older	HV01-15	
Total receiving positive results (Sum HV01-10 to -15)	HV01-16	

2 Prevention of Mother-to-Child Transmission

2.1 Testing for HIV

		Value
Antenatal	HV02-01	
Labour and Delivery	HV02-02	
Postnatal (within 72hrs)	HV02-03	
Total Tested (PMTCT) (Sum HV02-01 to HV02-03)	HV02-04	

2.2 HIV Positive Results

Known positive status (at entry into ANC)	HV02-05	
Antenatal	HV02-06	
Labour and Delivery	HV02-07	
Postnatal (within 72hrs)	HV02-08	
Total Positive (PMTCT) (Sum HV02-05 to HV02-08)	HV02-09	
Total with known status (HV02-04 plus HV02-05)	HV02-10	

2.3 Partner Involvement

Male partners tested - (ANC/L&D)	HV02-11	
Discordant Couples	HV02-12	

2.4 Maternal Prophylaxis (*at first contact only*)

Prophylaxis – NVP Only	HV02-13	
Prophylaxis – (AZT + SdNVP)	HV02-14	
Prophylaxis – Interrupted HAART	HV02-15	
HAART (ART)	HV02-16	
Total PMTCT prophylaxis (Sum HV02-13 to HV02-16)	HV02-17	

2.5 Assesment for ART Eligibility in MCH *(at diagnosis)*

Assessed for eligibility at 1st ANC - WHO Staging done	HV02-18	
Assessed for eligibilityat 1st ANC - CD4	HV02-19	
Assesed for Eligibility in ANC (Sum HV02-18 to HV02-19)	HV02-20	
Started on ART during ANC	HV02-21	

2.6 Infant Testing (*Initial tests only*)

PCR (within 2 months)	HV02-24	
PCR (from 3 to 8 months)	HV02-25	
Serology antibody test (from 9 to 12 months)	HV02-26	
PCR (from 9 to 12 months)	HV02-27	
Total HEI Tested by 12 months (Sum HV02-24 to HV02-26)	HV02-28	

2.7 Confirmed Infant Test Results

Positive – (within 2 months) – PCR	HV02-29	
Positive – (3 – 8 months) – PCR	HV02-30	
Positive – (9 – 12months) – PCR	HV02-31	
Total Confirmed Positive (Sum HV02-29 to HV02-31)	HV02-32	

2.8 Infant Feeding

EBF (at 6 months)	HV02-33	
ERF (at 6 months)	HV02-34	
MF (at 6 months)	HV02-35	
Total Exposed aged 6 months	HV02-36	
BF (12 months)	HV02-37	
Not BF (12 months)	HV02-38	
Not Known	HV02-39	
Total Exposed aged 12 months (Sum HV02-37 to HV02-39)	HV02-40	

2.9 Infant ARV Prophylaxis (*at first contact only*)

Issued in ANC	HV02-41	
Labour and Delivery	HV02-42	
PNC (<72hrs)	HV02-43	
Total Infants Issued Prophylaxis (Sum HV02-41 to HV02-43)	HV02-44	

3 Care and Treatment

3.1 On Cotrimoxazole Prophylaxis

HIV Exposed Infant (within 2 months)	HV03-01			
HIV Exposed Infant (Eligible for CTX at 2 months)	HV03-02			
On CTX - Below 15 years	HV03-03 (M)		HV03-04 (F)	
On CTX - 15 years & older	HV03-05 (M)		HV03-06 (F)	
Total on CTX (Sum HV03-03 to HV03-06)	HV03-07			

3.2 Enrolled in Care

Enrolled in Care - Below 1 year	HV03-08			
Enrolled in Care - Below 15 years	HV03-09 (M)		HV03-10 (F)	
Enrolled in Care - 15 years & older	HV03-11 (M)		HV03-12 (F)	
Enrolled in Care - Total (Sum HV03-09 to HV03-12)	HV03-13			

3.3 Currently in Care - *(from the tally sheet- this month only and from last 2 months,*

Currently in Care - Below 1 year	HV03-14			
Currently in Care - Below 15 years	HV03-15 (M)		HV03-16 (F)	
Currently in Care - 15 years & older	HV03-17 (M)		HV03-18 (F)	
Currently in Care - Total (Sum HV03-15 to HV03-18)	HV03-19			

3.4 Starting ART

Starting ART - Below 1 year	HV03-20			
Starting ART - Below 15 years	HV03-21 (M)		HV03-22 (F)	
Starting ART - 15 years & older	HV03-23 (M)		HV03-24 (F)	
Starting ART - Total (Sum HV03-21 to HV03-24)	HV03-25			
Starting - Pregnant	HV03-26			
Starting - TB Patient	HV03-27			

3.5 Revisits on ART (*from the tally sheet- this month only and from last 2 months*)

Revisit on ART - Below 1 year	HV03-28			
Revisit on ART - Below 15 years	HV03-29 (M)		HV03-30 (F)	
Revisit on ART - 15 years & older	HV03-31 (M)		HV03-32 (F)	
Total Revisit on ART (Sum HV03-29 to HV03-32)	HV03-33			

3.6 Currently on ART [All] - (*Add 3.4 and 3.5 e.g. HV03-34 = HV03-20 + HV03-28)*

Currently on ART - Below 1 year	HV03-34			
Currently on ART - Below 15 years	HV03-35 (M)		HV03-36 (F)	
Currently on ART - 15 years & older	HV03-37 (M)		HV03-38 (F)	
Total Current on ART (Sum HV03-35 to HV03-38)	HV03-39			

3.7 Cumulative Ever on ART

Ever on ART - Below 15 years	HV03-40 (M)		HV03-41 (F)	
Ever on ART - 15 years & older	HV03-42 (M)		HV03-43 (F)	
Total Ever on ART (Sum HV03-40 to HV03-43)	HV03-44			

3.8 Survival and Retention on ART at 12 months

ART Net Cohort at 12 months	HV03-45	
On Original 1st Line at 12 months	HV03-46	
On alternative 1st Line at 12 months	HV03-47	
On 2nd Line (or higher) at 12 months	HV03-48	
On therapy at 12 months (Sum HV03-46 to HV03-48)	HV03-49	

3.9 Screening

Screened for TB - Below 15 years	HV03-50 (M)		HV03-51 (F)	
Screened for TB - 15 years & older	HV03-52 (M)		HV03-53 (F)	
Total Screened for TB (Sum HV03-50 to -53)	HV03-54			
Screened for cervical cancer (F 18+)	HV03-55			

3.10 Prevention with Positives

Modern contraceptive methods	HV09-04	
Provided with condoms	HV09-05	

3.11 HIV Care Visits

Females (18+)	HV03-70	
Scheduled	HV03-71	
Unscheduled	HV03-72	
Total visits (HV03-71 & -72)	HV03-73	

4 Voluntary Medical Male Circumcision

4.1 Number Circumcised

		Value
0-14	HV04-01	
15-24	HV04-02	
25+	HV04-03	
Total (Sum HV04-01 to HV04-02)	HV04-06	

4.2 HIV Status (at circumcision)

Positive	HV04-07	
Negative	HV04-08	
Unknown	HV04-09	

4.3 Adverse Events (Circumcision)

During -AE(s)– moderate	HV04-10	
During– AE(s) – severe	HV04-11	
Post -AE(s)– moderate	HV04-12	
Post– AE(s) – severe	HV04-13	
Total AE During (Sum HV04-10 & -11)	HV04-14	
Total AE Post (Sum HV04-12 & -13)	HV04-15	

5 Post-Exposure Prophylaxis

5.1 Type of Exposure

Occupational	HV05-01 (M)		HV05-02 (F)	
Sexual assault	HV05-03 (M)		HV05-04 (F)	
Other reasons	HV05-05 (M)		HV05-06 (F)	
Total	HV05-07			

5.2 Provided with Prophylaxis

Occupational	HV05-08 (M)		HV05-09 (F)	
Sexual assault	HV05-10 (M)		HV05-11 (F)	
Other reasons	HV05-12 (M)		HV05-13 (F)	
Total PEP	HV05-14			

6 Blood Safety

Donated blood units	HV06-01	
Blood units screened for TTIs	HV06-02	
Blood units reactive to HIV	HV06-05	

Prepared By: (Name)……(Designation)…… (Signed)……

Verified By: (Name)……(Designation)…… (Signed)……

DASHBOARD DATASETS DERIVED FROM MOH 731 REPORT

HIV COUNSELING & TESTING	**PRE-EXPOSURE PROPHYLAXIS**
- *First test* - *Repeat test* - *Total tests* - *Couples (Concordant | Discordant)* - *Facility tested* - *Outreach tested* *HIV POSITIVE (Male | Female)* - *Below 15* - *15 – 24* - *25 and above* - *Total number*	*Type of exposure (Male | Female)* - *Occupational* - *Sexual assault* - *Other reason* *Total*
PMTCT (LINDA MAMA) - *Pregnant mothers that turned positive on first visit* - *Number of pregnant mothers* - *Number of mothers that turned positive* - *Number of babies that converted to positive*	**BLOOD SAFETY** *Donated Blood Units:* *Blood units screened for TTI (Transfusion Transmitted Infection):* *Blood Units reactive to HIV:*
CARE & TREATMENT *Enrolled in care (Male | Female)* - *Below 1 year* - *Below 15 years* - *15 years and above*	**F-MAP** *A detailed list of patient and drugs they use*

- *Total number* *Currently in care (Male | Female)* - *Below 1 year* - *Below 15 years* - *15 years and above* - *Total number* *Starting on ART (Male | Female)* - *Below 1 year* - *Below 15 years* - *15 years and above* - *Total number* *Revisiting ART (Male | Female)* - *Below 1 year* - *Below 15 years* - *15 years and above* - *Total number* *Pregnant:* *TB Patient:* *Currently on ART [All] (Starting ART + Currently on ART)* - *Below 1 year* - *Below 15 years* - *15 years and above* - *Total number*	
PREVENTION WITH POSITIVES	**AUTHORISED OWNER OF REPORT**

- *Modern Contraceptive methods* - *Provided with condoms*	**(MOH 731)** - Prepared by (Name/Designation/Signature) - Verified by (Name/Designation/Signature)