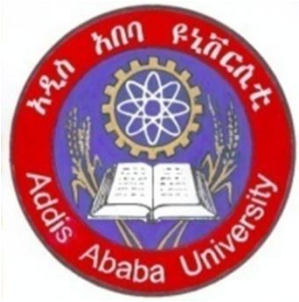

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Design and Development of a Web Based Client Complaint Management System for St. Paul's Hospital Millennium Medical College

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Contents

List of Figures

List of Tables

ACRONYMS

CCM - Client Complaint Management

CQI - Continuous Quality Improvement

EFY - Ethiopian Fiscal Year

EHAQ - Ethiopian hospital alliance for quality Initiative

ETC- Ethiopia Telecommunication Corporation

FAQ - Frequently Asked Question

FMOH -Federal Ministry of Health

HC - Health Care

HIPAA - Health Insurance Portability & Accountability Act

HIT- Health Information Technology

HSTP - Health Sector Transformation Plan

IPD - Inpatient Department

MVC – Model View Controller

OPD - Outpatient Department

PHP- Hypertext Processor

RAD -Rapid Application Development

SPHMMC - St Paul's Hospital Millennium Medical College

UML-Unified Modeling Language

WHO- World Health Organization

ABSTRACT

Background: Ethiopia is a country with a low-income and an overall limited budget. Despite the recent impressive changes in access to health services and improvement in health outcome, the health sector still suffers from the existence of inequality, poor quality of health service and a high burden of communicable and non-communicable disease.

The country has a three-tier healthcare services' delivery system and St. Paul's Hospital Millennium Medical College (SPHMMC) is one of the third level specialized hospitals in the country. Using client complaint management to improve client satisfaction and quality of services is a rare practice at the hospital and in Ethiopia in general.

Objective: The main objective of the project is to design, develop and test a web-based complaint management system for SPHMMC.

Methodology: The study was conducted in Addis Ababa, Gulele sub city, at Saint Paul's Hospital Millennium Medical College. It used qualitative case study to gather requirements regarding the proposed system. The participants of the study included clients and employees of Saint Paul Hospital. They were selected using purposive sampling technique. The sample size was 30. That is, 25 for requirement collection plus 5 for system evaluation studies.

Object oriented methodology, with incremental and iterative designing cycles, was used as a tool to design and develop the complaint management system. After development, the proposed system was evaluated using a user acceptance test.

Result: The project produced a web-based Client Complaint Management system (prototype) for the SPHMMC Hospital. The system uses the local language Amharic, in addition to English, to improve system usability.

Conclusion: The complaint management system has been designed and developed to adequately meet the main objective of this project, which is producing a tool to improve client complaint management. The system was found to be useful, easy to use and not unnecessarily complex.

CHAPTER ONE: INTRODUCTION

1.1. Background

Ethiopia is a Federal Democratic Republic country with 9 regional states and 2 city administrations, totally containing 805 districts [1].The country has a three-tier healthcare services delivery system characterized by a first level primary hospital, health centers, and their satellite health posts. On the second level, the tier is made up of general hospitals, and the third tier consists of specialized hospitals [2].

St. Paul's Hospital Millennium Medical College (SPHMMC) is one of the third tier level specialized hospitals in Ethiopia. SPHMMC is also a teaching hospital where many medical students have been trained by the college to serve the Ethiopian people. The hospital was established by Emperor Hailesilase in 1954 with the support of German Evangelical Church who named it St. Paul General Specialized Hospital. The hospital was reorganized as a medical college in 2007 by the council of ministers and was renamed as St. Paul's Hospital Millennium Medical College (SPHMMC). Its reorganization was completed in accordance with the Ministers' Council Regulation No. 2000/2003 at the turn of the Ethiopian Millennium. Currently, SPHMMC has a catchment population of 5 million, has 392 beds for inpatient care, and provides medical care for thousands of Clients every year (see Annex D for statistics sample) [3].

Health institutions, including SPHMMC, are established to save the lives as well as the well-being of their clients. Health service providers are expected to achieve or exceed client satisfaction requirements by providing quality services to help ease the discomfort and worries of patients. Even if it remains controversial whether clients' ratings reflect anything about technical quality or simply the interpersonal skills of the service providers, it remains clear that equity and quality of health services depend on well-trained health professionals, quality of health facilities and medical equipment. Therefore, client satisfaction is vital input for healthy and happily served patients, making it an important issue in healthcare management [4].

The practice of assessing clients' complaints at SPHMMC is rare. The specialized hospital in Ethiopia has a paper based system for assessing client complaint. As all paper based systems, in the current system, any kind of reporting has to be generated manually by going through each complaint form, which is time and resource wasting. The complaint collecting books and the keys to suggestion boxes also have been known to be lost leading to a major data loss. Therefore, SPHMMC could benefit from giving more emphasis to their client complaint management system if it is to aid in the quality improvement process.

This project aims to change the approach and management of client complaints at SPHMMC via a web-based system. Using this system, clients will be able to provide feedback to the hospital and enable managers and stakeholders bridge the communication gap. The system will also help to measure client complaints and increase the effectiveness of interventions by improving awareness of where changes have to be made and upgrades have to be done to improve the quality of services provided by the hospital.

1.2. Statement of the Problem

Client perception is an important issue in health care nowadays. Understanding the views, needs, demands, and woes of clients is an essential step in order to achieve client satisfaction. Client perceptions of quality are often influenced by their interaction with the health provider. However, some studies suggest that certain clients' demographic and clinical characteristics, including age, health status and the severity of illness, are associated with complaint scores more than the technical quality of care they provide [5].

Although it may seem impossible to keep all clients satisfied and complaints are caused by several factors, resolving client complaints can achieve a high level of satisfaction by working on related indicators and their improvement. A research study at Hazrat Rasoul hospital, Tehran, Iran, revealed that by setting up a waiting room, using guide signs, admitting clients with a bedside form and having a member of the staff welcome clients raised the level of satisfaction considerably, from 49% to 83% in 2 years of follow-up [6].

Clients' judgment of health institution can be rooted in various grounds and are often influenced by shared values. For example, the health service provider especially the triage department is considered to act as a gatekeeper of treatment for clients. According to a patient satisfaction survey in Iran, the comfort of the waiting room and cleanliness of the health institutions environment are also important client satisfaction factors. Those who rated the waiting room as “very poor” in comfort had dramatically lower overall satisfaction with their visit than those who rated the comfort of the waiting room as “very good” [6].

Clients' judgment of health institution service quality and their feedback are essential in health care services monitoring and improvement since it can be used as a subjective evaluation of the service received against the individual's expectations. Moreover, the need for evidence-based interventions in healthcare service areas such as medical care, nursing care, physical comfort, politeness of staff and waiting time can be pointed out, prioritized and addressed with complaint management tools. Client complaint management systems are one of these tools by which the equity and quality of health care services can be evidently evaluated for improvement.

In Ethiopia, Client Complaint Management (CCM) and generally the study of quality of health services is a newly developing field of study in need of attention. Currently, even though there have been encouraging improvements in the coverage and utilization of the health services, there is still an increasing trend of community dissatisfaction with the Ethiopian health care system [7].

Complaints of the Ethiopian public have been increasing in type, magnitude, and depth. People have been expressing their voice regarding poor service quality, unethical behavior of health workers, unavailability of medicines or lab service, and the high cost of the health services. The managers at all level do not properly understand the community demand or provide a timely response [8].Cognizant of this fact and with stringent direction given by the government, the FMOH identified enhancing good governance as one of the strategic objectives in the Health Sector Transformation Plan (HSTP) and also initiated the good governance movement in 2008

E.F.Y. to accelerate economic and democratic development and the citizen's intense pursuit of change [7].

According to the good governance package for the health sector, the major reasons for these complaints are unavailability of services, unethical health professionals, inhibitive prices, frequent service disruptions and poor service qualities [8].Further drilling down the problem proves that bad governance is one of the underlying causes as expressed by the theft of medicines, diversion of clients to private facilities, health workforce absenteeism, corruption, weak regulation and inadequate accountability. In addition, notable numbers of leaders at all level of the health system are not willing to respond to the demand of the community as well as to the questions raised by health service clients. These reasons characterize the health institutions as poorly performing entities [8].

Similar to the country's healthcare system, complaint management practices at SPHMMC are rare. Currently, SPHMMC uses a paper-based system for assessing client complaint. The system, like all paper-based systems, is susceptible to data loss, lack of follow through and manual generated reports. The complaint officers at SPHMMC said loss of complaint collection books and keys to suggestion boxes have occurred at times. That is data that could have been used to improve client satisfaction and quality of services.

Assume a client has been checked up/treated by healthcare service providers and is left unsatisfied, then the client have to write/fill a complaint form and give it to the complaint officer or write and simply put it in suggestion box. Later, upon receiving that piece of paper, the complaint officer will compile the complaints and submit them to the complaint management team and the client goes home without having any information whether the complaint is going to be resolved or even is going to be delivered to the appropriate department. Does that sound right?

Client's complaint data are routinely collected and used for continuous quality improvement by health care institutions in developed countries [9]. That is an experience the SPHMMC can benefit from. The goal of this project is to develop new software (i.e. Web, based solution) replacing the paper-based complaint management system in order to help clients and the

health institution. So that if the client is satisfied or dissatisfied he/she can submit his/her feedback to the organization and follow through the progress until an appropriate response is provided. Also enable the hospital to know the reasons for dissatisfaction and act accordingly and fix them, if there is something wrong with the services provided.

1.3. Objectives of the Project

1.3.1. General Objectives

The main objective of the project is to develop and test a web based client complaint management system in order to help SPHMMC improve health care services.

1.3.2. Specific Objectives

The specific objectives of the system are: -

- To design a complaint management system for SPHMMC.
- To develop a prototype client complaint management system for SPHMMC.
- To evaluate user acceptance of the client complaint management system.

1.4. Scope of the Project

The scope of the project is design and development of a web based complaint management system for St. Paul Hospital (SPHMMC), which is found in Addis Ababa Ethiopia. The web based system collects client complaints and feedbacks electronically and assigns resolutions to teams or individual employees to resolve the complaints. The project is focused in collecting and analyzing system requirements, designing and documenting of the system and development of the first version of the system.

1.5. Significance of the Project

As mentioned before, client satisfaction is an important issue in health care and this system can be helpful & applicable to the public as well as health-care service providers for establishing a good governance baseline. The beneficiaries of the system include patients, patient's family, SPHMMC medical board, employees and insurance companies. The benefits of the system include providing a tool for measuring health professionals' conduct and health services' quality at hospital. The system can prioritize areas in need for intervention, which result in improvement of client satisfaction and service quality at the hospital. It also gives patients a voice to stand against mismanagement, which in result also improves client engagement and involvement.

Public Health benefits of the SPHMMC Complaint Management System are also not negligible, and include early detection of possible mismanagement of resources and mistreatment of patients at the hospital. Improved tracking of complaint, better resolution (mitigation) rates and evaluation of health-care services, based on service level agreement or citizen charter, are also significant contributions of this project to the community and the hospital.

1.6. Organization of the Paper

The project is organized as follows: Chapter one is the introduction part and it covers the background, the statement of the problem, objectives, significance of the project, scope and limitation of the project. Chapter two deals with the literature review. Chapter three presents the methodology, tools and techniques used in carrying of the project. Chapter four is system analysis and it covers the existing system, functional and non-functional requirements and model of the system using UML diagrams with their descriptions. Chapter five covers system design of the project. Chapter six is Development and Evaluation of the proposed system, while chapter seven is conclusion and recommendation.

1.7 Operational Definitions

Clients-Are patients or their kin who submit complaints or feedbacks about the health service providers.

Complaint Management- It is method of handling complaints submitted by clients or customers of an organization due to misconduct, or incorrect or inappropriate treatment of customers or clients.

Complaint Management System- a system that encompasses techniques, processes and systems that allows the client to submit complaints and records provided resolutions.

Continuous Quality Improvement- is a technique similar to Quality Improvement but with emphasis on rapid response to issues arising in the normal work-flow of an organization.

Quality Improvement- are techniques employed by an institution to alleviate existing quality issues in service provision and find rooms for improvement for existing practices.

Resolution Officers or Officers- are service providers at St. Paul Hospital (SPHMMC) who are in charge providing mitigations or solutions for client complaints.

CHAPTER TWO: LITERATURE REVIEW AND RELATED WORKS

2.1. Overview

In order to understand the concepts associated with web based Complaint management systems, it is imperative to examine and analyze documents from experts regarding the area. The purpose of this review is to examine, analyze and obtain experiences in complaint submission, resolution management and report generation. The review is based on exhaustive assessment of literatures generally and specifically related to client complaint management.

First the paper defines complaints and their causes then specifically addresses client complaints. Furthermore, the paper reviews general client complaint management practices and cover specific practices regarding hospitals as well. Guidelines on how to develop Hospital client complaint management software are also discussed before finishing off the assessment with complaint management practices in Ethiopia and related complaint management works.

2.2. Complaints and their causes

A complaint is an "expression of dissatisfaction made to or about an organization, related to its products, services, staff or the handling of a complaint, where a response or resolution is explicitly or implicitly expected or legally required" [10].

Complaints range over wide dimensions of services provided by any and all organizations. A service is any act or performance that one party can offer to another that is essentially intangible and does not result in the ownership of anything [10]. Complaint areas include availability, accessibility and convenience, technical competence of providers, interpersonal skills and the physical environment where services are delivered.

Complaints are caused by several things; the major reasons are unavailability of service, inhibitive cost, unethical health professionals, frequent service disruption and poor service quality. It is hard to imagine a client transaction not vulnerable to problems and complaints.

Nor is it hard to see why businesses benefit can from making concerted efforts to prevent and respond to client complaints.

Research shows, in fact, that companies attract and keep clients when they follow client service standards and policies that prevent problems from arising, and are honest, fair and responsive when things go wrong. Complaints are an important way for the management of an organization to be accountable to the public as well as provide valuable prompts to review organizational performance and the conduct of people that work within and for it.

2.3. Client Complaints

Comments and complaints from clients provide unique information about their needs and the quality of service they receive. Open discussion of clients' concerns helps service providers, including health care professionals, to understand potential problems and how to improve their service to the public.

Complaints are generally unavoidable and no organization can keep all clients satisfied 100% of the time. We are human beings after all. But, only a small proportion of people who are dissatisfied will lodge a complaint (less than 4 per cent). They will tell their family and friends about their bad experience and go elsewhere if they can [10].

Client complaint is measured over a wide range of health service dimensions, including availability, accessibility and convenience of services, technical competence of the service providers, interpersonal skills and the physical environment where services are delivered. Client engagement is also another noticeable gap, and involving clients in decision making during service provision is essential in health care. Client rights need to be respected in their choice, confidentiality, keeping privacy, and ensuring continuity of care.

A proactive approach to capturing client feedback is needed if clients are to make a useful contribution to quality improvement, whether it's through complaints, suggestions or comments. Client complaints management takes many forms, from preventive to internal complaints-handling, external dispute resolution and comprehensive approaches.

2.4. Client Complaint Management

Client complaint management (CCM) encompasses techniques, processes and systems that lessen the chance of clients having problems and allow businesses to respond fairly, efficiently and effectively when complaints arise.

An effective complaint handling system provides three key benefits to an organization [11]:-

- It resolves issues raised by a person who is dissatisfied in a timely and cost-effective way
- It provides information that can lead to improvements in service delivery
- Where complaints are handled properly, a good system can improve the reputation of an organization and strengthen public confidence in an organization's administrative processes.

2.5. Client Complaint Management in Hospitals

Appropriate and timely use of health and health related information is essential element in the process of transforming the health sector. The decisions and organizational behaviors of service rendering facilities is also influenced by the amount of data they can gather and the capacity to translate it to meaningful information, which in turn is used for decision making. From an equivalently imperative viewpoint, public access for essential information on health and the health system are also important in terms of improving quality of care.

Clients have a unique expertise in relation to their own health and their perspective on how care is actually provided. Client complaints are, therefore, a unique source of information for health care services on how and why adverse events occur and how to prevent them. As well as reducing future harm to patients, better management of complaints should restore trust and reduce the risk of litigation, through open communication and a commitment to learn from the problem and prevent its recurrence [12].

Clients and their care takers are reluctant to complain about health care services because they generally place a high level of trust in health care professionals and rely on them for their

expertise. The fact that people are unwell makes them reluctant to express dissatisfaction or even to ask for explanations. Fear of repercussions and simply not knowing how to go about lodging a complaint have also been found to be significant deterrents [13].

One approach to overcoming these feelings is to treat complaints as part of a wider client feedback strategy. This encourages clients to talk about whether their needs are being met, and invites compliments as well as criticism.

2.6. Complaint Management Practices of the Ethiopian health sector

Federal Ministry of Health of Ethiopia initiated the good governance movement in EFY 2008 to accelerate economic and democratic development and the citizen's intense pursuit of change. Despite the impressive changes in access to health services and improvement in health outcome, the health sector still suffers from the existence of inequality, poor quality of health service and a high burden of communicable and non-communicable disease [8].

Presently, even though there has been encouraging improvements in the coverage and utilization of the health services, there is still an increasing trend of community dissatisfaction with the health system.

According to FMOH, a lot remains to be done towards improving quality of care at each level of the health system. The health system, over the last two decades, has been focused on improving coverage of essential health services. It is high time to pay attention to the quality and equity of health services at all levels of the system [7].

2.7. Hospital Complaint Management Systems' Development Guidelines

In order to understand the concepts associated with Client Complaint Management (CCM) system, it is imperative to examine and analyzed published documents from experts regarding the field. The better practice guidelines on complaints management for health care services and

the Ombudsman's Report are guideline reviewed and adapted to design and develop the complaint management system for SPHMMC.

The *Better Practice Guidelines on Complaints Management for Health Care Services* are voluntary Guidelines. However, they have been developed with the active involvement of accreditation bodies, health care complaints commissioners, governments, medical defense organizations, client groups and professional bodies and are likely to become what is expected of health care services. The standards set for accreditation programs in the health care sector include requirements for complaints management. The *Standards for Aged Care Facilities*, which are used to determine suitability for accreditation, have the most detailed requirements for complaints management [14].

The Guide sets out an eight-step process for creating and implementing Client Complaints Management initiatives, from problem definition through to publication, review and continual improvement. A number of tips and suggestions are provided, including the following:

- Be flexible and adopt an incremental approach
- Draw on existing institutional structures
- Provide a range of options
- Draw on the credibility and expertise of client organizations
- Hire the right people to do the job
- Draw on existing standards, criteria and benchmarks, when available.

The Ombudsman's Report 2009-10,revised in January 2017, Survey of Complaint Handling Practices in the Western Australian State and Local Government Sectors also provides further information on complaint handling practices in public authorities [15].The requirements adopted from this report are shown in Table 1.

Client's side	Service provider's side
➢ A user friendly complaint handling system ➢ To be heard and understood ➢ An explanation ➢ An apology ➢ Action as soon as possible	➢ A user friendly system for accepting feedback ➢ Clear delegations for staff to deal with complaints ➢ A system for recording complaints ➢ Improve complaint responses

Table 1: Summary of requirements from guidelines

2.8. Related Works

Two related complaint management systems were reviewed for this project. They are OS-Ticket and I-Sight Case Management. The details of the reviews are described in this section.

OS-Ticket Software

This is a web based Client Complaint Management system designed to solve issues opened by the clients of a business using tickets associated with the issues. The system provides interfaces for the client to submit an issue he encountered while getting a service and chooses a particular category of issues. Then he/she provides his contact details to be notified of the status of the ticket. The system is developed using popular technologies like PHP, MySQL and Apache server and is released in a liberal open source license.

Although the system is designed to be applied to varied companies it serves to illustrate the common features a complaint management system is supposed to offer. It provides end users with features such as ticket opening mechanisms, emailing clients about the status of their tickets.

It provides back end features to manage users, manage tickets, assign tickets to agents, design custom forms, adding new frequently asked questions and logging facilities. It also features graphing facilities for statistics organized by department, help topic and agents.

I-Sight Case Management Software

I-Sight is software designed to improve efficiency and boost client satisfaction. I-Sight enables quick and accurate response to client service requests submitted through any channel. I-Sight is integrated web based case management software for managing client service inquiries and complaints.

I-Sight HC provides the HIPAA complaint tracking tools for hospitals and other health care providers need to quickly and securely collect, manage, share and report patient complaints and other incidents. I-Sight HC employs patient complaint handling best practices that adapt to your business process.

I-Sight Patient Complaints Tracking Software Advantages

- Reduce risk associated with patient complaints
- Improves employee productivity
- Enables collaboration across the enterprise
- Improves patient satisfaction
- Enables a pro-active approach to complaint prevention

I-Sight Patient Complaints Software Features:

- Web-based design enables users to log complaints from anywhere within the enterprise
- Staff can quickly close complaints or escalate for further investigation
- Automated workflow to ensure the right people/ departments are aware of their tasks
- Complete audit trail of actions taken
- Supports anonymous submissions
- Extensive reporting: by location, issue, patient, and more

CHAPTER THREE: METHODOLOGY

3.1. Overview

The study was conducted in Addis Ababa, Gulele sub city, at Saint Paul's Hospital Millennium Medical College. It used qualitative case study and design science to develop the proposed web-based system. The participants of the study included clients and employees of Saint Paul Hospital. The sample size was 30, 25 for requirement collection interview plus 5 for system evaluation study. Participants were selected using purposive sampling technique.

Object oriented methodology, with incremental and iterative designing cycles, was used as a tool to design and develop the complaint management system. After development, the proposed system was evaluated using a user acceptance test.

3.2. Study Period and Area

The project was conducted from November 2016 to January 2017 in Addis Ababa, Gulele sub city, Saint Paul's Hospital Millennium Medical College. Currently, SPHMMC has a catchment population of 5 million, has 392 beds for inpatient care, and provides medical care for thousands of clients every year [3]. The hospital was selected for this project based on the previous knowledge of the candidate facility.

3.3. Source and Study Population

The source population was clients or their care takers, nurses, doctors and complaint officers at SPHMMC. The population of the study was patients (clients), doctors, nurses and complaint officers selected from their respective departments at the Hospital. 12 clients, 5 nurses, 6 doctors and 2 complaint officers were selected using purposive sampling technique to participate on the preliminary survey.

3.4. Sample Size Determination

Purposive sampling technique was used because the researcher was looking for small number of participants from a large pool of potential respondents. The number of participants of the requirement study was 25.Because, after25 of the chosen respondents were interviewed the researcher reached at the saturation point of sampling by observing more data will not lead to more information from the interview questions regarding system design and development. For user acceptance testing of the system, 5 clients were selected to participate in the usability testing session, as per the satisfaction of the required number of participants for the usability testing method used by the project (see 3.10 for system testing details).

3.5. Inclusion and Exclusion Criteria

The inclusion criterion for the project was staffs who are currently working in the selected hospital and the exclusion criterion was those who are not available in the time of data collection. The client participants were selected the same way from multiple visits of the data collection process.

3.6. Data Collection Tools

Interviews and document reviews were used as main techniques to capture the system requirement.

3.6.1. Interview

The interview was conducted with 25 selected individuals from the selected departments. The informants (participants) were patients (clients), nurses, doctors and complaint officers. In each department, patients were identified, and informed consent was obtained prior to the beginning of the study.

The respondents were briefly introduced about the purpose and the nature of the study, what the study focuses on and the benefits of the findings. Respondents were interviewed using interview guide specifically designed for the study (see Annex E). Their responses were used as an essential input for defining the requirements which is important for designing of the web based Client complaint management system.

3.6.2. Document Review

Information was gathered from different governmental and non-governmental health institutions in addition experts were consulted who works on the area of Client Complaint management to develop the system.

Information was gathered from the Federal Ministry of Health and St Paul's Hospital Millennium Medical College.

The following documents were reviewed in order to develop the system

- Health sector Good governance 2008 EFY, Ethiopian Hospital Reform and Ethiopian hospital alliance for quality initiative (EHAQ),2013(FMOH)
- SPHMMC, Citizen Charter
- The Better Practice Guidelines on Complaints Management for Health Care Services and The Ombudsman's Report 2009-10, Survey of Complaint Handling Practices

3.7. System Development Methodology

System development methodology is a process followed in projects to conduct all the steps necessary from requirement analysis to design and development. Object oriented methodology with incremental and iterative designing cycles was be used, as the system development tool, to design and develop the complaint management system [16]. The method is appropriate to design the system since there are different objects interacting within the system. The objects in

an object-oriented design are related to the solution to the problem that is being solved and the complaint management has clients, health service providers, complaints and resolutions. That is why the project used this method to design the proposed system.

In Incremental and iterative design, a system is grown via iterations and incrementally adding new features. Incremental development is a staging and scheduling strategy in which various parts of the system are developed at different times or rates and integrated as they are completed. Iterative development is a rework scheduling strategy in which time is set aside to revise and improve parts of the system [17]. Using incremental and iterative design allowed the system development process to be flexible and open to corrections at any given stage.

3.8. System Analysis and Design

For the designing of the web based Client Complaint management system Object Oriented software design methodology an iterative and incremental Object Oriented Analysis and Design Cycles was used.

The object-oriented methodology uses a set of diagrams or models to represent various views and functionality of a system and is commonly known as Unified Modeling Language or UML. Unified Modeling Language (UML) is a standardized general-purpose modeling language in the field of object-oriented software engineering. UML includes a set of graphic notation techniques to create visual models of object-oriented software systems [18].This modeling language is selected because it increase reusability and modification, it is easy and understandable and it is fast system developing approach. The result of the system modeling that helps to understand the system was done using system modeling tools listed below:-

Use case diagram: it is the simplest illustration of interactions of actors of the system showing relationships of actors with uses cases of the system while describing the main actions performed in the system.

Class diagram: class diagram is an integral part of the unified modeling language. This diagram shows the object classes in the system and the associations between these classes.

Activity diagrams: are graphical representations of activities and actions with support for alternative, iteration and concurrency.

Sequence diagrams: are graphical representations of users' interaction with the system to complete a certain task.

Deployment diagram: this diagram shows the assignment of executable files on the computing elements and the communication that involves between these entities.

3.8. System Development Tools

There are several choices that can be used to develop a web based system. Various tools were used during development of the first version (prototype) of the complaint management system for SPHMMC. The tools used to construct the prototype were chosen due to the capacity for flexibility, extendibility of the technologies. The rapid development technologies were selected based on the developer's familiarity with them. The tools are described briefly as follows:-

PHP v5.6.14

This is a widely used, free and efficient scripting language suited for web development and can be embedded into HTML. The complaint management website is developed using this language. PHP is a powerful server-side scripting tool for making dynamic and interactive web pages. The tool is enabling the complaint collection and resolution tracking system responsive and tailored to clients and officers. This makes notifications from the system usable and easy to employ. The development of this prototype used version 5.6.14 PHP.

CakePHP v3.1.3

CakePHP is an open-source rapid web development framework that makes building simpler and faster, while requiring less code to be written. It is among the most popular frameworks that

follow the well-known model-view-controller (MVC)approach written in PHP. CakePHP also offers a flexible database access layer and powerful scaffolding system [19]. This framework allows the complaint system to have a prototype, validated as an idea fast with a room for solid growth, after simple syntax, common sense design and code generation. The Version 3.1.3 of CakePHP was used in the development of the prototype.

Xampp v3.2.2

Xampp is a free and open-source cross-platform (i.e. means it works equally on Linux, Mac and Windows) web server solution stack package developed by apache friends. It consists mainly Apache HTTP server, MariaDB database (previously SQL, replaced beginning with version 5.5.30), and interests for scripts written in PHP and Perl programming languages. The tool has everything needed to set up a web server with a database and scripting language in an extractable file. The complaint management prototype uses Xampp to design and implement its SQL database. The development of this prototype used version 3.2.2 of the application.

Netbeans IDE, v8.0.2

Netbean is a software development platform written in Java. The Netbeans Platform allows applications to be developed from a set of modular software components called modules. IDE stands for integrated development environment. The Netbeans IDE is primarily intended for development in Java, but also PHP, C/C++ and HTML5. The application is an open-source cross-platform (i.e. means it works equally on Linux, Mac and Windows) development environment. The complaint management prototype was programmed on this IDE to ease code compilation and debugging, while supporting frameworks used. The development of this prototype used version 8.0.2 of the IDE.

3.9. System Testing

After designing and developing the first version (prototype) of the SPHMMC complaint management system, usability assessment test was carried out with clients and their care

takers. The usability testing was conducted on the client complaint management system involving 5 participants. The purpose of the testing was to understand whether the targeted users can use the system well and to assess if they accept the system. The test also assessed the effectiveness and usefulness of the system. During the process, Morea usability testing software was used as a tool.

3.10. Ethical Consideration

Ethical clearance was provided from Addis Ababa University School of Public Health to conduct this project and official letter was provided to St Paul's Hospital Millennium medical college from Addis Ababa University school of Information Science. Information sheet and consent forms were delivered along each interview and all interviewees have been asked their willingness to participate in requirement gathering; and informed verbal consent were also be obtained from all study participants and from every interviewee after the objective of the study informed. Besides, the convenience, confidentiality, privacy and comfort of the participants were considered.

3.11. Dissemination of Results

The final result of the project will be submitted to AAU as partial fulfillment of M.Sc. in health informatics. Later, the project will be presented to Ethiopian Ministry of Health and St. Paul Hospital Millennium Medical College.

CHAPTER FOUR: SYSTEM ANALYSIS AND DESIGN

4.1. System Analysis

Inductive approach was used to analyze data collected through interview because this approach is comprehensive and suitable where little or nothing is known about the study phenomenon. Inductive analysis is the most common approach to analyze qualitative data. The analysis is done to identify the common issues (challenges and perceptions) that happen again across the entire data collected using semi structured interview. Then the results in each identified themes are presented in narrative form.

4.1.1. Overview of System Analysis

System analysis focuses on understanding the application domain. The domain includes business processes and flows and objects, which has to be defined to design a useful and usable system. It is studied through the use of analysis activities. Analysis activities used during this project include interviews and document reviews. The data gathering process was held by the researcher.

Interviews

The interviews were conducted with 25 selected individuals from the selected departments. The informants (participants) were patients (clients), doctors, nurses and complaint officers.

Respondents were interviewed using interview guide specifically designed for the study. The interview guide has several sections to collect different kinds of data required for this study. Their responses were used as an essential input for defining the requirements which is important for designing of the web based client complaint management system.

Document Reviews

Information was also gathered from different governmental and non-governmental health institutions, especially from the Federal Ministry of Health and St Paul's Hospital Millennium Medical College. The documents that were reviewed in order to develop the system are FMOH , Health sector Good governance,2008 EFY (MOH), FMOH, Ethiopian Hospital Reform (MOH), SPHMMC, citizen Charter and Ethiopian hospital alliance for quality initiative (EHAQ),2013 (MOH).

In addition experts were consulted who work in the area of Complaint management system. Finally the information obtained was customized based on the user requirement.

Participants

The selection was based on convenience sampling technique at Saint Paul Hospital Millennium medical College (SPHMMC) in Addis Ababa, Ethiopia. St Paul's Hospital Millennium Medical College is one of the four Federal Hospitals administered by the federal ministry of Health to develop and test a complaint management system for the hospital. The response rate was 67.6 %, i.e. 37 individuals were approached and 25 were willing. The requirement collection for the Complaint Management system was conducted using 25 people, from which 13 of the participant were employees of the hospital and the rest of the participants were clients.

Participant	**Sex**		**Total**	**Has basic Computer skills**
	Male	**Female**		
Nurse	1	4	5	100%
Doctor	4	2	6	100%
Complaint officer	1	1	2	100%
Client	6	6	12	75%
Total	12	13	25	88%

Table 2: Participants of the requirement collection

4.1.2. The Existing System

The current system at SPHMMC, found in Addis Ababa Ethiopia, as of the starting point of this project, is mostly the traditional pen and paper way. Clients write the complaints on note book/complaint form to the moment the Complaint officer receives the complaint. They go back home without having any information on whether the complaint is solved or not.

In the current system clients complained about several issues. The current complaint submission form is attached in the annex section (see Annex A). The issues clients, described in the interviews, include health workers disrespecting clients and not providing care with dignity, the toilets of some Health institutions were unclean and there was water shortage and inconvenient space for waiting, physicians not appearing on time for work and caused congestions, shortage of beds and long appointments and waits for services at health institutions, disrupted services in pharmacy and laboratory units of the health institutions.

The existing system can be characterized as an ad-hoc process where complaints are passed to the management using informal and manual mechanisms which are not suitable to resolutions immediately. This kind of process is not likely to pin point of patient complaints areas in the service provision process. Complaints are likely to get unnoticed by the management of the institution and not get addressed in a timely manner. This causes frustration in patients and patients' parents who are already in distress.

To avoid such complaints some private Health institutions have implemented some kind of complaint management systems. But the system is very much in its infancy to act as full functional and gathering tool for a project of this magnitude.

This project proposes development of a web base complaint management system for the SPHMMC Hospital based on the following results:-

- Clients' willingness level to use the system
- Language requirement of the clients detects the system be built locally

4.1.3. Business Process of the Existing System

The current formal business process for complaint management at SPHMMC Hospital is linear and simple. Figure shows the business process.

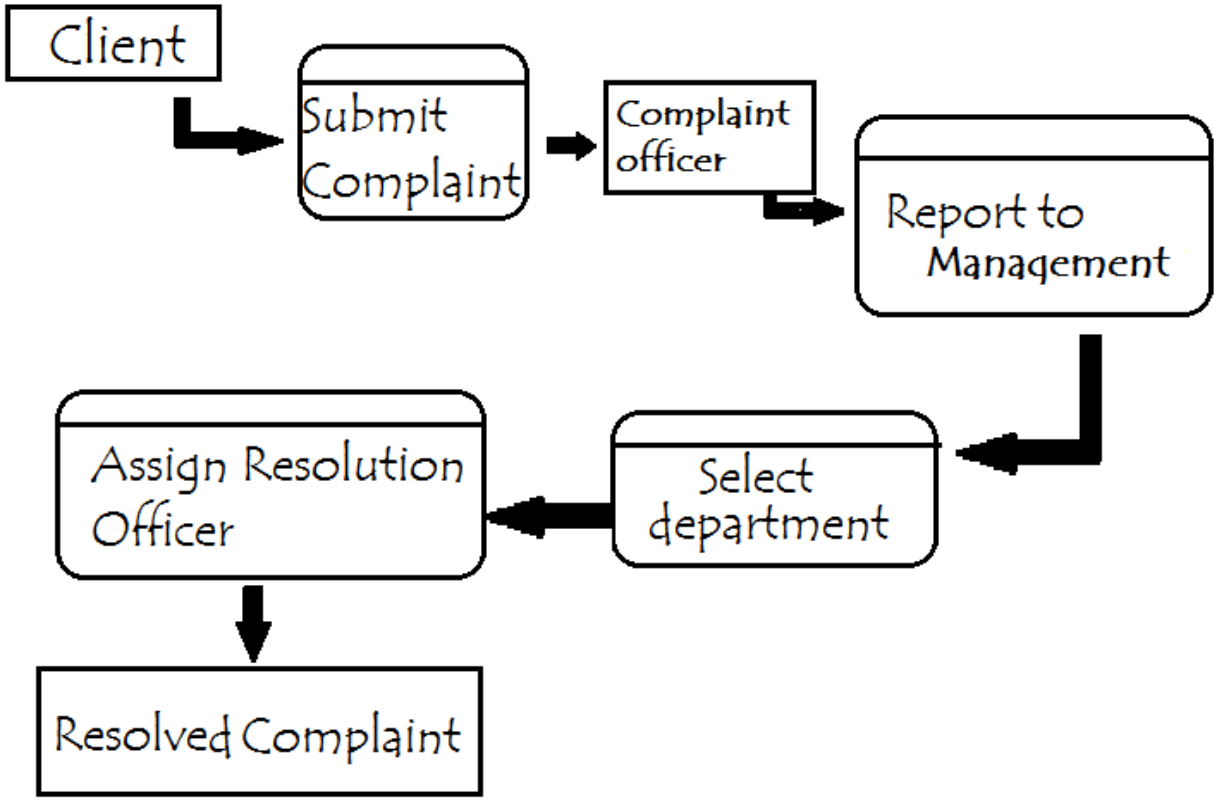

Figure 1: Business process of the current system, DFD diagram

4.1.4. Gaps in the Existing System

In the current system, continuous quality improvement is not possible because there is no structured way of collecting client satisfaction data and analyzing it. This causes a lot of wastage in time and resources due to inefficient key business processes and loss of clients due to unresponsive practices which ignore feedback from clients.

The basic problems related to complaint management at SPHMMC are:

I. The resolution officers, at SPHMMC, said complaint collection books and keys to suggestion boxes are also lost time to time. The books and boxes are also open to vandalism and theft. This lack of fitting security and upkeep of the complaint record in the system make way for disappointment and loss of information.

II. Complaints gathered on paper can be easily lost, misplaced or destroyed. For example, two whole books containing client complaints and suggestions were lost recently. This clearly obstructs the complaint resolution process.

III. Poor performance of the manual system leads to the missing or exploitative handling of the complaint by the staff or any member of the management. This is a circumstance where there is no way made for survey of the complaint management. There is no system or database set up to screen transfer of complaint submitted on paper or as verbal representation to the appropriate party.

IV. The current system has no formal way of tracking complaint resolution progress. It is completely impossible for a client to know how and when the complaints are going to be resolved.

V. The client does not have the necessary tools or mechanism to find out where treatment and services are located. Hence they have to waste their valuable time before starting their treatment; this is one of the reasons why complaints arise. The client might not even get the treatment because he/she might have to look for the department providing the specific treatment.

4.1.5. The Proposed System

The proposed system intends to address the issues discovered in the existing system. Therefore, the proposed system was designed after analyzing recommendations from reviewed guidelines (see Literature review for details) and the gaps in the existing system. The proposed

system is described using functional and non-functional requirements and system models over the next sections.

4.1.5.1. Functional Requirements

The following functional requirements of the system are identified by analyzing the existing system and gaps discovered within it. Guidelines were also used to map requirements to functional requirements. The functional requirements of the complaint management system are: -

1. The system registers users of the system.
2. The system allows clients to submit a targeted complaint.
3. The system lets users to access FAQs.
4. The system allows users to check complaint resolution status.
5. The system shows pending complaints.
6. The system should be able to add assign resolver to complaint.
7. The system should enable resolution officers to Close/Resolve complaint.
8. The system should be able to show reports on resolutions, assignments, and topics.
9. The system should enable rating of employee and department performances.
10. The system should be able to add new resolution officer.
11. The system should be able to show targeted resolution progress reports to concerned parties.
12. The system allows resolution officers to submit report on the resolution assignment.
13. The system should be able to manage user accounts.

4.1.5.2 Nonfunctional Requirements

Nonfunctional requirements of the system are: -

Accessibility: -The system should be accessible 24/7 from any browser after implementation.

Exceptions and error handling: - Error handling will be performed with as much accuracy as possible with the tools provided by the programming languages and the frameworks that we will be using.

Language: - The complaint management system should use the local language Amharic to increase usability of the system.

Performance: -The system should not be underpowered in order to serve multiple users simultaneously. The system should respond any request from users within seconds, otherwise it will frustrate to clients using via the World Wide Web.

Portability: - The system should be designed in such a way that the application can be accessed by any browser on a device, mobile or PC alike.

Reliability: -The system should have consistency and provide correct and timely reports to both clients and service providers.

Security: - The system should authenticate users before giving the user and administrative access to any sensitive information and high emphasis should be given to resisting all types of malicious attacks. To ensure the Client s' data is as secure as possible; measures like hashing passwords before saving them in the database, password protecting the database host administration software and locking the database server with a password.

User friendliness: - The system should be user friendly. The user interface is one of our main priorities. The interface has to be understandable not only by doctors and pharmacists but it has to be understood by the Clients as well, regardless of their educational background.

4.1.6. Contextual Modeling

Contextual modeling is a high level modeling technique that is used to define the boundaries of the system and illustrate the operational context of the system. After contextual modeling, one can differentiate what falls within the boundaries of the system and what is not included in the scope of the system.

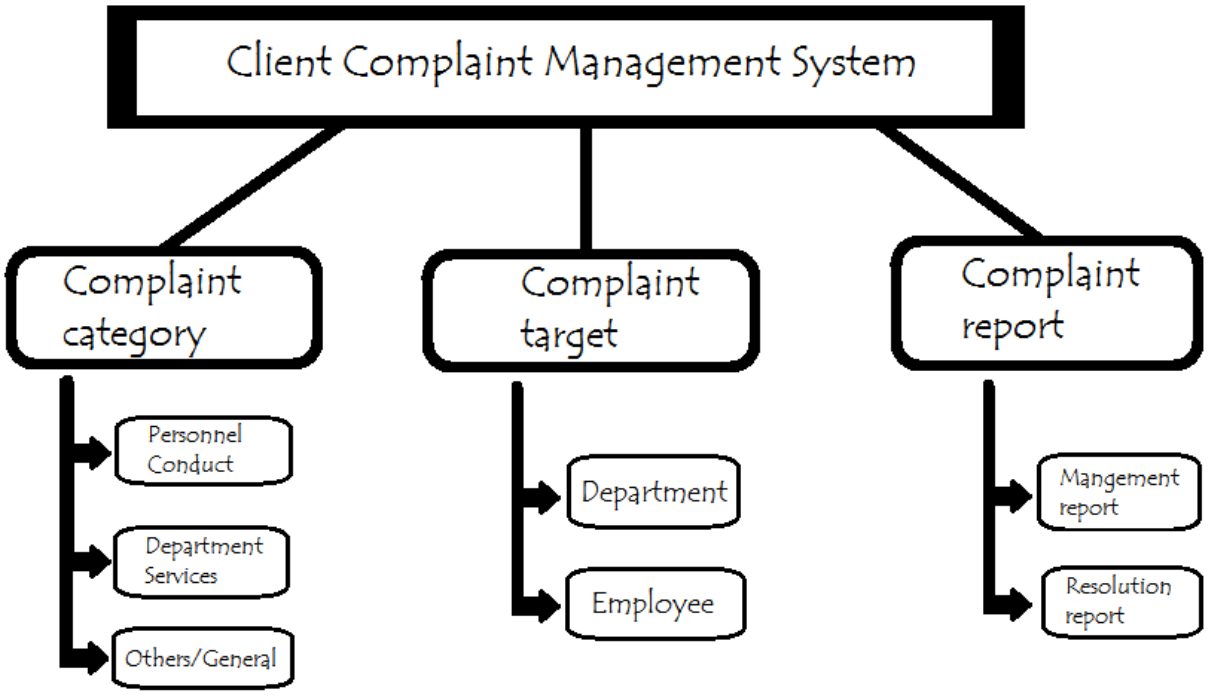

Figure 2: Contextual model of the system

4.1.7. System Modeling

System models are ways to document the system being designed. System model is a blue print of the system that describes the different views of the system using different UML modeling tools. The UML tools used to model the complaint management system include use case diagram, class diagram, activity diagrams and sequence diagrams.

4.1.7.1. Use case Modeling

A use case model identifies different types of actors and their interactions with the system. Actors might be a person, accompany or an organization, a computer program that interact with the system (i.e. users). Stakeholders have to directly with the system to be considered as actors, because not all stakeholders are actors.

Identified users of the complaint system are clients, resolution officers and system administrators.

1. System Administrators: - System administrators are managers of the system, including accounts and complaint assignments to resolvers.

2. Clients: - Clients use the system and have a complaint about one or multiple services provided and employees that provided them. I.e. Patient or family of a patient

3. Resolution Officers: - Resolution officers are employees, i.e. service providers, of the hospital including non-health professionals that view complaints and provide a solution for them. For example, department heads, directors and fulltime resolution officers.

There are 11 use cases identified for the complaint management system. They are shown in table 3 with their respective description.

Identifier	Name	Description
UC-01	Register	Allows new users to register on the system.
UC-02	Login	Allows the user to login to the system
UC-03	Submit Complaint	Allows the user to submit a complaint to the system
UC-04	Access FAQ	Allows the user to access FAQ page.

UC-05	Add Complaint Target	Allows the user to add a new complaint target
UC-06	Manage Complaint Topics	Allows the user to edit or delete complaint topics
UC-07	Assign Resolver	Allows the administrator to assign a resolution officer to a pending department complaint
UC-08	Manage User	Allows the user to add/edit/delete user accounts
UC-09	View resolution reports	Allows the user to view reports on complaint resolutions
UC-10	Resolve complaint	Allows the user to submit reports on complaint resolutions
UC-11	Check resolution status	Allows the user to check complaint status

Table 3: List of Use cases

A use case diagram, of the UML language, shows the relationships between users and the different use cases identified. Each use case is a business scenario or event for which the system must provide a defined response [20]. Figure 3shows the use case diagram of the complaint system.

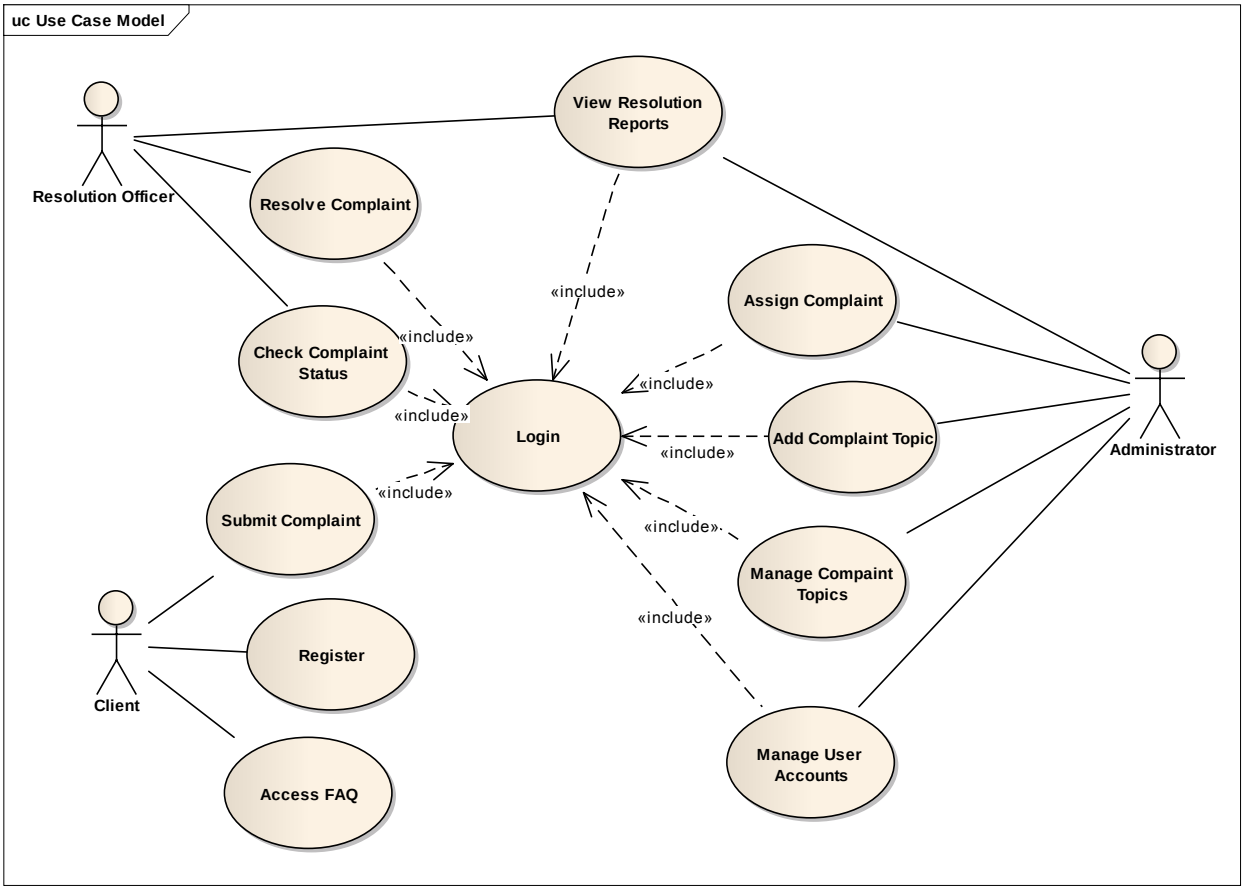

Figure 3: Client Case diagram

4.1.7.2. Client case Descriptions

Use case descriptions are written explanations of the Use-case diagram. The descriptions include the basic flow of the actions performed on the system paired with other probable alternate flows based on user's interaction with the system to accomplish a goal.

Name	Register
Identifier	UC-01
Description	Allows the user to register on the system
Actor	Client
Pre-Condition	The user must not be already registered.
Post-Condition	The user account is created.

Basic Course of Action

1. The user clicks sign up button.
2. The system displays sign up form.
3. The user fills data and clicks save button.
4. The system checks if password and password confirm are the same and all data is filled.
5. The system displays acknowledgment.
6. The use case ends.

Alternative Course of Action [4] a: Password or confirm do not match

1. The system informs the user “password and password confirm do not match”.

Alternative Course of Action [4] b: There is an empty field

1. The system informs the user “please fill out this field”.

Table 4: Description of ‘register’ use case

Name	Login
Identifier	UC-02
Description	Allows the user to login to the system
Actor	Client/Officer/Administrator
Pre-Condition	The user must be already registered.
Post-Condition	The user is logged in.

Basic Course of Action

1. The user starts the system.
2. The system displays login page.
3. The user types username and password.
4. The system checks password and username.
5. System displays the appropriate home page.
6. The use case ends.

Alternative Course of Action [4]: Wrong password or username

1. The system informs the user “Incorrect username or password”.

Table 5: Description of “login” use case

Name	Submit Complaint
Identifier	UC-03
Description	Allows the user to submit a complaint to the system
Actor	Client
Pre-Condition	The user must be already logged in to the system.
Post-Condition	The client's complaint is submitted.
Basic Course of Action 1. The user clicks submit complaint button from menu. 2. The system displays complaint submission form. 3. The user fills and submits complaint. 4. The system saves the complaint. 5. The use case ends.	
Alternative Course of Action [4]: The complaint form includes wrong or empty entry. 1. The system informs the user about the error. 2. Go to step 2.	

Table 6: Description of "submit complaint" use case

Name	Access FAQ
Identifier	UC-04
Description	Allows the user to access FAQ page.
Actor	Client
Pre-Condition	The user must open the complaint page.
Post-Condition	The user accesses FAQ page.
Basic Course of Action 1. The user clicks list FAQ button from menu. 2. The system displays FAQ page. 3. The user chooses a question from the FAQ list. 4. The system displays the answer for the selected question. 5. The use case ends.	
Alternative Course of Action: None	

Table 7: Description of "access FAQ" use case

Name	Add Complaint Targets
Identifier	UC-05
Description	Allows the user to add new complaint target.
Actor	Administrator
Pre-Condition	The user must be already logged in to the system.
Post-Condition	The system stores the complaint target.

Basic Course of Action

1. The user clicks on add complaint target button from menu.
2. The system displays complaint target registration form.
3. The user fills data and clicks on save button.
4. The system saves the complaint target.
5. The use case ends.

Alternative Course of Action [3]: The user entered wrong or empty data

1. The system displays error message.
2. The use case ends.

Table 8: Description of 'Add complaint topic' use case

Name	Manage Complaint Topics
Identifier	UC-06
Description	Allows the user to edit or delete complaint topics
Actor	Administrator
Pre-Condition	The user must be logged in to the system.
Post-Condition	The system performs action and displays acknowledgement.

Basic Course of Action

1. The user clicks/opens a complaint topic.
2. The system displays the details of the complaint topic.
3. The user chooses further action by clicking edit of delete.
4. The system performs action and displays acknowledgement message.
5. The use case ends.

Alternative Course of Action [4]: The user clicks add button

1. The system displays complaint topic registration form.
2. The user fills and submits data.
3. The system saves complain topic.
4. The use case ends.

Table 9: Description of "Manage Topics" use case

Name	Assign Resolver
Identifier	UC-07
Description	Allows the user to manually assign a resolution officer to a complaint
Actor	Administrator
Pre-Condition	The user must be already logged in and on unresolved complaint list page.
Post-Condition	A resolution officer is assigned to a complaint

Basic Course of Action

1. The user clicks assign resolver button next to the complaint.
2. The system displays appropriate resolution officer choices.
3. The user selects a resolution officer.
4. The system updates complaint data.
5. The use case ends.

Alternative Course of Action [4]:The complaint is assigned to a resolution officer already

1. The system displays officer change form.
2. The user fills and submits the form.
3. The system updates complaint details.
4. The use case ends.

Table 10: Description of "Assign Resolver" use case

Name	Manage Users
Identifier	UC-08
Description	Allows the administrator to manage edit or delete user accounts.
Actor	Administrator
Pre-Condition	The user must be and administrator and must be already logged in.
Post-Condition	The user account is updated

Basic Course of Action

1. The user clicks “list users” button from menu.
2. The system displays manage users form.
3. The user selects and the action edit.
4. The system displays edit user form.
5. The user fills and clicks save button.
6. The system saves the user and displays acknowledgment message.
7. The use case ends.

Alternative Course of Action [4]: The user clicks delete button

1. The system asks if the user is sure.
2. The user clicks ok. (If the user clicks cancel jump to step 4)
3. The system deletes the user data and displays action acknowledgment.
4. The use case ends.

Alternative Course of Action [5]: The user enters wrong or empty data.

1. The system displays error message
2. The system goes back to step 4.

Table 11: Description of “Manage Users” use case

Name	View Resolution Reports
Identifier	UC-09
Description	Allows the user to view reports on complaint resolutions
Actor	Administrator/Officer
Pre-Condition	The user must be already logged in.
Post-Condition	The user views complaint resolution status.
Basic Course of Action 1. The user clicks on view reports button. 2. The system displays list of report types. 3. The user selects report type. 4. The system displays the report. 5. The use case ends.	
Alternative Course of Action : None	

Table 12: Description of "View Resolution Reports" use case

Name	Resolve Complaint
Identifier	UC-10
Description	Allows the user to submit reports on complaint resolutions
Actor	Officer
Pre-Condition	The user must be already logged in.
Post-Condition	The user submits complaint resolution.

Basic Course of Action

1. The user clicks resolve complaint button.
2. The system displays resolution form.
3. The user fills and submits resolution form.
4. The system updates complaint data and displays acknowledgement message to the user.
5. The use case ends.

Alternative Course of Action [2]: There is no complaint assigned to the officer

1. The system informs the officer there are no complaints manually assigned to him/her.
2. The use case ends.

Table 13: Description of "Resolve Complaint" use case

Name	Check Complaint Status
Identifier	UC-11
Description	Allows the user to check complaint status
Actor	Officer/Administrator/Client
Pre-Condition	The user must be already logged in.
Post-Condition	The user views complaint resolution status.
Basic Course of Action 1. The user clicks on check complaint status button from menu. 2. The system displays one or list complaints appropriate for the user to see. 3. The user clicks check complaint status button. 4. The system displays the status. 5. The use case ends.	
Alternative Course of Action [3]: The user doesn't have any complaints in progress 1. The system informs the user there are no complaints 2. The use case ends.	

Table 14: Description of "Check Complaint Status" use case

4.1.7.3. Class Diagram

Classes are used to capture the vocabulary of a system.They represent software things, hardware things, and even things that are purely conceptual. The classes for the complaint management system were identified through iterative brainstorming with the users. Table 15 shows the complaint management system's classes identified with their respective descriptions.

No	Class name	Description
1	Complaints	A class to hold details about complaints.
2	Users	A class to hold username, password and other user account details.
3	Employees	A class to contain employee information, including their backgrounds.
4	Questions	A class to hold questions from clients and frequently asked questions already answered by SPHMMC staff.
5	Answers	A class to hold answer for questions.
6	Assignments	A class to hold complaints' assignment to employees, in order to provide resolutions.
7	Resolutions	A class to hold resolutions for complaints.
8	Departments	A class to hold details about departments.

Table 15: Description of Classes

A class diagram of the Unified Modeling Language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, their methods, and the relationships among them. The class diagram is the main building block of the object-oriented modeling. It is used both for general conceptual modeling of the systematic of the application. Class diagrams are used for data modeling [20]. The class diagram of the system is shown in the figure 3.

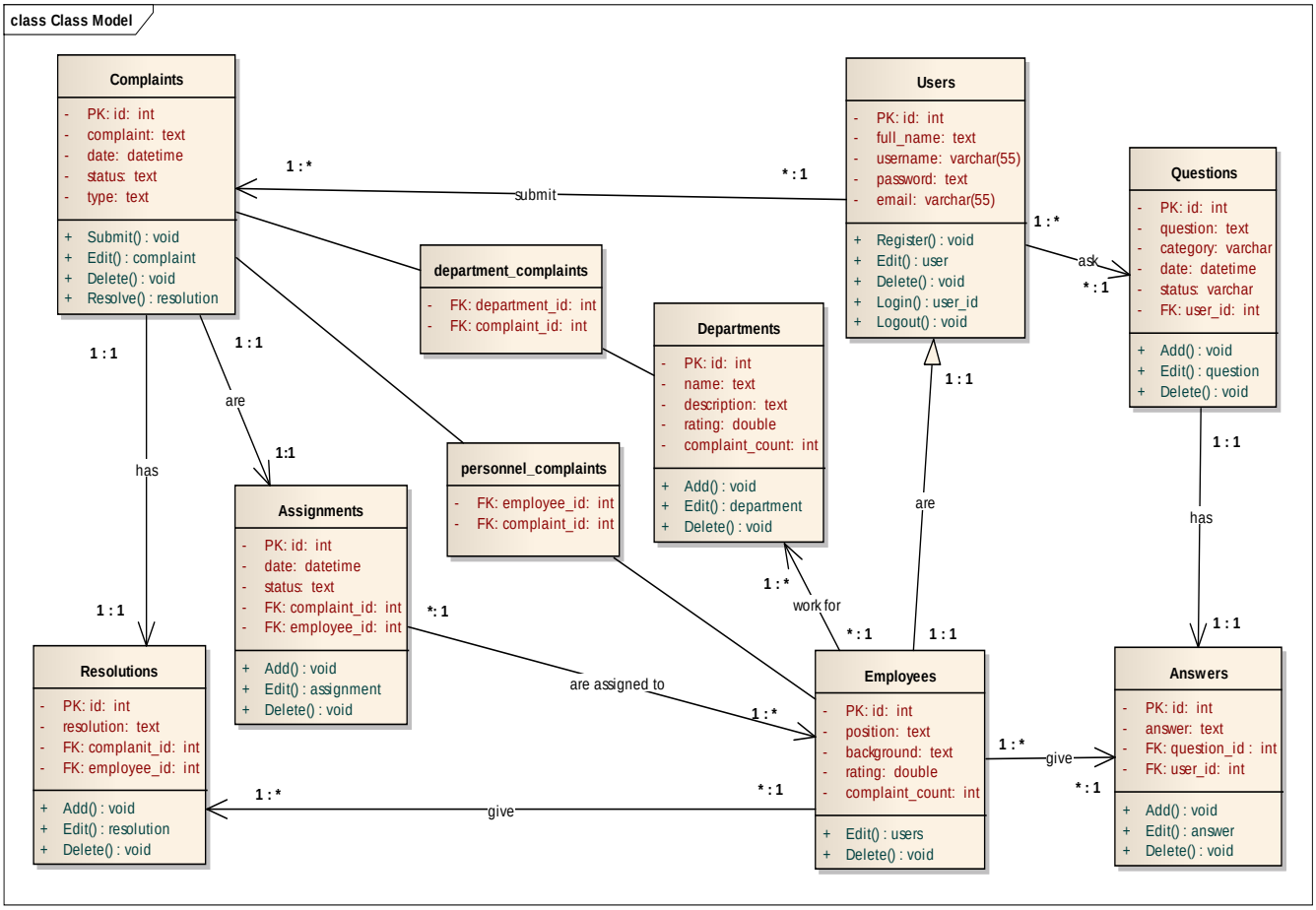

Figure 4: Class Diagram

4.1.7.4. Activity Diagrams

Activity diagram is another important diagram in UML used to describe dynamic aspects of the system. An activity diagram visually presents a series of actions or flow of control in a system similar to a flowchart or a data flow diagram [18].

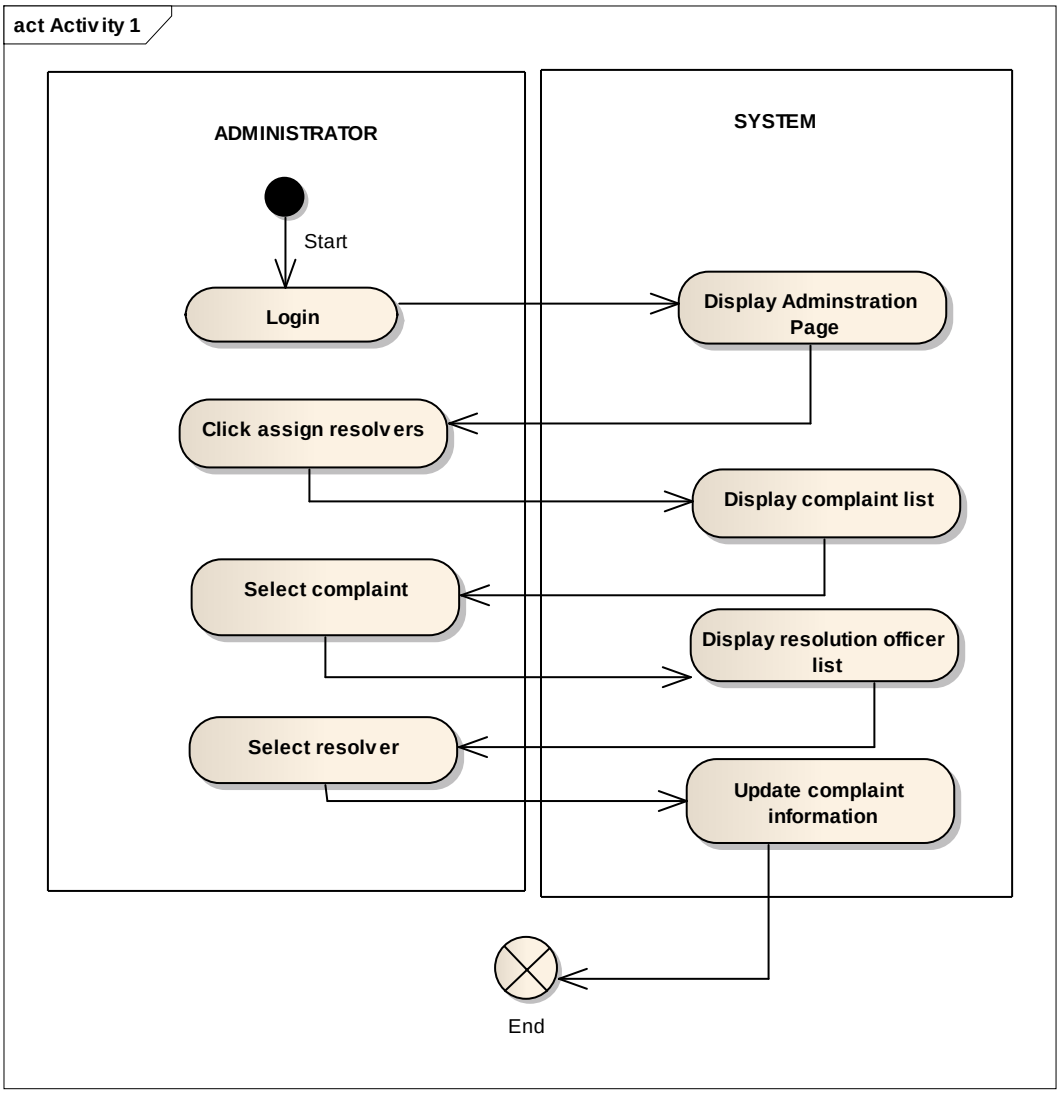

Figure 5: Activity Diagram for assigning a resolution officer

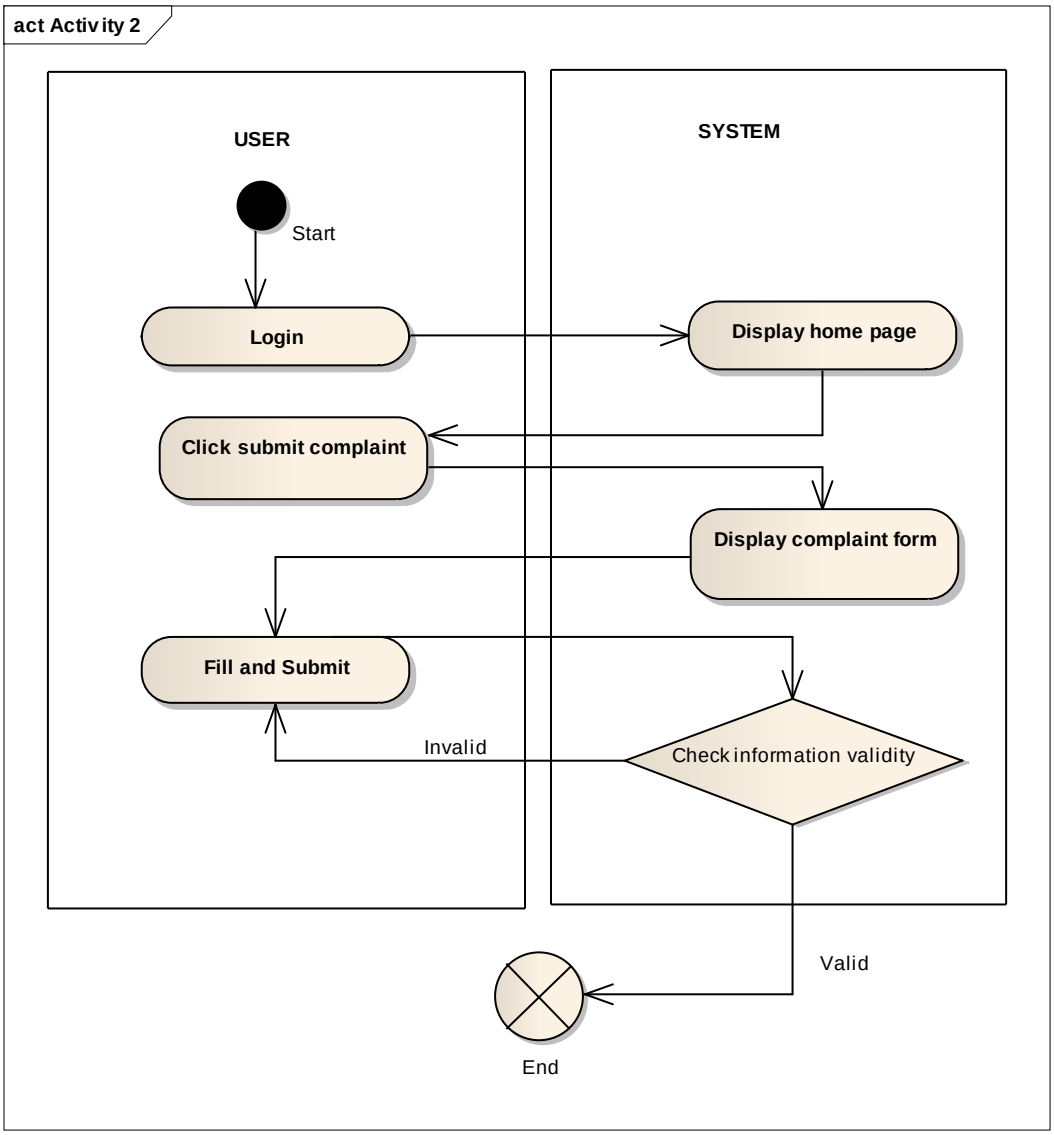

Figure 6: Activity Diagram for Submitting a Complaint

4.1.7.5. Sequence Diagrams

A sequence diagram of the UML language is an interaction diagram that shows how objects operate with one another and in what order. It shows object interactions arranged in time sequence [18].Sequence diagrams for login and resolve complaint are shown in figures 6 and 7 respectively.

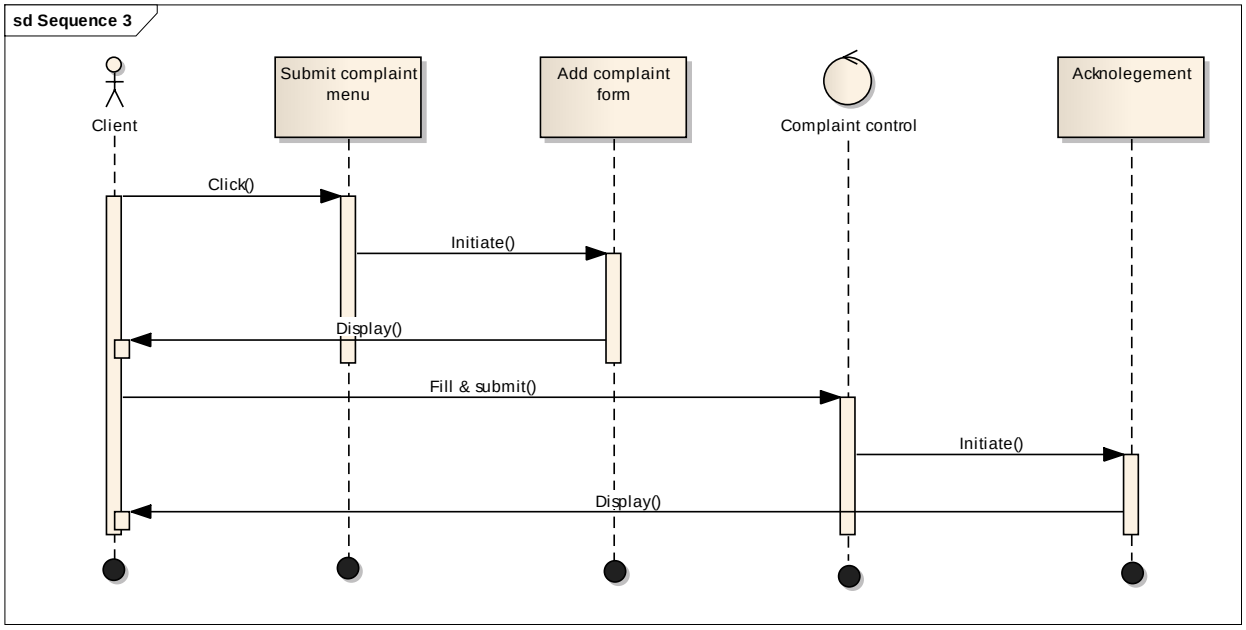

Figure 7: Sequence Diagram for submitting a complaint on the system

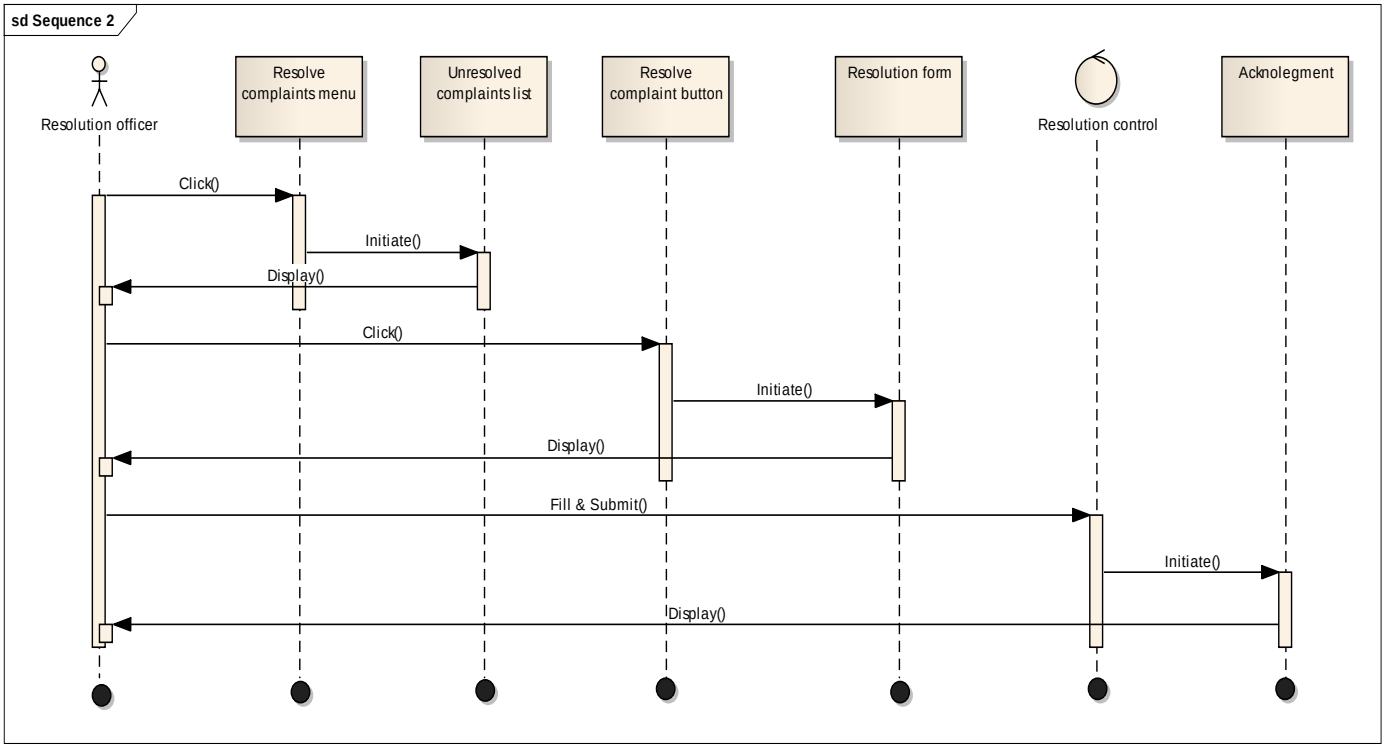

Figure 8: Sequence Diagram for entering a complaint's resolution response

4.2. System Design

System design is the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements. Systems design focuses on the solution domain and could be seen as the application of “systems theory” to product development [21]. The following subjects are discussed in this chapter: System design goals with respective criteria, system architecture, sub-system decomposition and Hardware and Software mapping.

4.2.1. Design Goals

Design goals describe the qualities of the system that developers should optimize. Such goals are derived from the non-functional requirements of the system. The design goals can be generally grouped into five categories. These are; performance criteria, dependability criteria, cost criteria, maintenance criteria, and End user criteria.

Performance: Performance in this instance comprises speed and capacity. The complaint submission website should serve multiple users simultaneously, upon request and responses should be displayed within 10 seconds. The Complaint Management System should also be able to handle maximum number of incoming lines, because underpowered websites frustrate clients. The tradeoff between speed and capability should always choose capability. The system should serve as many people as possible.

Dependability: The system should be able to handle invalid/wrong user inputs from the various inputs. The interface should reappear and should not loose correct portion of the data inserted. This system should also be trustworthy and reliable towards any personal data the user may give. Furthermore, the World Wide Web is highly susceptible to malicious attacks. So, the users of the complaint management system, especially administrators and resolution providing employees of the hospital, should login to the system using username and passwords before accessing sensitive data. Their passwords should also be hashed prior to database storing.

Cost: The implementation of the system should keep the cost to a possible minimum. The system should also be built with future changes in mind to make the changes less costly as possible. The balance between development cost and maintenance cost should be balanced.

Maintenance: The system should be easily expandable to add new functionalities and easily modifiable to make changes to the existing ones' in the future. Procedure and classes found in the complaint management system should be optimized.

End user: - This system should be accessible from any browser, Mobile phones & Personal Computers alike. The system should also be easy to use.

4.2.2. System Architecture

The Complaint Management system has Client/Server architecture, meaning servers provide services to instances of other subsystems, called clients or callers in this case.

The system is designed using three-tier subsystems organization, which divides the system into three layers (see Figure 8). The layers are: -

Interface layer: including all boundary objects that deal with the user.

Application logic layer: including control and entity objects.

Storage layer: including storage, retrieval, and query of persistent data objects.

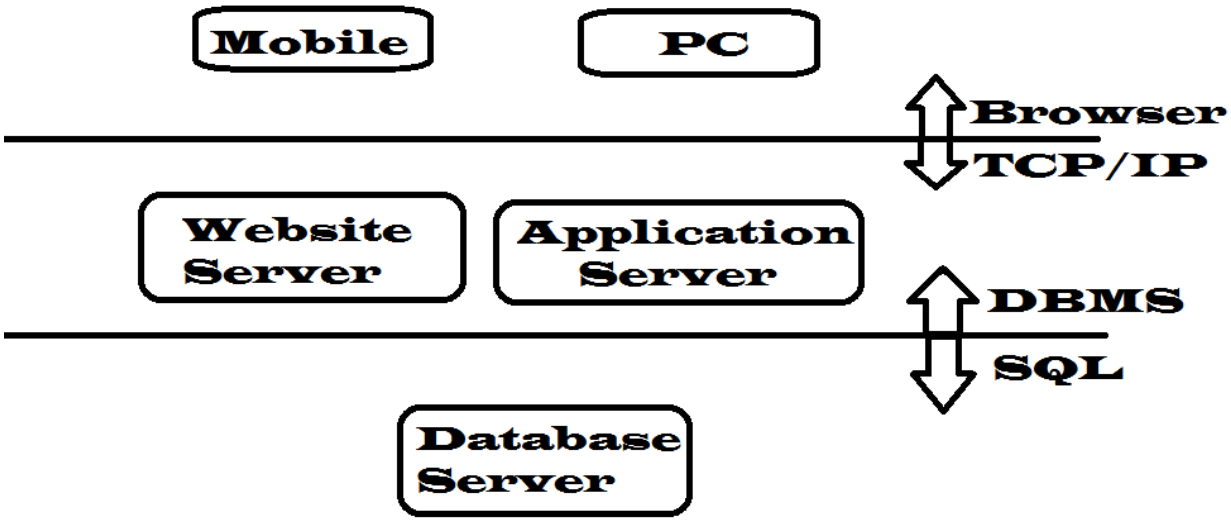

Figure 9: System Architecture of the Complaint Management System

4.2.3. Sub System Decomposition

Subsystem decompositions help the system be less complex and more manageable to implement. The subsystems can be considered as packages holding related classes/objects together. The complaint management system was decomposed based on the user groups of the sub systems. The first group includes service providers who are responsible for resolutions and the second includes clients and care takers submit complaints. The subsystems are user management subsystem, report generation subsystem, complaint submission subsystem and resolution subsystem.

User management subsystem

This subsystem is used to register new user accounts and mange, edit, view and delete, according to appropriate desire. Authentication, profile and home page personalization are also handled by this subsystem.

Report generation subsystem

This subsystem is used to generate complaint resolution statistics and total count of complaints of departments and employees.

Complaint submission subsystem

This subsystem is a complaint collection website that allows complaint submission and the tracking of resolution progress by clients.

Resolution subsystem

This subsystem is used to assign complaints to resolution officers both automatically and manually. The subsystem also enables officers to provide/enter resolution details for complaints.

Figure 10 shows the subsystemdecomposition of theComplaint ManagementSystem.

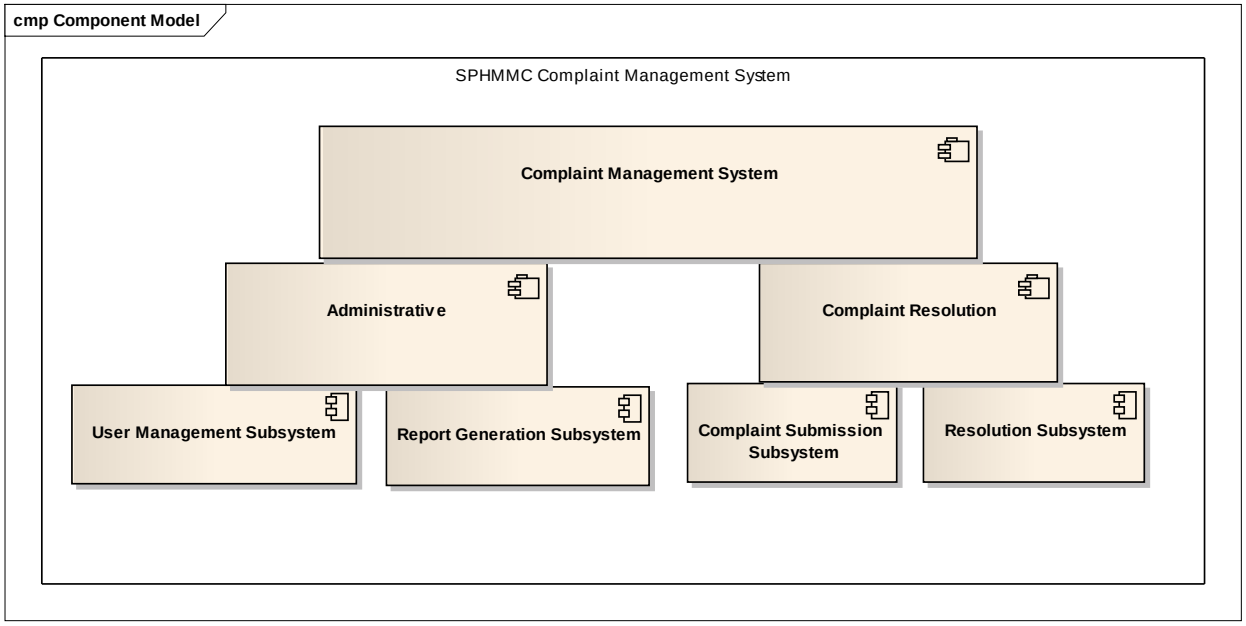

Figure 10: Subsystem Decomposition of the Complaint Management System

4.2.4. Deployment Modeling

One of the major tasks in system design deals with hardware/software mapping, which also known as deployment modeling. It is determining components that would be a part of the system, both hardware and software.

The Complaint Management System has a central server and clients networked with an access to the central server through the web application. The website is connected to the complaint management application and the management system stores and retrieves data to and from the database storage. To make system work as planned one needs to follow hardware and software deployment components that are shown in Figure 11.

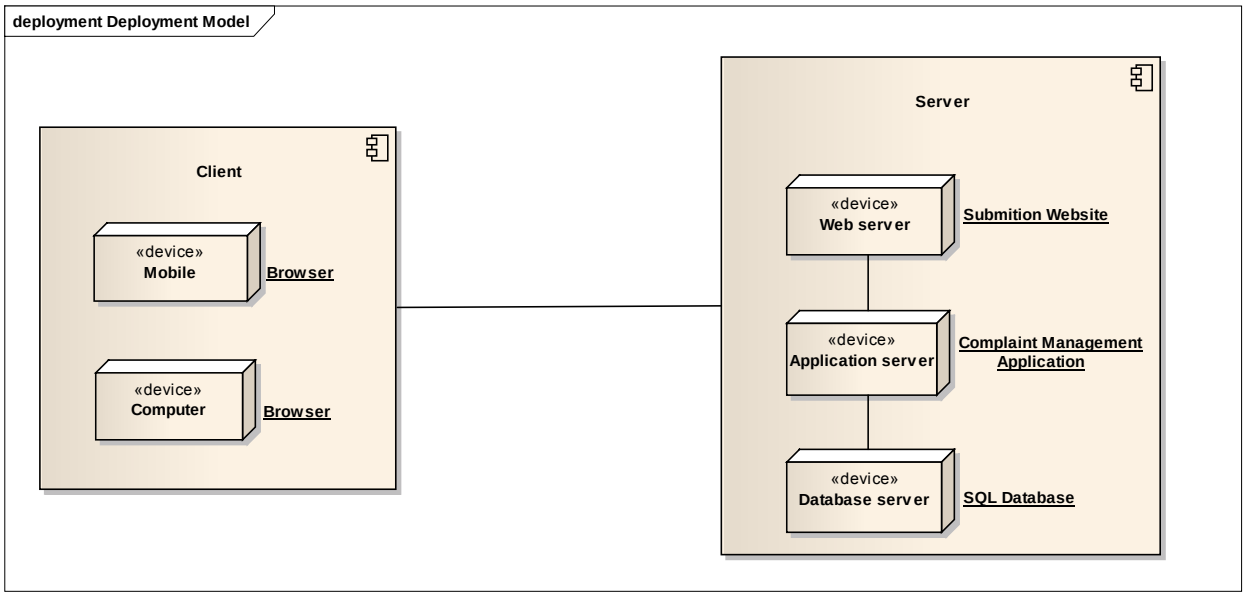

Figure 11: Hardware/Software Mapping for the Complaint Management System

CHAPTER FIVE: SYSTEM IMPLEMENTATION AND TESTING

This chapter includes details of system development and system evaluation used during this project.

5.1. Implementation

The implementation of this software includes several tools and steps. This section describes the technology choices and the development tools used to develop the prototype and why they were picked to do the job. The holistic view of implementation presented to the reader includes the process of the development and sample interfaces.

5.1.1. Web Technology for Complaint management

The World Wide Web is a very large distributed digital information space; it has grown to encompass diverse information resources [22]. The World Wide Web is a techno-social system to interact humans based on technological networks. The WWW enhances human cognition, communication, and co-operation. The reason for the Web's success is largely due to its simplicity for use of communication and information retrieval [23]. Web-based technology platforms allow integrated delivery of desired services to users with the right time and privileges.

Web based technology influence the community by improving literacy and the information displayed is going to be tailored for the targeted service users and the situation. According to World Wide Web foundation, some of the benefits of web-based application are: It can be accessed from the personal computer or mobile phone; people become familiar using the Web to get the news, weather forecasts, medical information, complaints, social media and the like [23].

5.1.2. Programming

The programming process of the complaint management system took an advantage of the CakePHP frame work. After building the database on Xampp server, the crud functions of the system were generated using the CakePHP command prompt tool. After the PHP code was generated it was edited accordingly by the developer, using Netbeans IDE, in to the final proposed system. The menus and the default layout were adopted from free online template by the developer. The sample final PHP code that resulted looks like the example on Annex I. The Amharic translation was later done using internationalization and localization features of the framework and the software Poedit (See Annex J).

5.1.3. Graphical User Interfaces

The Complaint Management Prototype is designed using interfaces qualities shown in this section. Some sample interfaces are choosen to show the concept of layout used by the software and Figure 12 shows interfaces of the system.

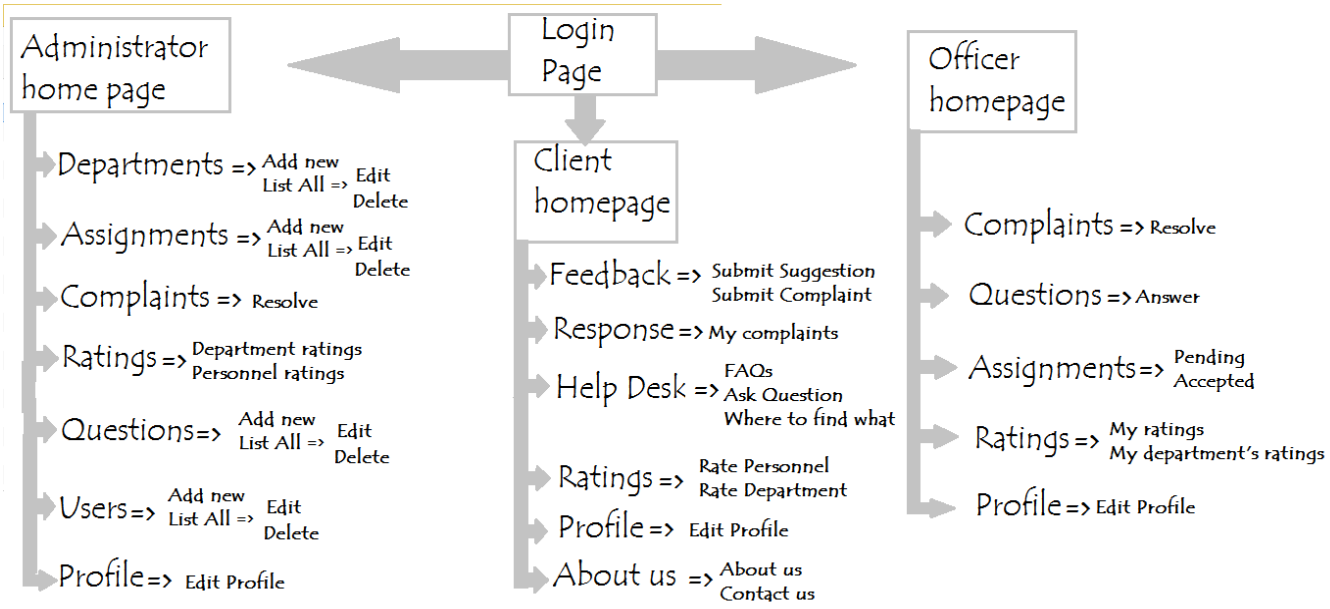

Figure 12: interface components of the system

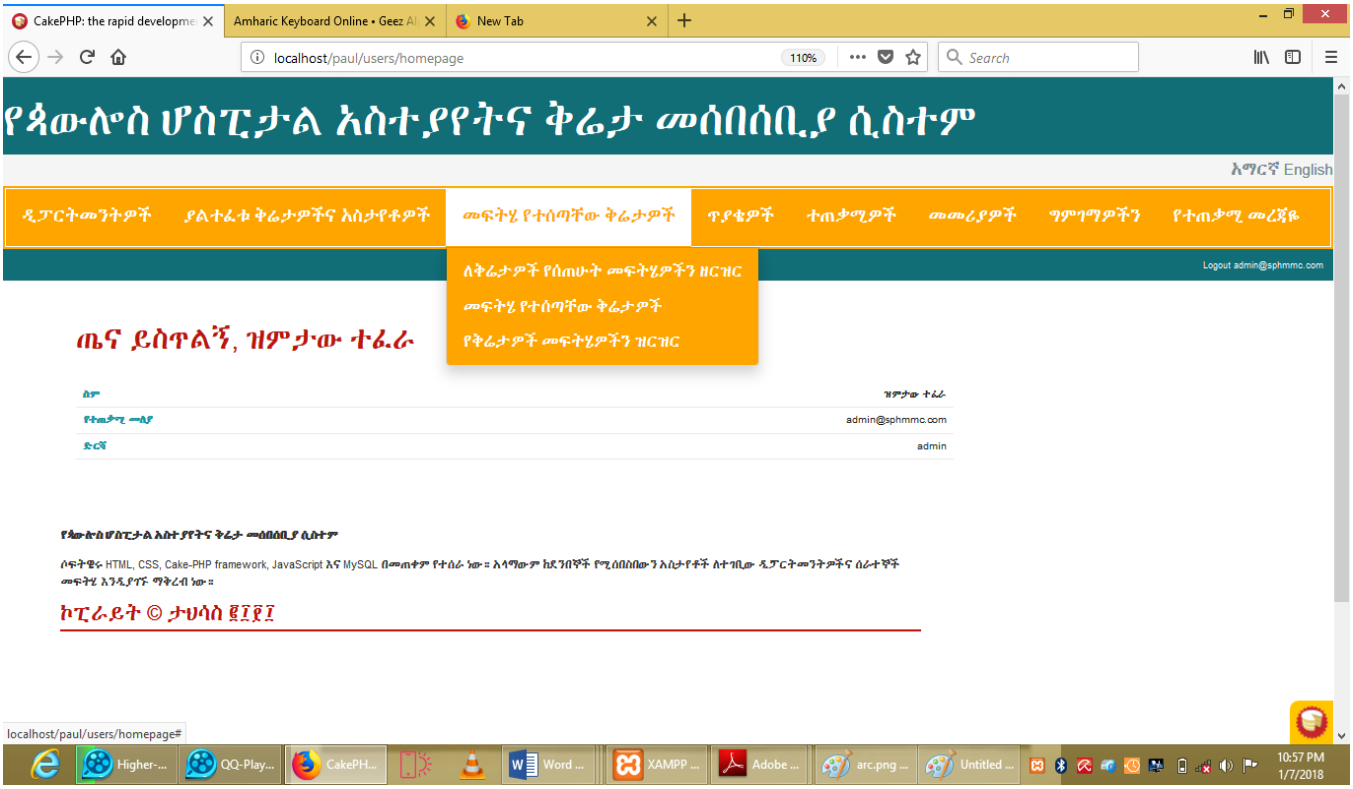

Figure 13: Interface, Homepage/Amharic

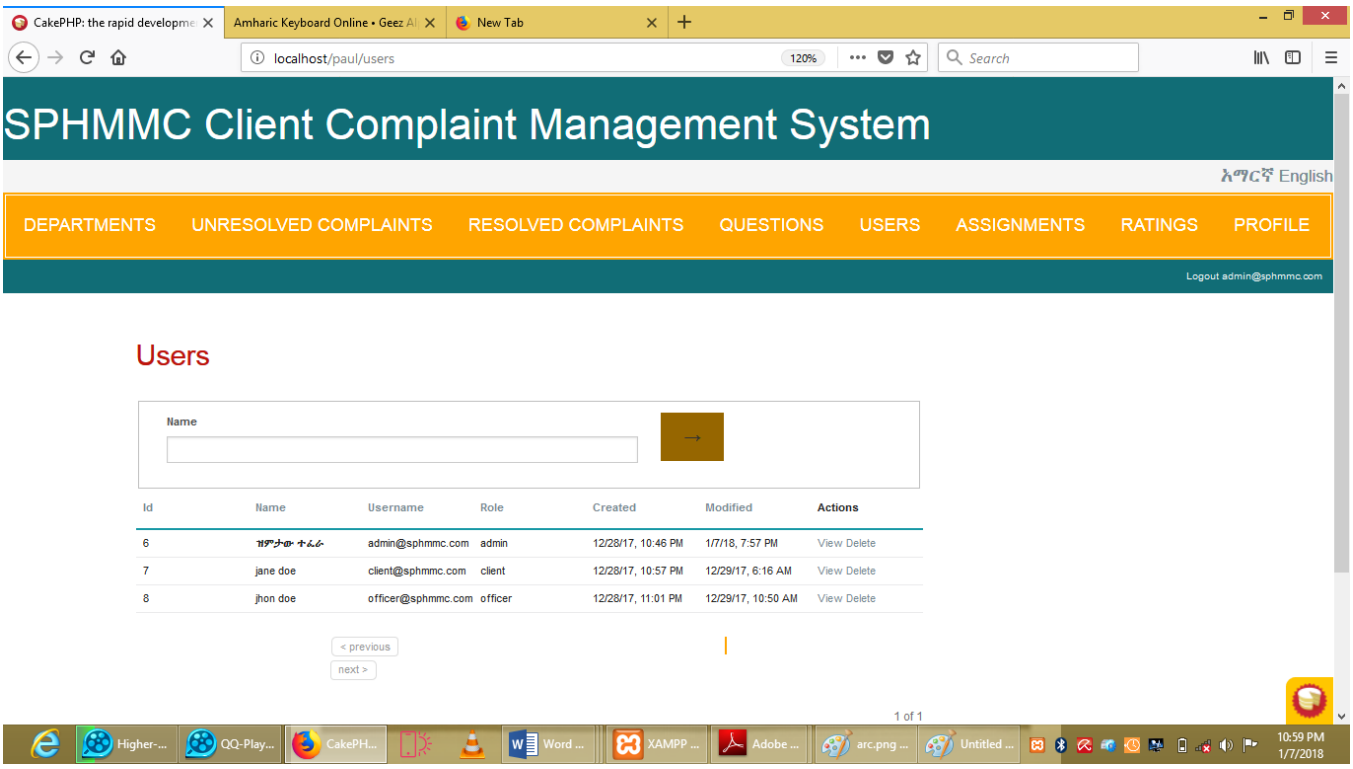

Figure 14: Interface, Search enabled users' list/English

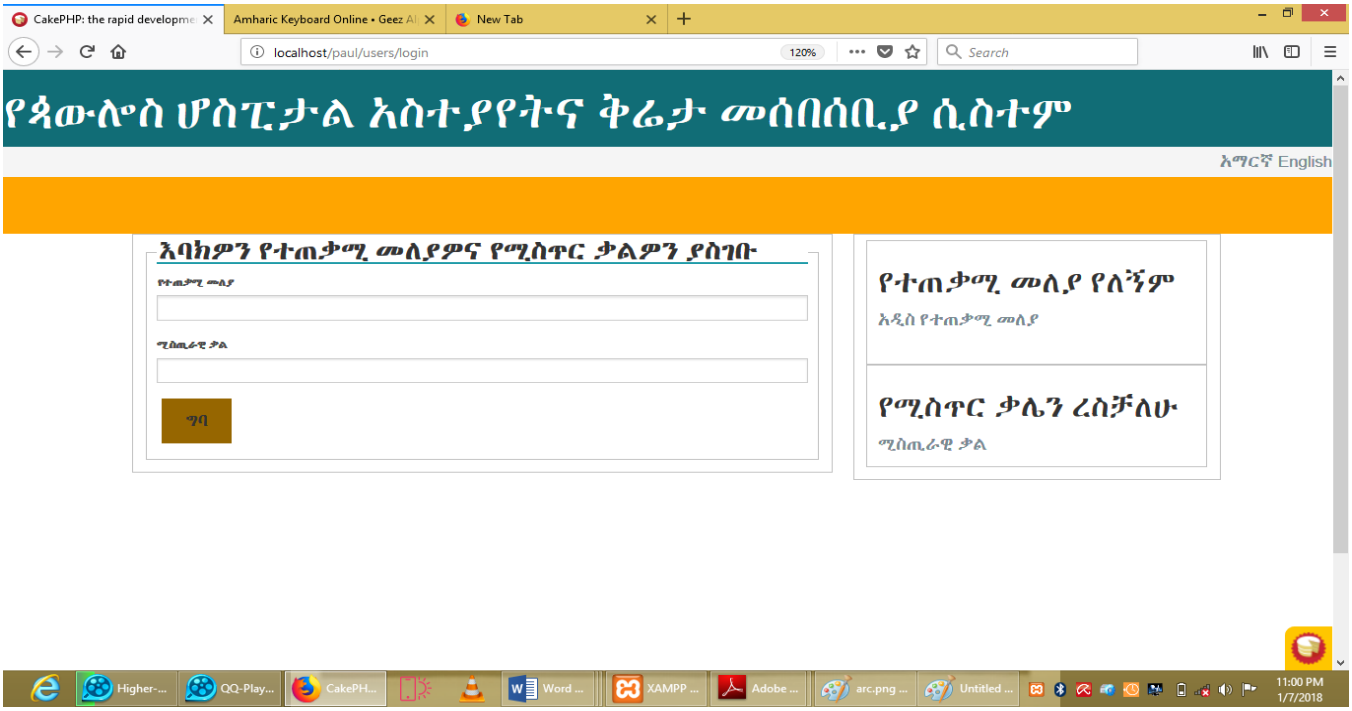

Figure 15: Interface, login page/Amharic

5.2. System Testing

This section includes details about the system testing. The methodology used, the participants included, the training given, the procedures used, the roles and tasks involved and the results of the usability study including the conclusions reached by them are presented below.

5.2.1. Overview

User experience testing is getting more and more popular and it is considered to be the best way to understand how real users experience an application. A well-designed usability test measures actual performance of a product on mission-critical tasks.

There are several usability testing methods including Card sorting, Paper prototyping, Focus groups, Usability lab testing and AB testing. The Complaint Management system is evaluated using usability lab testing method.

During the evaluation of the system, user-centered questions about the system were forwarded to the participants.

5.2.2. Usability Testing Methodology

In usability testing choosing the right method is an important step. The method used to test the Complaint Management system is usability lab testing method. This choice is made as a result of shared requirements between the Complaint Management system's values and the testing method characteristics. The criteria are: -

- The Complaint Management system has pre-defined scenarios to test.
- Observers need to be apart from the users/callers of the system to determine the real usability challenges and lessons of the prototype.
- The test is meant to discover functional issues followed by discussions to summarize the results.

5.2.3. Usability Test Procedure and Environment

The Complaint Management System usability test was done after the fulfillment of the basic requirements like laptop, Morae software, webcam, and network connection. The testers used the software based on task instructions, while there was an observer to discern the overall activities done by each participant. The study was conducted in a quiet room optimized to be used as a laboratory for the user acceptance test.

The test followed the following procedures shown below:

1- Developed test plan for Complaint Management System's usability and testing.
2- Arrange media (environment) to test the system.
3- Find and select participants for system evaluation.
4- Prepared test materials which were related to software tested.
5- Explanations were given for the participant.

6- Conducted test sessions

7- Data and observations were analysed.

8- Report compiled and recommendation was given.

Performance Measures

We have used the following performance measures which are listed as follows with respect to each task

- Time to complete each task and completion status (success/failure)
- Number of mouse Clicks
- Usefulness
- Ease of use

5.2.3. Usability Test Participants

During the evaluation of the Complaint Management system 5, people chosen to carry out the test. The people were chosen using purposive sampling technique. The details gathered about system test participants are presented in table16.

No	Sex	Age	Profession	Basic Computer Skill
1	F	29	Nurse	Yes
2	F	31	IT	Yes
3	M	18	Student	Yes
4	M	37	Trader	No
5	M	45	Doctor	Yes

Table 16: Usability test participants

5.2.4. Usability Test Training

The participants of the system evaluation were trained for 15 to 20 minutes prior to the test. The training included introduction to the goal of the test, the description of the system.

5.2.5. Usability Test Roles

The roles of the people involved in the usability test are described in table 17.

Role	**Task**
Tester	Attempt to complete a set of representative task scenarios as efficient and in a timely manner as possible. After the completion of the tasks, provide guided honest opinions regarding the usability and acceptability of the Complaint Management system.
Organizer	Give a brief orientation about the system prior to the usability testing for about 15-20 minutes. Explain the purpose of the usability test and the system to participants. Respond to participant's requests for assistance when needed. Record the usability test, identifying problems, concerns and errors.

Table 17: Usability Test Roles

5.2.6. Usability Test Tasks

Five tasks were chosen or testing the Complaint Management system the details are presented in table 18.

Task Name	Task Description	Test Requirement	Test Instruction
Task 1: Enter a complaint	This feature allows the user/client to register his/her complaint on the system **Task performance** Five times. **Task Type** Frequent, mistakes can be reversed. **Measurement attributes:** Recovery from wrong inputs Time to complete the task	This test requires: Browser PC Login	Register your complaint on the system Tip: Login first
Task 2: Login	This feature allows the user to loginto the system **Task performance** Five times. **Task Type** Frequent, mistakes can't be reversed. **Measurement attributes:** Recovery from wrong inputs Time to complete the task		Login to the system Tip: Use user name and password provided by the organizer
Task3: Register new user	This feature allows the user to add a new user to the system **Task performance** Five times. **Task Type** Frequent, mistakes can be reversed.	Login Administrator	Register a user Tip: Use an Administrator user name and password provided by the organizer

	Measurement attributes: Recovery from wrong inputs Time to complete the task		
Task 4: Assign a resolution officer	This feature allows the user to assign a resolution officer to a complaint submitted on the system **Task performance** Five times. **Task Type** Frequent, mistakes can be reversed. **Measurement attributes:** Recovery from wrong inputs Time to complete the task	Login Administrator	Assign an officer to resolve a complaint. Tip: The complaint must be under the same department with the officer Tip: Usean Administrator user name and password provided by the organizer.
Task 5: View Pending Complaints	This feature allows the user to view unresolved complaints, on the system, assigned to the user **Task performance** Five times. **Task Type** Frequent, mistakes can be reversed. **Measurement attributes:** Recovery from wrong inputs Time to complete the task	Login Resolution Officer	View unresolved complaints Tip: Use a Resolution Officer user name and password provided by the organizer
Task 6: Resolve a complaint	This feature allows the user to register his/her resolution details for assigned complaint on the system	Login Resolution Officer	Register a solution for a complaint Tip: Use a Resolution Officer user name and

	Task performance Five times. **Task Type** Frequent, mistakes can be reversed. **Measurement attributes:** Recovery from wrong inputs Time to complete the task		password provided by the organizer
Task 7: Add FAQ	This feature allows the user to add new question to the FAQ list. **Task performance** Five times. **Task Type** Frequent, mistakes can be reversed. **Measurement attributes:** Recovery from wrong inputs Time to complete the task	Login Administrator	Add FAQ with relevant information in need Tip: Use an Administrator user name and password provided by the organizer
Task 8: Add department	This feature allows the user add new department on the system. **Task performance** Five times. **Task Type** Frequent, mistakes can be reversed. **Measurement attributes:** Recovery from wrong inputs Time to complete the task		Register a department Tip: Use an Administrator user name and password provided by the organizer
Task 9: Edit	This feature allows the user edit	Login	

user details	account details of a registered user on the system **Task performance** Five times. **Task Type** Frequent, mistakes can be reversed. **Measurement attributes:** Recovery from wrong inputs Time to complete the task	Administrator	
Task 10: Access FAQ	This feature allows the user to view FAQs with respective information **Task performance** Five times. **Task Type** Frequent, mistakes can be reversed. **Measurement attributes:** Recovery from wrong inputs Time to complete the task		Access FAQ page

Table 18: Usability test tasks with details

5.2.7. Test Results and Conclusion

The participants of the usability testing were presented with number of prepared questions to evaluate the system after using the prototype. The evaluation discussion included 13 questions, 10 close ended and 3 open ended. The close ended questions used five scales Likert style and

were prepared in English to be translated in to Amharic on the scene. The results were recorded by the organizer. The results of the evaluation are presented in table 19.

No	Questions	Strongly Disagree(1)	Disagree(2)	Neutral(3)	Agree(4)	Strongly Agree(5)	Mean	SD
1	I would use this system to submit my complaints	0	0	2	3	0	3.6	0.45
2	I found the system unnecessarily complex	2	3	0	0	0	1.6	0.45
3	I thought that the system was easy to use	0	1	0	4	0	3.6	0.73
4	I think that I would need the support of a technical person to be able to use the system	4	1	0	0	0	1.2	0.37
5	I found the various functions in this system very well integrated.	0	1	2	2	0	3.2	0.68
6	I thought there was too much inconsistency in this system.	0	4	1	0	0	2.2	0.37
7	I found the system very cumbersome to use.	0	1	4	0	0	2.8	0.37
8	I felt very confident using the system.	0	0	0	5	0	4	0
9	I needed to learn a lot of things before I could get going with this system.	2	3	0	0	0	1.6	0.45
10	I could recover easily when I made mistakes while using	0	0	3	2	0	3.6	0.45
	Average						3.42	0.43

Table 19: Usability questionnaire result

The results of the evaluation are presented in the form of a table and a graph and they were analyzed using descriptive statistical analysis tools. The mean tells the average degree of agreement between respondents and the standard deviation shows the deviance of respondents' evaluation from the averages result. The usability testing questionnaire is attached in the annex section (see Annex C).Figure 17 shows time take by the participants to complete the tasks.

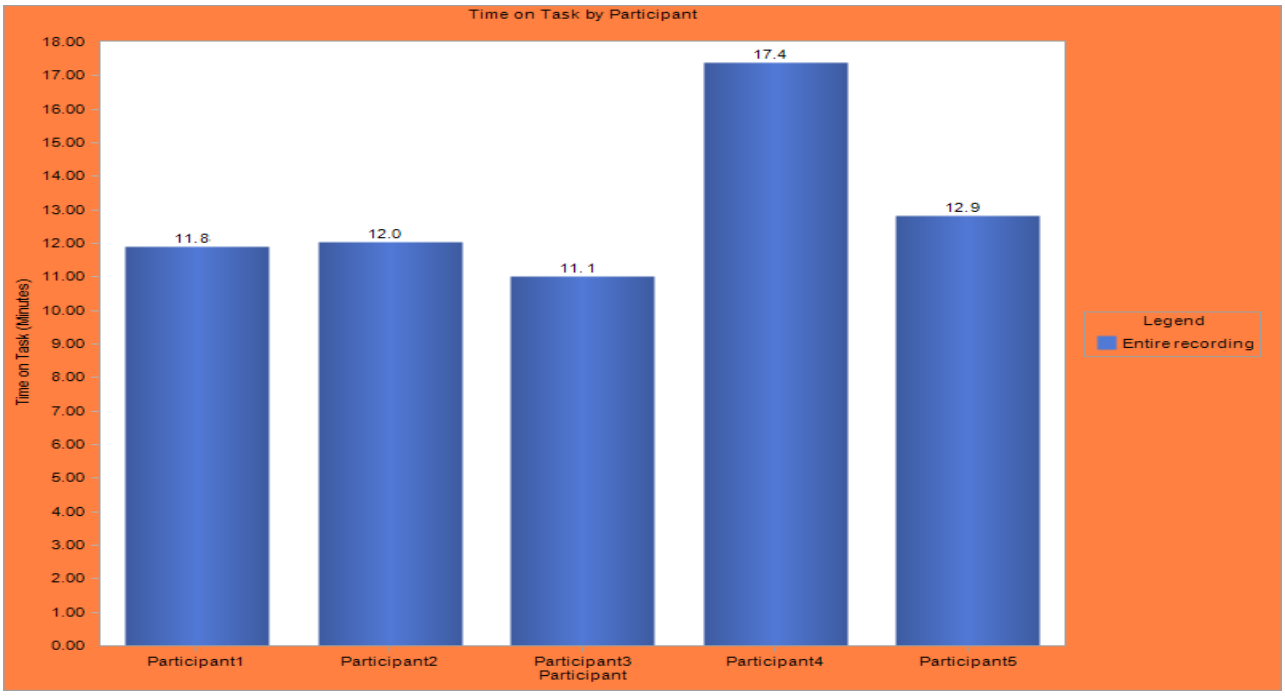

Figure 16: Time taken by each participant to perform tasks

Table 20 shows success rate of the user acceptance test.

No	**Success Score**		**Marker**		**Details**
1	Completed easy	0	Fatal Error	0	**Fatal Error:** Sever stops working for any given reason. **Medium Error:** The system stops responding to correct input or demands restart. **Minor Error:** System becomes unresponsive to correct input.
2	Completed difficulties	1	Medium Error	1	
3	Failed to Complete	2	Minor Error	2	

Table 20: Success score of the usability test

The average number of mouse clicks shows the tasks which were most confusing or difficult to perform. For example, submitting a complaint should not take more than 5 clicks, but it is observed that an average of 9 mouse clicks was done in order to perform this task. Table 21 shows average of mouse clicks it took by each participant to complete tasks.

Participant	Participant1	Participant2	Participant3	Participant4	Participant5	***Expected***
Mouse clicks	7.91	7.23	5.71	6.89	16.5	6.5

Table 21: Average number of mouse clicks by each participant

Overall, The SPHMCC Complaint Management System's evaluation results have shown that the system is easy to navigate and is easy to use, accessible and useful. Not only it had been shown that the Complaint Management System disseminates information for most of the target users using understandable presentation with pertinent interface and familiar language, but also, its features were client inclusive report resources for the first time.

CHAPTER SIX: CONCLUSINON AND FUTURE WORKS

6.1. Conclusion

Client complaint management System is a web based application which accepts Client complaints on Hospital Services. The primary goal of client complaint management system is to implement effective complaint handling and values feedback through complaints and to create Complaint system about how and where to complain is well publicized to clients and staff.

This project represents an electronic version of client complaint management system which provides complaint information gathered from clients to targeted employees and departments in a timely manner, addressed promptly and according to order of urgency, and the complainant is kept informed throughout the process. The system is also provides options to make complaint resolution status and progress accessible through the web page designed to answer complaints.

There are opportunities for internal and external review and/or appeal about the organization's response to the complaint, and complainant system was informed about these avenues.

This complaint system is kept confidential for personal information related to complaint, accountabilities for complaint handling are clearly established, and complaints and responses to them are monitored and reported to management and other Departments. It is also used a data source of client Complaints for the improvement hospital services.

In order to develop the prototype system, information is acquired through interviews with hospital clients and staffs. Relevant documents were reviewed and consultation from experts in the field was received.

Unified modeling language method was used to analyze the collected requirements and to create the design of the system. The system is developed using CakePHP open source frame work system. Testing and evaluation of the prototype system was done to describe to what extent the system is usable, then the users were asked to evaluate the usability of the system through user satisfaction survey. The result of the test shows almost all respondents are contented with the system.

Generally, this Client complaint Management System will serve as a basic source of complaint handling system. Hence, the prototype system achieves a good performance and meets the objectives of the project. Above all, the system operates in Amharic language, which increased accessibility and usability in general and the site has a responsive feature to be used in different platforms like desktop, laptop, tablet, and can be accessible in all areas.

Therefore, the Complaint Management system is useful & applicable to the hospital community and will help establish a good governance base line that could also be used for future developments in the area.

6.2. Future Works

This project, i.e. the Complaint management System, work has several limitations. The application was developed to send notification to only the recipient account and not his/her mobile phone and it does not provide the means of live communication between the complaint submitter and the responder. The system is designed and developed to be a stand-alone system. Therefore, it can't work with other web application in a fully integrated manner at this stage of its development life cycle.

The following recommendations are provided for organizations and future related area researchers and extenders of the project.

Recommendations for organizations

- SPHMMC should implement the system after paying web hosting fees, since the system was found to be usable and useful by the system evaluation.
- The FMOH should develop a generic version of the complaint management system for all hospitals to use with regard to different language and accessibility constraints.

Recommendations for future researchers and software developers

- The system should be implemented using other local languages to make it more accessible for Ethiopian citizens.
- Developers and researchers should continue to upgrade this system in to a more intelligent complaint management system including suggestions for potential remedies for repetitive complaints.
- Developers should fix errors discovered during the system evaluation to improve the quality and usability of the system.

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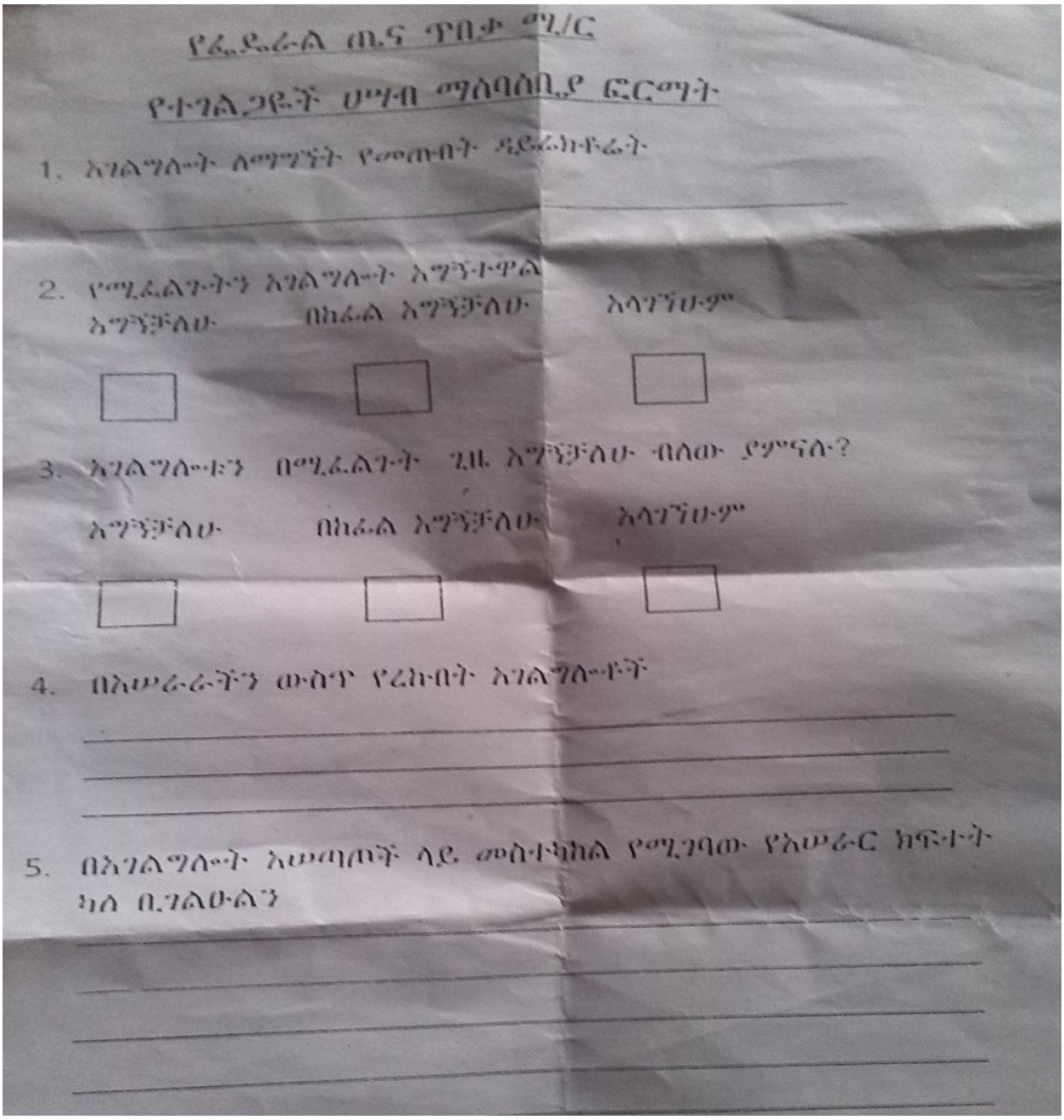
ANNEX A: SPHMMC current complaint collection form



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የተገልጋዮች ሀሣብ ማሰባሰቢያ ፎርማት

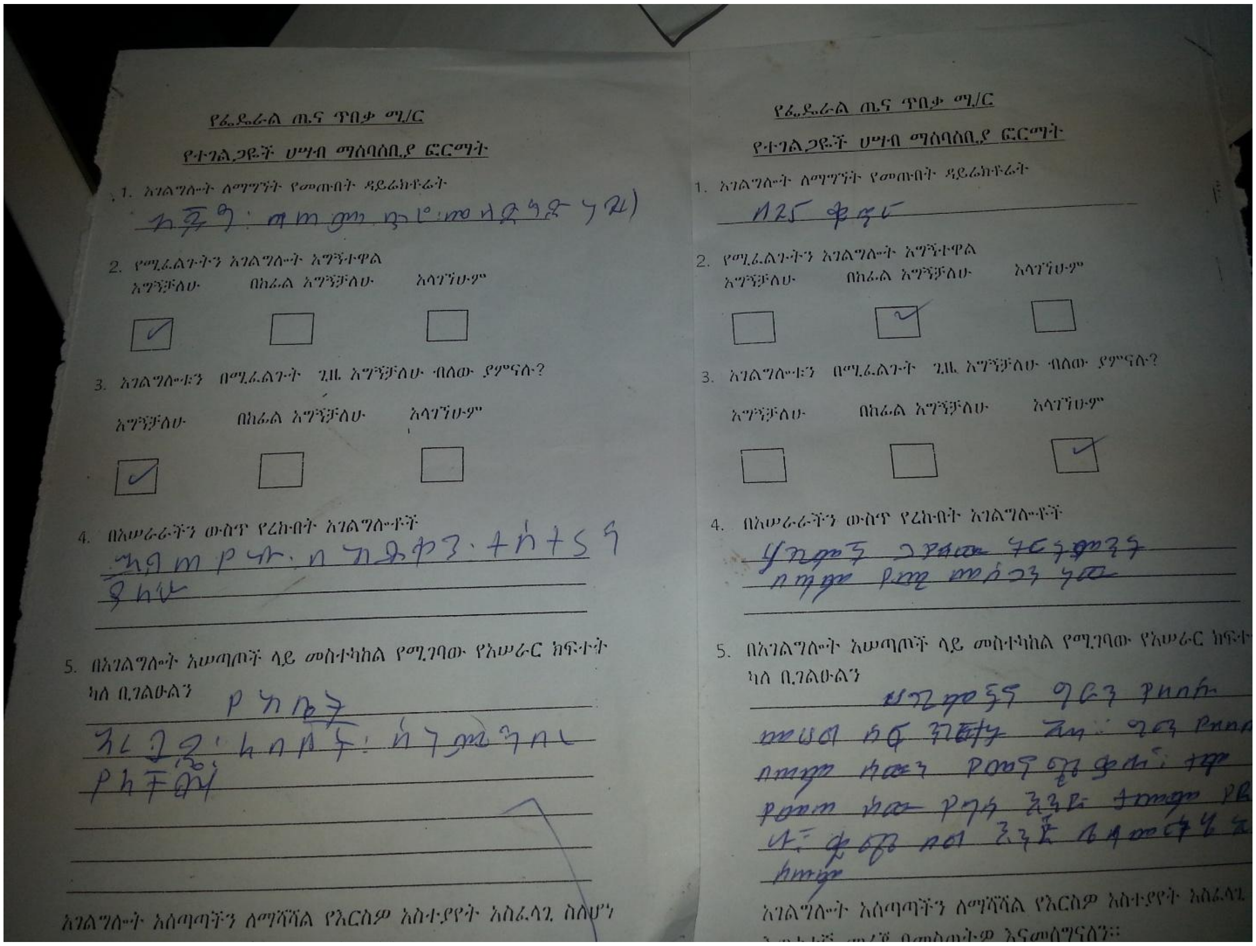
1. አገልግሎት ለማግኘት የመጡበት ዲይሬክቶሬት

2. የሚፈልጉትን አገልግሎት አግኝተዋል
   አግኝቻለሁ በከፊል አግኝቻለሁ አላገኘሁም

3. አገልግሎቱን በሚፈልጉት ጊዜ አግኝቻለሁ ብለው ያምናሉ?
   አግኝቻለሁ በከፊል አግኝቻለሁ አላገኘሁም

4. በአሠራራችን ውስጥ የረኩበት አገልግሎቶች

5. በአገልግሎት አሠጣጥ ላይ መስተካከል የሚገባው የአሠራር ክፍተት ካለ ቢገልፁልን



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የተገልጋዮች ሀሣብ ማሰባሰቢያ ፎርማት

1. አገልግሎት ለማግኘት የመጡበት ዳይሬክቶሬት
2. የሚፈልጉትን አገልግሎት አግኝተዋል
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3. አገልግሎቱን በሚፈልጉት ጊዜ አግኝቻለሁ ብለው ያምናሉ?
   አግኝቻለሁ በከፊል አግኝቻለሁ አላገኘሁም
4. በአሠራራችን ውስጥ የረኩበት አገልግሎቶች
5. በአገልግሎት አሠጣጦች ላይ መስተካከል የሚገባው የአሠራር ክፍተት ካለ ቢገልፁልን

አገልግሎት አሰጣጣችን ለማሻሻል የእርስዎ አስተያየት አስፈላጊ ስለሆነ

የፌዴራል ጤና ጥበቃ ሚ/ር

የተገልጋዮች ሀሣብ ማሰባሰቢያ ፎርማት

1. አገልግሎት ለማግኘት የመጡበት ዳይሬክቶሬት
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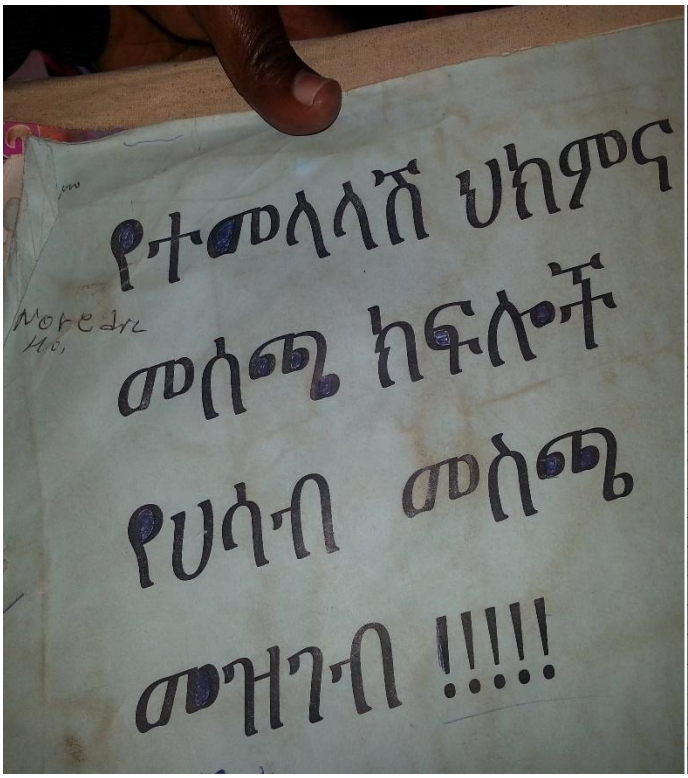
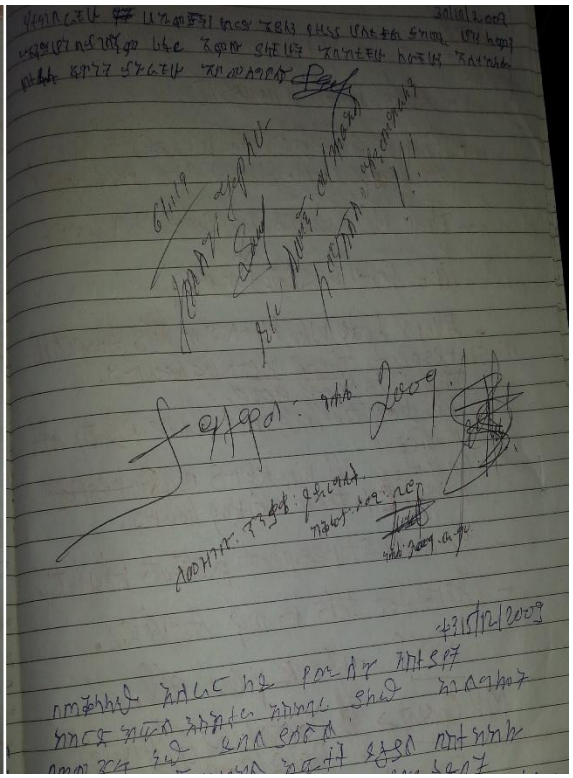
3. አገልግሎቱን በሚፈልጉት ጊዜ አግኝቻለሁ ብለው ያምናሉ?
   አግኝቻለሁ በከፊል አግኝቻለሁ አላገኘሁም
4. በአሠራራችን ውስጥ የረኩበት አገልግሎቶች
5. በአገልግሎት አሠጣጦች ላይ መስተካከል የሚገባው የአሠራር ክፍተት ካለ ቢገልፁልን

አገልግሎት አሰጣጣችን ለማሻሻል የእርስዎ አስተያየት አስፈላጊ

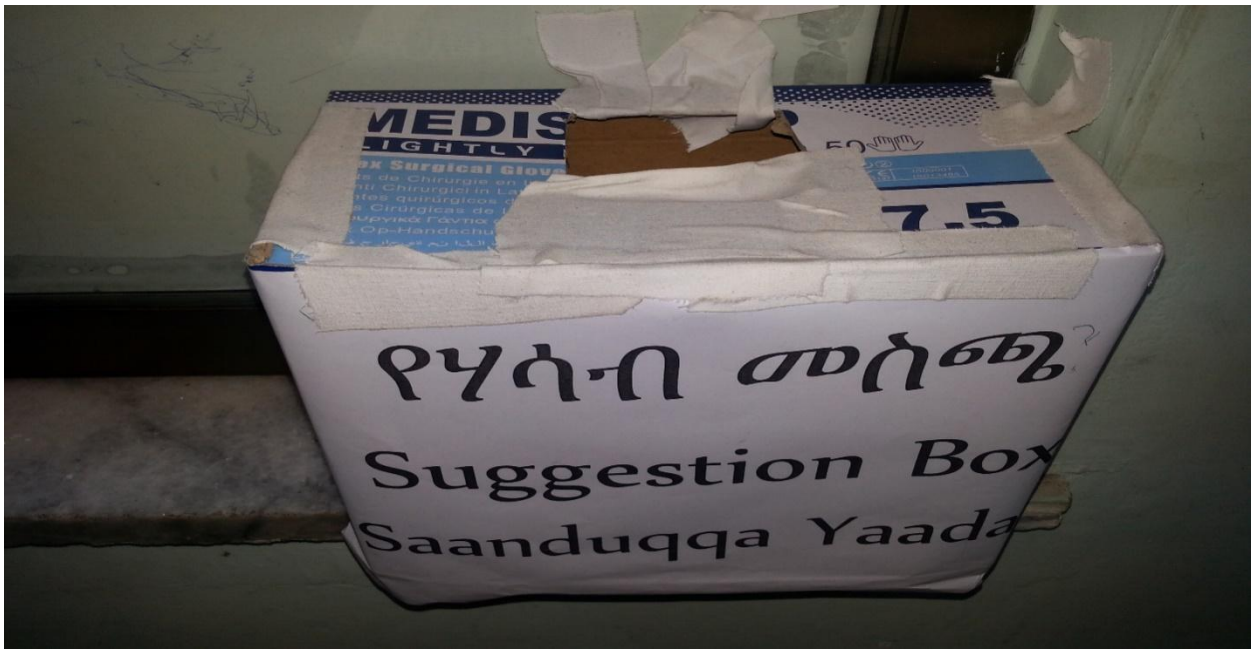
በመስጠትዎ እናመሰግናለን።

ANNEX B: SPHMMC complaint collection book





ANNEX C: SPHMMC suggestion box



ANNEX D: SPHMMC services' provided statistics

ANNEX F: Interview Guide for requirement collection

DEMOGRAPHIC

1. Circle your age range from the given choice

A) 18-25 years B) 26-33 years C) 34-41 years

D) 42-49 years E) 50 and above years

2. What are you doing at SPHMMC?

- ☐ I work here
- ☐ I'm a client here

3. If you work at SPHMMC, what is your work status?

- ☐ Nurse
- ☐ Doctor
- ☐ Complaint officer
- ☐ Other, please specify_____

ACCESSIBILITY (For clients only)

4. Do you have basic computer skills?

☐ Yes ☐ No

5.If your answer for question number four is yes, can you and are you willing to use the Internet to submit a complaint electronically?

☐ Yes ☐ No

6. If your answer for question numbers five is no, please specify the reason?

_____

_____

7. Have you submitted a complaint to SPHMMC before?

☐ Yes ☐ No

8. Do you know how to track the resolution progress on your complaints to the hospital?

☐ Yes ☐ No

9. If your answer to question number 8 is yes, how?

_____

_____

COMPLAINT COLLECTION (For clients and hospital personnel)

10. Do you know how complaints are submitted to the hospital?

☐ Yes. How? _____

☐ No

11. How long does it take to solve a complaint at this hospital?

_____

12. Do you have any remarks?

_____

_____

_____

COMPLAINT RESOLUTION (Only for complaint officers)

14. What are complaints solving processes in this hospital?

_____

_____

_____

15. How many complaint management related reports do you prepare?

_____

16. List complaint management related reports you prepare?

_____

_____

_____

_____

17. How do you prepare complaint reports?

_____

_____

_____

18. Do you have any remarks?

_____

_____

_____

ANNEX G: Usability test questionnaire (adopted from Morae)

Demographic

1. Please circle your age group

a. 18-25 years b. 26-33years d. 34-41 years e. 42-49 years f. Above 50 years

2. What is your sex?

- ☐ Male
- ☐ Female

3.Do you have basic computer skills?

- ☐ Yes
- ☐ No

Usability (Please mark your answer with an "X")

1= strongly agree, 2=Agree, 3=Neutral, 4=Disagree, 5=Strongly Disagree

4. I would use this system to submit my complaints.1__ 2__ 3__ 4__ 5__

5. I found the system unnecessarily complex. 1__ 2__ 3__ 4__ 5__

6. I thought that the system was easy to use. 1__ 2__ 3__ 4__ 5__

7. I think that I would need the support of a technical person to be able to use the system.

1__ 2__ 3__ 4__ 5__

8. I found the various functions in this system very well integrated. 1__ 2__ 3__ 4__ 5__

9. I thought there was too much inconsistency in this system. 1__ 2__ 3__ 4__ 5__

10. I found the system very cumbersome to use. 1__ 2__ 3__ 4__ 5__

11. I felt very confident using the system. 1__ 2__ 3__ 4__ 5__

12. I needed to learn a lot of things before I could get going with this system.

1__ 2__ 3__ 4__ 5__

13. I could recover easily when I made mistakes while using the system. 1__ 2__ 3__ 4__ 5__

14. What was the biggest challenge you faced when using the system?

_____

_____

_____

_____

15. What did you like most about the system?

_____

_____

_____

16. Do you have any other comment/s about the system?

_____

_____

_____

_____

ANNEX H: Consent form

All information about you is protected by law and your identity, contact information, or any information about you will not be given to any outside parties.

By answering the interview questions, you will be helping the development of a Complaint Management system, which aims to improve complaint management of SPHMMC via the World Wide Web.

Participant's name _____ (optional)

I know the interview will take less than 30 minutes. I decided to participate in this project knowing I will also be asked to complete a survey.

The participation was completely voluntary. I know I may skip any question I do not want to answer and I will not be affected in any way if I chose not to participate.

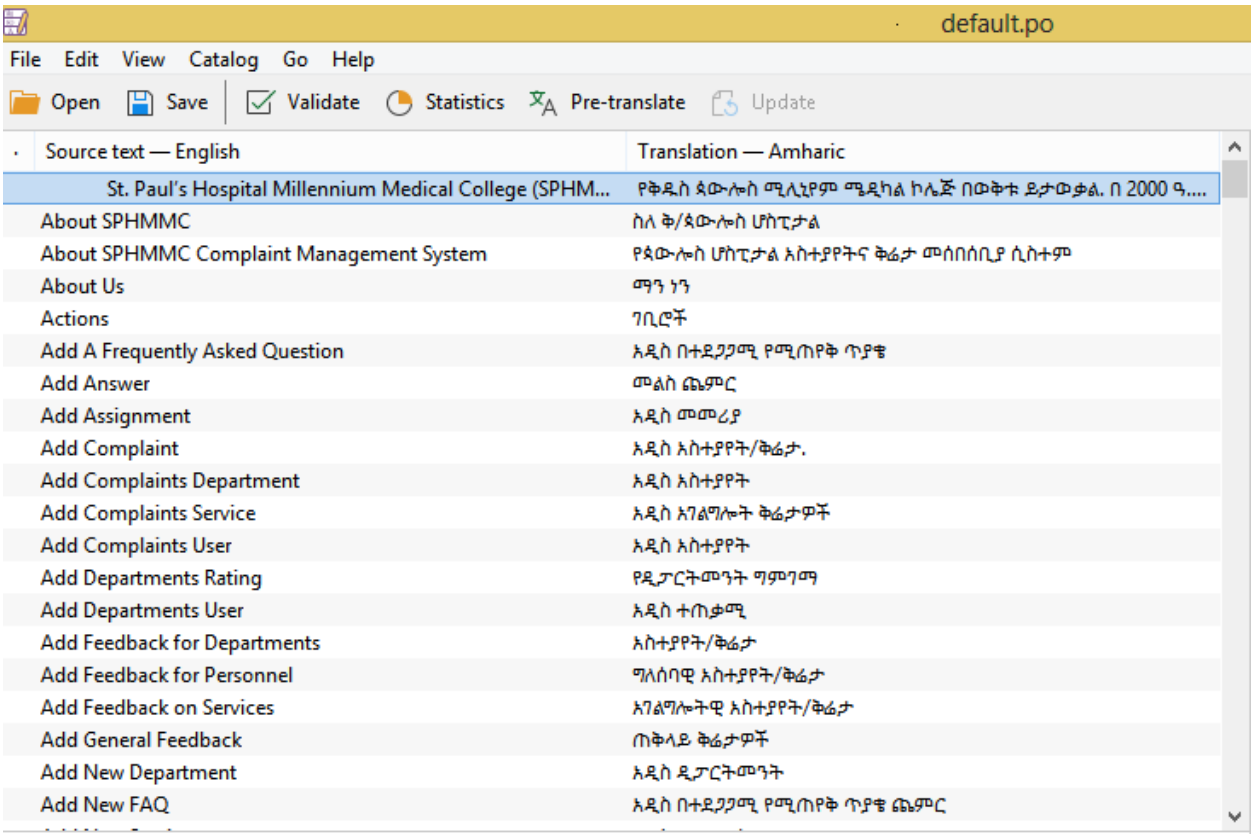
ANNEX I: Sample from the complaint management prototype's code

```
<?php

namespace App\Controller;

use Cake\Controller\Controller;
use Cake\Event\Event;

/**
 * Application Controller
 *
 * Add your application-wide methods in the class below, your controllers will inherit them.
 *
 * @link http://book.cakephp.org/3.0/en/controllers.html#the-app-controller
 */
classAppController extends Controller {

//    var $helpers = ['Auth'];
   /**
    * Initialization hook method.
    *
    * Use this method to add common initialization code like loading components.
    *
    * e.g. `$this->loadComponent('Security');`
    *
    * @return void
    */
public function initialize() {
```

```
        parent::initialize();

        $this->loadComponent('RequestHandler');
        $this->loadComponent('Flash');
//      $this->loadComponent('Flash');
        $this->loadComponent('Auth', [
//          'authenticate' => [
//              'Form' => [
//                  'finder' => 'auth'
//              ]
//          ],
            'loginRedirect' => [
                'controller' => 'users',
                'action' => 'home',
                '_full' => true
            ],
            'logoutRedirect' => [
                'controller' => 'users',
                'action' => 'login',
                'home',
                '_full' => true
            ]
        ]);
if($this->Auth->user())
        {
            $this->{'active_user'}= $this->Auth->user();
            $this->set('active_user',$this->Auth->user());
        }
    }
```

```
   /**
    * Before render callback.
    *
    * @param \Cake\Event\Event $event ThebeforeRender event.
    * @return void
    */
public function beforeRender(Event $event) {
if (!array_key_exists('_serialize', $this->viewVars) &&
in_array($this->response->type(), ['application/json', 'application/xml'])
      ) {
         $this->set('_serialize', true);
      }
   }
/**
 * CakePHP(tm) : Rapid Development Framework (http://cakephp.org)
 * Copyright (c) Cake Software Foundation, Inc. (http://cakefoundation.org)
 *
 * Licensed under The MIT License
 * For full copyright and license information, please see the LICENSE.txt
 * Redistributions of files must retain the above copyright notice.
 *
 * @copyright Copyright (c) Cake Software Foundation, Inc. (http://cakefoundation.org)
 * @link      http://cakephp.org CakePHP(tm) Project
 * @since     0.2.9
 * @license   http://www.opensource.org/licenses/mit-license.php MIT License
 */
}
```

ANNEX J: Amharic Translation



default.po

File Edit View Catalog Go Help

Open Save Validate Statistics Pre-translate Update

Source text — English	Translation — Amharic
St. Paul's Hospital Millennium Medical College (SPHM...	የቅዱስ ጳውሎስ ሚሊኒየም ሜዲካል ኮሌጅ በውቅቱ ይታወቃል. በ 2000 ዓ....
About SPHMMC	ስለ ቅ/ጳውሎስ ሆስፒታል
About SPHMMC Complaint Management System	የጳውሎስ ሆስፒታል አስተያየትና ቅሬታ መሰበሰቢያ ሲስተም
About Us	ማን ነን
Actions	ገቢሮች
Add A Frequently Asked Question	አዲስ በተደጋጋሚ የሚጠየቅ ጥያቄ
Add Answer	መልስ ጨምር
Add Assignment	አዲስ መመሪያ
Add Complaint	አዲስ አስተያየት/ቅሬታ.
Add Complaints Department	አዲስ አስተያየት
Add Complaints Service	አዲስ አገልግሎት ቅሬታዎች
Add Complaints User	አዲስ አስተያየት
Add Departments Rating	የዲፓርትመንት ግምገማ
Add Departments User	አዲስ ተጠቃሚ
Add Feedback for Departments	አስተያየት/ቅሬታ
Add Feedback for Personnel	ግለሰባዊ አስተያየት/ቅሬታ
Add Feedback on Services	አገልግሎትዊ አስተያየት/ቅሬታ
Add General Feedback	ጠቅላይ ቅሬታዎች
Add New Department	አዲስ ዲፓርትመንት
Add New FAQ	አዲስ በተደጋጋሚ የሚጠየቅ ጥያቄ ጨምር

ANNEX K: Declaration

I, the undersigned, declare that this research project is my original work and has not been presented for degree in any other university, and that all sources of materials used for the project have been acknowledged.

Declared by:

Name: Zelalem Worku

Signature: _____

Date: _____

Approved by:

Name: _____

Signature: _____

Date: _____

Name: _____

Signature: _____

Date: _____

Place and time of submission: Addis Ababa University, October 2017.