COLLEGE OF COMPU TING AND INFORMATION SCIENCES

A SCHEDULING MOBILE APPLICATION
A CASE STUDY OF MAKERERE UNIVERSITY HOSPITAL

By

CS17-03

DEPARTMENT OF COMPUTER SCIENCE

SCHOOL OF COMPUTING AND INFORMATICS TECHNOLOGY

A Project Report Submitted to the School of Computing and Informatics Technology

For the Study Leading to a Project Report in Partial Fulfillment of the

Requirements for the Award of the Degree of Bachelor of Science in Computer Science

Of Makerere University

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[June, 2017]

Declaration

We, group CS 17-03, hereby declare that the work presented is original and has never been submitted for an award to any university or institution of higher learning. We can confirm that where we have done consultations either from published material or the works of others, it has been attributed in this report.

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Dedication

We dedicate this project to the Almighty God who has given us life and strength throughout this period up to date.

And lastly to our dear parents and guardians, for your tireless efforts for giving us good education and your continuous struggle to pay our tuition, we thank you and dedicate all this hard work to you. Thank you very much for your love and support.

Acknowledgement

The success of this project, apart from the authors' efforts, largely depends on the encouragement and contributions of many. A very huge thanks to Mr. Lule Emmanuel for your guidance, support, help and continuous availability will never be forgotten. You have instilled in us a great confidence with the motivational speeches you gave us and you have earned a special place in our hearts for all the support you have thrown our way. Without you none of this would have been possible and this project would have never been completed.

To our dear lecturers, we are forever indebted to you for teaching us everything we know about computers and computer science. Thank you for providing us with knowledge which will help us in future and making us realize how valuable we are to the future development of our country and the computing industry at large.

To our friends and fellow "computer scientists", we thank you a greatly for Puttin up the various application tests and helping us in collecting requirements. We shall always thank you for your help.

Lastly, to the Lord God Almighty, Glory is unto your name. Thank you for keeping us safe throughout this period and keeping us all healthy and lively. We give you all the praise.

Abstract

Makerere university hospital has been providing services to students of makerere universit and local people for the past thity seven years. Due to to the increase in intakes at makerere university, reliable service delivery to students has detoriated since many students visit the hospital and the available staff cannot cater for the increased population

Information management in many hospitals is both paper-based and traditional. It also involves using some automated applications such as Microsoft office package to write up Medical Personnel schedules, patient slips, etc. Despite this automation, nearly all of the hospital activities, processes and the tools used are for the paper-based approach. To solve this problem, we proposed the development of the SMA.

The developed Scheduling Mobile Application (SMA) can support the the different hospital activities with ease and also provide mobules to be used in the day-to day activities at the hospital.
We developed the projet basing on callected requirements and specificationns obtained by using techniques such as interviews, document reviewingandquestionnares. The case study used inthe deve lopment of the application was Makerere University Hospital.
The application was designed to support the major processes at the hospital which include student requesting for appointments using the application and also their registration. The medical personnel are registered by the administrator and they can be able to view, accept and reject students Appointement request. The design of the system was done using a context diagram, entity relationship Diagram, data flow diagram, etc which were constructed using Microsoft Visio.
The system was developed using technologies like Java, MySQL, Java script and it runs on ecllipse, a smart phone and on a desktop.

The adoption of this systemandapplication would be valuable to MUH since such a system can help handle the ever increasing volumes of students at the university.

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Abbreviations

MUH Makerere University Hospital

SMA Scheduling Mobile Application

DFD Data Flow Diagram

ERD Entity Relationship Diagram

VAR Veteran appointment request

WHSS Web based hospital service system

CSS Cascade Style Sheets

XML Extensible Markup Language

CHAPTER 1

1.0 Introduction

1.1 Background

Uganda's health system was one of the best in the region by the 1960, it got worse in the 1970 during the military turmoil and civil strife. According to international health indicators, healthcare in Uganda is becoming more accessible and robustly public donor-private interlinked sector. (Mukasa, 2017) Following this trend along came Makerere University Hospital which is fully owned by the University. The hospital is located on Makerere Hill, off of Gaddafi Road, in Kampala Central Division, about 2 kilometers (1 mile), southwest of Mulago National Referral Hospital. (wikipedia, 2016) Before 1972, the university maintained a health post known as Makerere University Students Health Service or Sick Bay at the current Makerere University Police Post. In 1972, when Idi Amin expelled Asians, the university acquired the premises formerly known as Nile Nursing Home. The university Sick Bay relocated to the new premises. On 16 February 1978, President Idi Amin visited the Sick Bay and elevated it to a Hospital status. (Ndyabahika, 2016)

The Hospital comprises of various units which render different services to the University Community. It has medical units which are available to staff, both senior and junior, and to students. The Hospital has a 32 bed in-patient ward and admissions to the ward are exclusively for students only. However, the Hospital Administration is trying in every ways possible to improve on the services and aspects of the Hospital so as to provide wider and better services to the University Community. (MakerereUniversity, 2017)

Makerere University hospital has expanded over the years due to the increased number of students admitted by the University. This has opened its doors and made it gain popularity to the public though still operating under the old name Makerere University Hospital.

The hospital uses manual registration to capture student records and this has led to delay in the registration process since the population of Makerere University is large which results to high physical costs to be incurred in buying material like papers. Also data management is expensive since it's hard the manual registration process also leads to a poor mechanism in data management by making it hard for the user to delete, editing etc.

Since the population of Makerere University is so big, when students go for treatment or inquiries, the hospital gets over crowded which leads to some students missing out on treatment when the working hours are exceeded.

Our system will be able to solve the problems stated above in the following ways;

It will be able to register students online saving the time spent in the queues since its accessible anywhere and also saving material used during the registration process. The system will also provide an interface for students to have appointments with the different medical staff through booking to make sure that they get hospital services conveniently without wasting time in queues.

1.2 Problem Statement

Overcrowding has become a major problem at Makerere university hospital due to an increase in the number of students at Makerere University. This has caused delays in queues while students are waiting for treatment, counseling and registering with the hospital. Students have been reluctant to register with the hospital on time due to fear of making long lines while waiting for registration which makes them register at the last hour in their final years hence students are fined for late registration. Some students have diverted from the hospital and are now getting treatment from nearby clinics due to fear of making long queues most especially when they seriously sick hence poor medical service utilization by students.

1.3 Objectives

Main Objective

To develop an application that will enable Makerere university students register and request for appointments with the different medical personnel of different services at University hospital with convenience in order to solve students` congestion at the hospital.

Specific Objectives

The specific objectives of our system are:

1. To collect requirements needed to build the scheduling mobile application.

2. To analyze the requirements collected needed for building the scheduling mobile application.
3. To design application modules that will support requesting for appointments and registration of Makerere university students.
4. To implement the mobile application of the design mentioned in (2) above.
5. To test and validate the scheduling mobile application.

1.4 Scope

In this research, Makerere University hospital was used as the case study. Medical staff depending on their roles at the hospital and students were selected as a sample and then interviewed in order to gather the necessary information that led to the success of the project.

Our research majorly concentrated on providing an interface for students to request for appointments with Makerere university hospital staff of different specialties hence getting services effectively and conveniently without any delays.

It also provided an interface for online registration of Makerere university students hence eliminating the paper based registration system that is used in the registration of students which is characterized with delayed access, hard to update and retrieval of information, depreciation of records in terms of wear and tear.

It also helped to overcome the problem of overcrowding at the hospital by the students.

1.5 Significance

The application will be able to provide a mechanism for students to request for appointments with different medical staff of different specialties who will set the time and date to meet all students who request for appointments hence providing equal chances for all students to access medical services at the hospital.

Students will be able to register with the hospital anywhere and anytime hence saving time spent in queues which will enable students to register as fast as possible.

This will generally overcome the problem of overcrowding of students at the hospital with the desire of accessing medical services since only students who have confirmed appointments with the different medical personnel will have to go to the hospital.

CHAPTER 2

2.0 Literature Review

Introduction

The scheduling mobile application is an android supported mobile application that enables students of the Makerere University to register with the hospital online and also request for appointments with the different medical personnel at the hospital who thereafter reply to the students' appointment requests by setting their appropriate time and date when they can meet the different students. The students have to either decline or confirm the appointment if the time and date suggested by the medical personnel is appropriate for the student.

2.1 Definitions

Scheduling

Scheduling is the process of arranging, controlling and optimizing work and workloads in a production process or manufacturing process. (wikipedia, 2017)

Mobile application

A mobile app is a software application developed specifically for use on small, wireless computing devices, such as smartphones and tablets, rather than desktop or laptop computers. (Margaret, 2013)

Scheduling mobile application

This is a mobile application designed to help students to request for appointments with Makerere university hospital medical staff of different specialties such that each student has an equal chance of receiving medical services and also register online with Makerere university hospital.

2.2 Current system used at the hospital

The University hospital currently uses a manual system for student registration with it where a student is required to physically go to the hospital with his or her admission form in order to be

registered and further more appointments between the students and the medical staff is not supported with the current system.

This system faces the problems stated below:

Students spend relatively too much time in lines when they go to the hospital to be registered.

The nature of the system being manual, it becomes very difficult to edit data entered therefore mistakes in data may prevail in the hospital books.

The system is not convenient in a way that a student can't register at his or her time of wish.

The current system becomes costly for students in situations when a student misses registration at a particular day and has to keep coming back at the hospital for the same purpose.

Due to the absentia of an appointment mechanism between medical staff and students, it becomes hard for a student to see a doctor on time due to overcrowding thereby leading to relatively long lines (queues) to be made.

2.3 Existing systems

2.3.1 VETERAN APPOINTMENT REQUEST (VAR)

VAR makes it possible for Veterans to directly schedule primary care appointments and request assistance in booking both primary care and mental health appointments at the VA facilities where they receive care. In addition to scheduling appointments, Veterans can use VAR to track appointment details and the status of requests, send messages about requested appointments, receive notifications and cancel appointments. (U.S.DepartmentofVeteransAffairs, 2017)

Benefits of the Veteran appointment request

- You can cancel an appointment if you are unable to make it to that appointment
- See details for all pending, confirmed and upcoming appointments (both those requested through the app or through a VA scheduler), including date, time, clinic, care team and reason for visit

Weaknesses of the system

- It sends email notifications about appointment updates yet people rarely read their emails on a regular basis

2.3.2 WEB BASED HOSPITAL SERVICE SYSTEM (WHSS)

The project is to design a website for the hospital to enable health providers and patients communicate more effectively through the transfer of health information and services between different locations. (Jackie, 2006)

Benefits of the Web based hospital service system

- To enable health providers and patients communicate more effectively.
- Transfer of health information and services between different locations.
- Enables access of health services by patients in different places thus improvement of health standards.
- Enables timely web response to users inquiries.

Weakness of the system

- The application only looks at transfer of health information and services between different locations for patients and health providers without looking at the availability of the service in question at a particular place.

APPOINTMENT PRO

Appointment pro is one of the most Installed scheduling systems in in hospitals in United States and other parts of the world. Appointment pro is installed in more than 4500 hospitals like: Hayes green

beach hospital, Living medical center, Fairlawn rehabilitation hospital among others. (Spectrosoft, 2010)

Benefits of the appointment pro application

- The application has the ability to manage data.
- The application has a quick start up making it indispensable to the facilities it's implementing.

Weaknesses of appointment pro

The patient cannot cancel an appointment.

2.3.3 NEUMD SCHEDULING SYSTEM

NeuMD Medical Scheduling is an easy-to-use Appointments module that can handle multi-physician, multi-day, or multi office schedules. "It can create new patients, schedule recurring appointments and manage co-pays in just a few clicks. Track patient flow with a time-stamped record arrival, check-in, visit departure time. The automated telephone appointment reminder service helps reduce no-shows by up to 30 percent". (Neusofttechonologies, 2011)

Benefits of NeuMD scheduling system

- NeuMD offers cloud-based deployment option that can be easily customized in the way you want.
- NeuMD offers 12 hours of one-on-one coach training for new clients.
- The customer support of this practice management solution offers phone support.

Weaknesses of NeuMD scheduling system

NeuMD doesn't offer options to view a month or week's schedule.

2.4 PROPOSED SYSTEM

The Scheduling mobile application will consist of the registration page which will enable students to first register with the application in order to use it. It will also have the appointment page for students to request for appointments with the different medical personnel. The users will first have to down load the application and install it in their mobile devices.

Once installed, this application will remain into the device permanently until the user deletes it or uninstalls it. The student will have to register into the application for the first time where the students will be provided with a fill in forms that will capture the information required by the hospital to register students with it. The students will use their student number and password for logging into the app each time they want to use it.

On the appointment page the students will be provided with an interface to request for an appointment with any hospital medical staff to receive the different services provided by the hospital. The student will request for the appointment using his/her mobile phone. The medical staff will receive a notification for an appointment request from a given student as soon as the appointment request is sent by a student. Once the medical personnel replies to an appointment request, the student will receive a notification letting him or her know that his or her appointment request has been replied to by the medical personnel so that the student can either decline of confirm the appointment at the confirm or decline page depending on the date and time suggested by the medical personnel. The medical personnel can be able to view the confirmed appointments with the different students on the confirmed appointment page which consists of the student`s name, time and date for the appointment hence know the number of students to meet in a given day. The student can also be able to view the confirmed appointments with the different medical personnel on the confirmed appointment page which consists of the name of the medical personnel, time and date for the appointment.

The Administrator will use the desktop application to manage accounts for students and medical personnel who will be using the SMA. He will be able to register and de register medical personnel who will be attending to students. He will be able to edit details of the medical personnel in cases where the medical personnel`s account is compromised. He will also be able to delete fake students account in cases where someone registers as a student yet he or she is not.

Comparison between the existing systems and Scheduling Mobile Application

Feature	NeuMD scheduling system	Appointment pro	A web based hospital service system	Veteran appointment request	Scheduling mobile application
Registration	Present	Absent	Present	Present	Present
Re-scheduling if time is no appropriate	Not present	Absent	Not present	Present	present
notifications about appointment updates	Not present	Absent	Not present	Present	present
Application accounts management through the desktop application	Not present	Not present	Not present	Not present	present

Table 1 showing comparisons between the existing systems and the SMA

2.5 Conclusion

According to the literature review we have carried out, most of the existing systems examined are mostly not having brand names (generic). Most of them were developed on their own without specific organizations and yet each organization faces their own problems (challenges). Some of the challenges faced include insufficient knowledge about these systems which at times end up limiting their utilization. And due to advancement in technology, hospitals require software's that are customized according to their operations. The administrators follow a number of procedures that end up hindering the flow activities' at the hospital. Registration that is done on papers is very prone to miss handling of information and mistakes. Also so much time is wasted in queues as students wait to be attended to by the university medical staff.

Chapter 3

3.0 Methodology

3.1 Introduction

In order to solve the project's problems identified, the project needs to meet the objectives stated above. The methodology acted as a plan of action that linked the methods to the outcomes. Here we describe how we achieved the objectives of the project, procedures and methods that we followed.

3.2 Requirements gathering

We used the following methods to collect requirements.

Interview

An interview is a verbal questioning involving two or more people in a conversation, initiated by the interviewer for the specific purpose of obtaining research relevant information and focused by him on the content specified by the research objectives of description and explanation. (Nikhil, 2010)

We used interviews as a primary data collection technique because this enabled us to collect detailed information regarding the aim of the application. We managed to interview 15 students and 5 medical staff members at Makerere university hospital and we found a general issue of students spending a long period of time in lines without being attended and also so many students crowding the university hospital premises.

We were able to acquire the following information from the different interviewees.

Administrator

We found out the Makerere university hospital has been in existence for 37 years and has several doctors. The hospital offers services like immunization, x ray, ultra sound services, sexual and reproductive health services, routine medical examinations, drug dispensing and dental care. The hospital attends to a large number of students and people staying near it (local people). Registration is manual and it is done by secretary and students present their admission letters and identity cards at a fee of ten thousand.

Doctors

We found out that doctors prescribe medicine to students and note the next visitation day on medical forms. The doctors also said that they attend to a very big number of students every day since the university population is very big. Students come randomly to the hospital and over crowd the place and yet there are a limited number of doctors present which makes some students miss out on medical attention.

Students

Students said that they are not happy with the system at the hospital because they spend a lot of time in lines for like 2-3 hours waiting to be attended to and they sometimes miss out on medical attention. They also said they spend a lot of time looking for their manual files which the medical staff uses to attend to them. Also they spend so much time in registration since the system is manual and they have to line up for a good period of time. The files would have some mistakes that needed to be corrected for example the registration numbers, student numbers, etc.

Questionnaires

A questionnaire is a set of written or printed questions often with spaces for answers for obtaining statistically useful or personal information from individuals.

Questionnaires can be thought of as a kind of written interview. (McLeod, 2017)

We used questionnaires as another tool of data collection. We came up with questions written on papers in accordance to system objectives and interviewees answered the questions that were presented to them. We distributed 30 questionnaires and 23 of them were returned filled. The information we got from them correlated with what we got from the interview sessions

Brainstorming

Brainstorming is the process of free thinking and generating ideas without being bound by restraints such as "is this a good or bad idea?" (Slater, 2003)

We used this method to combine the different ideas we collected from the field using the different data collection techniques and we came up with the best idea that met the project's objectives.

Direct Observation

This is a method where individuals go into the field and see how activities are take place. We spent some time observing the different activities that take place at the hospital. Students spent a lot of time in queues before being attended to by the medical staff most especially the doctors. Also students with appointments lined up with other students to get attended to by the different medical staff which was nagging.

3.3 System design

During system design, we used a use case diagram and a data flow diagram to model the system processes and showed the flow of information within the application. This enabled us to describe the errors in the application and decision making during the phase of system implementation.

3.4 Implementation

This is the stage at which the system and the mobile application came true. We used the following languages:

- Android: This language consists of several APIs that facilitate the use of Google services.
- Java: this is an object orientated language that is core of the application. We also used java to design interfaces for the desktop application.
- XML: this was used to design interfaces which are easy to use by the students and the medical personnel.
- MySQL: it is an open source rational database management system that runs as a server providing multi user access to a number of data bases. This is the database we used for our project.
- PHP, JSON, CSS and are also other programming languages that we used.

3.5 Testing and validation

Testing

In this phase, we executed our application on an android mobile phone to see if the results are in conformance with the users` expectations and technical specification. Testing was intended for exposing the developed application to test inputs and observing its behavior to determine whether it is working as expected.

The information about student registration and appointments was processed fast enough without delays which reflected an efficient application. This enabled the doctor to receive that appointment request immediately it was sent by the student.

Validation

This refers to the process of ensuring that the data inserted into the application satisfies pre-determined formats or compiles with defined input criteria.

We allowed a small number of students to carry out the test of the application by feeding in their registration details and also requesting for an appointment with a given medical personnel. One of us acted as the doctor and was able to set the time and date when to meet the student. after the student confirmed the appointment, the details were sent the doctor`s confirmed appointment page. This enabled us to know whether the inserted information is the right information basing on the university`s required information. This also enabled us to know whether the application is user friendly and satisfies the user requirements depending on the users` comments.

During the application validation and testing, we found out that it meets the user`s needs and requirements. The application also provides security to students' appointment information in that only the intended medical personnel can view this information. The medical personnel and the students have to first login to be authenticated to use the mobile application. A student has to first be registered first to be able to request for appointments with the different medical staff. If a person uses another student`s credentials to register with the application, the administrator can be informed and he or she can be able to delete the fake account and allow the eligible student to register.

The administrator can also delete or edit a given medical personnel`s account depending on the current situation for example when the medical personnel leaves the hospital.

CHAPTER FOUR

4.0 System study, analysis and design

4.1 Introduction

This chapter covers the study of the existing systems weaknesses the current system functional and non-functional requirements and system design among others.

4.2 System study

In this section, the existing system was studied and evaluated the information flow within the system and the weaknesses of the existing system were presented. Through the different requirement collection techniques that we used which include questionnaires, interviews, observation, etc, we found out that the system has many problems leading to unreliable service delivery to students.

The graph below shows the average waiting time of students at the hospital per day

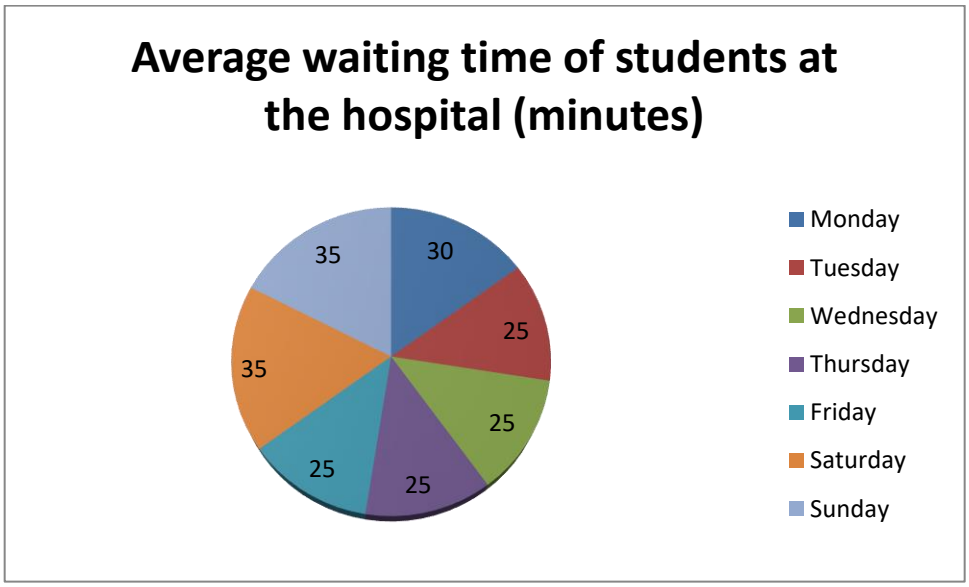

Figure 1 showing a pie chart showing the average waiting time per day of the week at the hospital

We analyzed the time spent by students at the hospital basing on a specific day of the week and we found out that more time is spent during the week end since some doctor are not available at the hospital hence all students have to be attended to by the few medical personnel available at the

hospital. Some move out to do community service like immunization of children. This leads to the average waiting time to increase to 35 minutes. Generally an average waiting time of 25 minutes during week days limits the number of students to be attended to in a day which causes some students to miss out on medical attention. On a Monday, the average waiting time increases even though it is a week day because some of the students that miss out on medical assistance during the week end have to visit the hospital on that day.

4.2.1 Existing/ current system

The University hospital currently uses a manual system for student registration with it where a student is required to physically go to the hospital with his or her admission form in order to be registered and further more appointments between the students and the medical staff is not supported with the current system. If the student needs medical services, he or she does not need to request for appointments with any of the medical personnel. He or she just visits the hospital.

4.2.2 Weaknesses of the system

In the existing system, registration is done manually and there is no room for appointments with the hospital medical staff. The weaknesses of the system are as listed below:

- Students spend relatively too much time in lines when they go to the hospital to be registered.
- The nature of the system being manual, it becomes very difficult to edit data entered therefore mistakes in data may prevail in the hospital books.
- The system is not convenient in a way that a student can't register at his or her time of wish.
- The current system becomes costly for students in situations when a student misses registration at a particular day and has to keep coming back at the hospital for the same purpose.
- Due to the absentia of an appointment mechanism between medical staff and students, it becomes hard for a student to see a doctor on time due to overcrowding thereby leading to relatively long lines (queues) to be made.

4.3 System Analysis

The data collected was analyzed in order to identify user, functional, non-functional, software and hardware requirements. These requirements guided us in the design and implementation of the SMA in order to simplify the existing manual system.

4.3.1 System requirements

4.3.1.1 User requirements

These are these expectations of users who are the students, medical personnel and the administrator from the system and how it should react to particular inputs and how the system should behave in terms of services, tasks or functions that it is required to perform and include the following

- It should be easy to use by the users.
- It should prevent user entry errors for example it should not allow entry of letters in the student number field.
- It should provide the user friendly interface.
- It should able to enable the users to navigate easily through the system to the different pages for as long as they are authorized to access them.
- It should be able provide notifications that let users know about appointment updates i.e. when a student sends an appointment request to a medical personnel and when a medical personnel replies to an appointment request.

4.3.1.2 Functional requirements

These are services that that SMA should provide, how the system should react to particular inputs and how the system should behave in terms of services

- The system should enable students to register with the application, request for appointments with the different university hospital medical personnel, confirm or decline appointments with the different medical staff basing on the medical personnel`s suggested time or date and also view confirmed appointments with the different medical personnel.

- The system should enable the administrator to verify the registration of students. It should also be able to enable the administrator register medical personnel who will attend to students, remove medical personnel who are no longer members of the hospital and also edit medical personnel's account details in cases where a medical personnel`s account is compromised.

- The system should enable the doctor to view students appointment requests, reply to them with suggested time and date when to meet the students, and also view confirmed appointments with the students.

4.3.1.3 Non-functional requirements

These are constraints to the system which are not directly concerned with the functionality of the system which include:

- The system respond faster to user inputs

- The system should respond to input errors for example when a person tries to login as an administrator, it should provide a pop up e.g. "wrong admin credentials"

- User interfaces should provide data validation against user input for example when a user (student or doctor) is logging in.

- The system should allow users' access restrictions through a username, student number, medical staff ID and password

- Users should access the system anytime hence making it reliable.

- It should be able provide notifications that let users know about appointment updates i.e. when a student sends an appointment request to a medical personnel and when a medical personnel replies to an appointment request.

4.3.1.4 Hardware requirements

These refer to minimum requirements of a hardware resource on which the system is to operate.

- The hardware configuration include Hard Disk: 40 GB, Monitor: 15" Color monitor, Keyboard: 122 keys. The basic input devices required are keyboard, mouse and output devices are monitor

- Maximum memory usage: 254MB* (by default)
- Disk space needed: 13.9MB
- Mobile device running Android 2.3.6 and above

4.3.1.5 Software requirements

The system will require supportive software to run on which ranges from operating systems to utility software. The system will run on any windows platform which has Xampp server installed and running and also netbeans. We chose MySQL for the implementation of the server database and the following software application developments tools were accordingly used

1. Android for the mobile application development.
2. Microsoft Visio for designing software models.
3. Java script, java and PHP for creating both front end and back end for users.
4. Netbeans for the desktop application development

4.4 SYSTEM DESIGN

System design is the process or art of defining architecture, components, modules, interfaces and data for the system to satisfy the specified requirements.

4.4.1 Process modeling

This is the activity of representing both current and future processes of an enterprise so that the current process may be analyzed and improved. In our project we scheduled the processes using data flow diagrams to show the flow of information and the sequence of events in the system

4.4.2 Context diagram for the scheduling mobile application

The diagram represents the system and all the stake holders that provide information, work and receive information relative from the system. Below is the context diagram for SMA:

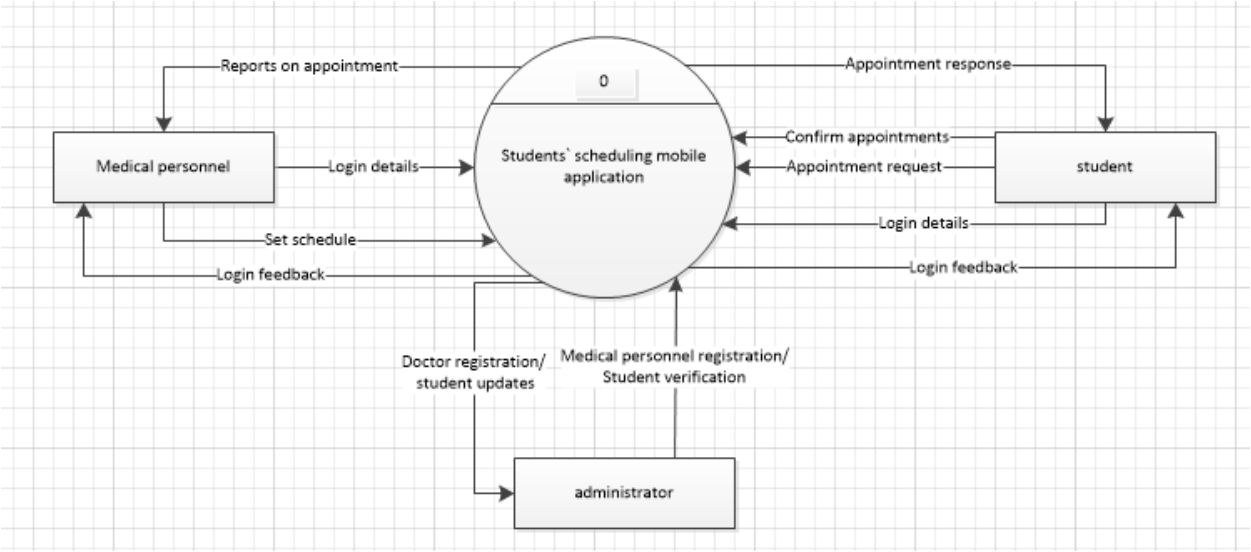

Figure 2 showing SMA`s context Diagram

Key of symbols

Process

External entity

Data flow

Data store

4.4.3 THE LEVEL 1 DATA FLOW DIAGRAM

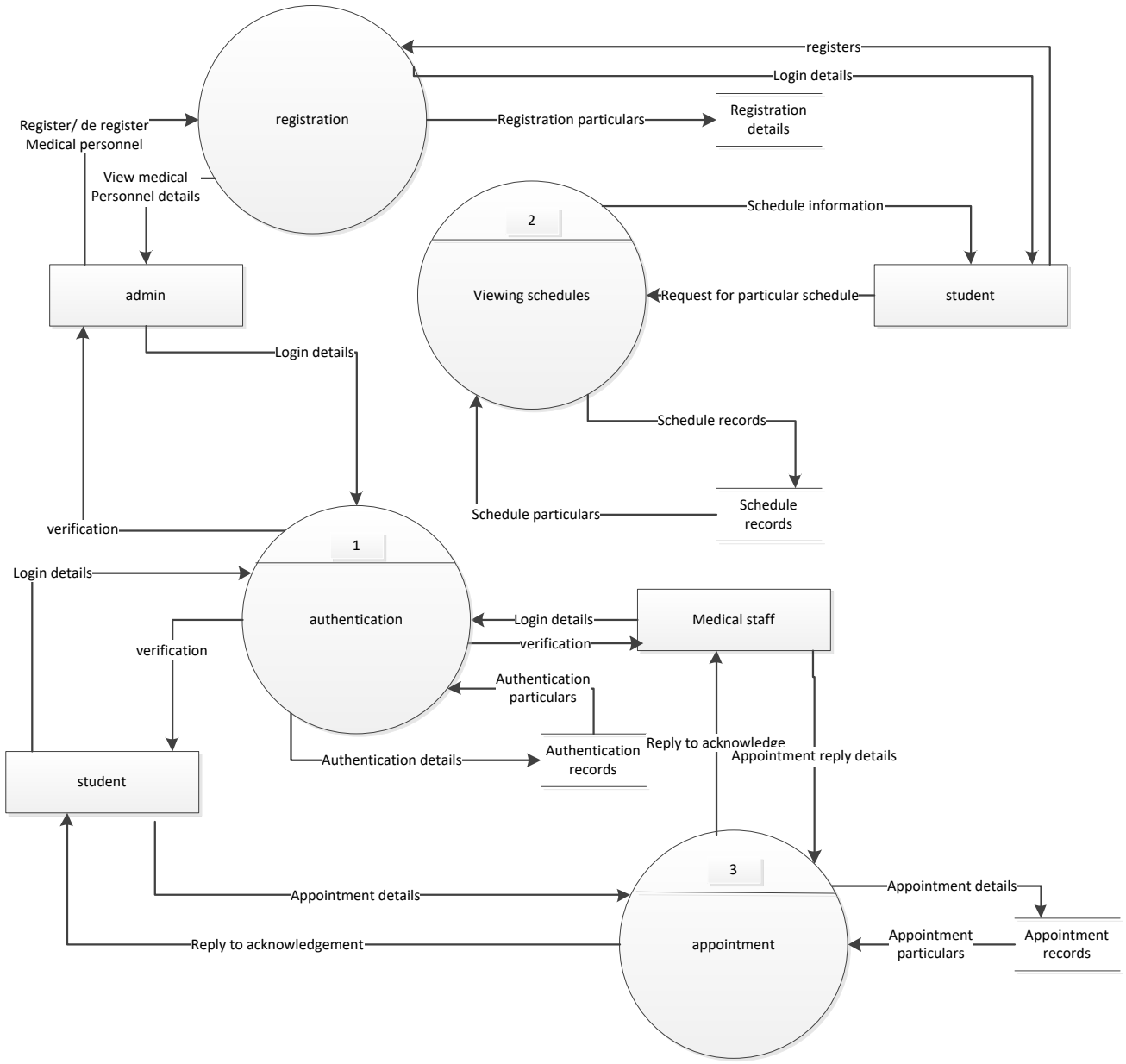

Figure 3 showing a data flow diagram for SMA

The DFD above shows the processes that take place in the Scheduling Mobile Application and the external entities that interact with the Application. The entities include students, medical staff and the administrator who makes changes in the application.

The student's registration details are captured at registration and he or she is provided with login details after registering. The student uses the login details to access the application services but before accessing these services, the patient must be authenticated (login). The student first selects a given service and then chooses a specific medical personnel with whom he or she can request for an appointment. The student then requests for an appointment with the selected medical personnel and waits for a reply. Once the medical personnel replies with a specific time and date when to meet the student, the student can then confirm the appointment or decline if time date and time are not appropriate.

The medical staff logs into the application using the details provided by the administrator. He or she then views and then replies to appointment request by choosing appropriate time and date when to a given student and waits for student appointment confirmation.

The administrator registers and de register medical personnel into the application. He or she can also verify student registration by removing invalid student accounts.

Data dictionary of the DFD

Table 1: **External entities of the DFD**

Name	Description
Patient/ student	Represents a student who makes appointment to meet the doctor
Medical personnel	This represents the person who views appointment requests and sets time and date appropriate for him or her to meet the students.
Administrator	This represents staff that have access to the system's database to make necessary changes which include deleting fake students accounts, registering medical personnel, editing medical personnel details and also removing medical

	personnel details for unavailable or departed medical personnel

Table 2showing external entities of the DFD

Table 2: **Process of the DFD**

Process name	Description
Authentication	This process helps to check if people accessing the system are authorized
Appointment	This process shows how students request for appointments and how medical personnel view appointment requests and replies to them.
Registration	This one helps students register with the hospital and application plus the registration of medical personnel done by the administrator.
viewing schedules	This enables students to view their pending schedules that have not been replied to by the medical personnel and also view confirmed appointments.

Table 3 showing the processes of the DFD

Table 3: data stores of DFD

Name	Description
Schedule records	Stores schedule information
Authentication records	This stores authentication details submitted by users (medical personnel and students)
Appointment records	This particular data store keeps appointment details submitted by medical personnel and student which are then viewed by the medical personnel and students.

Registration records	This store registration details for both the student and medical personnel.

Table 4 showing the data stores in the DFD

4.4.4 Architecture design of the system

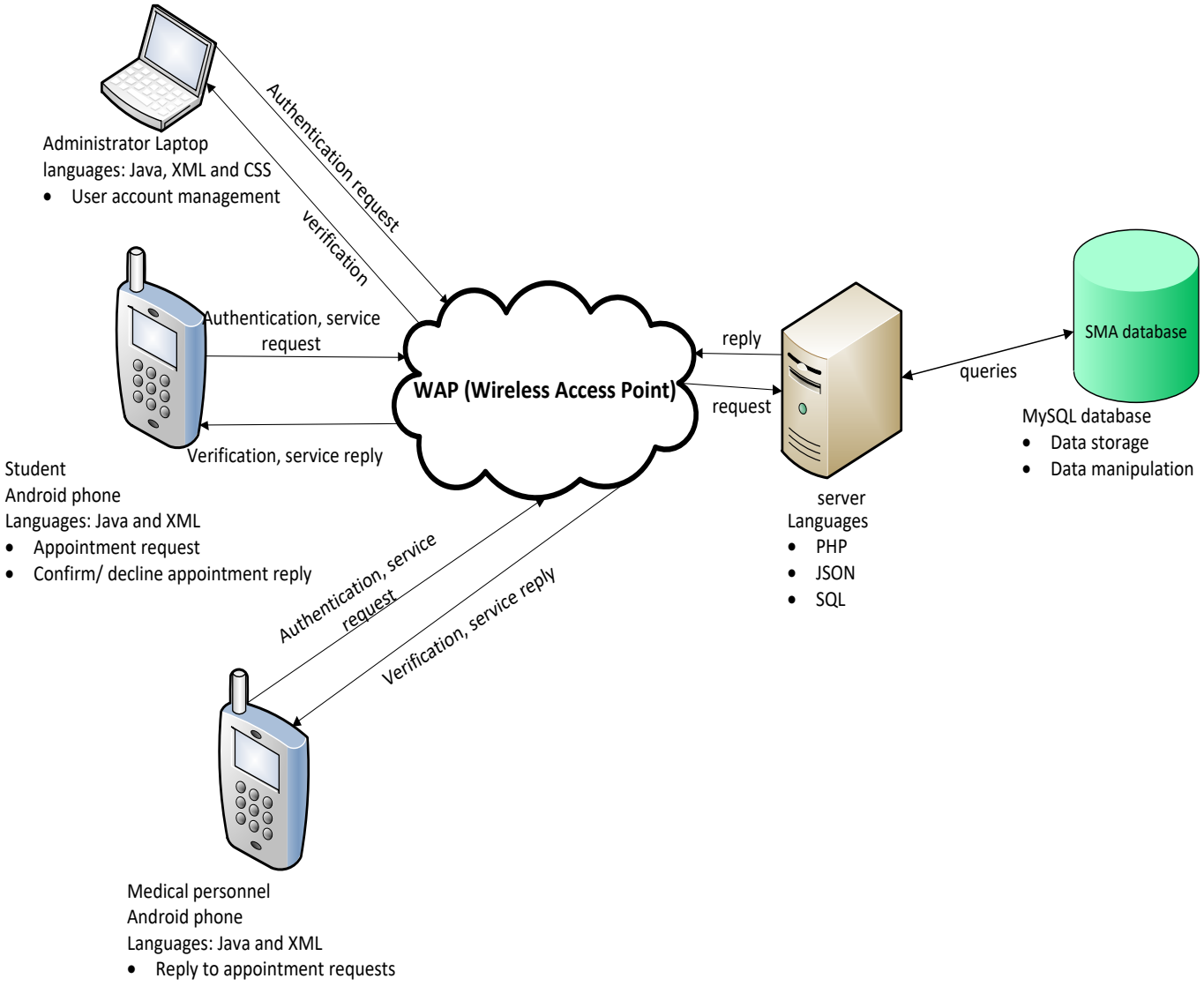

Figure 4 showing the architecture design of the system

The diagram above shows the architectural design of the system which requires both the doctor and students to use their smart phones connected to a network in order for them to access the database through the different activities like requesting for and replying to appointments, logging into the application, etc. the administrator must also be connected to a network in order for him to maintain the proper functioning of the application for example registering or deleting or editing medical personnel details. The server provides the different services to the users by replying to specific user requests.

4.4.5 Use case diagram

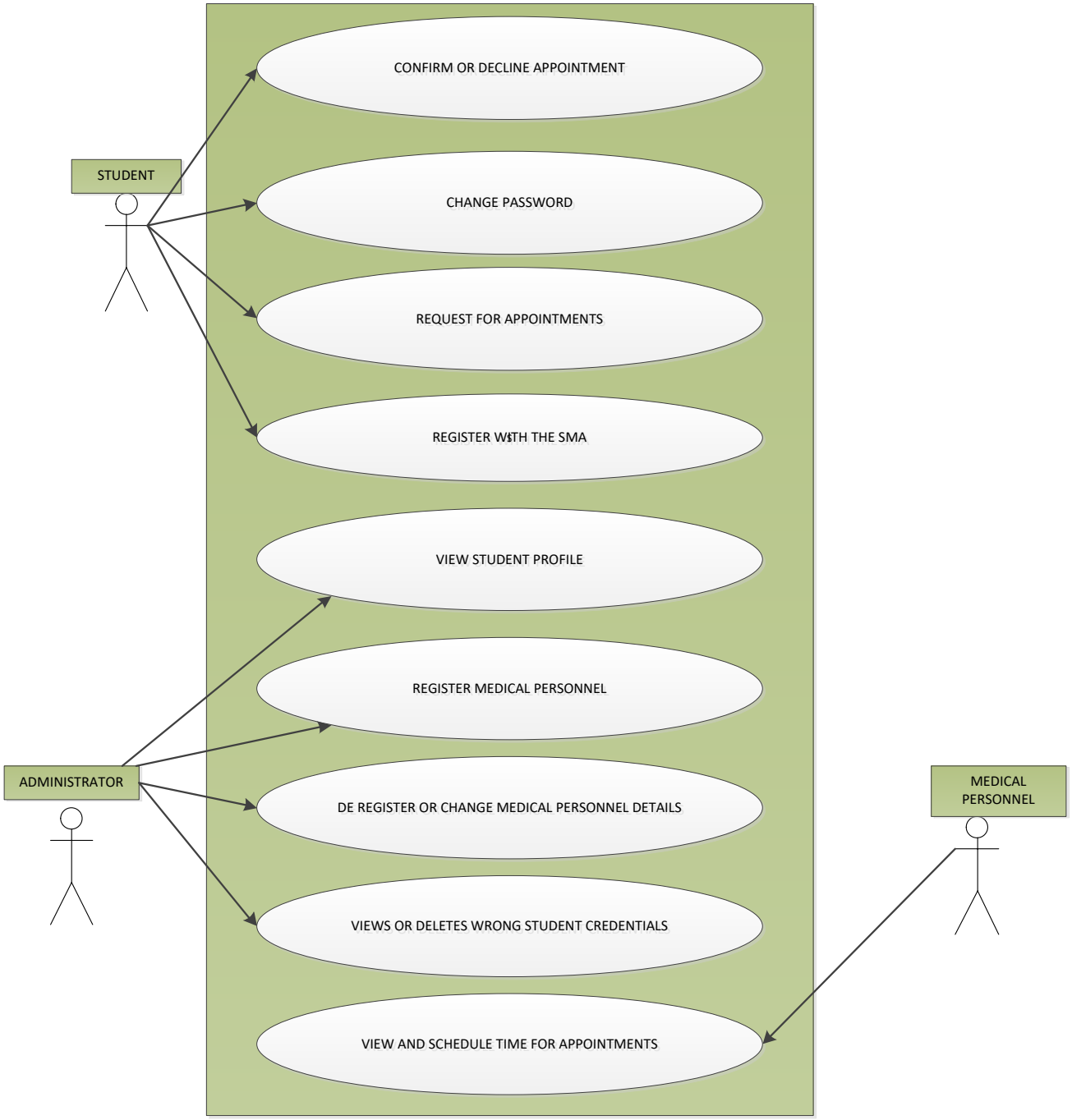

Figure 5 showing the use case diagram for SMA

From figure above, the only role of the administrator is to view or delete wrong students' credentials. He can also register, edit and also de register medical personnel.

The student has to first register with the mobile application in order for him or her to be able to request for an appointment with a given medical personnel and wait for a reply. He or she can then decline or accept the scheduled time by the medical personnel and also change his or her password.

The medical can view the appointment requests and schedule time and date for the student when he or she is available.

User Requirements

a) Actor: student

Input: log in credentials, registers at the hospital and requests for appointment with a medical personnel.

Output: successful login, successfully registered at the hospital and appointment sent.

Precondition: User has to be registered and using a smart phone connected to internet.

Flow of Events

a) Launches application

b) Register to access the application

c) Choose service and request for an appointment with a given personnel for that service.

d) Logs out on successful operations.

Alternative flow of events

a) Launches application

b) Login to access the application

c) View appointment details.

d) Logs out on successful operations

Alternative flow of events

In case of invalid log in credentials, the student can't access the application.

The information entered in the application won't be saved to the database in case of a missing field.

b) Actor: Medical personnel

Input: log in credentials, set time for appointment with a student.

Output: successful login, appointment set successfully.

Precondition: staff has to be registered by the administrator and using a smart phone connected to the internet.

Flow of Events

a) Launches the SMA application

b) Logins to access the application

c) Sets time and date when he or she is available to meet a student.

d) Logs out on successful operations.

Alternative Flow of Events

In case of invalid log in credentials, the hospital personnel can't access the application.

The table below shows description of symbols in the use case diagram

Name	Symbol	Description
Actor		It shows the individual or system that are external to the system but use it.
Association		Shows the connection between the actor and a particular use case.
Use case		It shows a single functionality of the system that an actor can interact with.
System		It defines the system boundary.

Table 5 showing description of symbols in the use case diagram

4.5 DATA MODELLING

This is the analysis of data objects that are used in the business or other contexts and identification of relationships among these data objects.

4.5.1 Conceptual data model

Identification of entities and their attributes

Entity name	Description	Attributes
Medical personnel	Details of a given medical personnel who accepts or denies student appointment request	medical personnel id, UserName, loginname, Password, service id and photo
Student	A person who makes appointments with any medical personnel	student no., regNo, course, tel, email, Gender, UserName, photo, student id and residence

Administrator	He is responsible for ensuring the right operation of the application through registering doctors and verify student registration	Username and password, administrator id, Level and photo
Appointment	This is an activity of requesting to meet with some one	Appointment id, student id, medical personnel id, description, replied, and date_created
Service	This is what medical personnel provide to students or patients	Service id, name, description, status, date_created
Appointment reply	This refers to sending of proposed time and date for an appointment to a student in response to the student`s appointment request by the medical personnel. It can also be the acceptance or decline of an appointment response from the medical personnel by the student	Appointment_reply id, medical personnel id, reply, appointment id, appointment date and time

Table 6 showing the entities, descriptions and attributes of the ERD for SMA

4.5.2 Modeling relationships between entities

An administrator can verify registration of one or more students and registration of one student can be verified by one administrator.

Figure 6 showing the administrator-student relationship

An administrator can register one or more medical personnel and one medical personnel can be registered by one administrator.

Figure 7 showing the administrator-medical relationship

A student can request for one or many appointment with different medical personnel and an appointment is requested by one student.

Figure 8 showing the student-appointment relationship

An appointment request is received by a given medical personnel and a medical personnel can receive one or many appointment requests.

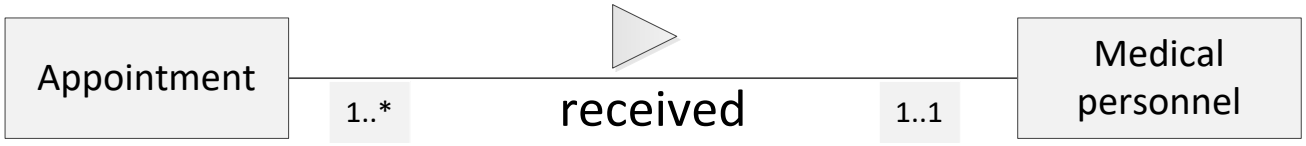

Figure 9 showing the appointment-medical personnel relationship

A medical personnel provides a specific service and a service can be provided by many medical personnel.

Figure 10 showing the medical personnel-service relationship

A medical personnel can send one or many replies and a reply can be sent by only one medical personnel.

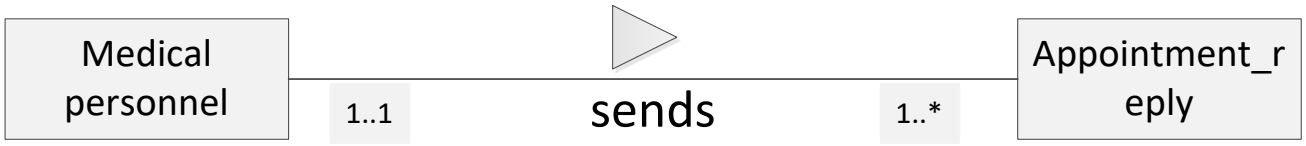

Figure 11 showing the Medical personnel-appointment_reply relationship

An appointment reply is received by one student and a student can receive one or many appointment replies from different medical personnel.

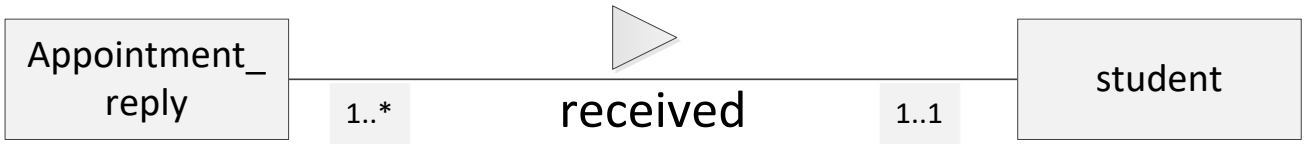

Figure 12 showing the appointment_reply-student relationship

A student can accept or decline one or many appointment replies and an appointment reply is accepted or declined by one student.

Figure 13 showing the student-appointment_reply relationship

4.5.3 Entity relationship diagram for our developed Scheduling Mobile Application

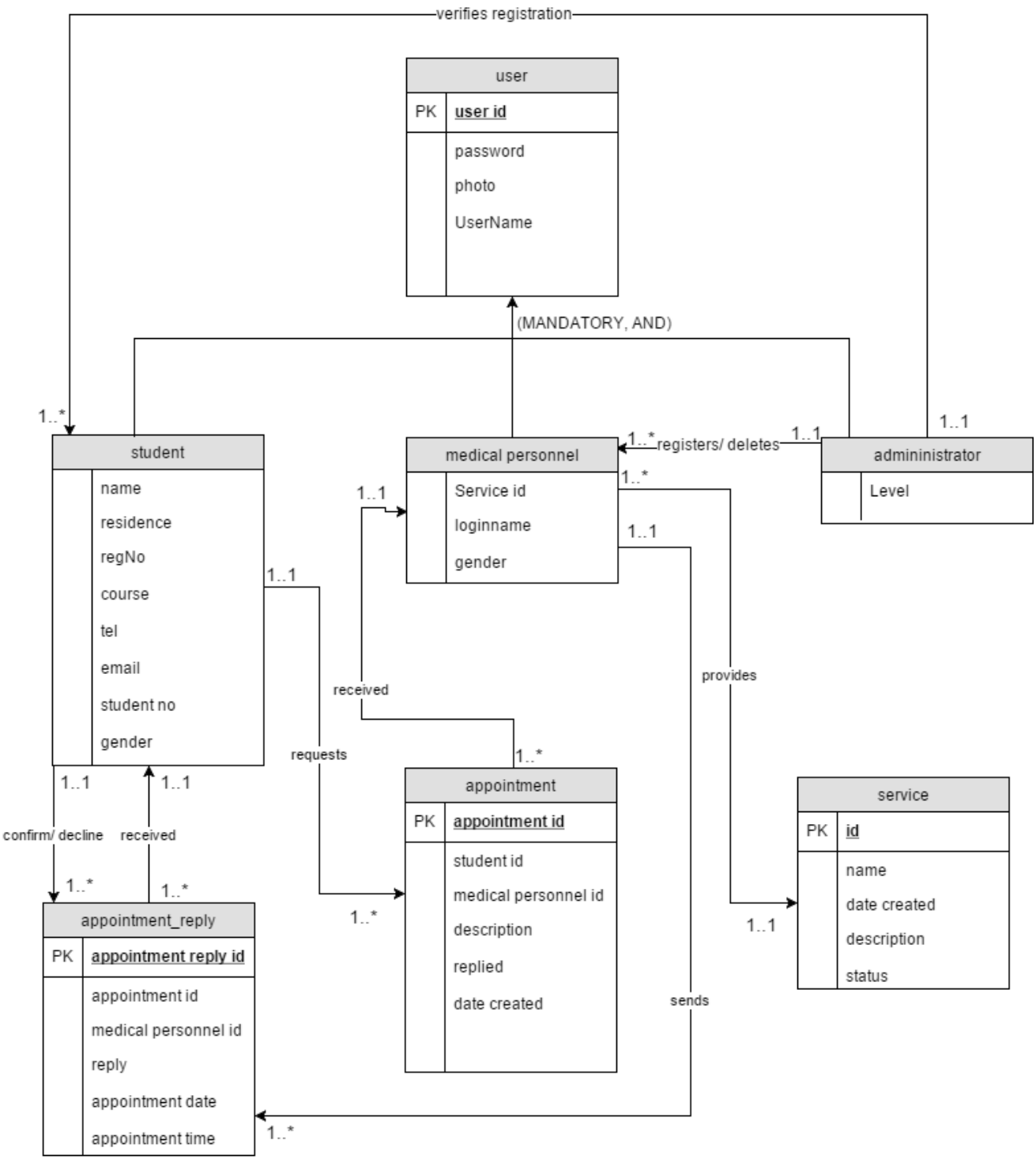

Figure 14 showing the ERD for SMA

4.6 Physical design

After constructing the entity relations model for the system, we mapped this model onto a relational schema to design the structures of the relations to be constructed in the database implementation

Administrator/user

Field name	Data type and size	Constraints
Administrator id	Int(11)	Primary key and not null
Username	Varchar(50)	Not null
Password	Varchar(20)	Not null
Level	Varchar(20)	Not null
Photo	Text	Not null

Table 7 showing the description of the administrator entity

Medical personnel

Field name	Data type and size	Constraints
medical personnel id	Int(11)	Primary key and not null
UserName	Varchar(50)	Not null
Password	Varchar(20)	Not null
service id	Int(11)	Foreign key and not null references service (service id)
Loginname	Varchar(10)	Not null
Photo	Text	Not null

Table 8 showing the description of the medical personnel entity

Service

Field name	Data type and size	Constraints
Id	Int(11)	Primary key and not null
Name	Varchar(200)	Not null
Status	Varchar(20)	Not null
Description	Text	Not null
date_created	Datetime	Not null

Table 9 showing the service entity

Appointment

Field name	Data type and size	Constraints
appointment id	Int(11)	Primary key and not null
Description	Varchar(200)	Not null
medical personnel id	Int(10)	Foreign key and not null references Medical personnel(Medical personnel id)
student id	Int(10)	Foreign key and not null references Student(student id)
Replied	Int(2)	Not null
date_created	Datetime	Not null

Table 10 showing the description of the appointment entity

Student

Field name	**Data type and size**	**Constraints**
student id	**Int(11)**	**Primary key and not null**
student no	Varchar(50)	Not null
UserName	Varchar(50)	Not null
regNo	Varchar(20)	Not null
Course	Text	Not null
Tel	Int(11)	Not null
email	Varchar(50)	Not null
Photo	Text	Not null
Gender	Varchar(10)	Not null

Table 11 showing the description of the student entity

Appointment reply

Field name	Data type and size	Constraints
appointment_reply id	Int(11)	Primary key and not null
appointment id	Int(11)	Foreign key and not null references appointment(appointment id)
medical personnel id	Int(11)	Foreign key and not null references medical personnel(medical personnel id)
Reply	Text	Not null
appointment date	Datetime	Not null
appointment time	Datetime	Not null

Table 12 showing the appointment reply entity

CHAPTER 5

5.0 IMPLEMENTATION, TESTING AND VALIDATION

5.1 INTRODUCTION

In his chapter we will describe the functionalities provided by the SMA using the screen shots we took and the findings of the research we carried out. The findings include results of every step we carried out. The steps taken in coming up with SMA include planning for the project, analysis of the already existing applications, requirements collection and developing the application with appropriate interfaces to meet the users' needs.

The developed prototype wentthrough several iterations and was finally validated. The application w as implemented using Java for the interfaces, PHP and MySQL for the database.

5.2 LITERATURE REVIEW RESULTS

From the literature review, we found out that a scheduling mobile application should be an online application which can be accessed by any person in any place even in remote areas and at any time. It should have the ability to update schedules made by users (clients) so that the different users who are supposed to attend to the clients (those that request for appointments) get the information as soon as possible to avoid any inconveniences.

We found out that such an application can save the time spent by clients who lining up without knowing the schedules of the service providers who can leave any time there by leaving the clients unattended to.

We also found out that such application can reduce congestions at points of service delivery since only clients with appointments are most likely to turn up since they are sure of being attended to in environments where the clients are so many

5.3 RESULTS OBTAINED FROM INTERVIEWS AND QUSETIONNAIRE

From the 30 questionnaires we distributed, 23 of them were returned filled. We managed to interview 15 students and 5 medical staff members at Makerere university hospital. Although we were able to get the data that we needed, it was difficult because some staff members were not genuine and we also failed to get some staff members. The instruments were distributed to three groups of respondents and the results were as follows

Administrator

We found out the Makerere university hospital has been in existence for 37 years and has several doctors. The hospital offers services like immunization, x ray, ultra sound services, sexual and reproductive health services, routine medical examinations, drug dispensing and dental care. The hospital attends to a large number of students and people staying near it (local people). Registration is manual and it is done by secretary and students present their admission letters and identity cards at a fee of ten thousand.

Doctors

We found out that doctors prescribe medicine to students and note the next visitation day on medical forms. The doctors also said that they attend to a very big number of students every day since the university population is very big. Students come randomly to the hospital and over crowd the place and yet there are a limited number of doctors present which makes some students miss out on medical attention.

Students

Students said that they are not happy with the system at the hospital because they spend a lot of time in lines for like 2-3 hours waiting to be attended to and they sometimes miss out on medical attention. They also said they spend a lot of time looking for their manual files which the medical staff uses to attend to them. Also they spend so much time in registration since the system is manual and they have to line up for a good period of time. The files would have some mistakes that needed to be corrected for example the registration numbers, student numbers, etc.

5.4 OBSERVATION RESULTS

We spent some time observing the different activities that take place at the hospital. Students spent a lot of time in queues before being attended to by the medical staff most especially the doctors. Also

students with appointments lined up with other students to get attended to by the different medical staff which was nagging.

5.5 DATA ANALYSIS RESULTS

From the data collected from the different individuals at the hospital, the study showed us the need for a mobile application which would help to eliminate all the delays and the errors made in the current system being used at the hospital. This would require all students to access the mobile application and make appointments with at any place in Uganda or outside Uganda for as long as they are computer literate. Their details would be captured and stored in the database and would be used by the hospital administrators concerned. After a successful login and making of an appointment, the concerned medical staff would accept the appointment and a notification would be sent back to the student for the appointment approval.

5.6 IMPLEMENTATION RESULTS

During the application implementation, we used different languages. These include java which we used to develop interfaces, PHP which we used to connect our application to the database, MySQL which we used to develop our database

5.6.1 Flow chart showing the flow of activities in the system and application

This shows the flow of activities within the system by the different users showing all the possible step that can be followed by the administrator, student and medical personnel in order for them use utilize the services provided by the system consisting of the mobile application and desktop application.

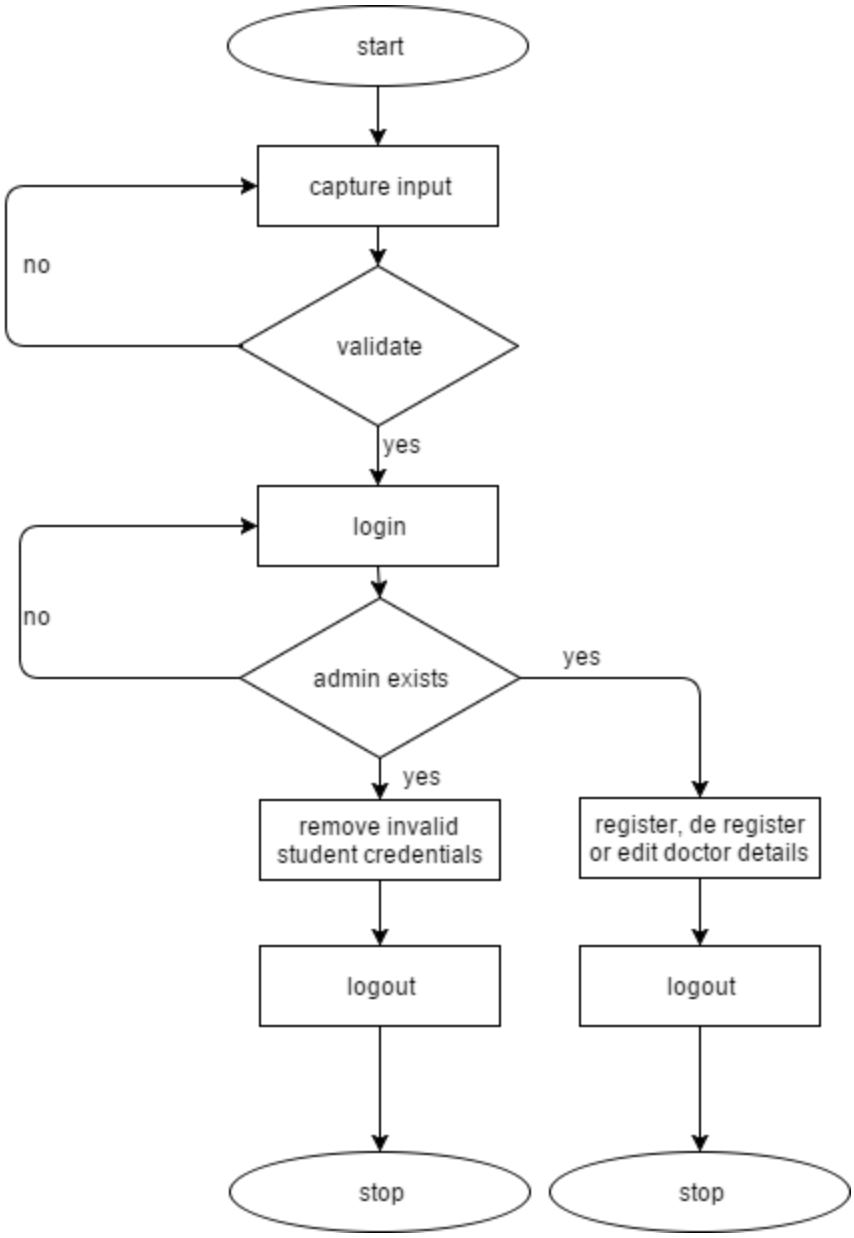

Figure 15 showing a flow chart of how the administrator uses the system

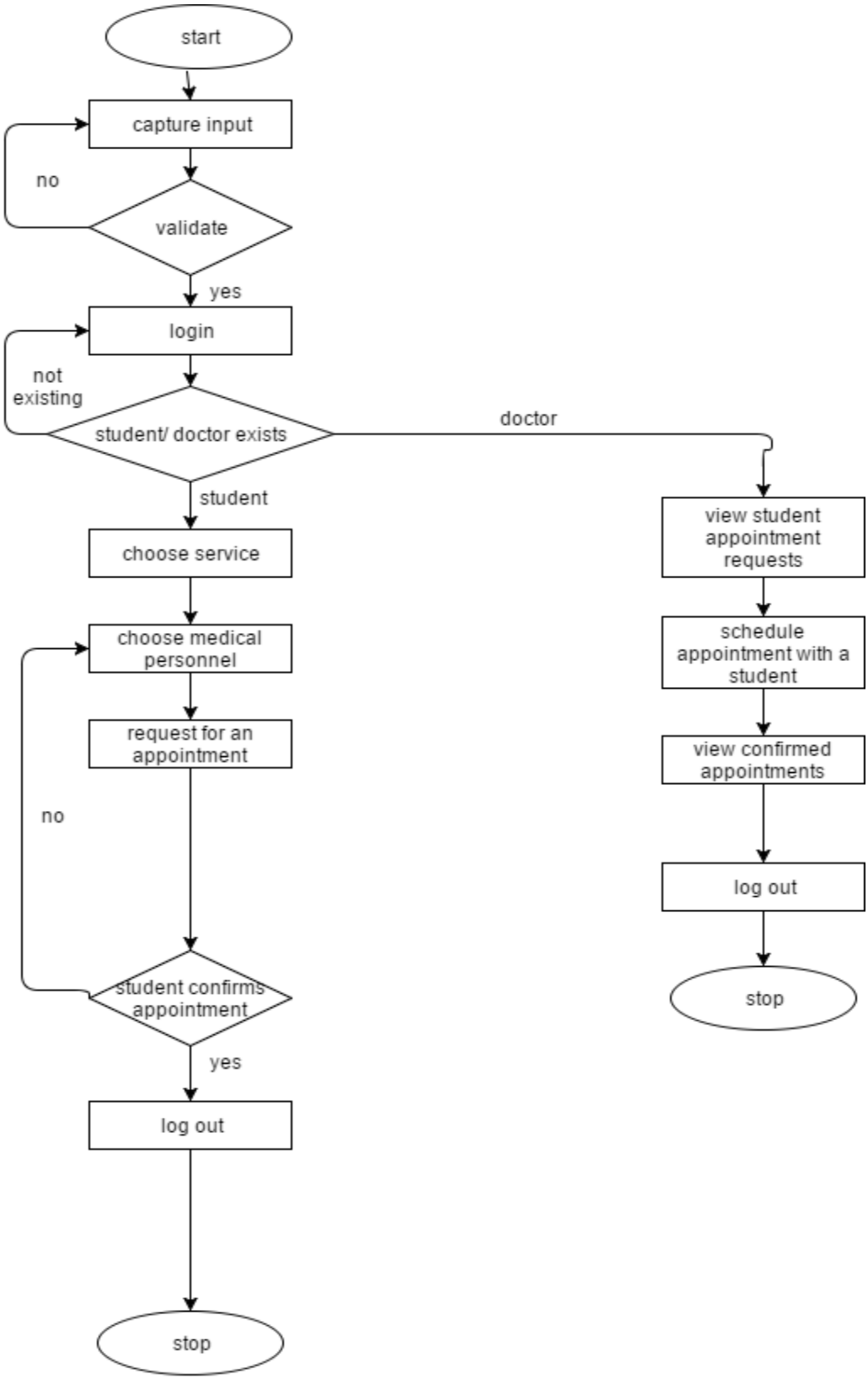
start
capture input
no
validate
yes
login
not existing
student/ doctor exists
doctor
student
choose service
choose medical personnel
request for an appointment
no
student confirms appointment
yes
log out
stop
view student appointment requests
schedule appointment with a student
view confirmed appointments
log out
stop

Figure 16 showing a data flow diagram how the student or medical personnel would use the SMA application

5.7 SYSTEM FUNCTIONALITY

5.7.1 MOBILE APPLICATION

Login page

This is a login page for both the medical personnel and the students. This page consists of drop down where the user chooses whether he or she is a student or medical personnel so that he or she can login accordingly.

The student uses his or her student number and password to login into the application while the doctor uses his or her username and password to login. If a student is not registered yet, a registration button is available so that he or she can insert registration details and he is taken to the registration page.

After logging in, the student is taken to the services page where he or she can choose a specific service basing on his or her problem. The doctor is taken to the appointment page where he or she can view appointment requests sent by students.

Figure 18 showing the student and medical personnel`s login page

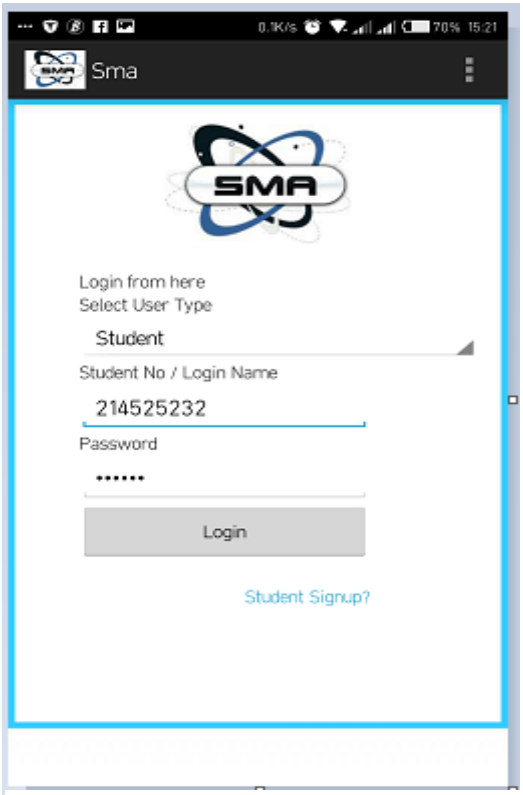

Figure 17 showing the student and medical personnel`s login page

Student registration page

The figure below shows the students registration page where the students are provided a form for them to fill in their details in order for them to request for appointments with the different university hospital medical personnel. The students must fill in their correct records without missing any fields in order for them to be registered.

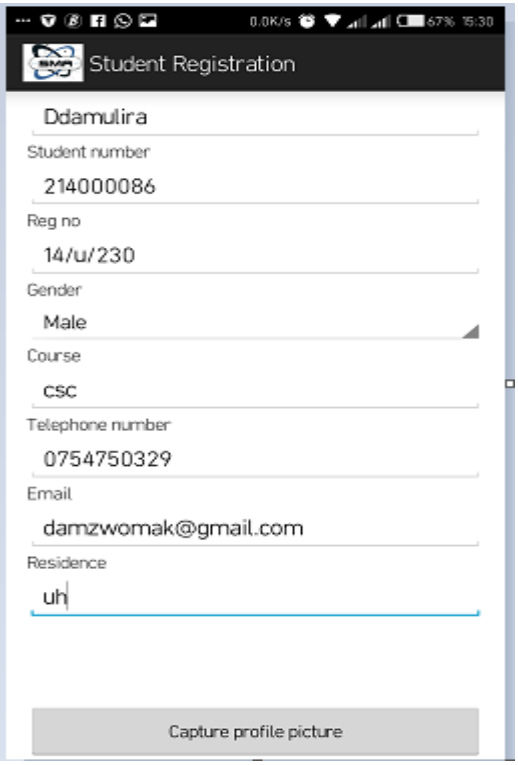

Figure 20 showing the student`s registration page

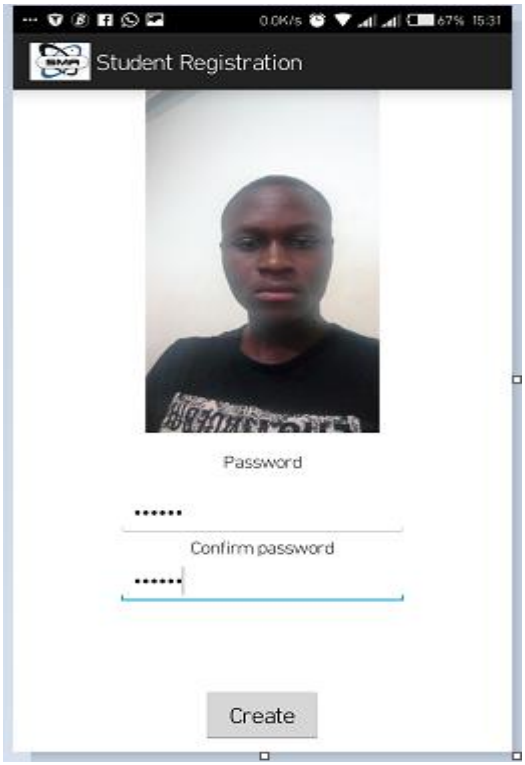

Figure 19 showing the student`s registration page continuation

Services page

The figure below shows the services page consisting of the different medical services provided by the university hospital which include immunization, x ray, ultra sound services, sexual and reproductive health services, routine medical examinations, drug dispensing and dental care where a student can choose any of them and he or she is taken to the page consisting of the different personnel for that service so that he or she can request for an appointment with any of them

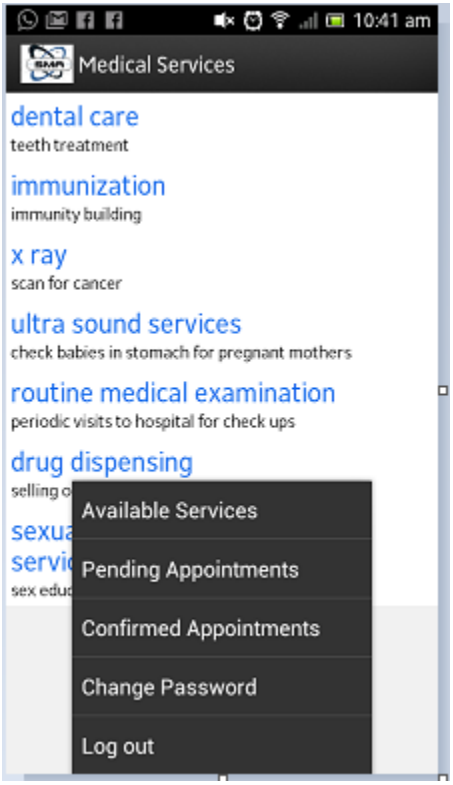

Figure 21 showing the services` page where students can choose any service appropriate for their medical problem

Student appointment request pages

The figure below show the appointment request page where a student can request for an appointment with a medical personnel. It contains fields where the student can put the appointment details depending of his or her current situation which helps the doctor to know what he or she expects when a student arrives at the hospital. This contains the reason for requesting for an appointment. The other fields will automatically be filled with the student`s name and student`s number which will all be viewed by the specified medical personnel who the student is requesting to have an appointment with. After the student inserts the details, he or she then presses the “send” button which submits the appointment information into the database which will be available for that specific medical personnel. The medical personnel will then receive a notification of an appointment request from a student.

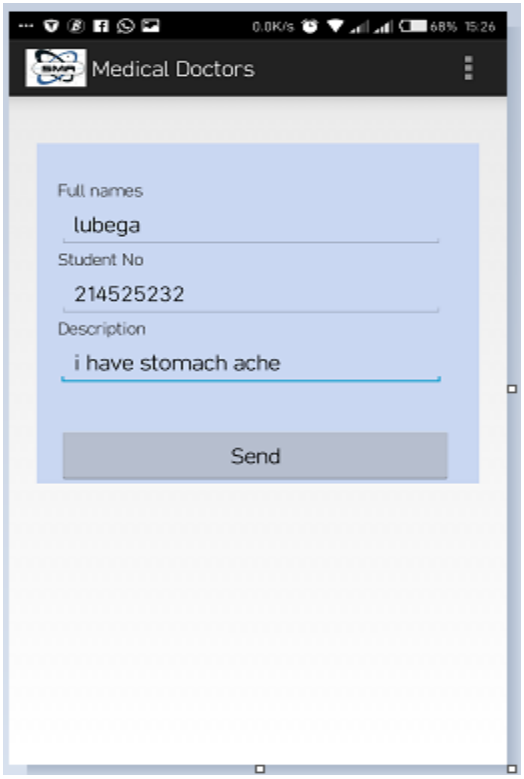

Figure 22 showing the student`s appointment request page

Medical personnel appointment reply page

This is where the medical personnel sets the time and date when he or she will be able to meet a given student who requested for an appointment with him or her. The page consists of a date and time picker which enables the medical personnel to easily choose the date and time. After he or she has chosen his or her appropriate time to meet the student, he or she then presses the reply button and the information is then stored in appointment reply table in the database. The student then receives a notification of a reply to the previously sent appointment request.

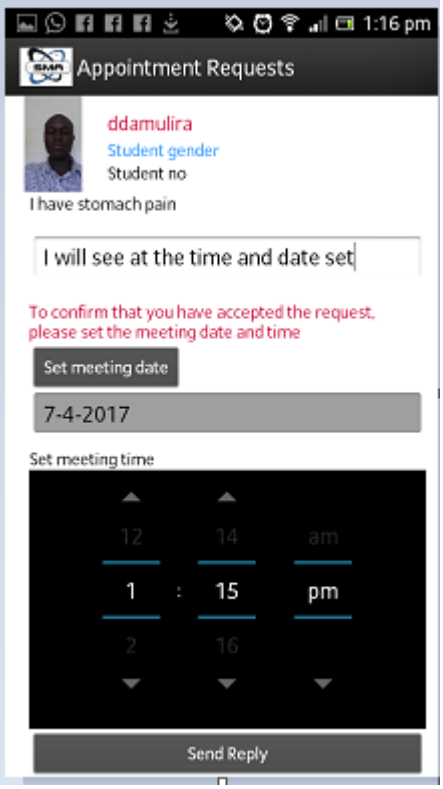

Figure 23 showing the doctor`s appointment reply page

Medical personnel`s confirmed appointments page

This is the page that consists of the medical personnel`s confirmed appointments with time and date when he or she will be meeting the different students.

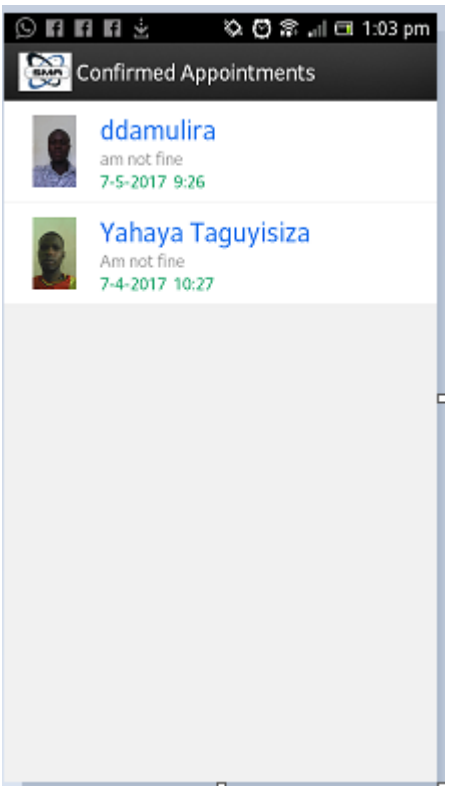

Figure 24 showing the medical personnel`s confirmed appointment page

Students appointment confirmation/ decline page

This is the page where the student accepts or rejects the medical personnel`s suggested time and date when to meet the student. The student first has to click on the replied appointment on the pending appointment page to be taken to this page

Figure 25 showing the student`s confirm or decline page for medical personnel`s replied appointments

Student`s confirmed appointment page

This is the page that has confirmed appointments of a given student with at least one medical personnel. No action is performed when a student clicks on any confirmed appointment. It consists of the time and when the student and medical personnel will meet.

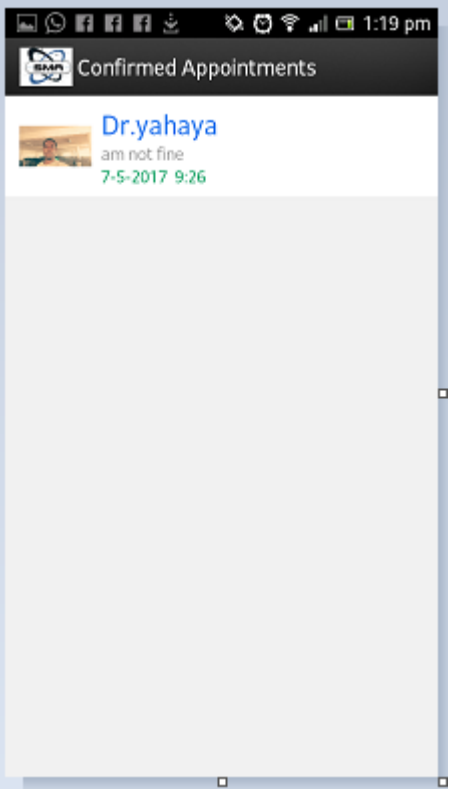

Figure 26 showing student`s confirmed appointment page

Students pending appointment page

This is the page that consists of either the appointment requests sent by students that have been replied to by the intended medical personnel consisting of medical personnel suggested time and date which are green in color or the appointment requests sent by students but they have not been replied to by the intended medical personnel.

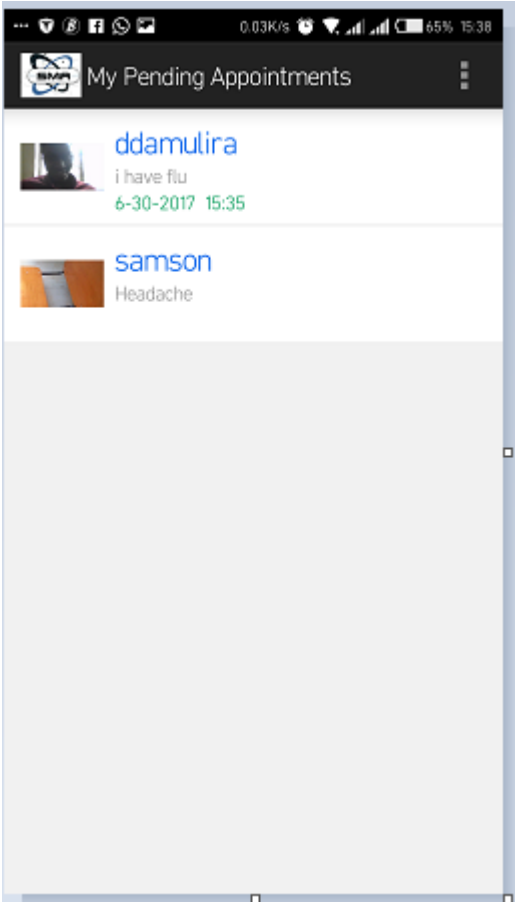

Figure 27 showing student`s pending appointment page

Medical personnel`s appointment request page

This is the page that has medical personnel`s appointment requests from the different students that need to be replied to by the medical personnel

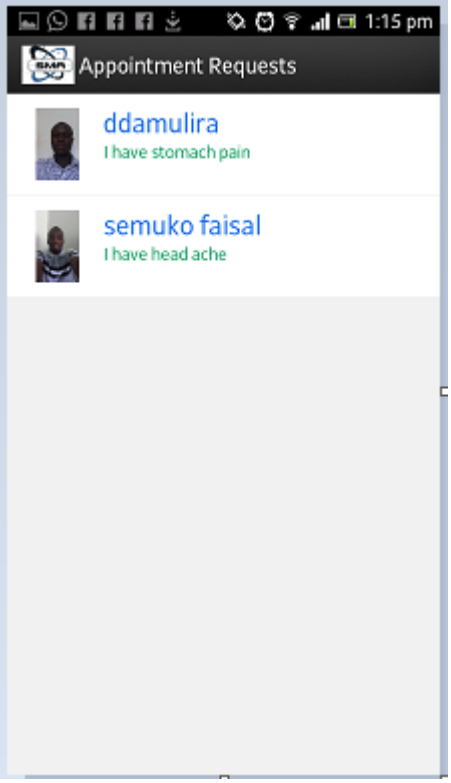

Figure 28 showing appointment requests from students for a given doctor

5.7.2 THE DESKTOP APPLICATION

Login page

This is the page where the administrator logs into the desktop application. This leads the administrator to the home page where he can be able to remove wrong credentials of students (security wise) and also register medical personnel who will be attending to students.

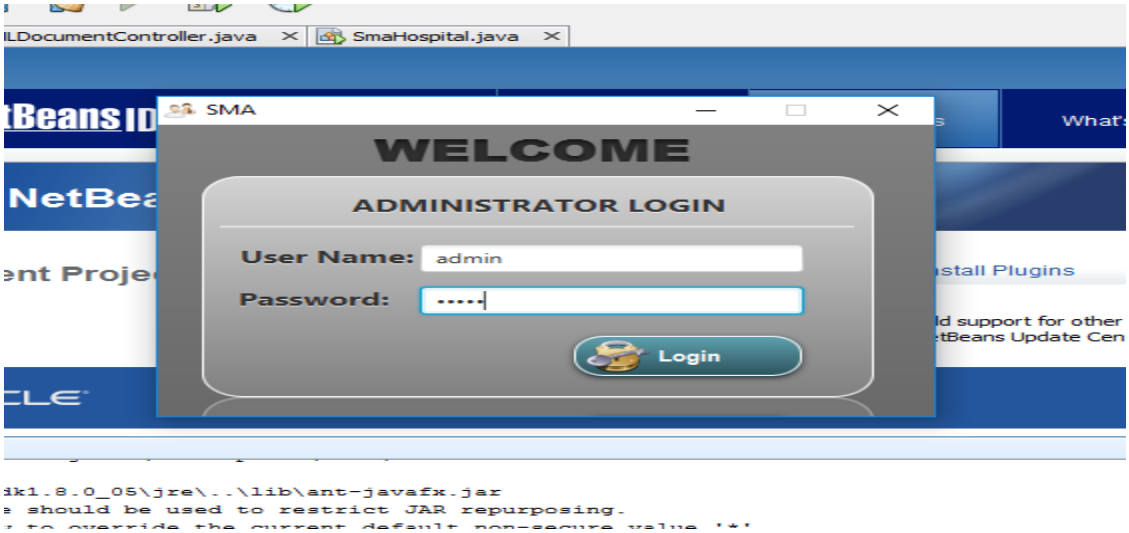

Figure 29 showing the administrator`s login page so that they can access the desktop application

Home page

This is where the administrator actually registers medical personnel and also removes wrong student credentials. It has two tabs the student tab where the administrator can delete wrong students` credentials and the doctors` tab where the administrator can register medical personnel so that they can use the SMA.

Still on this page the administrator can edit the doctors` credentials and also remove doctors in cases where the doctor no longer works at the hospital at the medical personnel tab.

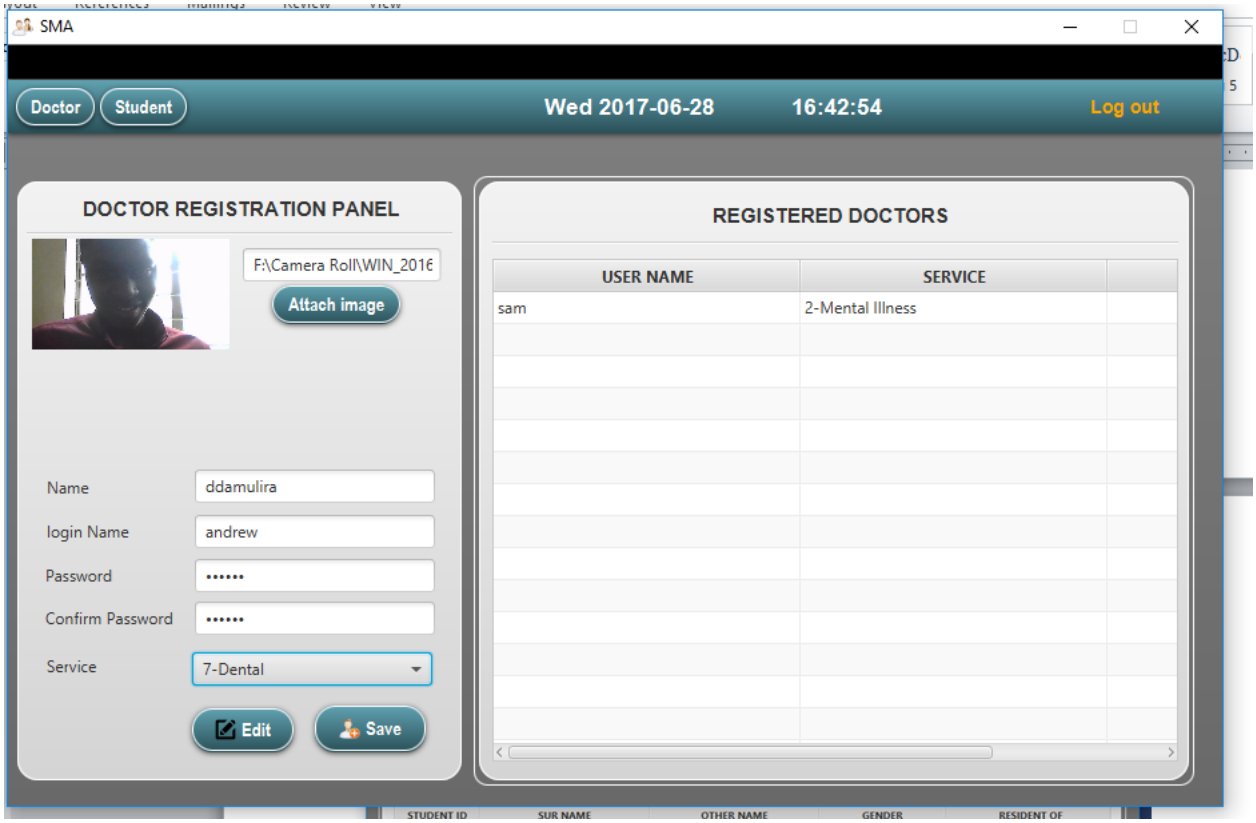

Figure 30 showing the administrator page for registering and editing and deleting medical personnel details

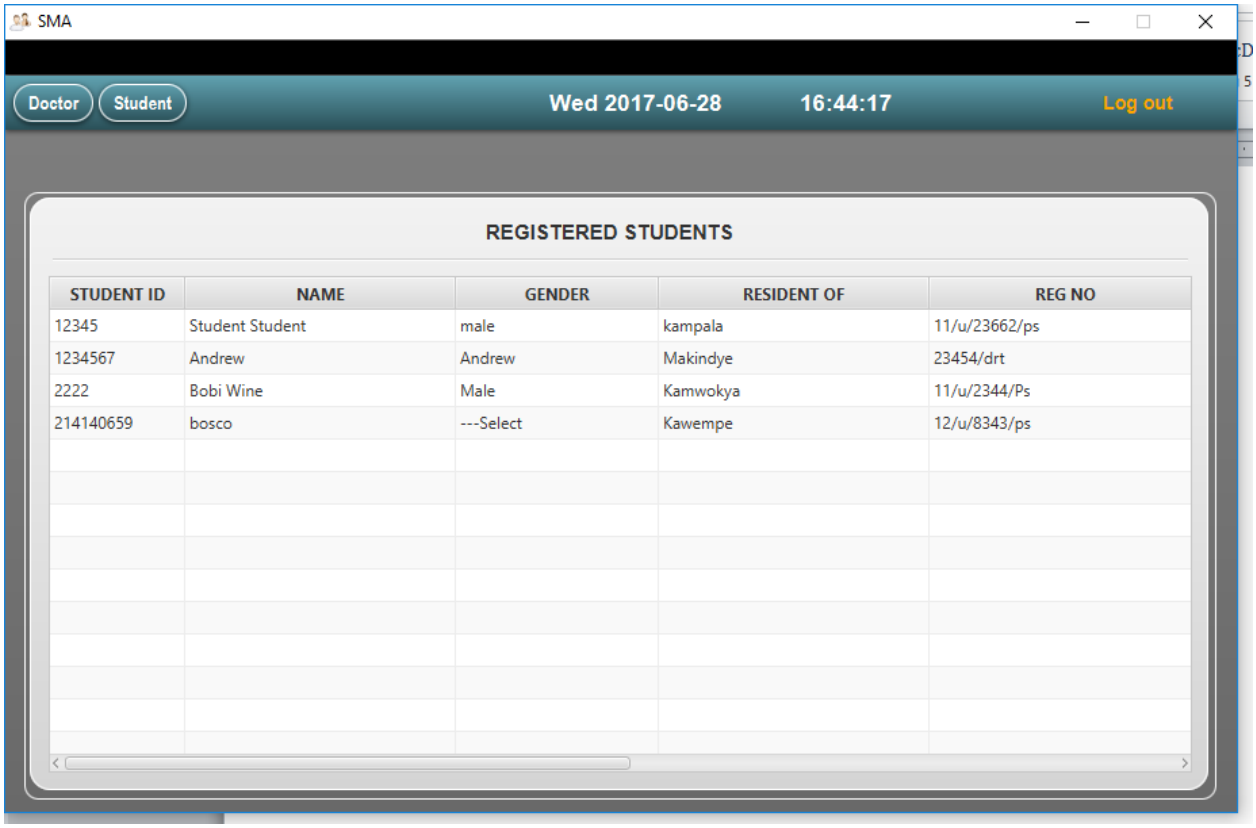

Figure 31 showing the administrator page where he or she can delete wrong students credentials such that fake users cannot access the application

5.8 Testing and validation

5.8.1 Testing

In this phase, we executed our application on an android mobile phone to see if the results are in conformance with the users` expectations and technical specification. Testing was intended for exposing the developed application to test inputs and observing its behavior to determine whether it is working as expected.

The information about student registration and appointments was processed fast enough without delays which reflected an efficient application. This enabled the doctor to receive that appointment request immediately it was sent by the student.

The black box method

We used this method to test functionality of the system to see whether the system is working very well. We provided the application to the different students and medical personnel who input information which they used in the mobile application and desktop application to see whether the system was providing the required functionality. Students tested by registering and requesting for appointments with the different medical personnel. The medical personnel used the application to reply to appointment requests made by students. The administrator who was one of us used it to remove some students' credentials and also registering, editing and deleting medical personnel credentials.

5.8.2 Validation

This refers to the process of ensuring that the data inserted into the application satisfies pre-determined formats or compiles with defined input criteria.

We allowed a small number of students to carry out the test of the application by feeding in their registration details and also requesting for an appointment with a given medical personnel. One of us acted as the doctor and was able to set the time and date when to meet the student. after the student confirmed the appointment, the details were sent the doctor`s confirmed appointment page. This enabled us to know whether the inserted information is the right information basing on the university`s required information. This also enabled us to know whether the application is user friendly and satisfies the user requirements depending on the users` comments.

During the application validation and testing, we found out that it meets the user`s needs and requirements. The application also provides security to students' appointment information in that only the intended medical personnel can view this information. The medical personnel and the students have to first login to be authenticated to use the mobile application. A student has to first be registered first to be able to request for appointments with the different medical staff. If a person uses another student`s credentials to register with the application, the administrator can be informed and he or she can be able to delete the fake account and allow the eligible student to register.

The administrator can also delete or edit a given medical personnel`s account depending on the current situation for example when the medical personnel leaves the hospital.

CHAPTER SIX

6.0 INTRODUCTION

This chapter presents the summary of the study findings; the conclusion arrived at and suggests areas that need more research to be carried out.

6.1 CONCLUSION

The stated objectives and design of SCHEDULING MOBILE APPLICATION were achieved to largely reflect the stipulations of the Makerere University Hospital management commitment. In the broadest terms, the SCHEDULING MOBILE APPLICATION goals and design are responsive to the call at the Makerere University Hospital to easy to access of medical services by the patients (students) and also to manage appointments efficiently since from the interviews we carried out, students were complaining of long lines in front of medical staff offices and in corridors. Sometimes students would not be attended to past working ours

This work is found rewarding as it enabled us researchers and developers to directly apply theory obtained from the lectures to real practical work. Course units like Data Structures and Algorithms, Database Management Systems, Research Methodology, Android development and Distributed Systems Development covered within the Bachelor of Science in Computer Science course have been largely applied in this project. During system implementation, the project enabled the scholars to learn more about the used programming tools like Java method invocations, and master their skills in creating and managing database using MySQL. We are now exposed to real life challenges of application development. Lastly, we have learnt to appreciate research journals, projects done by the previous students at COCIS, those posted on internet from different formulas and documentations of other scholars because they have helped us in coming up with the project report.

6.2 LIMITATIONS

It was difficult to decide which technology to use as some of the development platforms posed challenges to the designers. Below are some of the limitations

1. Insufficient resources to carry out some of the project activities in addition to limited access to college resources such as Internet, power some time and the Library.
2. It was difficult to collect data at Makerere University Hospital since some of the top administrators were most of the times busy, on and off in their respective offices.
3. Short duration for project completion. It was challenging to juggle between lectures and project activities.

6.3 SUMMARY

The Application is a Student Scheduling Application which is android based that keeps track of student's information as they register with it eliminating the manual student's registration. With the advancement of technology in Uganda and the world at large, while using this application, students can request for an appointment with the medical staff at the university hospital that can in turn set time and date which is convenient to them. Students also know when the different medical staffs of different departments are available at the hospital after confirming an appointment with them so that they go to the hospital knowing that they are going to get the services they want.

The project successfully achieved the objectives identified in chapter one. A scheduling Application has been designed and implemented as per the requirements and expectations of the users (student, medical personnel and the administrator).

6.5 future works

- We would like to include cancellation of confirmed appointments if the student or medical personnel cannot make it for that given appointment.
- An automatic SMS reminder that can be sent for each appointment an hour before appointment time so that students can honor their appointments.

6.6 Recommendations

Although the project was investigated, analyzed, designed, developed and implemented, a number of details were not covered as to utilize the fullest capacity of the application. It is therefore recommended that further study is under taken to improve the following

- Makerere University Hospital should provide a server to run the desktop application and database. We recommend Makerere University Hospital to implement the application as it is applicable to its situation since it was developed using its details and requirements. This will reduce the stressing factors and time wasted that were observed and also improve the record keeping problems recognized with the traditional system.
- The hospital should think of using an online scheduling mobile application.

- Full time applications to remind students to honor their appointments. An automatic SMS reminder should be sent for each appointment an hour before appointment time.

- The application should consider all hospital clients which include lecturers and residents near the hospital without considering only students.

- A student should be able to cancel an appointment in case he or she is too busy to honor it.

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APPENDICES

INTERVIEW

Interview guide

We are undergraduate students from Makerere University from the department of computer science conducting a survey on understanding the process of appointment at Makerere University Hospital and our main objective is to develop a scheduling mobile application. Therefore we kindly request you to respond honestly to the following questions which are divided into two questions A and B in order to help us through the process of development.

The information provided will be kept with great confidentiality by our team and your participation will be highly appreciated.

SECTION A: THE BACKGROUND AND REGISTRATION.

Background

ADMINISTRATOR

1. How long has this hospital been in operation?

   ……..

2. What is the capacity of the hospital?

   ……..

3. What services does the hospital provide?

   ……..

4. How many doctors do you have at the hospital?

   ……..

5. What could be the average number of students handled in a year?

   ……..

6. Do you have a registration office?

   Yes ☐ No ☐

   If yes continue to Q8 and if not answer Q7

7. How is registration handled?

   ……

8. Who is supposed to register?

……

9. What are the requirements for one to be registered?

……

10. How many students are registered monthly?

…….

11. Which challenges are faced in registering (patients) students?

…….

PATIENTS

1. At what time did you arrive at the hospital?

…….

2. How long did take you to be registered?

…….

3. How easy was it access the doctor after registering?

…….....

4. For how long did it take you do consultation with the doctor?

…….

5. Is the process that you went through that comfortable to you?

DOCTOR

1. How do you make appointments with students?

……

2. How many patients do you work on per a day?

…….

3. What challenges do you face in handling appointments?

……..

4. How would you improve/modify the current appointment process?

……..

QUESTIONNAIRE

We are undergraduate students from Makerere University from the department of computer science conducting a survey on understanding the process of appointment at Makerere University Hospital and our main objective is to develop a scheduling mobile application. Therefore we kindly request you to respond honestly to the following questions which are divided into two questions A and B in order to help us through the process of development.

The information provided will be kept with great confidentiality by our team and your participation will be highly appreciated.

Background and registration

Background

1. How long has this hospital been in experience?
    - 20 years ☐
    - 30 years ☐
    - 40 years ☐
    - Others specify……..
2. What services does the hospital provide?

    ……..
3. How many doctors do you have at the hospital?
    - 2 ☐
    - 3 ☐
    - 4 ☐
    - 5 ☐
    - Others specify if any……..
4. What is the average number of patients (students) you handle in a year?
    - 1000 ☐
    - <1000 ☐
    - >1000 ☐

- Other specify…….

5. What is the capacity of your hospital?

……

Registration

1. Do you have a registration table?

Yes ☐ No ☐

If **Yes** continue to Q3 and if **No** answer Q2

2. How do you handle registration?

……

……

……

3. Who is legible to be registered?

……

4. What are the requirements to be registered?

- Identity card ☐
- Admission letter ☐
- Registration fee ☐
- Others specify…….

5. How many students do you register in a week?

- 100 ☐
- 200 ☐
- 300 ☐
- Others specify…….

6. What challenges do you face registering students?

……..

……..

……..

……..

7. After registration what follows?

……..

……..

……..

Appointments

Doctor

1. How do you make appointments with your patients?
   - Phone calls ☐
   - Patient cards ☐
   - Others specify……..
2. How many patients do you treat a day?
   - 10 ☐
   - 15 ☐
   - 20 ☐
   - Others (specify)……..
3. What challenges do you face while handling appointments?

   ……
4. How would you wish to modify the appointment process?

   ……

   ……

   ……

OBSERVATION FORM

a) The time the patient arrived at the hospital?

b) How long it took the patient to get attended to?

c) How registration is done?

d) How long it took the patient to do consultations?

e) How long the patient spent at the hospital?

f) How is it is to access it he doctor after registration?

g) How are appointments made?

h) How appointment patients are handled?

WORK PLAN FOR OUR PROJECT

PROJECT WORK PLAN			
TASKS	START DATE	DURATION(DAYS)	END DATE
Idea generation	9th oct 2016	3 days	11th oct 2016
Project Definition	12th oct 2016	1 week	18th oct 2016
Concept paper writing	19th oct 2016	2 weeks	2nd nov 2016
Requirements collection	2nd jan 2017	1 week	9th jan 2017
Proposal writing	10th jan 2017	2 weeks and 2 days	26th jan 2017
Proposal presentation	27th jan 2017	1 day	27th jan 2017
Coding			
Phase 1	1th mar 2017	2 weeks and 3 days	17th mar 2017
Phase 2	18th mar 2017	2 weeks and 3 days	3rd april 2017
Additional features	4th april 2017	1 week	10th april 2017
Testing			
Phase 1 Testing	11th april 2017	2 week	24th april 2017
Phase 2 Testing	25th april 2017	1 week	09th may 2017
Documentation and coding	10th june 2017	3 week	1th july 2017
Presentation	02th july 2017	3 days	05th may 2017

BUDGET FOR OUR PROJECT

PROJECT BUDGET		
ITEMS	**RATE**	**AMOUNT IN SHELLINGS**
Equipment		
Stationaries		1,620,000
PC Computer	1,200,000 each	4,800,000
Printer	1,000,000	1,000,000
Phones	500,000 each	2,000,000
Server	2,000,000	2,000,000
Miscellaneous		
Operation, Maintenance, Repair of equipment		1,500,000
Communications/ airtime		200,000
Website hosting	500000 per year	500,000
In-service Training		
Rent of the workshop facilities		1,000,000
Refreshments		150,000
Transportation for the workshop		300,000
Grand Total		**15,070,000**