

## A MOBILE BASED STUDENT NOTIFICATION SYSTEM FOR MODIBBO ADAMA UNIVERSITY OF TECHNOLOGY, YOLA, NIGERIA

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### ABSTRACT

*Mobile technology is one of the fastest growing technology, thus various sectors are adopting it to perform their operations. Currently the faculty members paste notices on notice boards to reach students or create a long chain of information dissemination by involving the class representative as the middle man, which is outdated, a waste of resources (ink, paper, and manpower). The aim is to design and implement a notification system with bulk short message service (sms) feature to enable generic information dissemination regardless of the user's mobile operating system in form of a mobile application. The System was designed and implemented using SOAP (Simple Object Access Protocol), Java, C# and MSSQL programming. The interface was designed using the android development kit. JAVA programming language with SOAP web services were used to provide the dynamic interaction between the android application and the web services. The web services were created using ASP.NET C# with embedded JSON array in order to hand the web interaction between the web services and the database. When tested it pass all the test cases, which means nothing unusual occurred. Students are really concerned with regards to being notified in an easy consumable format beforehand.*

**Keywords:** Android Mobile Phone; Connectivity; Database Mobile Application; Notification; System.

### INTRODUCTION

Today, mobile technology has become one of the fastest, easiest, most portable and affordable means of information dissemination. According to eMarketer (2014) the number of smartphone users worldwide will surpass 2 billion in 2016. Such statistics confirms the importance of the current research with smart phone as the main delivery channel. Mobile technology refers to any device or technology that is portable. One can move around with it and perform a wide range of tasks in no time. These tasks include games, social networking, making calls, browsing, SMS and the like. This research contains the processes and techniques used to design and subsequently to implement and test a notification system by the name "Student Notification System" which will be a mobile phone application to be built using Android Studio (Android IDE).

Chewar and McCrickard (2003) viewed notification systems as interfaces which enables the user to access the required information. The current Students Notification System will render a service that helps in bridging the communication gap between a faculty and its students. The medium in which this will take place is mobile technology. It will be an android-based application, which will be designed to support push notifications only (from faculty to students), in the process providing same notification to non-android based students using bulk messaging service. The system will allow a faculty member to select the module/modules

he/she wishes to post announcements on to targeted students (students registered in the module). On the other hand the students also have the privilege of selecting modules they wish to be notified on. This should enable them to receive announcements posted by a faculty member on those respective courses. Since the target audience, which are faculty and students already possess the primary delivering/receiving device; it makes the system development much more feasible. The main reason behind this proposed system is to research on how mobile devices can be used to enhance communication between a faculty and its students in Modibbo Adama University of Technology (MAUTECH), Yola - Nigeria. Currently the faculty members paste notices on notice boards to reach students or create a long chain of information dissemination by involving the class representative as the middle man, which is outdated, a waste of resources (ink, paper, and manpower) and also slows down the rate at which information is been passed on to the students.

## **LITERATURE REVIEW**

Mobile devices nowadays are very essential in our daily lives and at the start of these devices; they have been referred to as “handsets” that were principally used for making calls plus sending and receiving text messages. The 1st commercially mobile device was the Motorola DynaTac 8000x that first appeared in 1983 and had a straightforward contacts application (Clark, 2012). By the top of the 20th century, mobile applications started showing in phones like Nokia by putting the celebrated snake game, tick-tack-toe, calculators, calendars and Tetris on their devices.



Figure 1. Image of the Motorola Dynatac 8000x (Ha, 2010).

With time, customers began to rise the need for additional applications however the mobile phone makers had inadequate resources for developing fashionable luxurious applications. The start of the new millennium related to speedy increase within the use of those devices, sensible phone firms like Samsung, Apple and Blackberry came to existence and began developing additional luxurious, fun and different fashionable mobile applications. These applications are written in many programming languages like C, C++, Java, Python and plenty of others. Mobile applications were written for single platforms however with the ascent of technology related to technical expertise gained over time; these applications are created to run on many platforms. These applications are out there for transfer on many mobile platforms like iTunes, Google store and different open platforms. According to Laban and Hall (2013) Juniper analysis estimates that in 2014, the direct and indirect revenue to be generated from the sales of mobile applications can total \$25 billion.

Mobile Applications are often of many classes from booking applications like shopping for tickets or booking appointments, games, shopping applications like eBay or Amazon, finance like stocks or currency converters, banking like GTbank mobile banking and the like. The importance of mobile applications cannot be underestimated particularly during this era of globalization. The utilization of mobile applications reduces time process of functions as a result, things are done quicker and easier (Andrawes, 2012).

### **Mobile Applications in the Educational Sector**

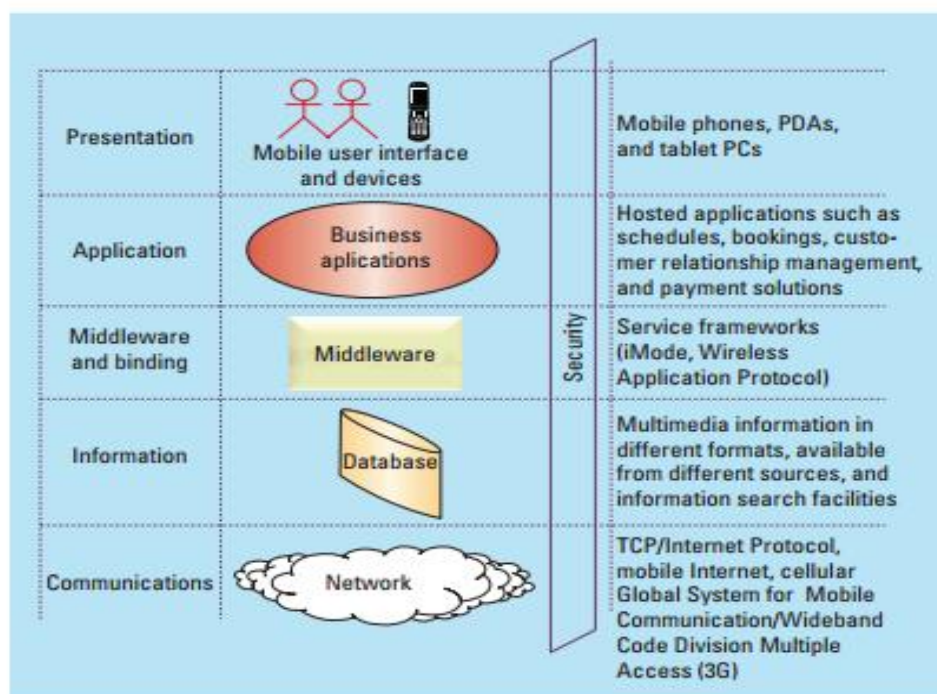
One of the major reasons for inflated attention paid towards mobile device usage within the instructional sector is the speedy increase in variety of mobile devices (such as mobile phones, personal digital assistants, and iPads) as enhancements within the technological capabilities of those devices. With decreasing prices these mobile devices have become accessible to additional individuals. These mobile devices supply multiple options and capabilities like creating phone calls, recording audio/video, storing information, and accessing the net. All of those functionalities are often utilized in an academic context (Maccallum and Jeffery, 2009). Learning sectors can use mobile devices to bridge the communication gap between teachers and students in various ways. One of these ways is notification system adoption. Chewar and McCrickard (2003) viewed Notification systems as interfaces, which enables the user to access the required information. The user need of notifications is well recognized by information provider (Vastenburg, Keyson and Ridder, 2008). Additionally McCrickard *et al.* (2003) said that the users want to be notified by the information relevant to them or their task. Where the notifications can be commercial advertisement, critical information alerts, or Educational information that can be notified through messages or e-mails text messaging and multimedia messaging on mobile devices are rapidly growing (Shankar and Balasubramanian, 2009).

### **Mobile Application Development**

**This** is the process of developing applications which acts as an added feature in any handheld device. The applications which are developed in mobile application development process can be downloaded by the end user either by using various different mobile software distribution platforms available in the market else it can also be taken from application stores. These applications can also be found as pre-installed applications in the mobile devices. The scope of mobile application development is now not only restricted to one category or one trend. It covers vast range of booming sectors like business, Games, News, Weather, Education, and Money or the finance sector are some of the few categories where the mobile application development process is carried on. According to Gartner Inc (2015), by the end of 2017, market demand for mobile app development services will grow at least five times faster than internal IT organizations' capacity to deliver them. Gartner forecasts mobile phone sales will reach 2.1 billion units by 2019, which will fuel demand for apps in the enterprise that meet the high performance and usability of consumer apps. The existence of Mobile applications have presented many new opportunities for industries, companies or enterprises and also, the presence of these opportunities brought by these apps has some challenges which exists. The main challenges presented by these mobile apps are that of development and implementation (Unhelkar and Murugesan, 2010). According to Leow (2015), enterprises find it a challenge to rapidly develop, deploy and maintain mobile apps to meet increasing demand, as it is exceedingly difficult and costly to hire developers with good mobile skills. Organizations increasingly find it difficult to be proactive against competitive a pressure, which is resulting in their mobile apps becoming tactical, rather than strategic. Other challenges faced in mobile application development include ensuring access and usability, facilitating optimum user interactions on mobile devices, customizing mobile functionality according to user profile,

dealing with the bandwidth and poor reliability of wireless communication (Unhelkar and Murugesan, 2010).

Using development tools that can produce apps more rapidly is crucial for enterprises to help bridge the gap between mobile app demand and supply. Significant innovation is driving this market and replacing traditional coding approaches, such as native development tools, with more effective RMAD tools. There are many approaches to RMAD, including drag-and-drop codeless tools, code generation and orchestration, model-driven development, virtualization, forms construction, and others. These approaches are allowing those with no programming skills or coding ability, such as people in business roles, to rapidly assemble mobile app prototypes and continuously iterate on these designs (Gartner Inc, 2015). There's a framework that is employed by developers to handle some of these challenges and this framework is the Mobile Applications Development Framework (MADF). The framework has six layers and every of those layers feature an explicit development challenge within which it addresses and these layers are: Communication, data, Middleware and Binding, Applications, presentation and Security (Unhelkar and Murugesan, 2010).



**Figure 2. The Six Layers of the MADF (Unhelkar and Murugesan, 2010).**

The Figure 2 on top shows the layers of the MADF in sort of hierarchy and the security level covering all alternative layers. It includes info confidentiality, handiness and integrity that may be a major concern for mobile applications. This framework does not only address development challenges but it also brings together user interface design as well as code and design reuse which is an essential quality in application/software development (Unhelkar and Murugesan, 2010).

## METHODOLOGY AND DESIGN PHASE

### Survey Research

Survey research means a systematic collection of data from a sample of respondents in order to understand and to predict future behaviors, attitudes, decisions and lifestyles of a population (Oates, 2006). Survey are widely established and used in the field of Information

Systems. Pinsonneault and Kraemer (1993) defined survey as a method of “gathering information about the characteristics, actions or opinions of a large group of people, referred to as a population.” There are three main characteristics of using this method, these includes asking people to collect information in a structured format, a quantitative method that can be used to identify information concerning with relationship between variables and it can also be used to collect a fraction of the study population, which can generate the results for the full population (Pinsonneault and Kraemer, 1993; Malhotra and Grover, 1998). Surveys tend to be economical as it can cover a large amount of people with in the shortest possible time and at a relatively low cost. Survey does not give detailed information about a research area.

### Observation

According to (Itinfo.am) “Observation is an act or instance of noticing or perceiving”. Observation has to do with carefully taking note of the happenings, causes and changes that take place in a particular setting. During the observation course at MAUTECH, It was noted that students needed a helping hand to make their academic life less challenging.

### Questionnaire

Questionnaires are the set of questions, which are already defined and placed in determined order (Oates, 2006). It is conducted in the absence of researcher, asking people to collect information in a structured format (Oates, 2006). This data collection method is very economical. The drawback of using questionnaire according to Pinsonneault and Kraemer (1993) shows that response rates tend to be low, when conducting surveys using questionnaires. Sometimes irrelevant answers are provided to some questions. A questionnaire was designed and circulated to 100 MAUTECH students randomly. The student survey questionnaire gave the analysis.

### Class diagram for the System

In software design, a class diagram describes the system by mapping out its classes, attributes, operations and the relationship among the classes. Figure 3 shows the class diagram.

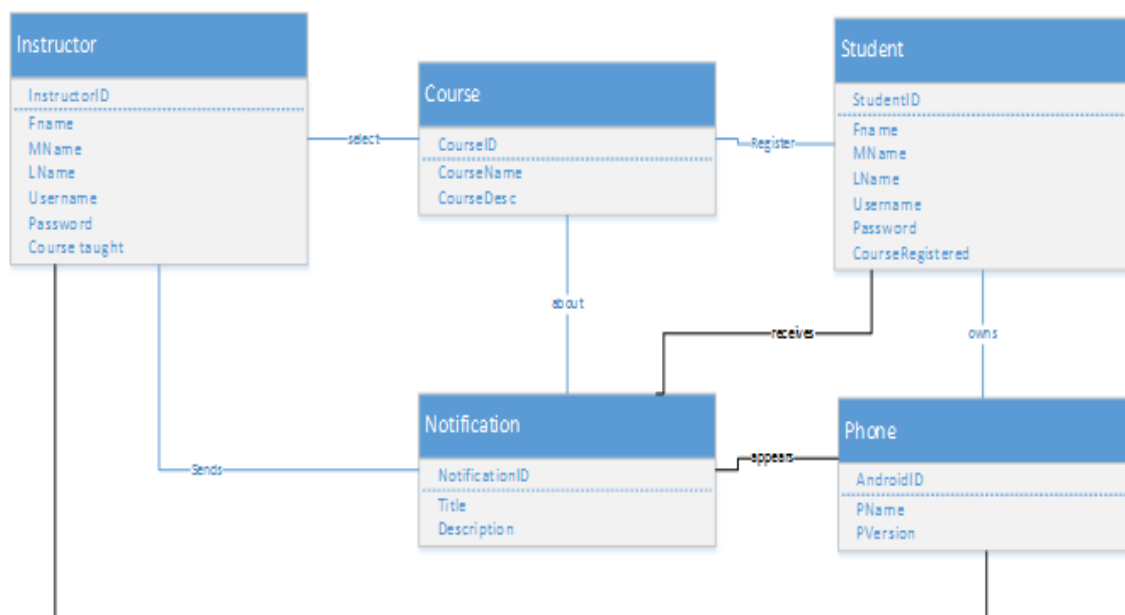


Figure 3. Class Diagram



## Database Model for the System

MS SQL was used in the database design. The first step is to outline all the possible entities and relationships (Figure 4).

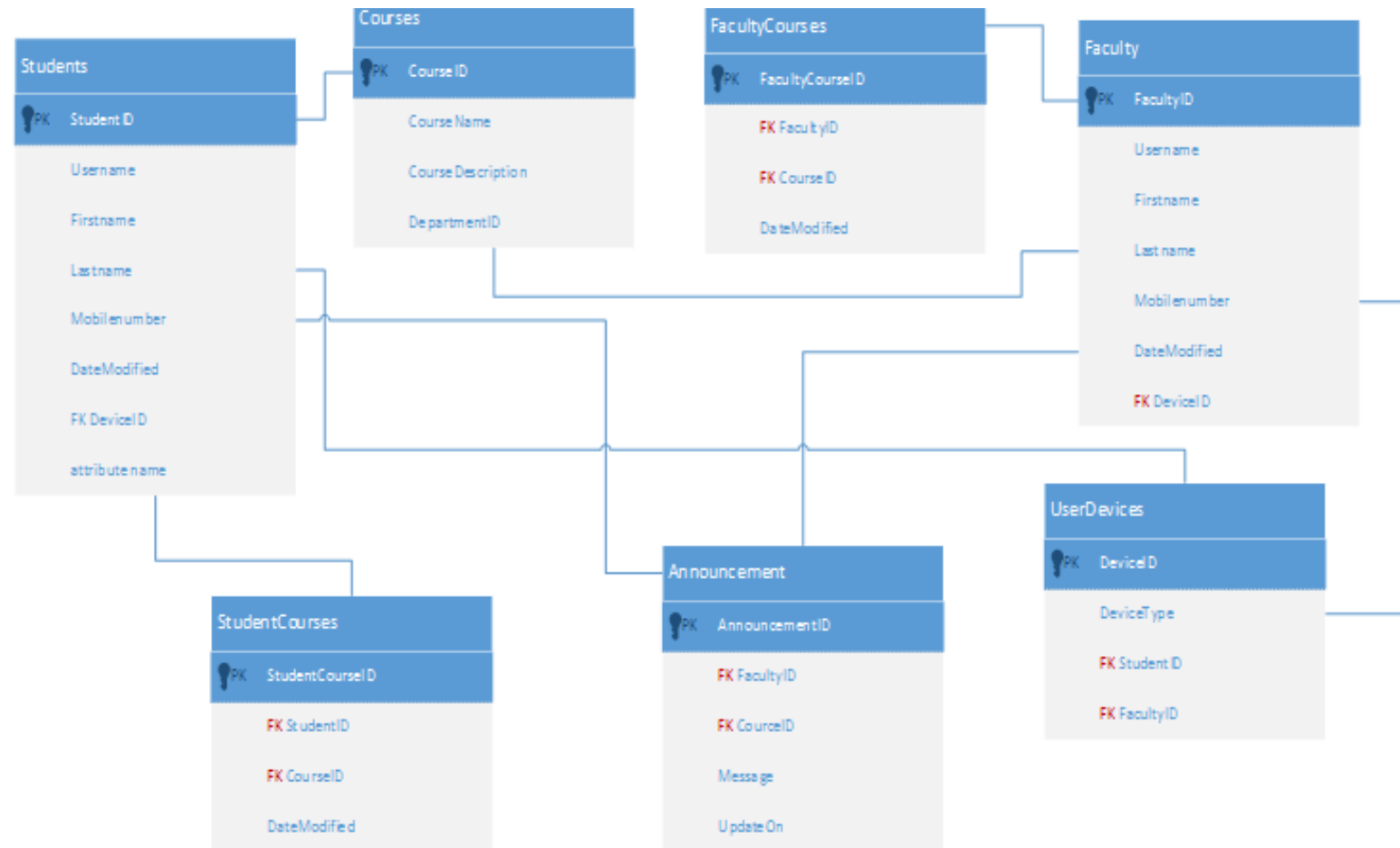


Figure 4. Entity Relationship Diagram

## The proposed System Network Design

To provide a better understanding of how the mobile app works, Figure 5 shows the communication flow between faculty members and their students, on a network design level.

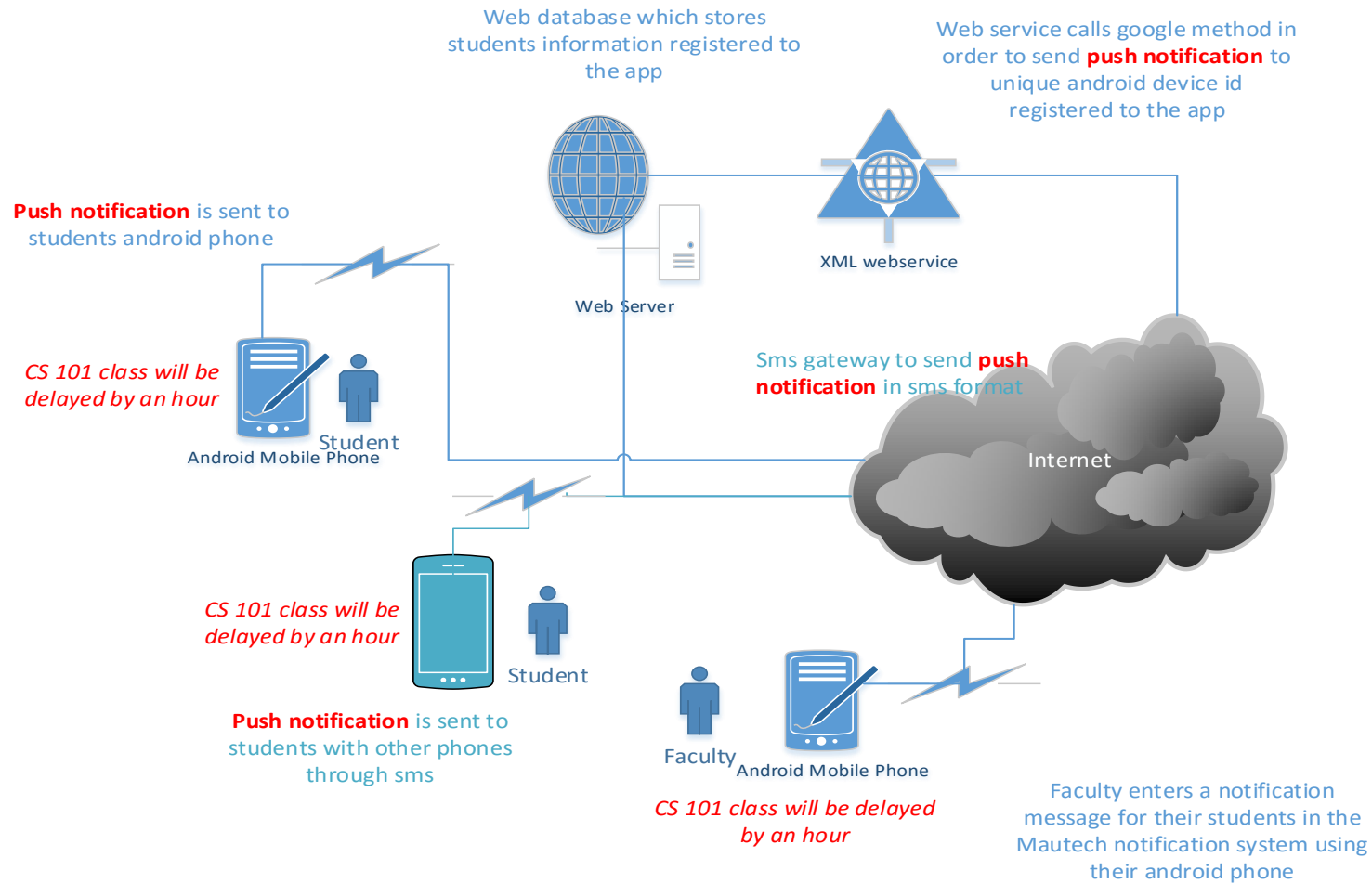


Figure 5. Network Architecture for the System

## THE IMPLEMENTATION PHASE OF THE SYSTEM

The MAUTECH Student Notification System was designed and implemented using SOAP (Simple Object Access Protocol), Java, C# and MSSQL programming. The interface was designed using the android development kit. JAVA programming language with SOAP web services were used to provide the dynamic interaction between the android application and the web services. The web services were created using ASP .NET C# with embedded JSON array in order to hand the web interaction between the web services and the database. The “back end” of the MAUTECH Student Notification system was built using the MSSQL relational database management system. The MAUTECH Student Notification android app tables and relationships were created using MSSQL management studios.

### User Login and registration

The login and sign up page was the first implemented task as it is the first section a user comes in contact with. It can also be referred to as the launcher activity because it is the first thing that appears when the activity is installed on the emulator. It is concerned with querying the user for their personal details, which if validated and verified grants the user access. This activity gives the user a choice to login if they are already registered or sign up if they are new to the system. Figure 6 and Figure 7 are snap shots of the login and sign up screens.



Figure 6. Login Page

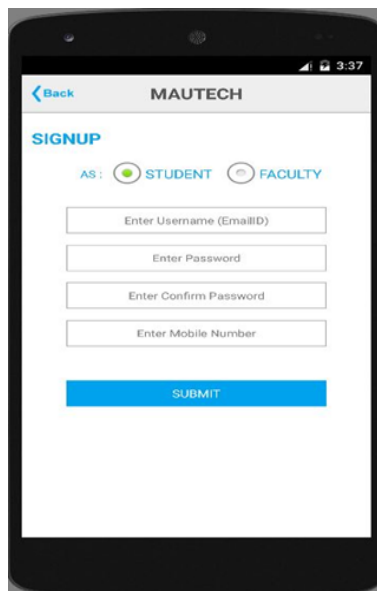


Figure 7. Sign up Page



Figure 8. Home Page Screen Shot

### Homepage

After a user logs in or signs up, he/she is directed to the next activity which is the home page. The homepage is the next activity a user is directed to after they login successfully. It is named homepage.java. It has a corresponding XML file named homepage.xml for the interface design. This homepage consists of other tabs which are: PASSWORD etc.

### Screen Layout Design

The design of the screen layout was developed to appear similar through the pages of the application. The navigation links were around the app page. The main content of the applications, which are the data entry screens are displayed in the center of the mobile screen. The Figure 9 shows how most of the design screens appear in MAUTECH Notification System android application.



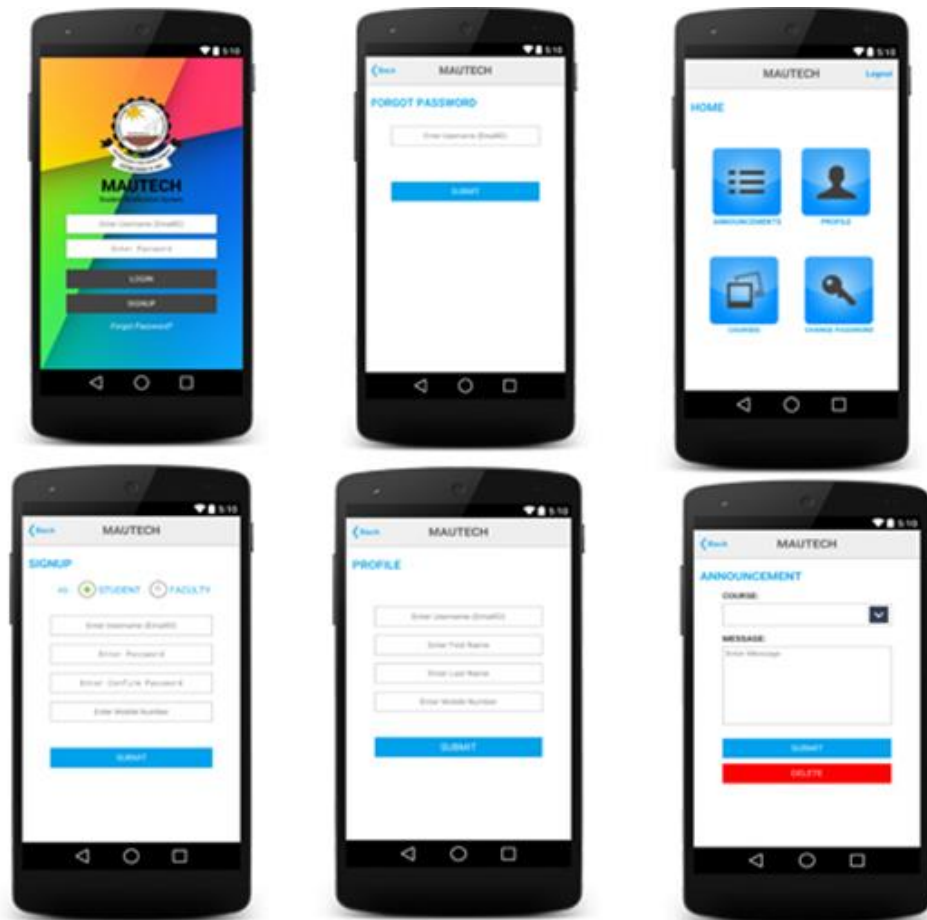


Figure 9. Screen Layouts

**Exception and Error Handling:** The MAUTECH notification system is designed to handle external and internal errors affecting the application. The internal errors are triggered when a user ignores a compulsory text field or tries to gain access to unauthorized area of the app. An empty field exception method checks whether the right data is correctly entered within the text field. If a user enters an incorrect text or leaves the entry blank, the exception methods triggers an error message to the user.

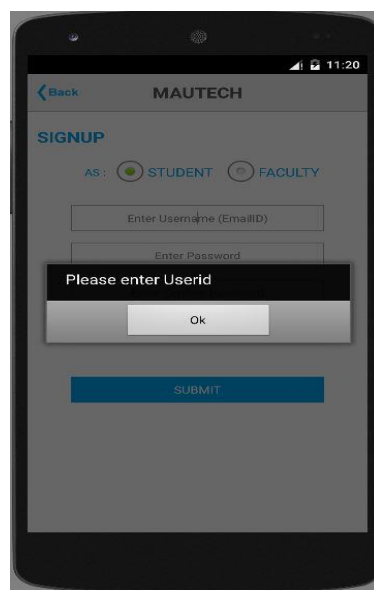


Figure 10. Error Message for Leaving Sign up Text Area Blank

## Test Plan and Results

In the application test, both unit and system tests were carried out. Every part of the software went under thorough test. Although unit testing is time consuming, it really helped in fault detection. The results of the test plans are as follows:

**Table 1. Test Plan and Results**

<i>Test Case</i>	<i>Requirement Description</i>	<i>Data Input</i>	<i>Expected Result</i>	<i>Actual Result</i>	<i>Pass/Fail</i>
Faculty Login	A faculty member can login with their details.	Faculty username and password.	Successful login and navigate to homepage.	Same as expected.	Pass
Student Login	A student can login with their details.	Student username and password.	Successful login and navigate to homepage	Same as expected.	Pass
Duplicate detail	Signing up with already existing user detail(s)	Entering existing username/password/phone number	Sorry the username/password/cellphone number already exists	Same as expected.	Pass
Incorrect login	Logging in with wrong details	Entering a wrong userID/Password	Incorrect userID/password.	Same as expected	Pass
Leaving a text field blank	Leaving an empty login text field	Clicking submit button	Please enter userID/Please enter password.	Same as expected.	Pass
Leaving a text field blank	Leaving an empty sign up text field	Clicking submit button	Please enter username/password/confirm password/cell phone number.	Same as expected.	Pass
Leaving a text field blank	Leaving an empty update profile text field	Clicking submit button	Please enter username/ firstname/ lastname/cellphone number	Same as expected.	Pass
Posting announcement without course selection.	Faculty trying to add announcement before selecting course	Clicking add button	Please select course	Same as expected.	Pass
Leaving announcement text field blank	Faculty leaving the add message text area blank and clicking the submit button	Clicking submit button	Please enter message	Same as expected.	Pass
Viewing announcement without selecting course	Student trying to view announcement details without selecting course	Clicking the announcement tab	Please select courses from home screen first	Same as expected	Pass
Registering with the correct user details	Signing up with correct user details	Entering username, password, confirm password, cellphone number.	Successful	Same as expected.	Pass
Viewing announcement	Student being able to view announcement	Click on announcement	Successful	Same as expected.	Pass
Adding an announcement	Faculty being able to add announcement	Type in message	Successful	Same as expected	Pass.

## CONCLUSION AND RECOMMENDATION

In conclusion the objectives of this proposed system were achieved. The major aim of this research is to design, implement and test a notification system for students in form of a mobile application on which faculty members will be able to post notifications to multiple mobile platforms and for students to view it. When tested, it passed all the test cases, which means nothing unusual, occurred. With reference to the literatures reviewed, the research showed that mobile app usage with in the instructional sector is rapidly increasing. Students are really concerned with regards to being notified in an easy consumable format beforehand.

Although all the main functionalities of this system were implemented with positive test results, not all intended requirements of the project were met. There are some further enhancements that could be made. Some of these missing functionalities include ability of students to be reminded intermittently by an automatic timer when a deadline is closing in and also student's ability to send messages to faculty members, which makes it a push, and pop notification system. These are some of the limitations of the research.

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