NORTH AMERICAN UNIVERSITY

MASTERS THESIS

GTU Plus+: AIO Student Assistant

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Declaration of Authorship

I, Parantap PANDYA, declare that this thesis titled, “GTU Plus+: AIO Student Assistant” and the work presented in it are my own. I confirm that:

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- Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated.
- Where I have consulted the published work of others, this is always clearly attributed.
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- I have acknowledged all main sources of help.
- Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself.

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Date:

"The best thing about a Boolean is that even if you are wrong, you are only off by a bit."

Anonymous

NORTH AMERICAN UNIVERSITY

Abstract

Dr. Ibrahim Suslu

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Master of Science

GTU Plus+: AIO Student Assistant

by Parantap PANDYA

As the technology has grown more and more, mobiles phones have become an integral part of our daily life. It has become imperative for education institutes to have solutions at the mobile level that can allow the students to be constantly connected with them. Gujarat Technological University, one of the biggest state university in Gujarat, INDIA, is also joining the crusade of creating a solution at the mobile phone level that would enable them to make the lives of students easier. GTU Plus+ is an attempt towards that. GTU Plus+ is a mobile level solution for all the problems that students face while using the university website, as well as, a collection of various features that would make the data delivery efficient. With this system, students will be able to access results, exam schedules, course curriculum, archives of old papers, grade history, and a lot more. Students will also be able to receive real time notifications on declaration of results, or on any important notices. They will also be able to make all kinds of payments to the university right from the application itself. GTU Plus+ targets to be a simple, yet intuitive, solution for the student at the mobile phone level, which would enhance the communication between the university and the students.

Acknowledgements

“Appreciation is a wonderful thing. It makes what is excellent in others belong to us as well.”

As they say, man’s quest for knowledge never ends. And in that quest, I have experienced that the theoretical and practical knowledge are essential and complimentary to each other. This type of project most certainly cannot be a one-man show. While I am feeling a great degree of satisfaction at the completion of this phase of the project, this satisfaction would be ephemeral if I fail to thank and acknowledge the people who have been involved, directly or indirectly, with the project.

At this moment of my substantial growth, I cannot find enough words to express my gratitude towards those who were constantly involved with me during the project. I talk about numerous people without whose help this project would be stuck in its nascent stages.

I would like to express my sincere gratitude to our mentor and guide, Prof. Dr. Ibrahim Suslu, for his consistent guidance. His timely corrections, and wholehearted trust in me is one of the vital reasons why I have been able to complete this phase of the project with comfort.

I would also like to thank the staff members of my department. Those subtle advices they had for me eased my way considerably going into the project. I also want to express our thanks to all the colleagues and classmates for their inputs at different times. I am thankful to all of my family members who were a source of inspiration to me. Lastly, but not the least, I would like to thank North American University for allowing me to design, create and pursue this project.

Parantap Pandya

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Introduction

1.1 Problem Summary

As the technology has grown more and more and become an integral part of our daily life, almost all the colleges and universities have joined the crusade of becoming tech-savvy. A lot of them have developed their own websites to provide easy information access to the teachers, students and administrative departments. But despite of their noble intentions, not many of them are able to provide uncluttered and faster access to the said material. They try to take the user to the information instead of attempting to do the other way around. Certain issues that are faced by the users of such systems like not being able to find particular information in due time, or not being able to pay fees on-the-go, not being able to receive vital messages in emergency situations, managerial staff having to work through piles of papers, ailing students not being able to stay all caught up with the happenings of the college/university etc.

To eradicate this to its optimum, a mobile application should be implemented which has a robust database and a strong web server, where the information can be shared easily among the students and also being kept so that it can be retrieved at any time by anybody who is in need of it.

1.2 Introduction to System

Let’s face it, we live in a not-so-patient society. We know what we want and we want it now. Most of us can’t count the times when we have sat waiting for our computers to take over 15-20 seconds to boot up and have found our patience tested. Mobile Apps have taken the “wait” out of mobile. In fact, initially when mobile apps started becoming functional and popular among consumers, a Morgan Stanley Research (conducted in 2012) predicted that mobile users will outnumber the desktop/laptop users by the end of 2014. And accurately enough, that is exactly what has been happening (seen in Figure 1.1).

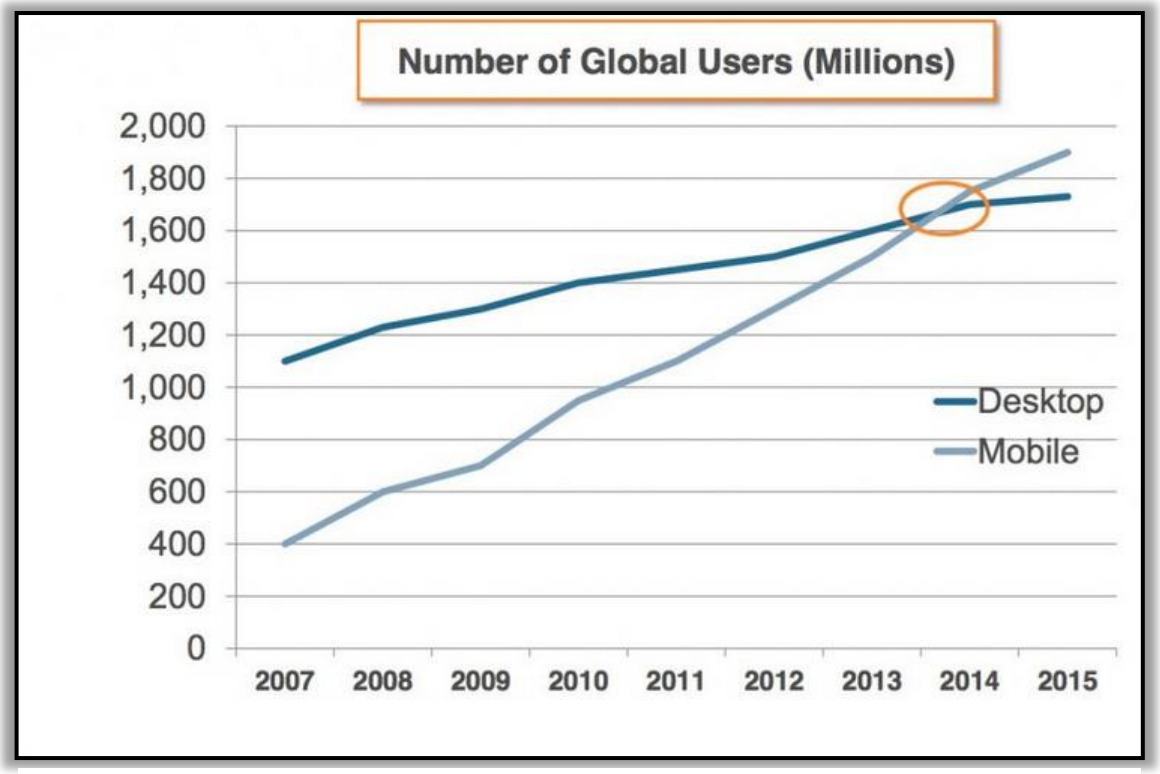

Figure 1.1: Study about Number of Global Mobile Users

It's the year 2019. You don't need to open and browse through the entire website looking for a tiny amount of information. Sometimes the website provides so much of relevant information that searching for something in specific becomes as difficult as finding a particular needle from a stack of needles. These things tend to be pretty time consuming and annoying. Not anymore..!

We are working towards developing a system that runs on the mobile platforms, and combines multiple entities into one. Hence making the search and discover process simpler. Primary goal of the project is to develop a reliable mobile application that provides an easy, uncluttered and faster access to any information that the user needs. Talking from the user perspective, it is much better to bring the necessary information to the user instead of taking the user all the way to where the information resides. That is the central idea of the application which not only delivers the info to the users, but does so without any annoying ads, popups or other hindrances.

Websites, even when they are well-built, don't offer the kind of instantaneous, on-the-go capabilities as mobile apps. They can be slow to load, have too many pages, and often have glitches that require students to re-input information. They are quickly becoming archaic to students who have grown up using apps. Websites, in this sense, may soon be compared to the Dewey Decimal System that we were once required to use. If a higher learning institution wants to connect and engage with students, they're not going to do it from behind a desk or via a desktop application. It means campuses must go where students are spending the bulk of their time, and that's their smartphones. They are expecting, based on what they've come to learn from their personal lives, that everything they need will be accessible via the Internet and even more so, mobile apps.

In a study of student preferences for mobile usage [1], conducted by Educause, numerous students were interviewed on their preferences of mobile app usage. Some of its statistics are as shown in Figure 1.2 and Figure 1.3:

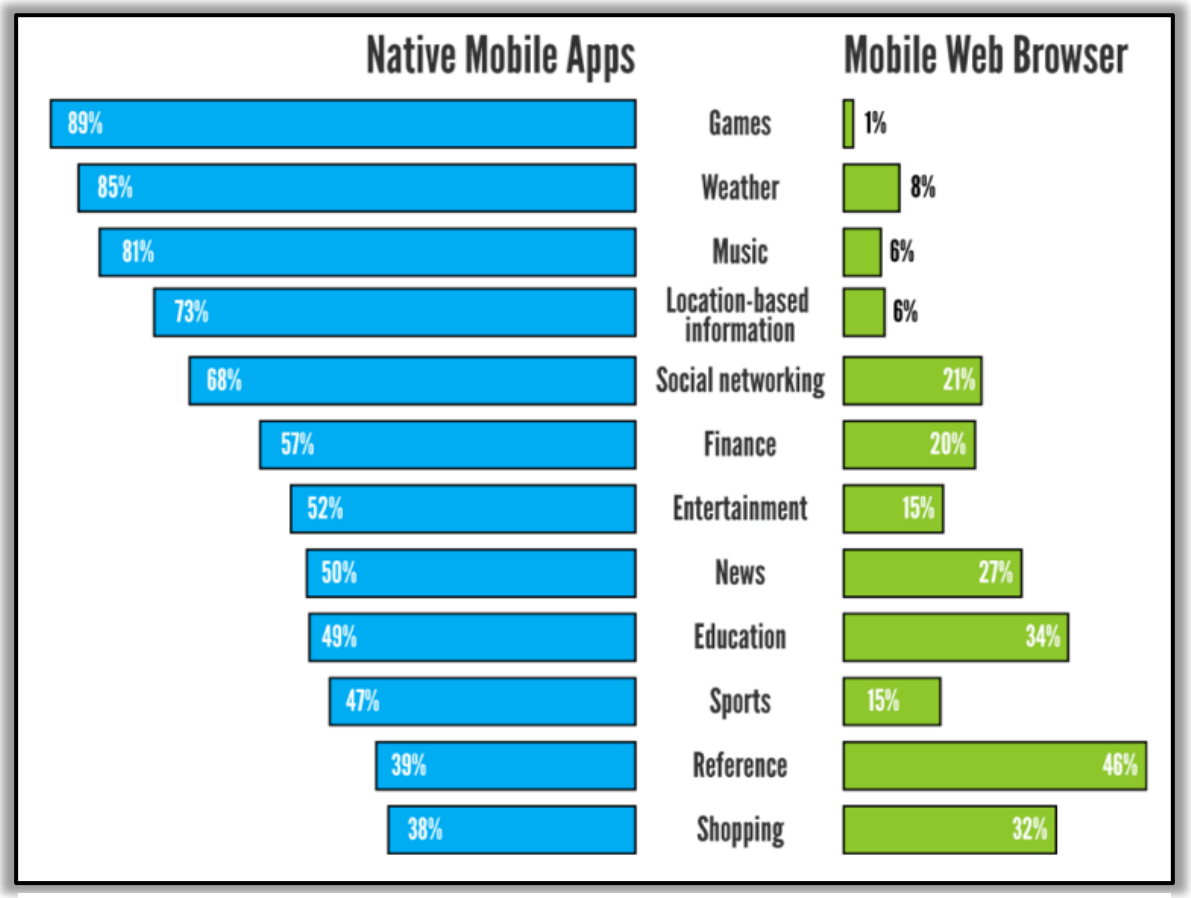

Figure 1.2: Student Preference for Mobile Access by Function Category

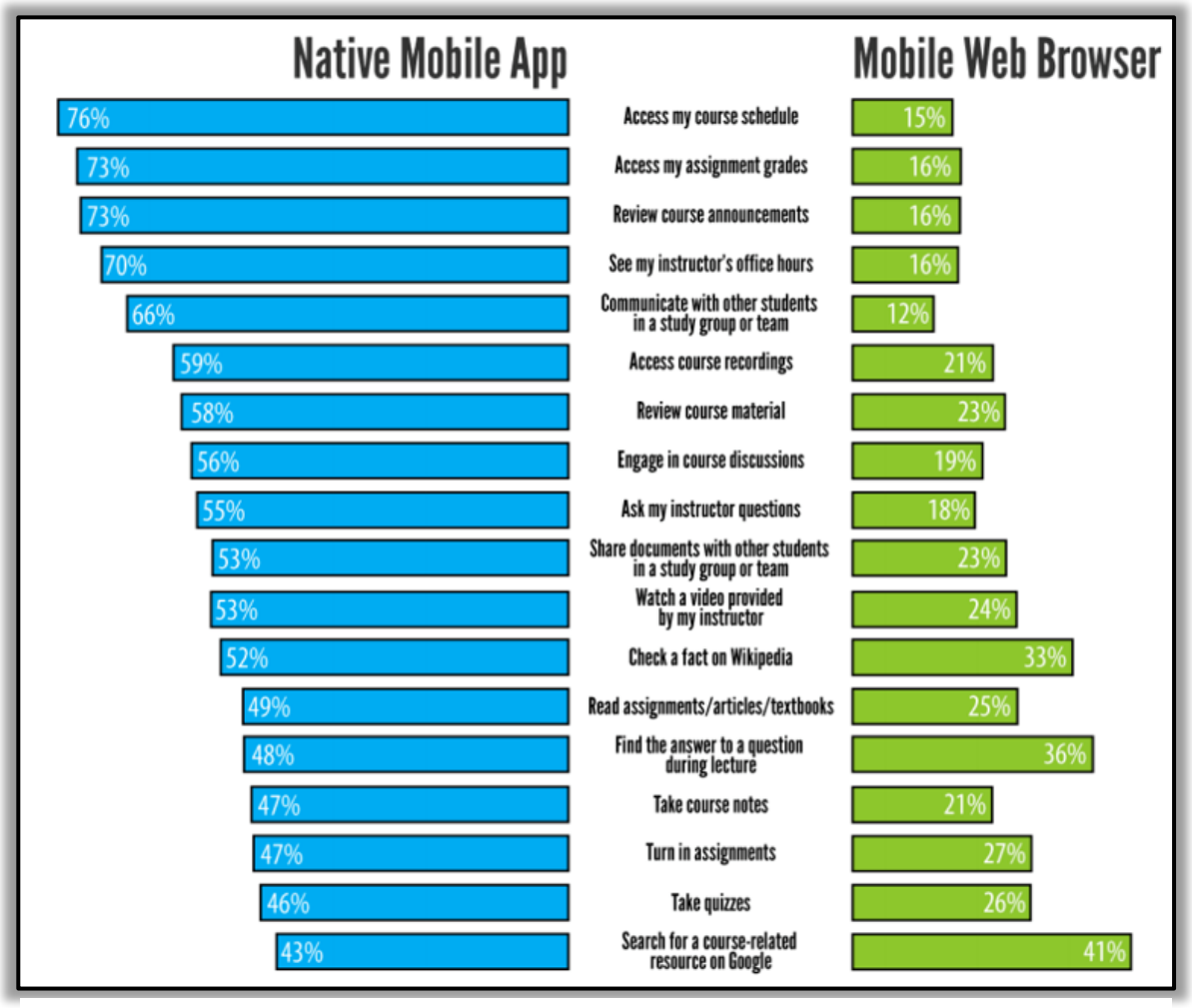

Figure 1.3: Student Preference for Mobile Access for Course Related Tasks

The future of learning is mobile, whether it is a simple delivery technology or something that enables a new method of education not yet possible. This is the future that many of us, as students, see. That is where our solution factors in. GTU Plus+ is a simple interface mobile level application that takes all the information from the Gujarat Technological University website, processes it, sifts through it, and then provides all the relevant information to the users in an uncluttered and faster manner. The application can be used by current students, perspective students, alumni students, professors, administrative staff and anyone who is related to GTU.

1.3 Aim, Objectives, and Significance

1.3.1 Aim

The new system will bring about efficient and effective academic information system. The concise documentation of students and staff details will tremendously improve its timely decision support. The project would also go a long way in fostering good perception of the information age in various institutions and individual organization, thereby breaking the ugly bone of continuous use of manual and archaic systems. It fosters on the in-depth, principles, rules and protocols of coding, scripting and hosting of database driven mobile application. It will also help in making the processing of information as well as in the sport feedback faster. It also stirs and gives focus to the institutions of higher learning on the facilities obtained in the use of modern system of communication. In order to produce a more classified knowledge of the subject matter, the we intend to develop the system and procedure for the university to ensure that end-users are provided with equisetic tools and data that are cost effective and easily accessible.

1.3.2 Objectives

- Eliminating the need of tedious handwritten record keeping process
- Data availability for the administrative personnel right on their phone
- Straightforward and breezy access to information for students about results, syllabus, news, and a lot of other stuff
- Keeping the parents / guardians posted about the progress of their children in a simpler, uncomplicated manner
- Completion of monetary transactions with least amount of hassle
- Identification and solution of user wishes, concerns, problems, and values
- Smooth and intuitive user experience

1.3.3 Significance

This research work critically explores the possible ways of making clear of the mystery behind mobile application development, databases and related technologies, web hosting services, protocols and of course design. Without shifting the focus to the most convenient communication medium, we might still be in darkness for the next few years and by then a new invention might be made which can sentence us into another thousand years of dark

ages. The study will go a long way to cutting down on time wastage, inefficient use of statistical data, manual errors and duplication of efforts by both staff and academic personnel. It will also enhance efficient querying and inquiring, ensure security of records and assist the university in coping with the daily work bases. Designing a database driven mobile system for an educational institution entails more of data collection than traditional programming. Nevertheless, the outcomes and benefits of a well-planned system cannot be emphasized. Although many factors contribute to an effective system, yet there are so many that one could not but think of them all.

1.4 Structure of the Report

The first chapter primarily acts as the introduction to the topic and the subject of the project. The area of research, relevant previous findings, the actual research problem, and the objective of the project are mentioned in the first chapter. The second chapter is more about the literature review and theoretical focus. In that chapter, we elaborate on the surveys conducted by us of the different literature on the relevant areas. The methodology and implementation, Chapter 3, is all about the basics of the project. How the project is working behind the scenes, how the user can use it, the methods that we have chosen in order to implement the project, and details on how the project has been carried out. Chapter 4 talks about the results and findings: the solutions that the project provides, the problems that it addresses, and the questions that arise. The final chapter is all about the conclusion, summary of everything that we have gone through, and the road map of the future.

Chapter 2

Related Literature and Theoretical Focus

2.1 Literature Review

The development and design of the student management system based on the network environment [2] discusses the method of the management information in higher education. On the basis of a comprehensive investigation and analysis on the student management in higher education, the authors establish the models of the college students' management information by adopting the advanced information technology, and construct the student management information platform. Moreover, they analyse the characteristics of the information management in higher education, and elaborate the methods to solve the difficulties confronting in the student management of the higher education. Finally, the key method and technology to carry out the information management platform are presented.

In Android-based Attendance management system [3], a method of taking attendance by employing an application running on the Android platform is proposed. This application, once installed can be used to download the students list from a designated web server. Based on the downloaded list of students, the device will then act like a scanner to scan each of the student cards one by one to confirm and verify the students' presence. The device's camera will be used as a sensor that will read the barcode printed on the students' cards. The updated attendance list is then uploaded to an online database and can also be saved as a file to be transferred to a PC later on. This system will help to eliminate the current problems, while also promoting a paperless environment at the same time. Since this application can be deployed on lecturers own existing Android devices, no additional hardware cost is required.

The paper, designment of student information management based on b/s architecture [4], uses the B/S structure to design the student information management system, and explains the system design principle, system plan and structure, the function module of information system according to current university student information management needs. It provides an interactive students management platform for the information of a large number of students and the management of students.

Research and implementations of web services in android network communication framework using Volley [5] includes combination of Web Services and mobile devices will promote the development of mobile applications. Volley framework (Google 2013 proposed) has the advantages of convenient use and network request faster, but it does not support Web Services. Extension of Volley, to support the Web Services, which can facilitate the Web Services application development, but also can improve the access performance of Web Services. On the basis of analysis and research of the Volley, Ksoap2 and Java Web Services, through the implementation of the HTTP Stack interface and the expansion of JSON Object Request to realize support for Web Services .The scheme uses JSON format to transfer data, support SSL/TLS protocol requests, custom parameter, sets or gets the request header. This scheme is good compatibility, easy to use, suitable for application on Android platform.

A Study of Student Information Management Software [6] provides the particulars to carry out the performance, management and decision-making functions of enterprises or organizations. Enormous grow of students is caused to expand the functionality in the respective educational institutions. As student added to the educational system it is difficult to manage and track student details. To overcome difficulties, the authors have come up with a new approach student information management system with additional features. This new approach will provide fast processing, efficient student tracking, and produces desired result. This approach will allow students to save their personal details. It is more secure, reliable and easy to use.

The college student management system design using Computer Aided System [7] utilizes computer aided system. The model plays main role in an institution or in the college management. Initially, the system has developed with four layers based on the hierarchy such as Web display layer where application is deployed and displayed for end users. Business logic layer responsible for handling the functionality of the product. Data access layer is responsible for viewing the data. Database layer responsible for storing the student data. In Database layer ER diagram has been designed to provide data normalization. The process provides complete information about student, faculties and educational institution. Third thing in this project is to allowing user based on their categories.

Toward A Student Information System [8] provides end user a seamless navigation to the application and ease of access. The model provides information management storing of student academic reports. This model consists of various functionalities like information about the courses available in the college starting from first grade to graduation. It also enables students to enrol to particular course online, online fees payment, examination results, and also get notified when important events occur. All data stored and retrieved through the application is secure. So, to achieve this the authors have developed a powerful

web based secured interface application which supports all type of request which are coming from the students also which gathers and corrects all student information. To achieve this, authors have used similarity (Euclidean distance) algorithm. The results showed that the new information gathered by the SDS has the ability to fill the requirement and done the error correction in the traditional model. The system provides seamless access through the web-based application to access and manage different department or all over the organization. This system is used to mainly monitor the attendance for the university. Students are provided access to login to application and view the progress report and attendance report. Initially faculties/students get registered with the system once they finish registration process, they can access the system as well as they are able to do the changes in the data. As per the requirement, users are granted with certain level permission to manage and track the student information. Either student or faculty can upload and copy the statistics from the database. Since it is a web-based application which is accessible from any part of the world it has certain features like accessibility, ease of use, etc. It is developed to suit the current environment which is rapidly growing in the student domain.

Chapter 3

Design, Methodology and Implementation

3.1 Methods of Data Collection

There are numerous approaches to data collection depending on the nature of the research being conducted. In this project, the methods adopted include the following: Interview, World Wide Web, references to published and unpublished collection. The data collected for this research can be broadly classified into two types, namely: the primary and secondary data.

Primary Data

Primary data can be defined as data collected directly from respondent relevant to the subject under investigation. The primary data obtained in this case is by interview method. The primary source data collection are the sources from where first-hand information can be obtained. The tools for gathering the primary source of data collection include; interview, observation and questionnaire etc.

Secondary Data

These are the sources of data collection in which an already made data is being obtained i.e. the information that is already in printed form. Sources of secondary data include, textbooks, magazines, journals etc. In case of this project, most of the data is published documents and references.

The Interview Approach

We employed a combination of both oral interview, questionnaires and observation method by consulting staff, students, lecturers and downloading of information from websites to investigate the system. The oral interview and distribution of questionnaires were limited to the Gujarat Technological University.

3.2 Design Analysis

When we balance desirability, feasibility, and viability, we increase the value of our design solutions. A good depiction of the same is shown in Figure 3.1.

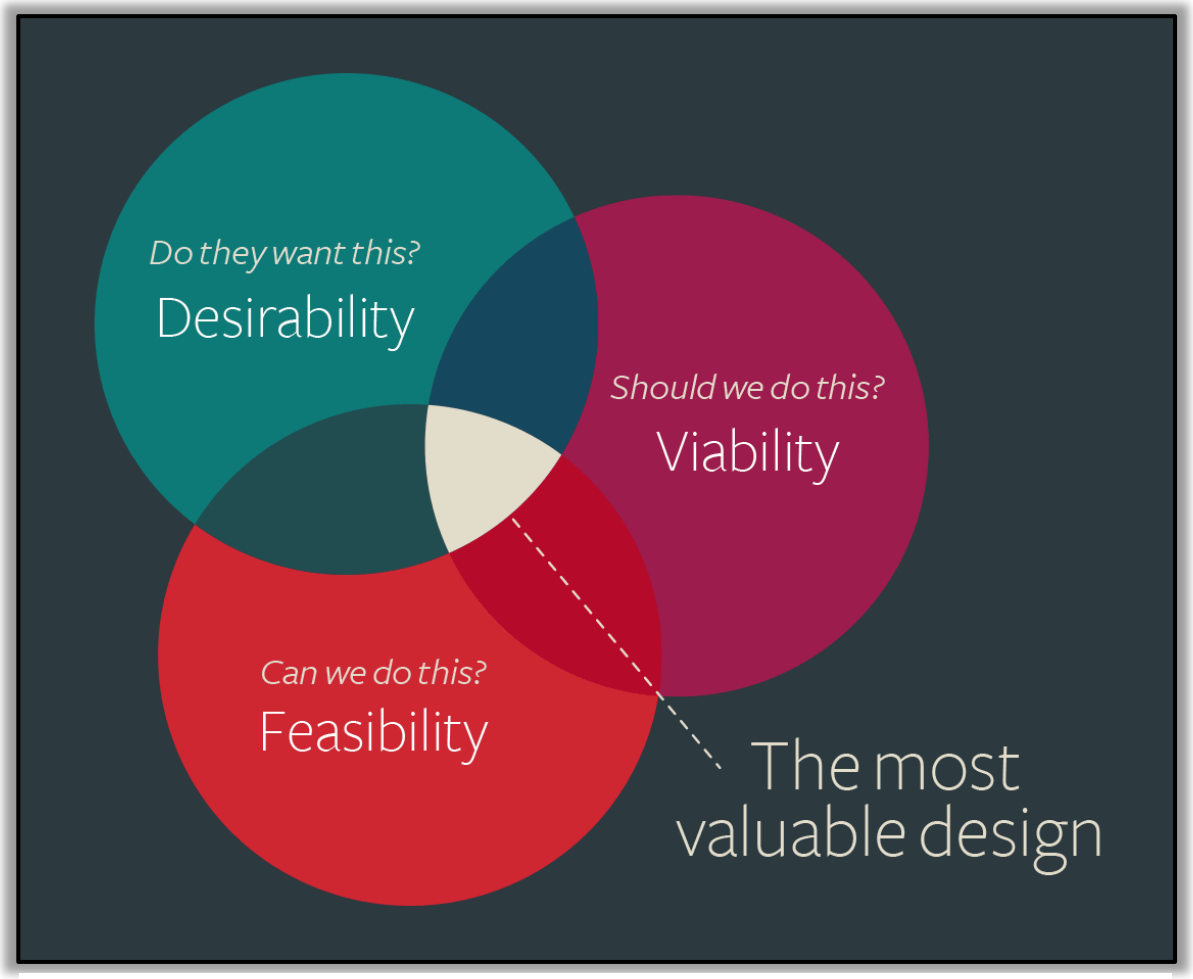

Figure 3.1: Description of Desirability, Viability and Feasibility

The three factors that helped the project design stay on course are discussed below:

Desirability

Will this solution fill a need?

A great place to start is by checking to see if the project is adding value to the world. According to our literature review, a product that combines all the different services and provides relevant information is not available for our targeted university. Hence the solution will fill a need.

Will it fit into people's lives?

Understanding the people using our solution tells us how they live and in what way our solution supports or conflicts with their lifestyle and use cases. And when we look at it, the simple and intuitive user interface, and the number of services that are provided in the simplest of manner, the application will make it easier to fit into the lives of the students of Gujarat Technological University.

Will it appeal to them?

While it shouldn't be the only consideration, we also don't want to neglect the appeal factor altogether. Therefore, we are trying to create the application in a manner that feels natural to the user. When it comes to desirability of a product, the first brand name that comes to mind is Apple. Simple designs yet elegant looks..! Figure 3.2 shows what they have to say regarding the desirability of a product:

Figure 3.2: Description of How a Good Design should be

Will they actually want it?

There's no point in going through the trouble (and resources) designing and executing on a project that nobody wants in the first place. So, we are trying to keep a minimalistic approach in the design.

Feasibility

Is the technology needed to power the design solution available or within reach?

Sometimes the goal is to create a new technology, but sometimes we need to work with what we've got. In our case, we have all the technology available for us. All there needs to be done is proper programming that puts together all the functions that work seamlessly.

How long will this take?

Of course, most of us would like to have what we want yesterday, and we are not advocating for unreasonable deadlines. But when a reasonable client request is to have a project up and running in two months, yet our solution is projected to take six months to complete, it's not a feasible solution. There's no need to extend the timeline simply to accommodate our own ideals to the detriment of a client's deadline.

Viability

Will the design solution align with the business goals?

By understanding what the business wants to accomplish, we can focus our energy in the right direction.

3.3 Implementation Strategy

We have gone through a step by step process wherein we initially created the AEIOU canvas which advocates the concept of design thinking. Here, AEIOU stands for Activity, Environment, Interaction, Object and User canvas respectively. Then we created Empathy Mapping canvas, Ideation canvas and Product Development canvas that primarily involve research and data collection. We also collected data and made a list of problems that organization entities face in the day to day life. We made sure that all those problems are addressed in the planning phase of the project. We also roughly estimated the amount of resources used in the regular life of the organization. Taking that amount into account, we planned for our product in a manner that decreases the usage of the resources and helps the environment simultaneously.

3.3.1 Product Development Canvas

Purpose

It refers to the purpose of why we are developing what we are. The purpose of this concept is to provide users with an environment which is:

→ More convenient

→ Faster

→ Easier to browse

→ Improved user experience

→ Showing the primary features right away while also determining useful secondary features

→ Usable while offline yet syncs automatically as soon as you go online

→ Using lesser paper means hence supporting the GoGreen Initiative.

People

They are the key customer segment who will use this product/ service or the end product of the concept we are pursuing.

→ Students: They will be the major part of users of the current project. It would help them to find all the information necessary, check for results, staying notified about the events, seminars being conducted, contact information and a lot more

→ Faculty: Just like the students, even the professors / teachers can stay connected to the latest happenings of the college / university as well as staying in touch with students regarding their study and important notices

→ Parents: It will be helpful to all the parents who want to keep a tab on the progress of their child / children. It will also give them alerts about the particulars, facts and statistics that they want to know

→ Administrative Staff: The product will most likely eliminate the tedious handwritten record keeping process. All the information that the admin staff needs will be available to them on a click or few touches without any hassle.

Product Experience

This refers to what the consumers feel when they use the product or service.

→ Prompt Direction: Student would feel less tensed once they know the facts about the newer topics. They won't feel lost or misinformed.

→ Independence: When people can do their work without anyone's assistance, they feel more independent

→ Convenience: The product offers the users more convenience as it is easy to carry and use

→ Time Saving: It is much easier to navigate through an application instead of searching through a website

→ Intuitive: The more the people feel at ease while using the application, more the number of users.

Product Functions

Functions are the product's answers to user's problems/needs. They do something that user wants. Few of the functions implemented in our concept are:

→ Circular / Notification Board: The application should deliver the users with the latest circulars and notification to keep them informed.

→ Results: It should make is easier for the students to check for their result without any kind of unnecessary hassles.

→ Archive of Old Papers: It should have all the old papers so that the students can download them and refer them as a studying material before exams.

→ Curriculum Details: There should be a database which can provide the students with all the details of the career/ faculty they want to pursue.

→ Contact Information: The students should not feel at ill-ease while finding contact numbers of colleges or the university help centres.

Product Features

Product features are specific. One or more features will power a function. The features required in our product are:

→ Easy Navigation: The user should not experience any difficulties in going to one page and returning to the main page.

→ Light Weight: The application should not take up too much of a storage space or RAM to create problems for user.

→ Real-time Alerts: This is to make sure that users get all the information on their home screen without much of a fuss.

→ Enhanced Search Function: If there comes a case where the user is not able to find something while browsing, the search function should enable them to find things quickly.

→ Student Discussion Forums: Uniting the ex as well as the current students and the faculties to help each other and make learning a more interesting activity.

→ Real-time Information of Events: If there is a case of student missing some important event, the news updates and the photographs should help them feel there.

→ Easy to Handle: The handling of the application should be easy as parents are one of the key users

→ Easy to Use: It should be easy to use for various kinds of users

3.4 System Modules

The project is a mobile application that will act as a bridge for communication between the Gujarat Technological University and its students. The application will be a combination of the existing services and features from the GTU website, alongside a few new features that make the resulting product intuitive, easy to use, and efficient. The primary features of the project are listed below:

- Result Module: This module of the application will be a combination of the result module of GTU website, as well as, GTU's mobile application specifically created for results. This module will keep things simple for the user, but will fetch data efficiently behind the scenes from the quickest source.
- Timetable Module: This module, as the name suggests, will show the user exam schedules for their internal examinations, final theoretical examinations as well as

the practical examinations. In case of change in any of the existing schedules, the application will automatically create an alert of this change for the user.

- User Profile: This module will contain all the details of the user. Starting from all of their results, their GPA, college and class information, to interactive graphs and insights that will give the user a better idea of their performance.
- Syllabus: This module will have a collection of all the courses offered in all the branches, of all the colleges affiliated to the Gujarat Technological University. This module actually will be an original solution to an existing problem on the GTU website, where the surfing and searching process is tedious.
- Exam Papers: Just like the curriculum, this module will have a dataset of all the exam question papers dating back as many as 10 years. Users will be able to access all these papers in simple 3 click process, without any extra hassle at all.
- Payment: Be it the semester fee payment, or a single course fee payment, or just a simple payment to obtain transcripts, the user will be able to handle everything from the app itself. The app will directly connect the user to respective payment portal based on the user requirements.
- Grade History: Anytime, anywhere when the user wants to access their grade history (regardless of the fact whether the user is connected to internet or not), this module will provide the user with instant access. It will also provide user with other statistics such as student rank in their college, and in the entire university.
- Circulars and Notices: Instead of having to pin something on the notice board, or working hard to spread the news via word of mouth, the university will be able to reach the students in a seamless manner with this module. The students will receive a categorized, and sorted set of circulars and notices, which they can skim through.
- Real time notifications: The user will get real-time notifications of their own result declarations, timetable declarations, new curriculum declarations, as well as all the important university circulars and events.

3.5 Implementation

3.5.1 Project Planning

Project planning is perhaps one of the most important works in developing any project. Before the project can begin estimate regarding work to be done, what resources will be required and how much time will elapse from start to the finish of a project. Planning helped us to prepare a framework that enabled to make us a reasonable estimate of all such things. Project planning is concerned with identifying and measuring activities, milestones and estimating some basic attributes of the project

→ Cost: how much will it cost to develop the project?

→ Duration: How long will it take to complete the development?

→ Efforts: How much efforts would be required?

The effectiveness of the subsequent planning activities is based on the accuracy of this estimation. Scheduling man power and other resources, Staff organization and staffing plan, Miscellaneous plans such as quality assurance plan, configuration management Plan, etc.

Project management involves planning, monitoring and control of people, process and the events that occurs as software evolves from a preliminary concept to an operational implementation. Cost estimation is a related activity that is concerned with estimating the resources to accomplish the project plan. Software project management is an umbrella activity within software engineering. It begins when any technical activity is initiated and continues throughout the definition, development and support of computer software. Project must be organized into effective teams, motivated to do high quality software work and coordinated to achieve effective communication. The product requirement must be communicated from customer to develop, partitioned into their constituted parts and position for work by the software team. The process framework is selected and appropriate software engineering paradigm is applied and set of work, task is chosen to get the work done. The project must be organized in a manner that enables the software team to succeed. A project management activity encompasses measurement and matrix, estimation, risk analysis, schedules, tracking, and control.

3.5.2 Process Model

Process models are processes of the same nature that are classified together into a model. Thus, a process model is a description of a process at the type level. Since the process model is at the type level, a process is an instantiation of it. The same process model is used repeatedly for the development of many applications and thus, has many instantiations. A process model is roughly an anticipation of what the process will look like. What the process shall be will be determined during actual system development. The goals of a process model are to be:

Descriptive

→ Track what actually happens during a process

→ Take the point of view of an external observer who looks at the way a process has been performed and determines the improvements that must be made to make it perform more effectively or efficiently.

Prescriptive

→ Define the desired processes and how they should/could/might be performed.

→ Establish rules, guidelines, and behaviour patterns which, if followed, would lead to the desired process performance. They can range from strict enforcement to flexible guidance.

Explanatory

→ Provide explanations about the rationale of processes.

→ Explore and evaluate the several possible courses of action based on rational arguments.

→ Pre-defines points at which data can be extracted for reporting purposes.

3.5.3 Project Development Approach

Our project is developed using specific software development lifecycle. Software development approach is best suited for the project depends on the requirement and other factors. A process model is a development strategy that is used to achieve a goal that satisfies the requirements abiding by the constraints. There are many types of Software Process Model like:

→ Spiral Model → Linear Sequential Model

→ RAD Model → Incremental Model

We have used the Spiral Model (shown in Figure 3.3) for our project. The spiral model is a software development process combining elements of both design and prototyping-in-stages, in an effort to combine advantages of top-down and bottom-up concepts. Each phase starts with a design goal and ends with the client (who may be internal) reviewing the progress thus far. Analysis and engineering efforts are applied at each phase of the project, with an eye toward the end goal of the project.

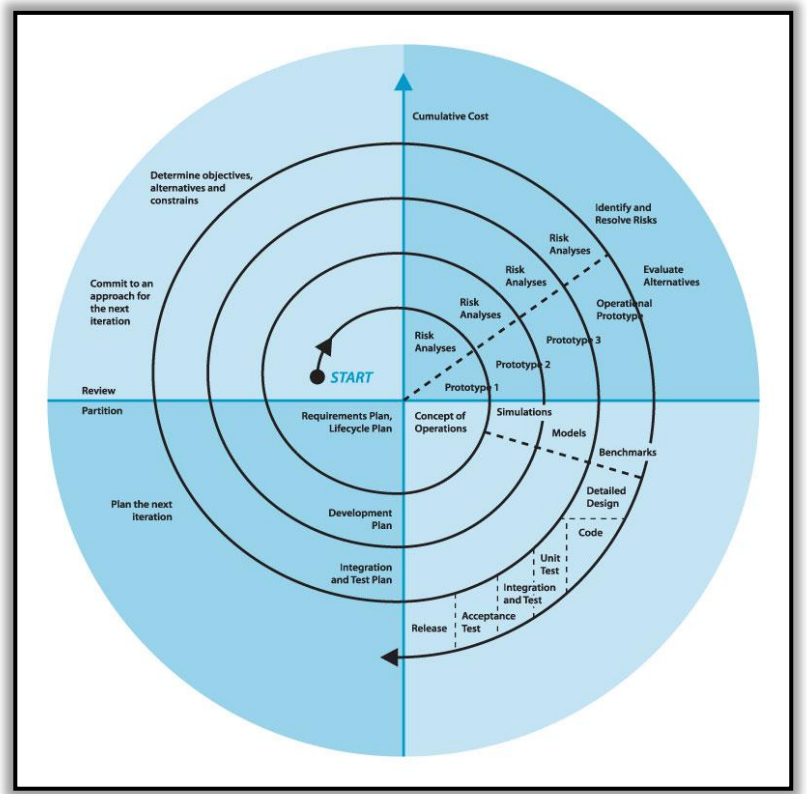

Figure 3.3: Spiral Model

Why Spiral Model?

→ Estimates (i.e. schedule, etc.) got more realistic as work progressed, because of important issues were discovered earlier.

→ It was more able to cope with the (nearly inevitable) changes in the product.

→ Development process was mostly expected.

→ Risk involved was of high priority.

→ Project might have benefited us from a mix of other development methodologies.

→ Delivery date takes precedence over functionality, which can be added in later enhancements.

3.5.3.1 Requirement Gathering

Here first the initial requirements for developing the system were gathered from various sources available externally and internally as per the proposed system.

The four sub activities for the process are:

→ Requirements discovery

This is the process in which we interacted with the project guide to collect the requirements for the system. We found their point of views and find what they wanted to do. We also collected the requirements from the users of system.

→ Requirement classification and organization

This is the process in which the requirements which we collected from different sources were classified and organized in specific manner.

→ Requirement Prioritization and negotiation

This is the process in which we gave priority to each requirement. Some requirements conflicted with other requirements so on the basis of their priority we dropped the requirements which had less priority to secondary level.

→ Requirement documentation

This is the process in which we kept doing the documentation of all the requirements.

3.5.3.2 Design

As per the requirements gathered from the above phase, we designed the basic structure of our product and tried to satisfy the primary requirements first. Once the primary requirements were structured properly, we started adding the secondary requirement to the document. User interface has been designed in a very simple manner that enables the user to understand the application without any manuals.

3.5.3.3 Development

This process deals with implementation of the design decided in the above phase. Using the latest development tools in designing, the user interface was designed. And after developing an initial prototype of a part of the system it was handed over for evaluation. The necessary corrections were made and the interface was improved.

3.5.3.4 Evaluation

This process deals with implementation of the design decided in the above phase. Using the latest development tools in designing, the user interface was designed. And after developing an initial prototype of a part of the system it was handed over for evaluation. The necessary corrections were made and the interface was improved.

3.5.3.5 Milestones and Deliverables

Milestone and Deliverables are one of the more important tasks for the project scheduling because if milestones are achieved in specific amount of time than it increases the confidence of the developing team and makes the further work a bit easier. Deliverables means that software is delivered with all the requirements specified by the user. The pie chart below (Figure 3.4) shows milestones achieved during the development of our system.

Milestone

Milestones are tools used in project management to mark specific points along a project timeline. These points may signal anchors such as a project start and end date, a need for external review or input and budget checks, among others. In many instances, milestones do not impact project duration. Instead, they focus on major progress points that must be reached to achieve success.

Milestones have no duration; they represent instantaneous events that occur throughout the project. Typical project events that are marked with milestones are:

- → The completion of project phase
- → The approval of a deliverable
- → The completion of a scheduled review
- → The completion of any activity
- → The commencement of an activity

Deliverables

A deliverable usually has a due date and is tangible, measurable and specific. A deliverable can be given to either an external or internal customer and satisfies a milestone or due date that is created and produced in the project plan. A deliverable can be a software product, a design document, a training program or other asset that is required by the project plan. In a project environment it is recognized good practice for all tasks to have deliverables. The assertion is that tasks with no physical outcome are of questionable value.

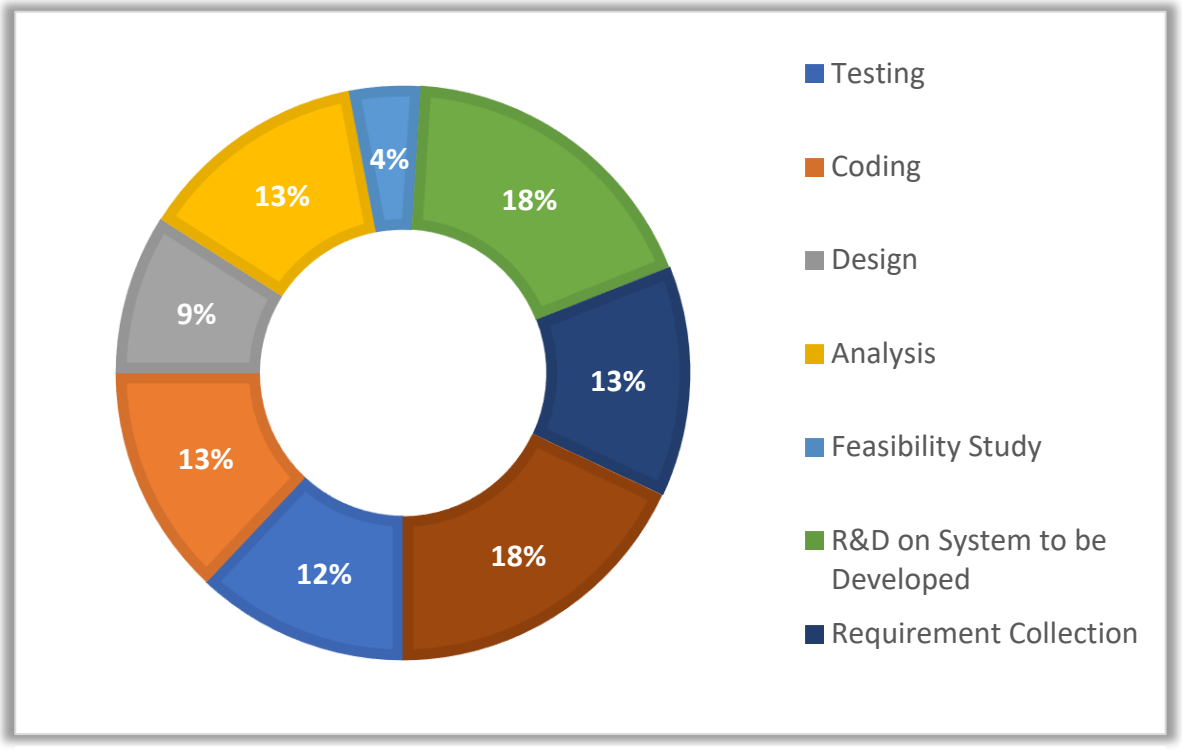

Figure 3.4: Milestones achieved during System Development

3.6 System Flow Diagram

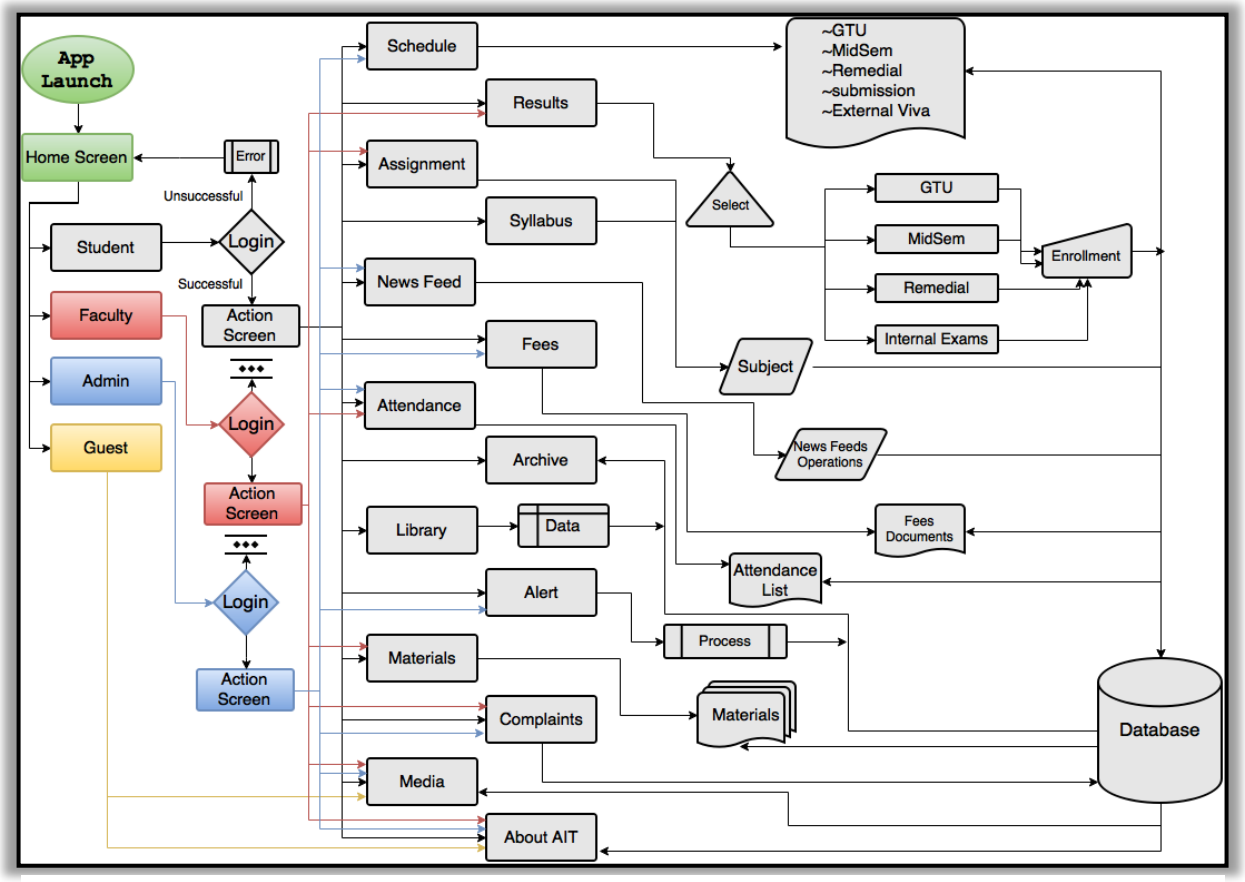

Figure 3.5: System Flow Diagram

3.7 Entity Relationship Diagram

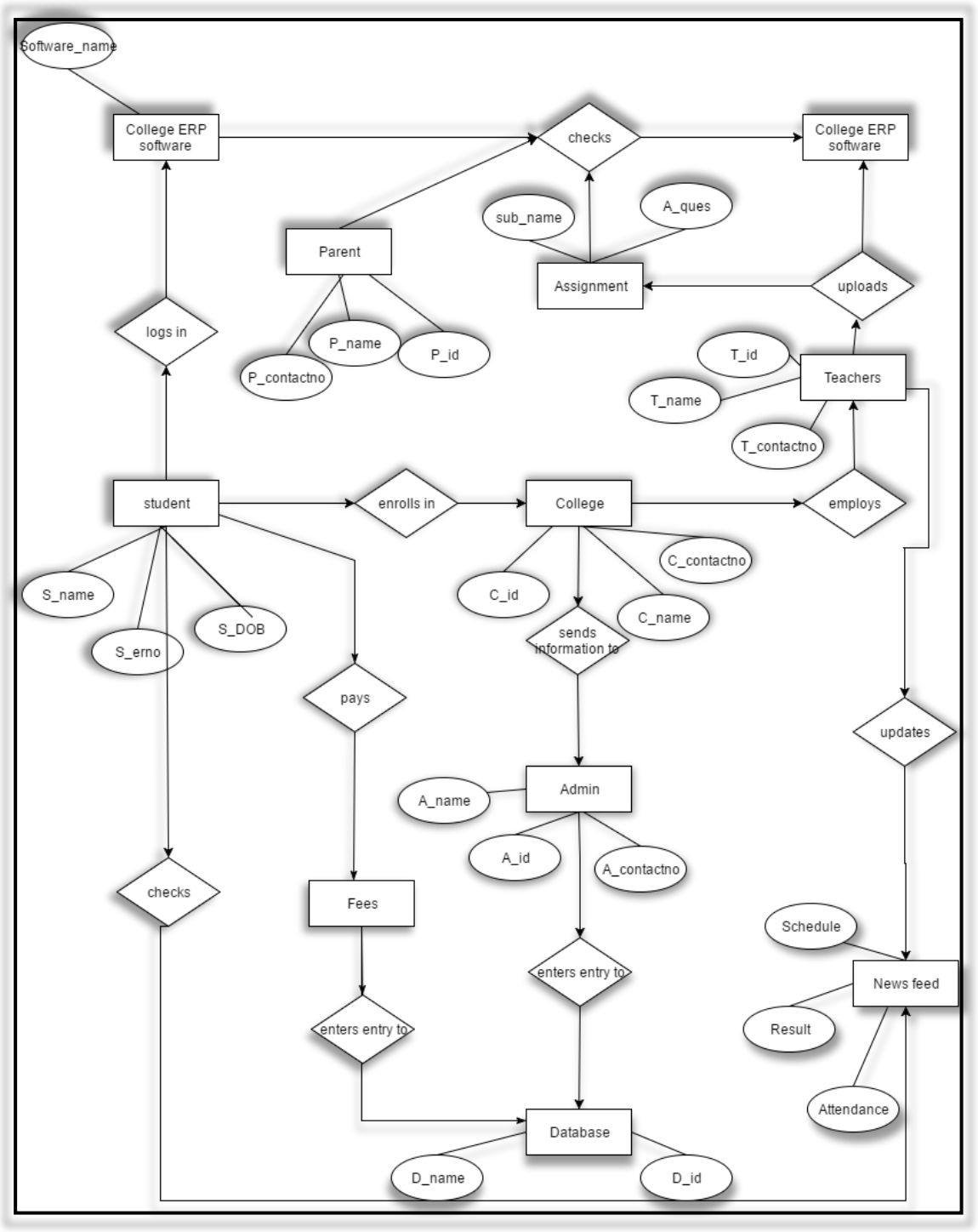

Figure 3.6: Entity Relationship Diagram

3.8 UML Diagrams

Use Case Diagram

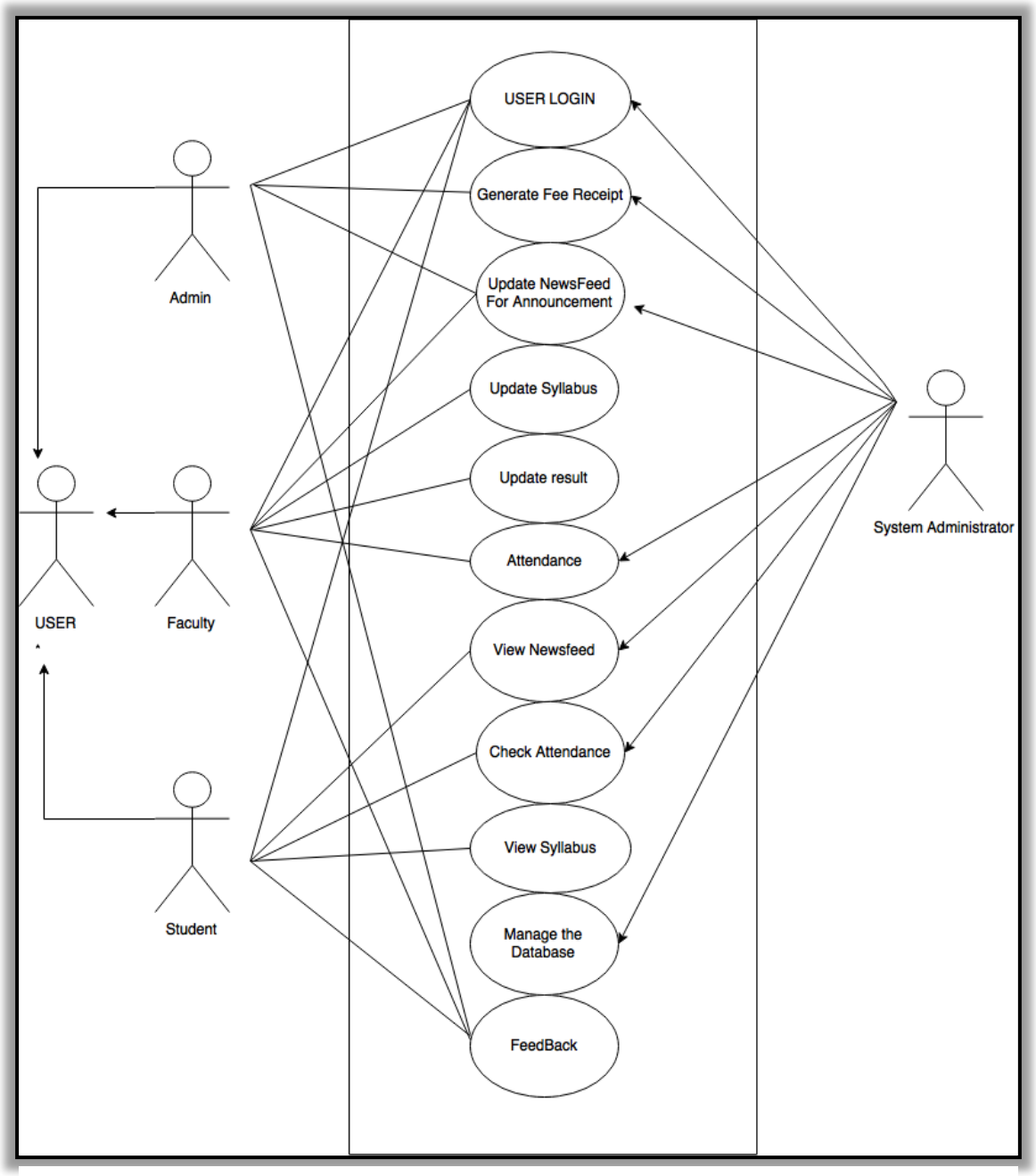

Figure 3.7: Use Case Diagram

Activity Diagram

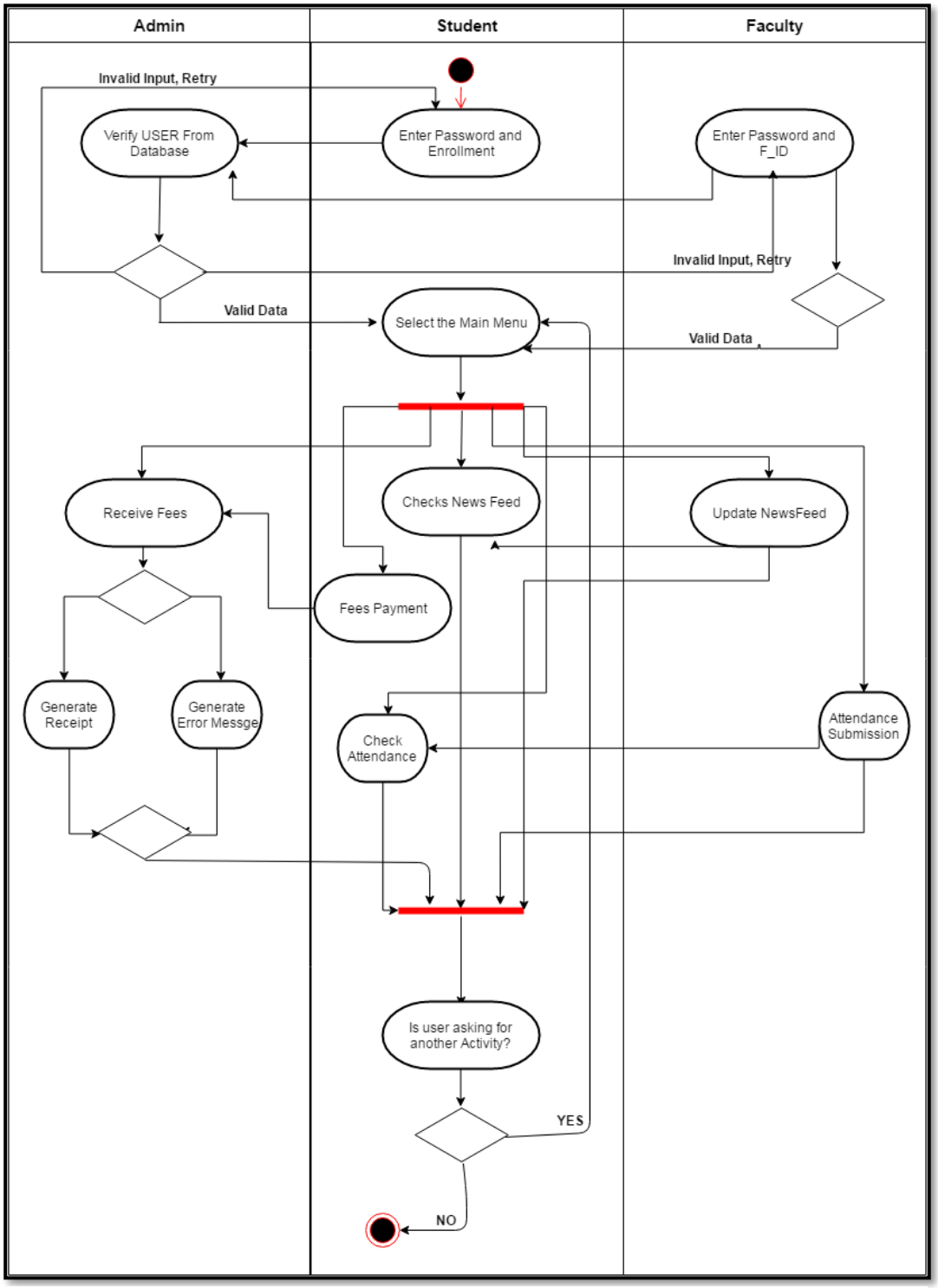

Figure 3.8: Activity Diagram

Sequence Diagram

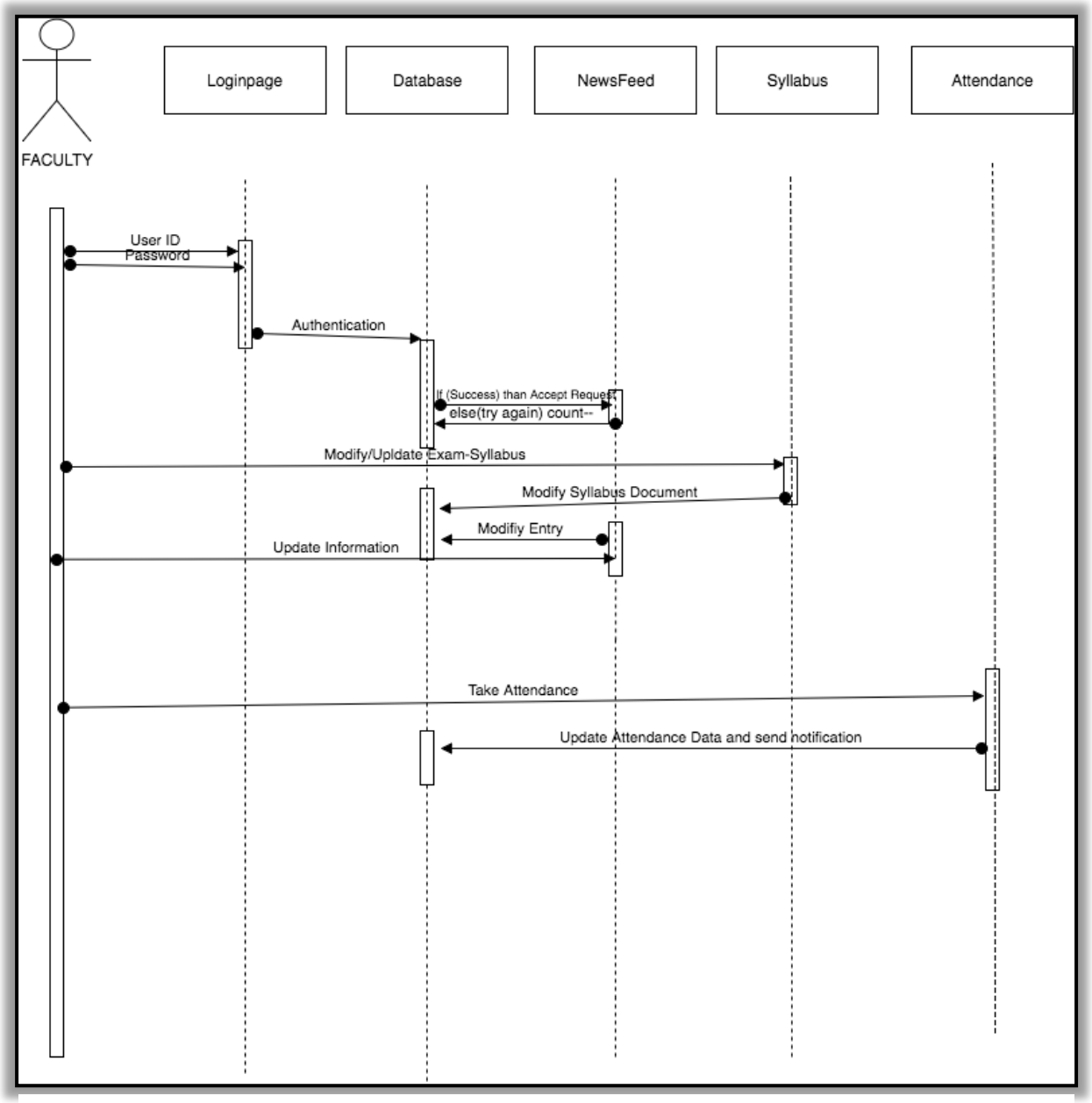

Figure 3.9: Sequence Diagram

Context Diagram

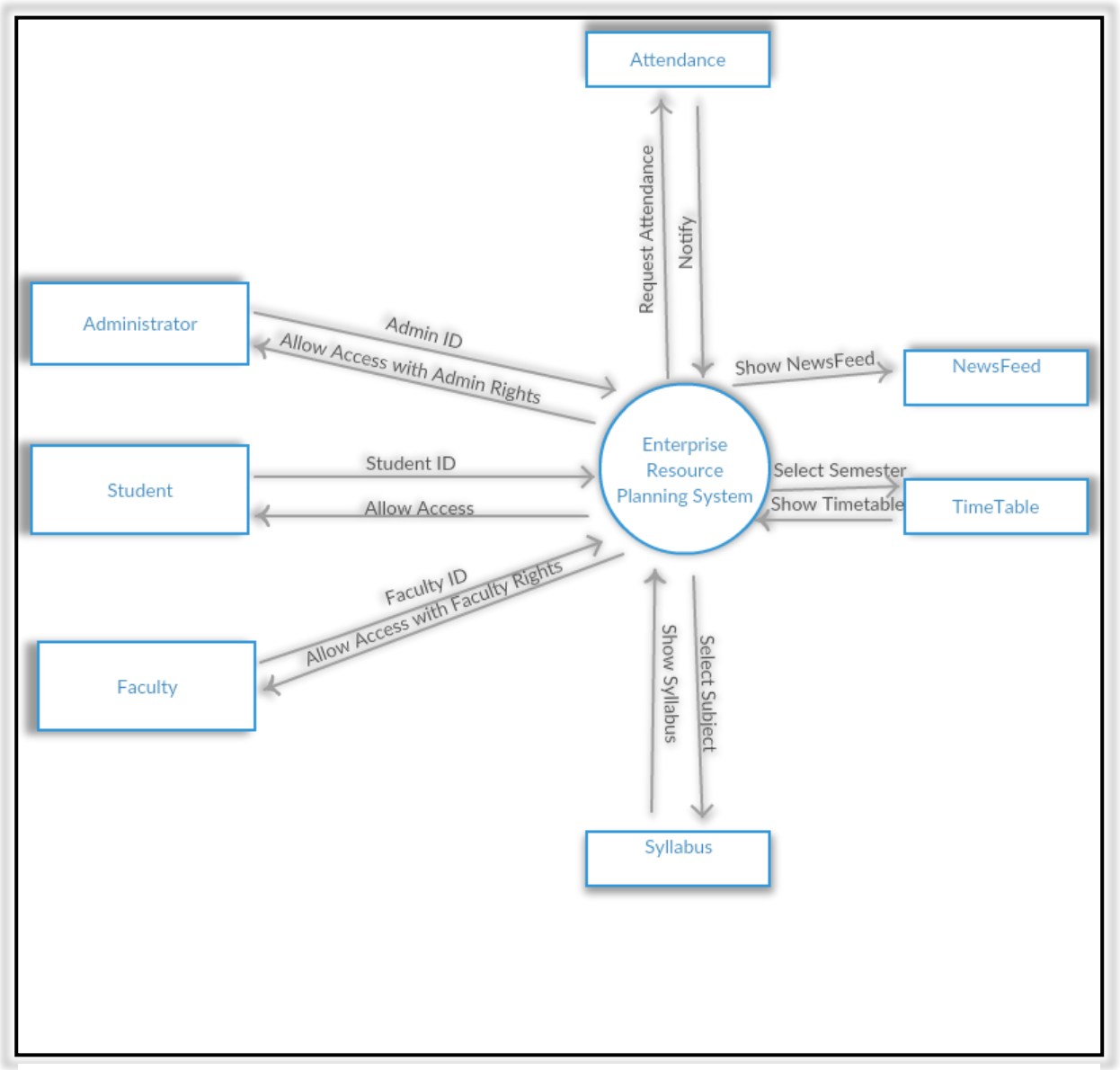

Figure 3.10: Context Diagram

Collaboration Diagram

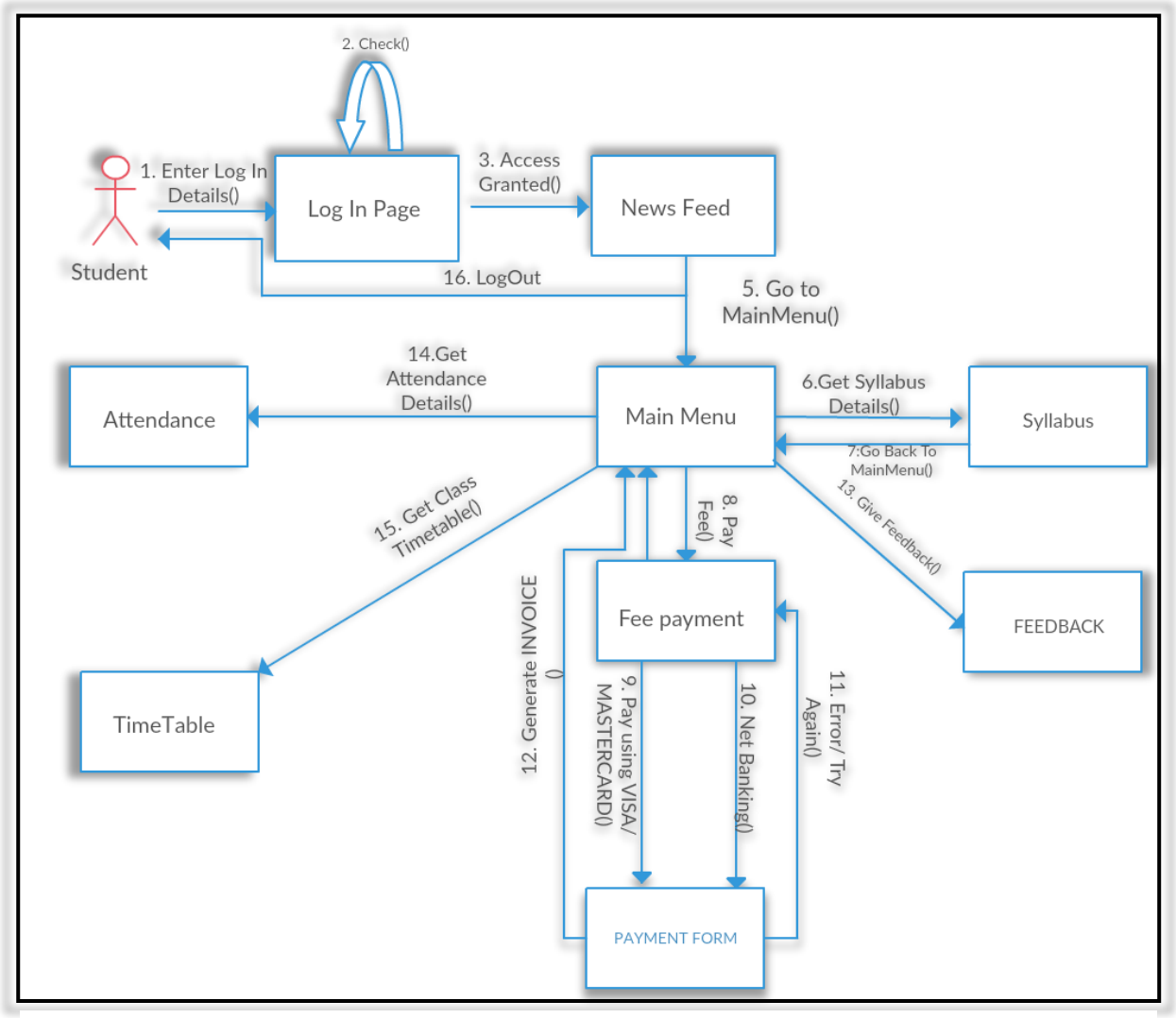

Figure 3.11: Collaboration Diagram

Chapter 4

Testing and Results

4.1 Testing

4.1.1 Testing Plan

The main objective of doing testing is to identify all defects existing in software. Basically, the testing of web application consists of providing the program with a set of test inputs (test case) and observing that whether the application behaves as expected.

Testing is the process of executing a program with the explicit intention of finding errors, which makes the program fail. The tester is actually trying to make the program fail. A successful test is the one that finds errors.

Regardless of which strategies the analysts follow, there are preferred practices to ensure that the testing is useful. The levels of tests and types of test data, combined with testing libraries are important aspects of the actual test process. Among the various testing practices or strategies that are followed by analysts, the two important ones are unit testing and system testing.

4.1.2 Testing Methods

Unit Testing - Module Testing

In this testing individual components and modules are tested to ensure that they operate correctly. We had tested each and every module such as login details, user details, for regular users, visitors. For this we have checked the database for particular entry for validation and the verification.

Integration Testing

This testing is a systematic technique for constructing the program structure while at the same time conducting tests to uncover errors associated with interfacing. All the modules testing in the unit testing are integrated and are tested for their inter-dependency. This system mainly works on the integration of all the departments. So, we have checked when user logs into the system, the user details should be fetched properly.

Validation Testing - Alpha Testing

Alpha Testing is conducted for various validations. The participator enters his test the system by entering live data. If any error occurs in the system, they directly contact us. During this testing, we discovered certain error that would have prevented the users from submitting the bug report. The error was taken into account and resolved.

Security Testing

This testing is done to confirm that the software allows only authorized users to access and use the system. There are five types of users in our system including the students, faculty, administrative staff, parent and guests. Without proper authentication it is not possible for any user to login to the system and use the core functionalities. By only letting the user enter their authentication id and validating them by their phone number/ email address, we have negated the need to use a password for login, which makes the system even more secure.

Acceptance Testing

This type of testing is done when the system is being deployed. The testing data are supplied by the system procurer. Our product is still in development where many features are yet to be added and many functions are still to be smoothened. Hence the acceptance testing has not been carried out on the product yet. But once the product is ready for deployment, the product will be tested.

4.1.3 Testing Strategies

Black Box Testing

Test cases are designed using only functional specification of the software without any knowledge of the internal structure of it. For this reason, black-box testing is also known as functional testing.

There are essentially two main approaches to design black box test cases:

- Equivalence class partitioning
- Boundary value analysis

White Box Testing

Designing white-box test cases requires knowledge about the internal structure of software. Hence, white-box testing is also called structural testing.

There exist several popular white-box testing methodologies:

- Statement coverage
- Branch coverage
- Path coverage
- Condition coverage
- Mutation testing
- Data flow-based testing

4.1.4 Testing Conditions

A test case is a document, which has a set of test data, preconditions, expected results and post-conditions, developed for a particular test scenario in order to verify compliance against a specific requirement.

Test Case acts as the starting point for the test execution, and after applying a set of input values, the application has a definitive outcome and leaves the system at some end point or also known as execution post-condition.

4.2 Results

There are quite a few outcomes and takeaways that are there after going through all the heavy development work. Primary results of having such a solution would be:

- **Speak where you're heard:** Students and their mobile phones are inseparable. Because of this, having a university-branded mobile app is one of the best ways to catch their attention and build a brand in a crowded market.
- **Accessible anywhere, anytime:** Though a student portal serves as a good means of communication, it's the accessibility factor which makes a mobile app far more effective. Students will have access to all the resources at all times. More importantly, during emergencies and situations that need immediate attention, mobile app is much handier as compared to browser-based support.
- **Streamlined communication channels:** No need to go through the pains of designing and printing brochures, pamphlets or sending an email and hoping that the students would see it. Save a lot of time and resources, while seamlessly tracking student engagement levels through the solution. Even bigger draw with mobile apps is the ability to send customized content to chosen student demographics and thus nurture student engagement.
- **Automated routine administration activities:** Setting up appointments, scheduling events and the following up with the registration process can be pretty hectic. Even after multiple rounds of announcements and flyers, one might still not get the required registration or the attendance. A mobile solution can not only get quick responses but also save time and effort by automating the process.
- **Instant connection to students whenever needed:** With our system, one never has to worry about last-minute announcements, notifications or any information that need to be conveyed immediately to all students or target groups. It can be easily sent through push notifications to the preferred target group on their mobile apps in seconds.
- **Availability with online helpdesk and knowledge base:** Our system will also help in automating the entire 'student inquiry' process, saving a lot of time and effort. Prospective and enrolled students can easily create service tickets regarding issues that require support via the mobile app, anytime, anywhere. They can also have access to the knowledge base, FAQs and links all useful information that they might require on-demand.
- **Quick access to relevant student information for useful insights:** Our system integrates with SIS/LMS systems that collates data and provides with meaningful

insights. These insights will help to quickly tap into any information needed about an individual student with just a click.

- **Centralized system for all student needs:** One of the main benefits is that the entire communication, content, staff and student directory is available in one centralized system. Instead of using multiple platforms for different kinds of communication and information, one can use single solution for all student engagement needs. From raising an inquiry request to responding to polls and surveys, one can manage everything from a single mobile application.
- Encouragement in peer communication and engagement
- Immediacy: Instant availability of information
- Compatibility across devices
- Custom Notification
- Seamless integration with users
- Better co-ordination between Faculties and Students and Parents
- Handling of monetary transactions with least amount of hassle
- Paperless work
- Saving of time and other valuable campus resources

Chapter 5

Conclusion

5.1 Summary

The principal intent of the project is to reduce the amount of human work and largely automate the whole process of institution management. We are also aiming to provide a single channel of communication between the students, parents, faculties and the administrative staff of the particular university. Simultaneously, the project also will focus on the amount of work the user has to do in order to get things done, with minimal amount of interaction the application will do what the user wants it to do. While providing most of the functionalities offline, we will also make sure that the application does not take up a whole lot of space in the user handset. All and all the project, on paper, seems to be a very promising one. Once released, it will, hopefully, end up bringing a substantial amount of change in the work system of the institution. We will work steadfastly and with tenacity to bring the whole project to life and attempt to make the user lives a lot more simplified.

5.2 Advantages

→ No need to register, login and you're good to go

→ Offline availability of majority modules

→ Faster web content delivery on mobile devices

→ Quicker response time

→ Easy, Understandable and Less Complex UI

→ Improved end user quality of experience

→ Supports older devices

→ Smoother performance on older devices

→ Support Go Green! initiative, saves valuable campus resources

5.3 Comparison with Existing Solutions

There are similar applications available: many of them having very less functionalities, some of them having a lot of bugs, lot of them not being managed anymore, quite a few of them being limited to newer versions of android, a number of them with cluttered and complex UI, and a very infinitesimal number delivering what is promised.

Our research suggests that there is no existing solution available specifically for this university that performs all the operations which our product promises. Although there are handful of application for other universities which are supposed to be quite similar to this product, but every one of them have their own drawbacks and limitations. We are trying to take the best features from various existing solutions and adding few unique features of our own to create a product that makes the life of the user easier.

While we accept that few of the features and functionalities that are provided in the product have already been implemented in various products independently, it is equally important to note that our product is a mixture of those features with quite a few added unique features and functionalities.

The product is designed by keeping the students in the centre. But while the app may seem to be limited for students, it is just as equally useful for the faculties, principal, HODs, administrative staff, parents and guardians.

5.4 Future Enhancements

It is absolutely absurd to concede that a product is perfect, complete or finished in the computer world. The evolution constantly takes place no matter what we do. *"There's always a way to do it better - find it!"* – the simple quote from Thomas Alva Edison seems very appropriate for the invariably advancing world of programming.

We always have to keep in mind the features that can be added in order to raise the level of the application, and the methods that can be improved upon to make the application, as a whole, a lot faster than it currently is.

After a certain interval of time, post the app release, we are planning to introduce certain enhancements like:

→ Event registration

→ Placement information

→ Individual achievements section

→ Volunteer registration

→ Video lecture portal

→ Transportation vehicle management and tracking

→ Forums

→ Leave management

→ UI and UX improvements according to user reviews

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Education

North American University — *Stafford, TX*

M.S. in Computer Science (Data Analytics Major) — *Aug. 2018 - PRESENT*

- Summa Cum Laude : 4 GPA

Ahmedabad Institute of Technology (Gujarat Technological University) — *Ahmedabad, India*

B.E. in Computer Engineering — *Aug. 2013 - Jun. 2017*

- 8.99 / 10 CGPA

Skills

Programming	Python · Java · Kotlin · C · VBA
Back-end	MySQL · MSSQL · REST API · Flask · Django · Cassandra (partial) · Neo4j (partial)
Web/Media	PHP · JavaScript · XML · HTML5 · CSS · GIT · Adobe XD · GIMP
Languages	English · Hindi · Gujarati · Spanish

Experience

Tectona Soft. Solutions — *Ahmedabad, India*

Junior Software Developer — *Jan. 2018 - Jun. 2019*

- Part of the team that built Cyber Security Audit Tool (CSAT) with features including Asset and Change Management, Desired Configuration Management, Patch and Software Management, Application Controlling, Cyber Security Audit and Remote Management and Audit.
- Part of the team that built Vulnerability Assessment and Penetration Testing (VAPT) system that scans computers, networks, servers, operating systems and application software in order to identify the presence of known and unknown vulnerabilities.
- Gained experience with various stages of the System Development Life Cycle including System Construction and Integration phase, and Unit Testing phase.
- Gained experience in programming in Core Java, Socket Programming, Java SNMP, and Java Web Services.
- Gained experience in database programming with MS-SQL, MySQL, and Graph Database Programming using Neo4j.
- Deployed machine learning modules that were a part of the Security Operations Center (SOC) products.

Internships

School of Sciences, Gujarat University — *Ahmedabad, India*

Intern for Research in Bio-informatics — *Feb. 2016 - Feb. 2017*

- Worked as an intern with the Department of Botany, Bioinformatics and Climate Change Impact Management, School of Sciences in Gujarat University.
- Gained experience with Comparative Genome Analysis techniques, and Next Generation Sequencing technology.
- The research was later published in the Internation Journal of Parasitology.

Projects

Syllable Recognition and Word Formation — *Personal Project*

Natural Language Processing, Artificial Intelligence — *PRESENT*

'GTU Plus+' Mobile Application — *Personal Project*

Android, Java, XML, Python — *2017 - PRESENT*

- PlayStore URL: https://play.google.com/store/apps/details?id=com.lazyvariables.gtuplusplus

Enterprise Resource Planning system for College — *Bachelor's*

Android, iOS, Software-as a-Service — *Jun. 2016 - Mar. 2017*

Bluetooth controlled Robot using Arduino Circuit — *Bachelor's*

C — *Feb. 2016*

Presentation

Software Development Models and Testing Methodologies

Ahmedabad, India

Presenter & Host — *Feb. 2017*

- Introduced the history of software development, models used for the development, and the essential differences among them.
- Introduced various functional and non-functional testing methodologies with their defined test objective, test strategy, and deliverables.

Data Encryption and Cyber Security

Ahmedabad, India

Presenter — *Aug. 2016*

- Introduced the history of cryptography and its evolution over the years.
- Explained in detail the importance of cyber security, various vulnerabilites and attacks, and the role of data encryption in order to prevent these attacks.

Android Development: Native Apps vs. Web Apps vs. Hybrid Apps

Ahmedabad, India

Presenter — *Jun. 2016*

- Introduced android software development as a process along with the languages commonly used for the development.
- Discussed, in depth, the various types of application development, their merits and demerits, and when each of them should be chosen.

Extracurricular Activity

Published Paper in International Journal of Parasitology

India

Co-Author — *Feb. 2016*

- The study was about Comparative Genome analysis of Plasmodium sp. and identification of unique signature with Next Generation Sequencing Technology.
- DOI: https://doi.org/10.24870/cjb.2017-a18

TECHNOSPARX 2017

Ahmedabad, India

Coordinator, Event Organizer — *Feb. 2017*

- Organized coding competition, hacking competition for annual inter-college meetup for all the colleges affiliated to Gujarat Technological University.
- Created mobile applications in order to make the registration, and organization of the event more efficient.
- Gained experience in problem writing for coding competition.

TECHNOSPARX 2015

Ahmedabad, India

Volunteer — *Jun. 2010 - Jun. 2017*

Cricket Team for Ahmedabad Institute of Technology

Ahmedabad, India

Member — *Aug. 2015 - Mar. 2017*

Image Institute of Education

Ahmedabad, India

Tutor, Teacher — *Mar. 2013 - May. 2016*

- Gained in-class teaching experience by teaching Physics, Chemistry, Mathematics to 11th, 12th Grade students.
- Gained knowledge about several business field like Management, Strategy, Finance and Marketing from helping in managing the institute.

Interests

Artificial Intelligence Machine Learning · Data Analytics

Algorithms Data Structures · Design and Analysis of Algorithms

Database Database Management Systems · Backened Development

Mobile Mobile Application Development · UI/UX Design