

# Chapter 15

## College Management System and Ubiquitous Technologies in Education



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**Abstract** In recent digital era, as electronic systems empower the fast creation and circulation of documents, hence, individuals supplant paper documents with electronic ones. In the academic domain, electronic documents as data sources have expanded in number; and thus, recovering the data among an enormous number of documents has become an issue. College management system can help to develop the proficiency and adequacy of this system. It can further enhance the sharing of information between students and get groundbreaking thought from other investigations which can result in the creation of a smart education system. *WonderVersity* is an Android application which we have designed in this perspective. This application gives a common and simple platform dedicated to college-going students, in order to foster a superior communication between them, the faculty members, and the other administrative staff. By doing so, our project allows to offer special and supportive elements of raising appropriate queries, where students can post their inquiries and any connected member can respond to them. Besides, through an online management system, every faculty member could benefit from an assistance choice which helps him in finding any data with respect to classes, faculties, and webinars. *WonderVersity* additionally makes a stage where students can get regular updates of their participation prospectus and time table. It is also important to mention that the *WonderVersity* application works fluidly as it depends on a web-based data set framework called firebase. Overall, it is able to find out every element that is required to tackle the essential issues of college students.

**Keywords** Android application · WonderVersity · Online management system · Smart education system · Documents · Firebase

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261

# 1 Introduction

The plan and execution of any data system aims at giving the administrative staff of organizations, and more particularly schools, the information related to clients/students in order to reach them easily, as well as to supplant their ongoing paper records. In this perspective, it is commonly known that the school staff is expected to transfer all the information, results, and school notices through a solid, online point of interaction utilizing android gadgets (Manekar et al., 2017). Before any real record alteration that could take place, the data server does an exhaustive audit of all the data and approves it. The system is then designed for student UI, allowing students to get advice and tips provided by their seniors. All the data is stored securely on SQL servers under the school administrator's watch. The system reduces desk work and the amount of time needed to access student records. Prior to this drive, the school heavily relied on paper records, which had their own disadvantages. This system provides a fundamental link point for maintaining student data. It might very well be used by educational institutions or schools to efficiently manage student records. Using a manual system to achieve this goal is difficult because the data are scattered and may be excessive, and gathering pertinent data might be very time consuming. Our proposed system guarantees to defeat these impediments. The main objective of this paper is to provide data in a straightforward manner so that organizations like Internet-based enlistment and profile making of students, participation checking, round notices, along these lines decreasing automation of the record-keeping process and administrative tasks at educational institutions. There is a rising pattern for advanced education organizations normal to screen student records (Kamane, 2017). This mobile app creates investigates the consequences of exploration that thought about the impact of participation on student execution; reviewed planning students about participation issues, imparted the outcomes to associates remembering understanding for a Departmental strategy change, and evaluated the methodology scholastic staff ought to take towards unfortunate participation.

The web-oriented application proposed in the present work enables to provide complete information about the college's faculty, students, facilities, and other related elements. This application offers a virtual tour of the campus. It affords the most updated information about the faculty and students here. This traditional application was created to assist students of a company with information on the curricula, subjects, classes, assignments, grades, and schedule. It also provides assistance so that a staff member can review his daily schedule, transfer tasks, and notify the kids (Mei-shan et al., 2012). Here, the manager will handle the student and resource records, create the schedule, and transfer the most recent information on the grounds. We can cite some of these features as follows:

- *College data:* Through this aid, the person can get all available information about the college campus, including courses offered, affirmation process, situations, college events, accomplishments, etc (Zhongxi, 2015).
- *Students location:* Any organization that requires to review the college student's profile will actually want to choose the specific students for their needs, so they

will be provided with a specific connection through which they may get the necessary information (Hlaing and Ko, 2015).

- *Student status*: It indicates the level of student participation. Workforce will update it occasionally and should be visible to students and guardians (Sultana et al., 2015).
- *Student's result in exams*: This office provides the student's performance on every test that a college or university, such as a midterm, directs. Resources that students and parents can access will update the test scores that pupils received.
- *Test notification*: This office informs students and guardians about assessment plan.
- *Events*: It will provide information on various events that the college will occasionally organize. Information regarding these events will be updated by the head.
- *Online tasks*: With this assistance, the office can pass work to its staff, and students can present their assignments online (Vantova et al., 2017).
- *Data about staff*: It will assist in maintaining accurate information about college staff, such as their area of expertise, organizational structure, date of hire, compensation, and so forth. When students graduate from the college, the head will use fresh resources and wipe their records clean (MohanJoshi, 2015).

## 2 Related Research Works

Some of the proposed works related to the domain of our research are cited as follows:

1. Joshi et al. (2018) implemented their "Android Based Smart Learning and Attendance Management System" while using Android applications for things like online study materials, announcements, academic calendars, exam reminders, online attendance records, performance records, and parent notification systems. With the use of a smart phone, this technology enables teachers to collect attendance and maintain student records for use in ongoing assessments. As soon as a student's attendance falls below the defined attendance level, this system sends them an SMS as a prior warning.
2. Noor et al. (2015) developed the "Android-Based Attendance Management System." In this paper, a technique for taking attendance using an Android platform application is suggested. Once installed, this program can be used to retrieve the list of students from a certain web server. The gadget will then function as a scanner to individually scan each student card to validate and verify each student's existence based on the downloaded list of students.
3. Yue and Jin (2010) implemented "The Development and Design of the Student Management System Based on the Network Environment" which talks about how information is managed in higher education. We build the student management information platform and design models for college students' management

information by utilizing cutting-edge information technology on the basis of an extensive investigation and analysis of student management in higher education. Additionally, we examine the characteristics of information management in higher education and develop solutions to the challenges students face when managing their higher education.

4. Dhiman et al. (2019) developed “A New Android Application (Breeze) for College Management System,” which includes the distinctive and practical function of question-raising, where students can post their questions and anyone can respond. In order to keep an eye on problematic posts, a report tool is also offered. This feature alerts the administrator to incorrect posts and suggests potential remedial measures. Additionally, it offers users a support option that enables them to find out any information on labs, teachers, and lecture halls. Additionally, Breeze develops a site where users may check daily updates to their attendance schedule. The Breeze app operates without a hitch because it is built on the Firebase online database technology. Additionally, it offers fundamental functionality like password and profile image changes and password recovery.

### **3 Planning and Analysis**

#### ***3.1 Problem Analysis***

Currently, students’ information is placed physically in colleges. The students’ subtleties in isolated records are monotonous. Alluding to this large number of records and refreshing them is more than required, especially in order to diminish manual mistakes.

##### **3.1.1 Issues in Existing Framework**

- It was confined to a unique system.
- It was less user-friendly.
- It involves a lot of manual labor (the term “manual system” does not necessarily mean that we just use pen and paper; it also refers to using spreadsheets and other basic software).
- It necessitates the hiring of an increased number of workers.
- The procedure was laborious.
- The mechanism in place was incredibly less secure.
- Making several sorts of reports is impossible.

### 3.1.2 Solution for These Problems

The activities that aim to motorize the entire cycle while still taking the data set blend method into consideration are included in the improvement of the new framework.

- Ease of use is given in the application of different controls, making it user-friendly.
- The framework makes the general endeavor the executives significantly simpler and versatile.
- It may be reached over the Internet.
- Different classes have been utilized to give record move and mail features.
- While the endeavor progression is underway, there is absolutely no possibility of a data breach occurring at any level.
- It gives a raised level of safety utilizing various protocols like https, etc.

## 3.2 System Analysis and Arranging Versus User Necessity

### 3.2.1 User Requirements

By examining the user needs, the following prerequisites have been gathered as follows:

- A person should have the option of accessing the framework from the application's home page.
- The administrator is able to create users based on user demand.

Administrators have the ability to move the data for a specific student. Users (students, parents, and faculty) can view reports when a move is successfully completed (Al-Muhaidhri, 2019).

- The user will genuinely desire to view the circumstance with their explicit student ID number.
- The student (user) is permitted to use all of the offices, just as he would in a college.
- Students have more energizing access to attendance, views, grades, reports, and numerous offices.
- Each student's record will have a unique page where he may examine his grades, attendance, and other information.
- With the username and secret word provided, parents may easily view the student's record.
- Staff members can inform students of their attendance and other information.
- The administrator confirms this large number of reports and creates them so that users might be able to see them.

The next step is to examine the problem and determine its unique circumstances after examining the project's prerequisites have been determined. Focusing on the current framework and understanding the requirements and scope of the new framework are the stage's two main activities. Both tasks are equally important, but the initial development serves as a foundation for providing the useful specifics and, later, an efficient plan of the suggested framework (Sulaiman et al., 2014). Understanding the characteristics and requirements of another framework involves creative problem-solving and knowledge of the currently operational framework because a poor understanding of the latter can result in a deviation from the original plan. A few elements of the system include:

- **Memory limitations:** There are memory constraints due to the quick progress of dirty databases which has various exceptional keys and colossal datasets.
- **Software interfaces:** Oracle MYSQL Workbench serves as the backend and Advanced JAVA serves as the frontend; the association point is an ODBC controller.
- **Framework highlights:** Simple Graphical User Interface (GUI), easy to use, no need for special preparation, reasonable cost, and defense through affirmation procedure.
- **Significant ideas utilized:** Using ADODB Connection, we have connected our frontend and backend code. In our endeavor, we have made use of the data environment and data reports. To make clear elements open to everyone, we used modules.

### ***3.3 Feasibility Gained by Our System***

#### **3.3.1 Specialized Feasibility**

Since our project is in JAVA, we need to have a strong base in programming. A PC with Java Development Kit (JDK) is required.

#### **3.3.2 Economical Feasibility**

To execute the framework, we require more than one PC. Since the framework will be completed in the existing environment, there will be convincing explanation to buy the PCs. The system is financially feasible.

#### **3.3.3 Operational Feasibility**

Our framework will be quite easy to present and use. Hence our framework is functionally commonsense.

### 3.3.4 Cost-Benefit Analysis

The cost incurred as a result of our framework integrates only the product interminably cost of the PC expected to run the endeavor the advantages brought about by our framework will consolidate.

## 3.4 Model Analysis

This document assumes the life cycle (SDLC) enhancement since it accurately depicts all of the framework's requirements. It suggests that designers will use it, and it will be crucial during the testing phase. Later changes to the requirements must go through the standard change underwriting process. In his 1988 article, "A spiral Model of Software Development and Enhancement," Barry Boehm described the "SPIRAL MODEL." This model served as the main tool for understanding why the accentuation models were used rather than the primary model to investigate iterative development.

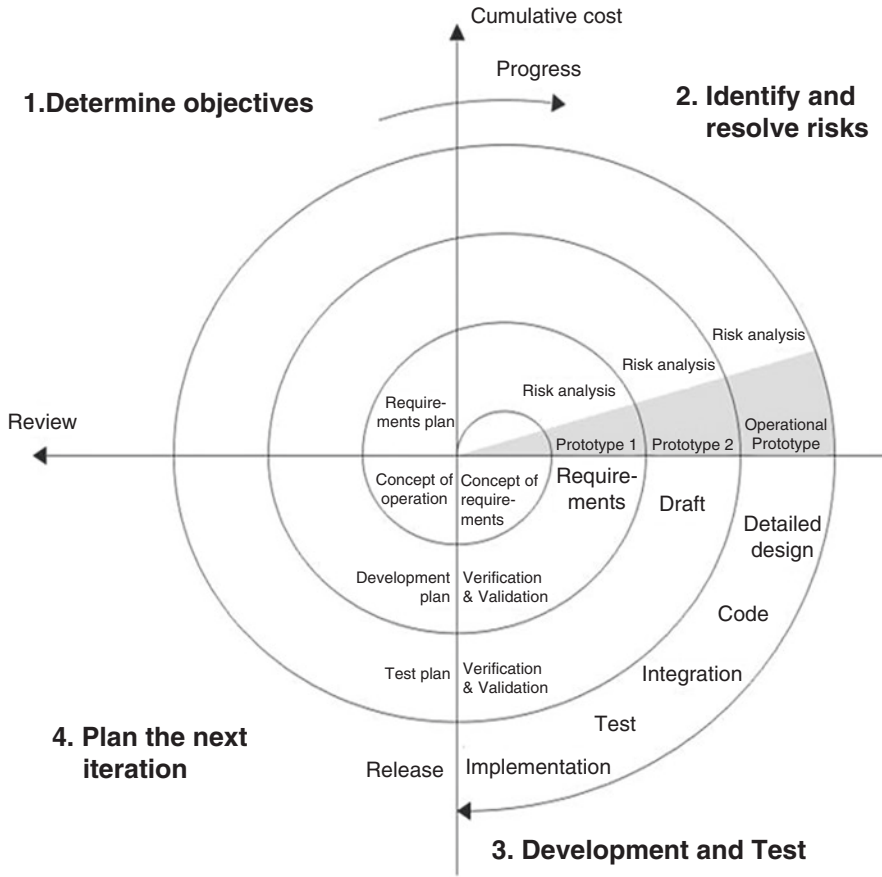
The emphases often lasted from a half year to two years, as initially thought. Every step starts with a plan goal and ends with a client reviewing the progress made thus far. At each stage of the project, efforts are made to examine and plan with an eye toward the mission's specific goal.

### The Steps for Spiral Model Can Be Summed Up as Follows

The new framework requirements are explained in as much detail as reasonable. This framework typically entails: meeting with numerous users, talking with all of the internal or external users, and discussing various aspects of the existing framework. Thus,

- A draught of the new framework is created.
- From the initial plan, a first model of the new framework is created. This paradigm, which is typically scaled back, provides an estimation of the characteristics of the unavoidable outcome.
- A later model is made using the following four steps:
  1. Examining the advantages, disadvantages, and risks of the first model in a long time.
  2. Defining the requirements for the next model.
  3. Setting up and organizing the next model.
  4. Building and evaluating the next model.

At the client decision, the entire endeavor can be stopped if it is thought of as unreasonably uncommon to accept the gamble. Risk factors may have implied that improved cost overwhelms, working expense error, or anything other part that might, in the client's judgment, result in a not exactly palatable possible result.



**Fig. 15.1** Spiral model related to college management system. (Source: Researchers' own production)

- As shown by the four-part approach previously described, the current model is examined similarly to the previous model, and if necessary, another model is created from it. The prior innovations are tweaked until the client is satisfied that they achieve the desired result.
- The final structure is constructed after being thoroughly examined and tested in light of the improved model. Regular maintenance is performed under the premise of preventing major setbacks and minimizing downtime.

Figure 15.1 shows how a spiral model acts.



## **3.5 Survey of the System**

### **3.5.1 Graphical Interface**

A strategy seen as a crucial issue through a scrutinizing interface has been encouraged by the flexibility of the causes for the association point. The major level GUIs have been asked for this purpose, including:

- The administrative UI
- The functional or traditional UI

The administrative user interface (UI) is focused on the consistent information, which is crucial for hierarchical operations and requires real approval for information acquisition. With the provision of robust information search capabilities, the association assist the associations with all of the contingent states, including Data consideration, Data crossing out, and Date reviving. Through continuous information and necessary organizations, the utilitarian or customary UI aids the customers upon the structure in trades. Additionally, the useful user interface helps regular clients manage their own information in a modified manner in accordance with supported adaptabilities.

### **3.5.2 Number of Modules**

The system after detailed examination has been perceived to be given the going with modules:

The modules included here are:

#### School Data

Through this aid, one can obtain all available information on the school's facilities, such as courses offered, the confirmation process, circumstances, school events, accomplishments, and so forth.

#### Student Tracking

Any organization or association that has to look at a list of the school's pupils will really want to choose a single student for their needs; therefore, they will be provided a specific link via which they may access the information needed.

### Student Participation Status

It gives the participation status of students. Workforce will refresh the participation occasionally and should be visible to students and guardians.

### Student's Presentation in Tests

This office provides a student's performance on each test that a college or school assigns, such as a midterm exam. Resources that students and parents can use will be used to update the marks that kids received on tests.

### Test Notification

This office informs students and guardians about assessment plan.

### Occasions

It will provide information on various events that the school will occasionally host. The chairman will update the information on these events.

### Online Tasks

This help gives the office to workforce to transfer tasks and to students to present these tasks on the web (Shulin and Jieping, [2014](#)).

### Data About Staff

It will assist in maintaining comprehensive information about school employees, such as their field of expertise, unit, date of hire, pay, and so forth. When they graduate from the school, the head will hire new personnel and wipe their record clean (Thangam et al., [2017](#)).

## ***3.6 System Planning***

### **3.6.1 Pert Chart**

Focus is placed on things like a cost-benefit analysis, specialized attainability, time plausibility, and job usefulness while performing and evaluating achievability. PERT charts should be used for project scheduling. To determine whether

the suggested system is realistic for the organization, a practicality study is conducted.

### **3.6.2 Technical Feasibility**

The technical viability focuses on the existing PC system, such as the hardware, software, and so on. Banks need to handle SQL databases, which are often well-accessible with extensive development help from manuals and websites.

### **3.6.3 Economic Feasibility**

The most frequent method used to determine whether a system is adequate is called the economic feasibility. This technique, more often known as a cost/benefit analysis, entails determining the benefits and investment funds that are typical of the applicant system and contrasting them with costs. The decision is therefore remade to plan and implement the system if it is determined that the benefits outweigh the expenses.

### **3.6.4 Requirement Analysis**

The “feasibility study” is another name for this interaction. The improvement group focused on the site necessity at this stage. They investigate the need for a potentially compelling depiction of the site and enhance security features. The group sets up a record with the various explicit ideas for the rival system near the end of the feasibility study. It also includes faculty assignments, expenses, project schedules, deadlines, and so forth. The process of obtaining requirements is intensified and unusually focused on programming. This stage’s primary goals are to identify the demand and identify the problem that needs to be solved. It was accumulated to follow realities during this time.

- Decide the clients’ needs
- Distinguish current realities
- Lay out the objectives for the proposed system
- Feasibility for the latest system

## ***3.7 System Analysis and Design***

The overall design of the product and its intricacies are described at this stage. In terms of client-server innovation, this stage describes the various stages needed for bundle engineering, database planning, information structure planning, and so on.

In the entire improvement cycle, evaluation and design are crucial. Any inaccuracy now could cost money to fix later on in the programming development process.

Thus, following is the fundamental methodology taken during website planning:

- DFD
- Database Designing
- Structure Designing
- Pseudo code for strategies

### 3.7.1 Waterfall Model

The Waterfall Model is a successive programming headway process, in which progress is seen as streaming reliably plummeting and descending (like a cascade) through the times of origination, initiation, analysis, plan (validation), development, testing, and maintenance.

In order to use the waterfall paradigm, one goes from one stage to the next in a successive way. When the necessities are completely finished, one proceeds toward the plan. The software being referred to is planned and an outline is drawn for implementers (coders) to follow—this plan ought to be an arrangement for executing the prerequisites given. Whenever the plan is completely finished, an execution of that configuration is made by coders. Toward the later phases of this execution stage, separate software parts created are consolidated to present new functionality reduced risk through the evacuation of errors.

As part of the software engineering life cycle process, we used the waterfall model. It is the most widely adopted, most established, and least complex process model for programming development.

The name of this paradigm comes from how the typical programming life cycle is described as a series of slipping advances.

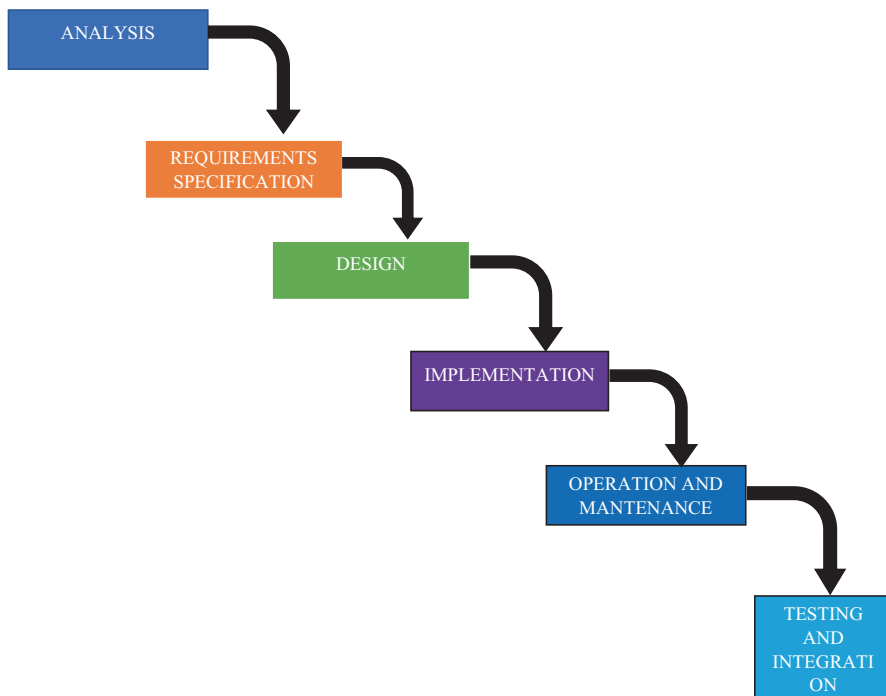
The project is divided into several stages, with some overlap and enough recirculation between them. The emphasis is on planning, scheduling, meeting deadlines, budgeting, and carrying out the entire framework at once. Broadly written documentation, conventional surveys, the board's approval/signoff at the conclusion of most stages, and data innovation are all used to maintain tight control over the project's existence before moving on to the next step.

The fundamental standards of the waterfall model are as follows (Fig. 15.2).

### 3.7.2 ER-Diagram

An entity relationship (ER) diagram is a kind of flowchart that delineates how “elements,” for example, individuals, articles, or ideas, connect with one another inside a framework (Fig. 15.3).

Fundamental standards of the waterfall model are:



**Fig. 15.2** Water fall model of college management system. (Source: Researchers' own production)

### 3.7.3 Flow Chart

The framework stream chart is a visual portrayal of all handled in successive request. The system stream outline chart is a graphical portrayal of the connection between every one of the significant parts or steps of the framework. Stream graph chart can exclude minor pieces of the framework (Fig. 15.4).

## 4 Method

### 4.1 Method Adopted and System Implementation

- The application runs on a web server called Apache Tomcat.
- The climate variables are all established.
- The web apps organizer will not let you move the application.

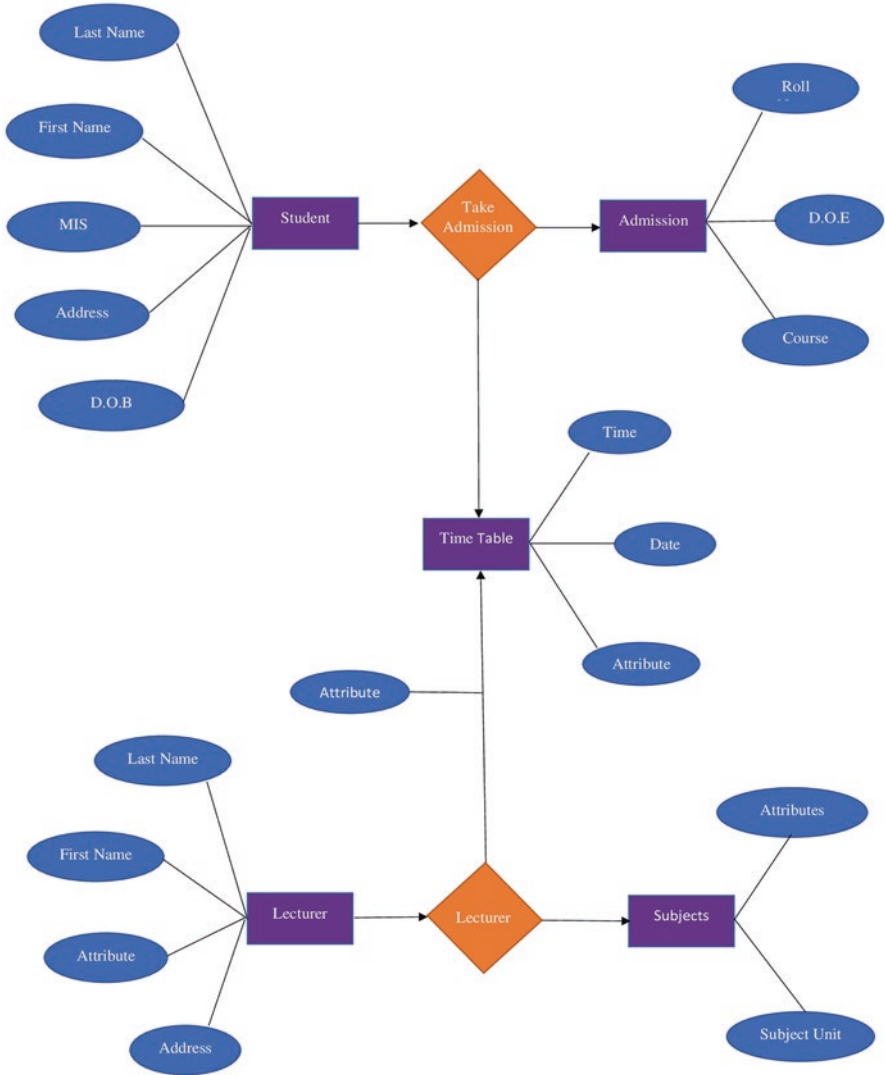


Fig. 15.3 ER-diagram of collage management system. (Source: Researchers' own production)

- The web server has now started.
- A web application composing <http://localhost/cis> is demonstrated.
- Web.xml records are used to regulate client and stream activity.

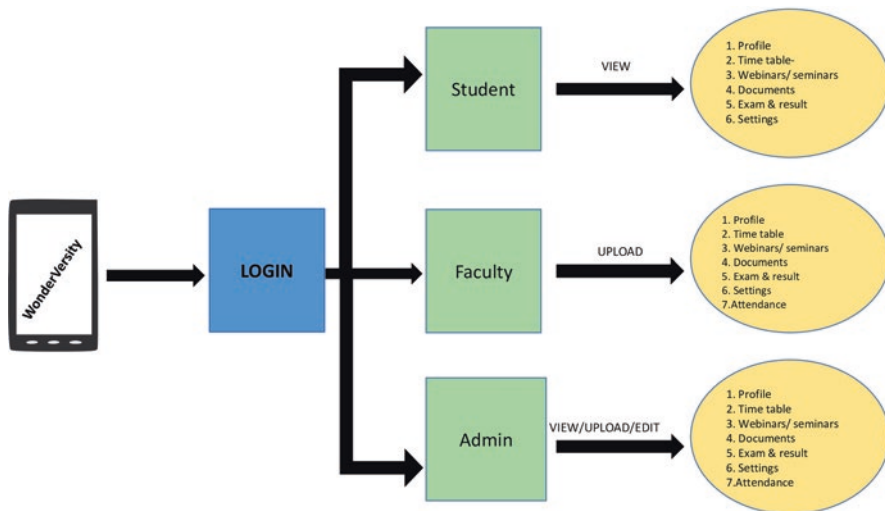


Fig. 15.4 Flow chart of collage management system. (Source: Researchers’ own production)

## 4.2 Details of Hardware and Software Used

### 4.2.1 Hardware Specification (Minimum)

Disc space:	30 MB
Processor:	Snapdragon
Memory:	512 MB RAM
File system:	32 bit

### 4.2.2 Software Specification

Operating system (server side):	Windows XP
Operating system (client side):	Lollipop
Client end language:	XML
Local validation:	JAVA
Server-side language:	JAVA
Database:	Firebase
Web server:	XAMPP server
Web browser:	Chrome/Mozilla Firefox

### ***4.3 Method Used for Testing***

A system cannot be finished until every aspect of it has been tested. However, this provides the impression that the project is complete; a project cannot exist without going through this stage. Therefore, at this point it is determined whether the project can successfully complete the ongoing climate execution with few to no break-downs, so a package can still be rejected at this stage.

#### **4.3.1 Testing Techniques**

Typically, white box testing and discovery testing are used to separate programming testing methodologies. These two approaches are used to illustrate the viewpoint a test engineer adopts when organizing experiments.

##### **Black Box Testing**

In black box testing, the product is treated as a “black box,” with little to no knowledge of how it is being executed internally. Comparability dividing, limit esteem analysis, all-matches testing, fluff testing, model-based testing, detectability grid, exploratory testing, and detail-based testing are examples of black box testing methodologies.

##### **White Box Testing**

When comparing white box testing to black box testing, the analyzer approaches the internal information designs and calculations (and the code that executes these). A test suite that was created using black box testing methods can also be evaluated using white box testing procedures. This ensures that the primary capacity focuses have been tested while allowing the product group to examine areas of a system that are rarely used.

##### **Gray Box Testing**

This type of testing at the customer, or black-box, level involves approaching internal information designs and computations for reasons for planning the experiments. Controlling information and designing results are not considered to be “dim box” tasks because they are visibly outside the “black-box” that we are referring to as the system being tested. When conducting combination testing between two code



modules created by two distinct designers, where just the points of interaction are exposed for testing, this differentiation is extremely important. Dark box testing may also involve dissecting code to determine things like limit values or error messages.

1. Execution testing determines whether the product is capable of handling massive amounts of data or clients. Most often, this is referred to as programming versatility. Typically, this non-functional software testing procedure is referred to as load testing.
2. Testing for solidity determines whether the product can consistently function adequately in or over an appropriate period of time. The term “indurations test” is frequently used to refer to this non-functional software testing procedure.
3. Assuming the user interface (UI) is not challenging to use and understand, convenience testing is anticipated to verify this.
4. For programming that handles sensitive data and to prevent system disruption by programmers, security testing is essential.
5. These aspects of programming are anticipated to be tested by internationalization and limitation, for which a faux restriction technique can be used.

Now, some of the factors which we have taken into consideration while developing the project are mentioned below:

- If the client wants to use it in a laptop/desktop, we have prepared a website for this app to be used and the data will be automatically updated in the app whenever any changes are made in the website as it is connected to the website.
- If the client asks for a multifactor authentication at the time of login, we can update the system as per the client’s requirement. Basically, there exist 3 types of multifactor authentications: knowledge-based, possession-based, and inherence-based authentication. As we have already been using knowledge-based authentication, in the future we can update the app and include the other two authentication types in the system. For the website purpose, we can use the first two authentication types, that is, knowledge based and possession based. As knowledge-based authentication is already being used, we only need to insert the possession-based authentication to the website and the rest for the mobile application (Bhavana and Jasmine, 2016).
- When results of any exams are announced in a college/university, there is a huge rush of students who are going to log into this portal simultaneously. There can be over thousands of concurrent users. Hence, we have decided that we will connect this site to the university servers. As in universities, there are thousands of data already been registered in their servers and the servers are handling all those students’ login details in the university website without any hustle, so we can connect our site to the university servers and those thousands of logins can be handled easily by their servers (Figs. 15.5, 15.6 and 15.7).

**Fig. 15.5** Input screen of the app



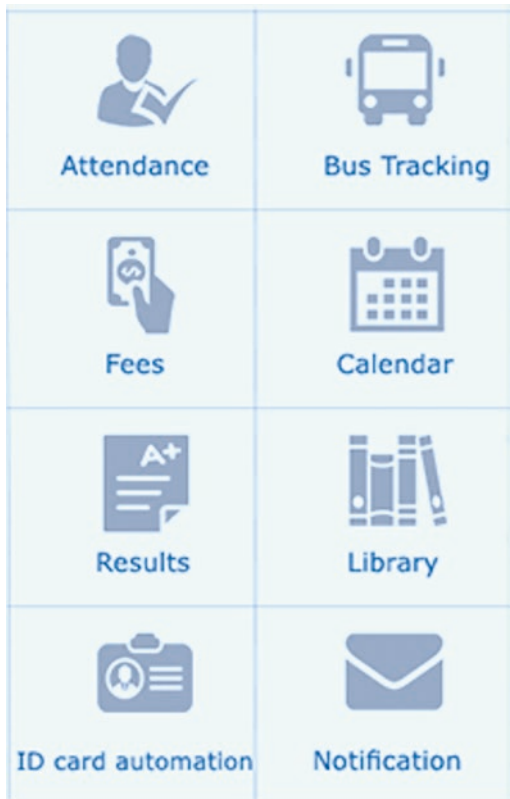
## 5 Results

### 5.1 Input and Output Screen Design (Snapshots)

## 6 Conclusion and Future Perspectives

The college management system is the plan of action required for handling problems related to a particular business. This experience has been successfully completed with all of the components mentioned and detailed in the framework requirement. An accurate information about any college is essential for the advancement and success of both students and the workforce. Thus, the proposed system meets the best needs of both associated parties in an appropriate way.

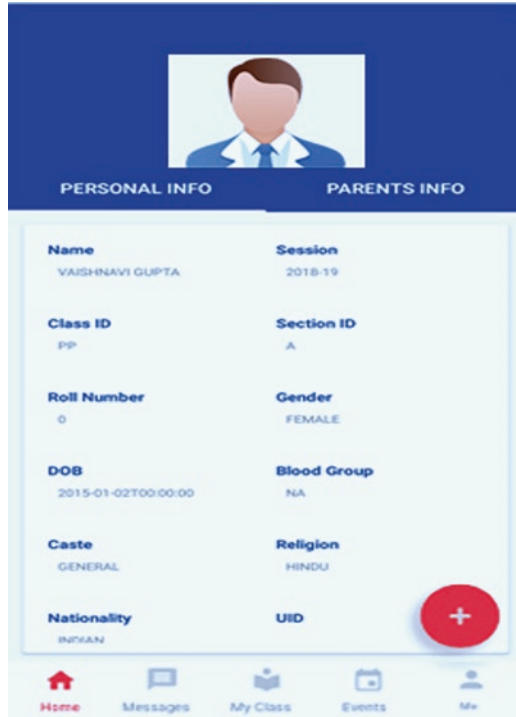
**Fig. 15.6** Index screen of the app. (Source: Researchers' own production)



Accordingly, our project is basically focused on the advancement of students, and on a total framework that is a data-based support that could be available inside the faculty. The design is to lessen the errand of the staff individuals and to help them practically from all viewpoints. Labor and manual work will be enormously diminished by the appearance of this Android-based application, and any data refreshes/recovery should be possible effortlessly. Students are introduced into this application with the necessary adaptability and they might associate with the specific staff all the more often for any reason at any time any spot. From now on, the students might plan with this application, they can have the option to see their inward stamps and report to the specific employees assuming that rectifications are to be made. This framework will bring an easier use and an upgraded framework which will meet all the expectations of the staff individuals engaged with the association. In any case, further updates on this application and extraordinary enhancements are to be applied to it in the upcoming days, in order to give some ground to the requirements of the staff individuals and the students.

This college management system can be further extended by adding more features like placement opportunities, library books, location tracking, etc. Students

**Fig. 15.7** Output screen of the app. (Source: Researchers' own production)



and faculty members can use these services in a hassle-free manner through the mobile application. This mobile application can reduce manpower as all essential information, documents, etc., can be found in just a single app. This application permits flawlessly interfacing the educators, students, administrators, and guardians and keeping them continuously informed of all parts of the organization (Bansal et al., 2015).

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