Collaborative portal for a school

Team Mora Scorpions

154051J	M.L.P.Jayasekara
154133M	S.A.A.M.Weerasinghe
154048G	H.K.D.S.Jayampathi
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Faculty of Information Technology

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Supervisor Name: Dr. Supunmali Ahangama

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Faculty of Information Technology

University of Moratuwa

2017

Declaration

We declare that this thesis is our own work and has not been submitted to in any form for another degree or diploma at any university or any other institution of tertiary education. Information derived from the published or unpublished work of others has been acknowledged in the text and a list of references is given.

Name of students Signature of students

M.L.P.Jayasekara

S.A.A.M.Weerasinghe

H.K.D.S.Jayampathi

M.M.P.Madhubhashini

T.K.T.Hansani

Supervised by :

Name of supervisor: Dr. Supunmali Ahangama

Signature of supervisor :

Date:

Acknowledgements

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Abstract

As school based learning teaching process is significantly widespread there is a lack of collaborative environment for the stakeholders to communicate and integrate. With an aim to overcome this deficiency we introduce a Collaborative Portal for a School which creates an integrating framework for teachers, students, parents and principals of modern education systems. This system provides an efficient platform to integrate the stake holders, analyze the overall performance of the students and teaching progress of teachers etc. It addresses several gaps such as absence of homework, syllabus and complain handling modules in most of the prevailing modern school management systems such as School Time Software, Fedena School ERP and etc and introduces remedies for them. The system is realized by using the technologies such as Asp.net core, Bootstrap, Jquery, CSS, firebase and HTML by implementing a web interface, mobile app, RESTful API and backend database as the main modules. The system goes deeper in to the school procedure by implementing syllabus handling, report handling, complain handling and attendance recording mechanisms in the collaborative portal. In this respect, Collaborative Portal for a School provides an easy administration facility that encourages the substitution of existing, traditionally developed mechanisms of school management by efficient methodologies.

Contents

Chapter 01

Introduction

1.1 Introduction

This chapter is basically giving an overall description about the software solution designed for a school in summarized form. The collaborative portal for the school is designed to address the drawbacks of currently prevailing school management systems and to make the main parties involving in the school curriculum more interactive in an efficient manner.

The problem domain, its importance of being addressed, the way it is addressed, selection and adoption of technology to address the identified problem domains are clearly described in detail through this report.

School is a core center where teaching learning process occurs in an active manner. To make the process more fruitful and effective collaboration among parents, teachers, students and principals should be achieved. Unless it would end up with different problems of administration and compromised interaction among different stakeholders.

Therefore it is critically important to focus on, creating IT based solutions for integration of school centered activities.

1.2 Background and motivation

Now a days there is a less interaction among teachers, students, principal and parents in the school. Because of that these individuals cannot get regular updates on whether their syllabus is up to date or not, information about attendance records, achievements they reached any special notes and student homework.

Today parents cannot track most of things that their children do including checking whether they reached the school in a particular day, results of their assignments and term tests and special notes that are sent by the teacher or principal. And in the principal’s point of view if he/she wants to check how the syllabus is going on,

education status of the students he/she has to do it manually. And also it takes lots of effort to send notice to other parties. Principals don't have a proper system to get to know about his/her school students and teachers regularly. Now a day's principal get to know about students and teachers attendance manually and monthly or yearly. If principal wants to know about teacher's syllabus coverage up to now, he/she should go and check teacher's details manually. Teachers cannot have a direct connection with parents. They have to go through the students and sometimes students face problems with finding notes and other educational stuff [2],[4].

These weaknesses of the prevailing system motivated us to put forward this software solution.

1.3 Aim and Objectives

1.3.1 Aim

The aim of the project is to develop a system to create a collaborative environment among teachers, parents, students and the principal of modern education systems.

1.3.2 Objectives

- To design and develop a software platform to interact teachers , students ,parents and principals in an efficient manner.
- To design a system to display the overall and analyzed student performance and teaching progress accurately.
- To implement an android based mobile application to interact the users efficiently.

1.4 Proposed Solution

The proposed solution includes two major features as a web application and an android application. The data related to the students (attendance records, marks, achievements etc) is stored in the database .It can be accessed by both the website and the mobile application.

The system basically focuses on four types of users as the teacher, parent, student and the principal. The users are allowed to create separate logins on the website with specific features and the users are displayed with a GUI relevant to the user type.

Teacher is able to enter, update and modify the attendance records of the students, marks of the students, upload the daily taught modules, home works given to the database .The user is able to view the overall attendance, student performance and teaching progress as a graphical representation at a given time. They are also given the ability to send instant messages to relevant parents regarding different matters and view the responses raised by them. Also special notices can be shared to all the students and parents at once.

Principal is allowed to have an overall view on the attendance of students, teaching progress of teachers in different classes, complains raised by parents, solutions taken and pending complains through this application which creates a convenient platform to do the management efficiently .Principal is given the ability to send a message to the whole school at once.

Students are allowed to view the attendance records, percentage of attendance up to the given date in case of A/L students, view the marks and graphical evaluations on their performance. They are allowed to share notes with friends if needed. The system is implemented so that students can view only their reports. Students can comment on the study contents which are posted by teachers. Then teachers also can reply to them making a collaborative environment.

Parents are allowed to view attendance and performance of their child, evaluate their performance throughout the year using graphs. They are given the chance to send messages to the teachers and principals as required. They are provided with a dashboard feature into which only the needed options can be dragged and dropped.

1.4.1 Technology used

For the development of the software following technologies have been used

- ASP.NET with .net core
- SQL database server
- TFS – Team Foundation Server
- Android
- JSON

In addition MVC pattern and Bootsrap are to be used in the implementation.

1.5 Summary

This chapter gives a brief description of the software solution “Collaborative portal for a school” and lets the reader understand the problem that has been addressed, the way it is addressed, expected outcomes and the technology adopted in achieving it in a nut shell.

1.5.1 Structure of the dissertation

Chapter 01	Describes the overall project scope
Chapter 02	Is based on the technology adapted
Chapter 03	Describes the reviews on other similar projects
Chapter 04	Basically describes the adoption of technology in solving the identified problem
Chapter 05	Describes the analysis and design of the project
Chapter 06	Describes the implementation procedure of the project
Chapter 08	Includes the details of citations
Appendix A	Describes the individual contribution and further details on technology, implementation and analysis and design

Chapter 02

Current issues on collaborative portals for schools

2.1 Introduction

Collaboration of the school based activities with high efficiency and accuracy is the problem domain that we are going to address through our software solution. Therefore in order to specifically understand the related problems of the project and to decide the respective best solutions we have referred some similar approaches on similar problem domains. We have grabbed the designing concepts and the basic ideas on technology that should be adopted, based on the studies on such similar projects and we have addressed several gaps that were identified.

This chapter is regarding the existing similar projects that we have studied, identified gaps and the uniqueness of the solution we developed.

2.2 Background of the project

Information and communication technology which is vastly being developing day by day is increasingly becoming an important factor for improving the efficiency of school curriculum. Management of both internal and external practices related to a school is important to yield maximum educational outcomes for the students. On the other hand collaborating the activities of different parties taking part in the school management is critically important [2],[4].

As a result a special focus has been imposed on collaborating the school based activities using software solutions nowadays. Different researches and approaches have been done on achieving this collaboration.

Teachers, Students, Principal and Parents are the four main stakeholders interacting with each other in a school based system. Therefore implementation of better communication and cooperation among these parties is vitally important. The currently prevailing manual system of interaction among these sectors is

inconvenient, time consuming and inefficient. Integrated all the four stakeholders on a common platform is more effective than the manual systems prevailing nowadays.

Within the school curriculum different activities such as attendance recording, student report generation, syllabus manipulation, handling complains raised by parents and sending, receiving different notes among the interacting parties are some of the activities taking place.

There are lots of inconveniences related to all these tasks .Manual entry of student attendance is cumbersome. Inconveniences of manual entry of student marks and report generation, Unavailability of a method to access the syllabus coverage at a given date, inability to handle complains in a logical manner are the drawbacks of modern school based systems which tempted us in finding this software solution.

2.3 Similar approaches on collaborating portals for schools

The main aim of our software solution is to collaborate all the four stakeholders (teacher, parent, principal and student) on a common platform .While designing this, different requirements and different sub problems related to the basic problem domain arose. Therefore to have background knowledge on these problems and requirements the following existing systems were referred. The similarities and dissimilarities of them with our system and the weaknesses of those soft wares were identified and modified.

I. MySchool Web Based School Management Software
II. School Time Software
III. Fedena School ERP

2.3.1 MySchool Web Based School Management Software

This is a web based application which facilitates storage of data about staff, students and guardian, creation of attendance reports and sending them to parents, informing for emergencies or cancelled events to guardians, provision of grade reports ,creates configurable dashboard and menu options[9].

Based on this application we got the basic idea of how to integrate different parts of our software solution. The main defect of the system we encountered with this

software is the lack of flexibility and it does not have a mobile app to integrate the activities.

We have improved the basic ideas grabbed through studying this project to implement the attendance, report handling and messaging modules together with an android mobile app.

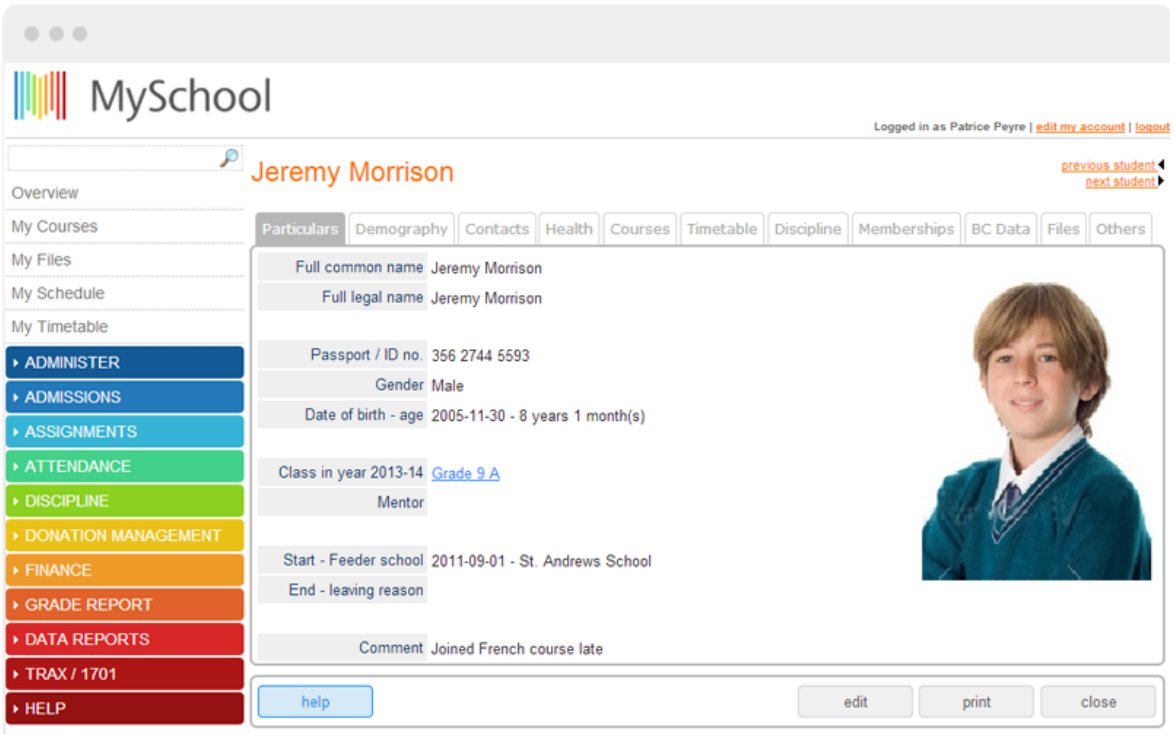

Figure 2 1 MySchool software

2.3.2 School Time Software

School-time software is another similar software solution for handling the school management activities efficiently. It provides multi user interaction and ability to configure multiple curriculums within the same system. In addition it allows the publishing of list of exams and scored results so that different users can view those using respective logins. Based on this system we have grabbed the main designing concepts for our software solution [3].

It is a SaaS based software which does not need special hardware to run. It also provides an android app for the software.

2.3.3 Fedena School ERP

Fedena School ERP is a school based software solution which provides a user-friendly dashboard allowing users to log in the system. It includes 18 core modules

such as Student/Parent login, report center, student information, messaging system and etc [3].

This system is easy to be configured and allows customization and provides a user friendly interface. Based on the ideas grabbed through the studies of this project we developed the attendance, report creation and user registration module.

Figure 2 2 Fedena software

All the referred similar systems were providing different combinations of features which make the school management process more effective. But none of them provided all the features that our software solution provides.

Homework manipulation process which focuses on daily homework upload and facility of viewing them by parents and students is a specific feature that our system provides to the user.

Also the process of handling complains raised by parents is another approach on which we have paid our focus. Our software solution provides the ability for parents to raise complains about the failures on management process of the school or teaching defects of the teachers, anonymously or with their identity to the principal or to the teachers according to the preferences of parents.

Similar systems / List of features	MySchool Web Based School Management Software	School Time Software	Fedena School ERP
1. Attendance handling and analyzing feature	✓	✗	✓
2. Report generation	✓	✓	✓
3. Syllabus inclusion and analyzing current progress	✗	✗	✗
4. Profile with specific features for different users	✗	✓	✗
5. Sending messages and notes to parents	✓	✗	✓
6 Homework manipulation	✗	✗	✗
6. Complain handling	✗	✗	✗

7. Android app	✘	✘	✓

Table 2.1 Comparison table for the existing similar systems

2.4 Summary

This chapter which basically focuses on similar systems that have been developed based on similar problem domains as ours lets the reader understand the background of the software product. In addition this clarifies the influence of other systems on the software system that we tend to develop. The comparison table at the very end provides a summarized comparison of features among different similar systems.

Therefore as a whole this chapter lets the user understand the uniqueness of our software solution over the other similar approaches.

Chapter 03

Technologies adopted

3.1 Introduction

The previous chapter was based on similar approaches to similar problem domains and their influence on the software solution.

This chapter gives a detailed description on the adopted technologies to implement the system, the reasons behind selecting those technologies and a logical analysis of the suitability and specialty of the technological approach adopted over the other alternate options.

3.2 Technologies used

For the development of the software following technologies have been used

- ASP.NET with .net core
- SQL database server
- TFS – Team Foundation Server
- Android
- JSON
- Firebase
- Azure

In addition MVC pattern and Bootsrap are to be used in the implementation.

3.2.1 ASP.NET with .net core

3.2.1.1 What is ASP.NET with .net core?

This is an open source, cross platform which allows programmers to develop dynamic web based applications. ASP.NET Core has been released by Microsoft as a modular framework which is compatible in both the Windows .NET Framework and .NET Core cross-platform. In ASP.NET Core both the ASP.NET MVC and Web API have been reunited .This includes the four components known as Entity framework core, identity core MVC core and Razor core. It provides following features which makes

web development easier. Since ASP.NET core comes in NuGet packages optimization of apps with high performance, high security and less servicing is possible [5].

3.2.1.2 Why it is used?

There are different approaches that can be adopted in developing web based applications such as Laravel,Ruby on Rails, Perfect etc. We have chosen the ASP.NET core web framework because it provides a set of tools and libraries that makes the common procedure of web development easier. And the most influencing fact to select it over the other alternatives was that our client was interested in that and requested to use it.

It ensures security and safety through built in windows authentication and reduces the code stuff in complex applications.

It is comprised of a powerful toolkit that provides lots of features like WYSIWYG editing, automatic deployment and so on.

This provides simplicity and easy maintainability of pages since source code and HTML are found together in ASP.NET core.

This framework is language independent and provide better performance through early binding, native optimization and just-in-time compilation.

Since other web frameworks such as Ruby on rails are slower in development and update we have chosen ASP.NET core for developing our web based front end. This software solution should be compatible with different types of computer platforms and it should provide the security for the student details, and flexibility and power on web pages are essential for the better functionality of the software. Therefore since this web framework does the execution of source code on the server itself all these facilities are provided.

3.2.2 SQL database server

3.2.2.1 What is SQL database server?

Microsoft SQL server which was developed by Microsoft is a software which provides the storage and retrieval of data as per the request of the other applications which are running on the same computer or on any remote computer, via the network.

It stores the data in a database which is comprised with a set of table and it supports different data types such as Float, Decimal, Integer and so on. In addition it allows the

dynamic management views (DMV) and data base contains views, indexes, constraints as well as stored procedures.

In order to minimize disk input output operations SQL server buffers the pages which are in RAM. It allows concurrency which gives the ability for different users to use the system at the same time.

Different services such as service broker, replication services, analysis services, reporting services, notification services etc are also provided by this SQL server in addition to the relational database management which lets the software designers to easily develop their work [7].

3.2.2.2 Why it is used?

For the Software product that is to be developed, a database management system is required to store, retrieve, update and modify different types of data according to the requirement. Therefore to fulfill this we referred several database management systems and chose Microsoft SQL server instead of selecting Oracle, MySQL and SQLite.

The reason for choosing Microsoft SQL server is that it provides password complexity, patch access, separation of duties, security certification and some other specific features that other server does not provide. Therefore by considering all these factors we decided to develop backend of the software product using this Microsoft SQL server.

The software needs to manipulate data related to teachers, students, parents and principals and to update, modify and delete data items as per the requirement with highest consistency. Quick retrieval and integration with different applications is also required. Therefore all these requirements can be achieved conveniently through this database management system[5].Adoption of technology for the development of the software will be discussed in detail in Chapter 4.

3.2.3 TFS – Team Foundation Server

3.2.3.1 What is TFS?

TFS which stands for Team Foundation Server is also a Microsoft product which is suitable as a back-end for different IDEs but mainly well-fitting to Microsoft Visual Studio and Eclipse. This is a tool dedicated for process improvement which increases efficiency which tracks the process to ensure whether a progress is encountered [8].

It goes on collecting metrics to identify the problem and access the improvement over time. TFS provides the following set of major features.

- Version control
- Work item tracking
- Project management
- Team build
- Data collection and reporting
- Team project portal
- Team foundation shared services

TFS ensures the inter communication among the development team and support different agile methods of software development. It ensures the effective collaboration among team members throughout the software development life cycle.

3.2.3.2 Why it is used?

The software product which addresses the school based activity collaboration is to be designed by a group of five members. Therefore in order to ensure proper communication and collaboration among members throughout the development process in designing, implementing, building as well as in testing phases is vitally important. This Team Foundation Server ensures this need of systematic collaboration.

On the other hand since we use SQL server for storing data it is supported by TFS also. The provision of bug tracking and integrated test tools and overall process progress analyzing mechanisms influenced us on selecting this technology.

3.2.4 Android

3.2.4.1 What is Android?

Android is a mobile app development technology which is widely used today. It is a software piece which makes the hardware to function properly. It allows more customized mechanisms to design different apps and handle different features [1].

Since other mobile app development technologies such as ios are more expensive and need special requirements to implement mobile apps using those.

3.2.4.2 Why it is used?

On the requests of our client to develop a mobile application to make the collaboration process easier, we selected android based web app development. One main reason which influenced us on selecting it was that mobile phones supporting android OS are mostly available.

This app should provide the ability for user to access different modules like messaging, complaining, notice handling, viewing homework and so on via the mobile phones.. Therefore since android is more user friendly technology which allows easy manipulation and having affordable costs we decided to implement the mobile app based on android.

3.2.5 JSON

3.2.5.1 What is JSON?

JSON is the acronym for JavaScript Object Notation which is used for the storage of information in an organized and easily accessible manner. It provides a logically accessible collection of data in a human –readable format.

When human interact with computers it is easy for human to read and write while computers find it convenient to parse and translate. JSON is text which allows the conversion of JavaScript to JSON and vice versa.

This technology allows users to work with data in the form of JavaScript objects without more complication.

In addition this technology allows the storage of JavaScript objects in the form of text.

Therefore JSON is easily understandable, lightweight, language independent format which ensures convenient data interchange [6].

Instead of using XML for the same purpose of transmitting data among the server and the web application JSON is more suitable because it does the same process in a more compact form consuming less bandwidth.

3.2.5.2 Why it is used?

In the software solution that we are designing to collaborate the school oriented activities we need to establish proper data exchange mechanisms between the web and different servers efficiently.

JSON technology provides a convenient way to transmit data from server backend to the JavaScript code and since it allows serialization and deserialization mechanisms which consume less space and simplify the complexity than other alternatives.

Since JSON requires less bandwidth download time will be reduced and most of the servers limit the amount of transmittable data in a message. On the other hand since our software solution implements REST API , JSON is vitally serving a big service in transmitting data between server and client. Detailed descriptions on technology adoption will be discussed in later chapters (Chapter 4)

3.2.6 Firebase

3.2.6.1 What is Firebase?

Firebase is a mobile and web application development platform. Firebase Storage provides secure file uploads and downloads for Firebase apps, regardless of network quality. It allows the developer to store images, audio and other needed content. Firebase Cloud Messaging, Realtime Database and firebase hosting are some other special features of the technology.

3.2.6.2 Why it is used?

In the software solution we need to implement a real time chat which allows the teachers and parents to communicate with each other. This was established using firebase real-time database.

3.2.7 Azure

3.2.7.1 What is Azure?

This is a Microsoft's application platform for the public cloud. The cloud services, virtual machines, websites and mobile services are the main services of the azure technology.

3.2.7.2 Why it is used?

This is used as a platform for creating and hosting websites and web applications. The Restful API is hosted on azure cloud services.

3.3 Summary

This chapter is a description on the approach followed in selecting suitable technologies to implement the intended software solution. The reasons for adopting the selected technology over the other available alternatives and the applications of them on the project are clearly discussed here.

The influence of selected technologies on the implementation of different modules like web based front end, back end and android based mobile app have been briefly described in the chapter and detailed descriptions on implementation and designing approach will be enlighten in the later chapters.

Chapter 04

Adoption of technology on our approach

4.1 Introduction

This chapter gives an overview of the technology adoption procedure of the project to solve the identified problem domain. From the previous chapter the selected technologies for the project were discussed in detail and this is a detailed review on how the selected technologies are used in our system.

4.2 How to adopt technology to solve the selected problem?

Our software solution which is designed with the aim to collaborate the activities of a school is useful mainly for four types of stakeholders as demonstrated in *Figure 4.1*.

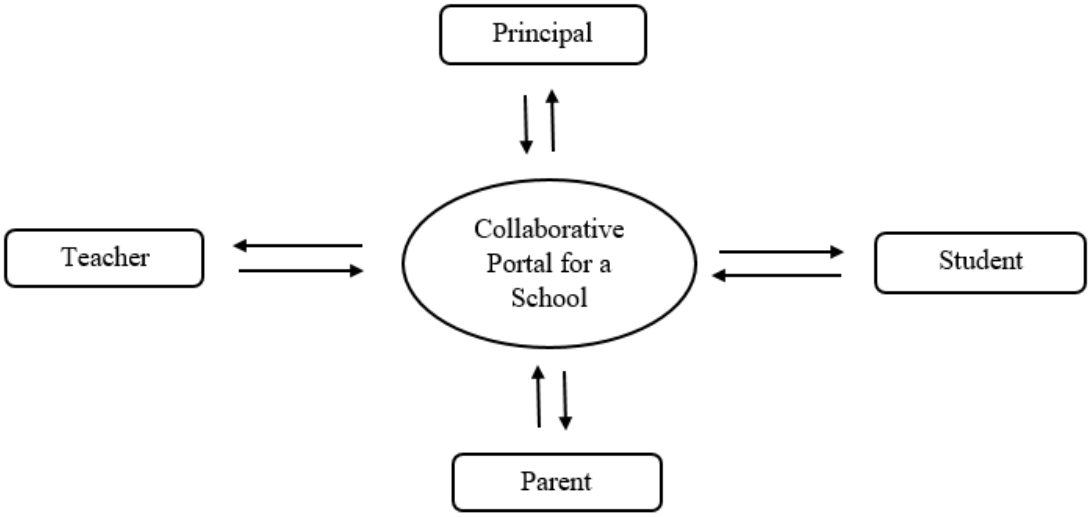

Figure 4.1 User Interaction with the Proposed System

These four distinct users are given specific privileges to handle different activities related to school centered activity collaboration. The proposed software solution is made up of eight sub modules which are dedicated to provide different functions to these four types of users.

This system allows teachers to enter daily attendance records, update records when necessary and to view the uploaded records by all four users. A particular student or a parent is allowed to view only their respective attendance and not of others. The system processes the input data and highlights the frequent absentees while providing a graphical representation of overall attendance of students of a class to display the evaluated attendance records (80%).

Teachers can input student exam marks and student achievements to the system. Students and parents are allowed to view only the respective students' marks, not of others while teacher and principal can view marks and achievements of all the students when required. Based on the inputs provided by the teacher a the system outputs a graphical representation to analyze the marks.

Teachers are allowed to update daily syllabus coverage so that all the four types of users can view the things taught daily. Graphs are created to evaluate the progress of covered syllabi at a given time and gives analyzed reports on time needed to complete the rest of syllabus allocated to them based on the inputs. This also provides ability for students to raise questions about subject matter and teachers can view them and respond when necessary.

The software provides different profiles with specific features to different users and grants access control (Teacher should be able to see marks, attendance of all students to whom he/she teach and students can't see other students' marks). Also a dashboard is developed for parents to drag and drop the needed options to their interface. (homework, attendance etc)

This allows sending messages among teachers and parents. Also principals are allowed to send instant messages to the whole school at once. (parents, teachers, students, principal)

Teachers are given the privileges to upload home works while parents and students are allowed to view them.

Parents are able to send complains to principal or teacher .Principal and teacher can view the complains directed to them and respond. We have implemented feedback methods to check whether the parents are satisfied with the taken actions. Mechanisms are included to identify the number of solved and unsolved complains while delivering a summary of solutions taken so far. Options are included to add complains anonymously if parents need that.

The system is also comprised of a mobile app which is developed using android technology and it allows the users to experience software features through their mobile phones. The app can be used by all the four users except the admin. This includes a crucial subset of features that the web application provides to the user.

- Handling notifications for all the users
- Complain handling
- Viewing reports
- Notice handling
- Ability to comment on notes uploaded by teachers
- Facility to view homework
- Entering and updating attendance record by teacher

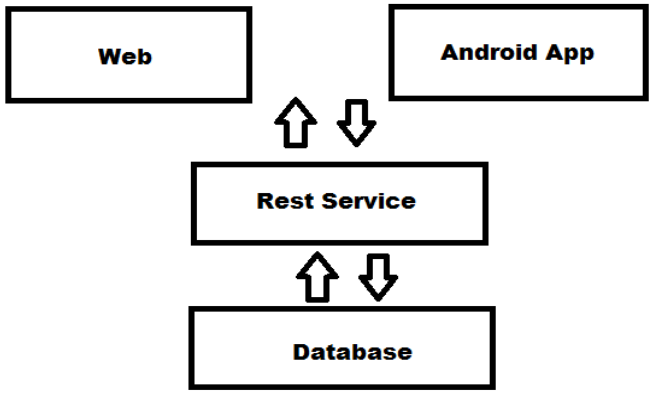

Figure 4.2 Top level architecture of proposed solution

The back end of the software which includes all types of data inputs by the users are stored in the database designed using Microsoft SQL server and codefirst . It allows

easy and secured storage of data and convenient updates and modifications which are crucial in modules like attendance manipulation.

The front end of the software (the web interface) is developed using ASP.NET core .Here c# is used for coding purpose and software is developed based on Mvc pattern and using Bootsrap predefined frameworks.

RESTful API which is implemented and hosted on azure cloud service is an interface between client and server provides more flexible outputs in formats like JSON.

4.3 Summary

This chapter basically focused on describing what our project is in detail. And also the adoption of technology on solving the identified problem domain is discussed here. Details about different types of users who are benefitted by the system and their respective inputs and delivered outputs are explained through the chapter in detail.

Chapter 05

Analysis and design of the application

5.1 Introduction

Success of a software product lies on the satisfaction of the users who are benefitted from that. Therefore in order to deliver a product of best standards, requirement analysis and design phases play a major role. The designing of software in such a way to deliver all the expected requirements to the customer includes a set of specific tasks such as UML diagram designs, top level architectural design and so on. This chapter is a description of how our identified problem domain was analyzed and designed to deliver a high quality final product.. This includes the requirement gathering details, requirement analysis details as well as UML diagrams which explain the functionality and structure of the software solution.

5.2 Analysis

Analyzing the identified problem domain to which we are hoping to design a solution is crucially important in software development. If this phase is messed up software developer will not be able to deliver a product that satisfies the customer requirements. Therefore as the first and foremost task requirements were analyzed using different strategies to identify the expected values by the customer exactly.

5.2.1 Requirement Analysis

To proceed the software development successfully requirement gathering and analyzing is vitally important. The reason it is the rigid foundation for developing a product that would satisfy the users expectations .If the developer has no means to identify what the users of the product expect from that it will create lots of problems. Therefore as the first step we focused on gathering both functional and nonfunctional requirements and analyzing them.

Mainly we had several discussions with the client to clarify what they exactly expect from the product and to understand the users whom that will be benefited from it. In addition we reviewed several similar systems that have been developed to address similar problems and identified the requirements. Since we all have past experiences

on school time, the requirement gathering procedure for the software solution was not much difficult. We had several discussions with students, parents, teachers as well as principals about the drawbacks and inconveniences that are experienced in the now prevailing system.

Based on all these analyzing events we identified two types of requirements as User requirements and data storage requirements.

5.2.1.1 User requirements

Mainly there are four types of users interacting with the process and they have different requirements.

Teacher

- Entering, updating and viewing attendance records
- Entering, updating and viewing student marks and achievements
- Entering, updating and viewing daily covered syllabus
- Uploading homework and notes
- Receiving and replying complains sent by parents

Parent

- Viewing attendance of their children
- Viewing marks and report of their children
- Viewing homework
- Sending complains to teacher or principal anonymously or with identity

Student

- Viewing attendance
- Viewing homework
- Viewing report and marks of term tests
- Commenting on notes uploaded by teacher

Principal

- Viewing attendance of students
- Sending messages to whole school
- Viewing and responding the complains raised by parents

In addition to above functional requirements of the users nonfunctional requirements such as usability, security, reliability should be ensured.

On the other hand data that is input by different users have to be stored in a proper manner so that easy retrieval is accomplished.

5.3 Design

After analyzing the requirements properly we started to design the solution based on gathered requirements. Mainly the software product was designed with two modules as the front end and back end. Back end was designed to store all the data in a data base whereas the front end is made of two parts as the web and the mobile app. Both of these provide 4 types of interfaces with specific features for the four types of users.

Front end

This module is mainly implemented in two ways as the web interface and mobile app. It includes different views and options for different users. All the users are allowed to log into the system. It is a common functionality for all the users. Users are allowed to input different data into the system through various options in the interface and they are stored in the back end data base. Whenever users select view option on interface respective data are retrieved from the back end.

RESTful API

RESTful API interacts the client and server .It is responsible for data exchange between front end and back end.

Back end

This is implemented with Microsoft SQL server and Codefirst. The database stores all the data types and ensures convenient retrieval whenever client requests.

Mobile app

This is created using Android technology providing a subset of features that the web interface provides. It provides messaging, complain raising, notice manipulation, commenting on uploaded notes, viewing homework and report as well as attendance marking features to the users.

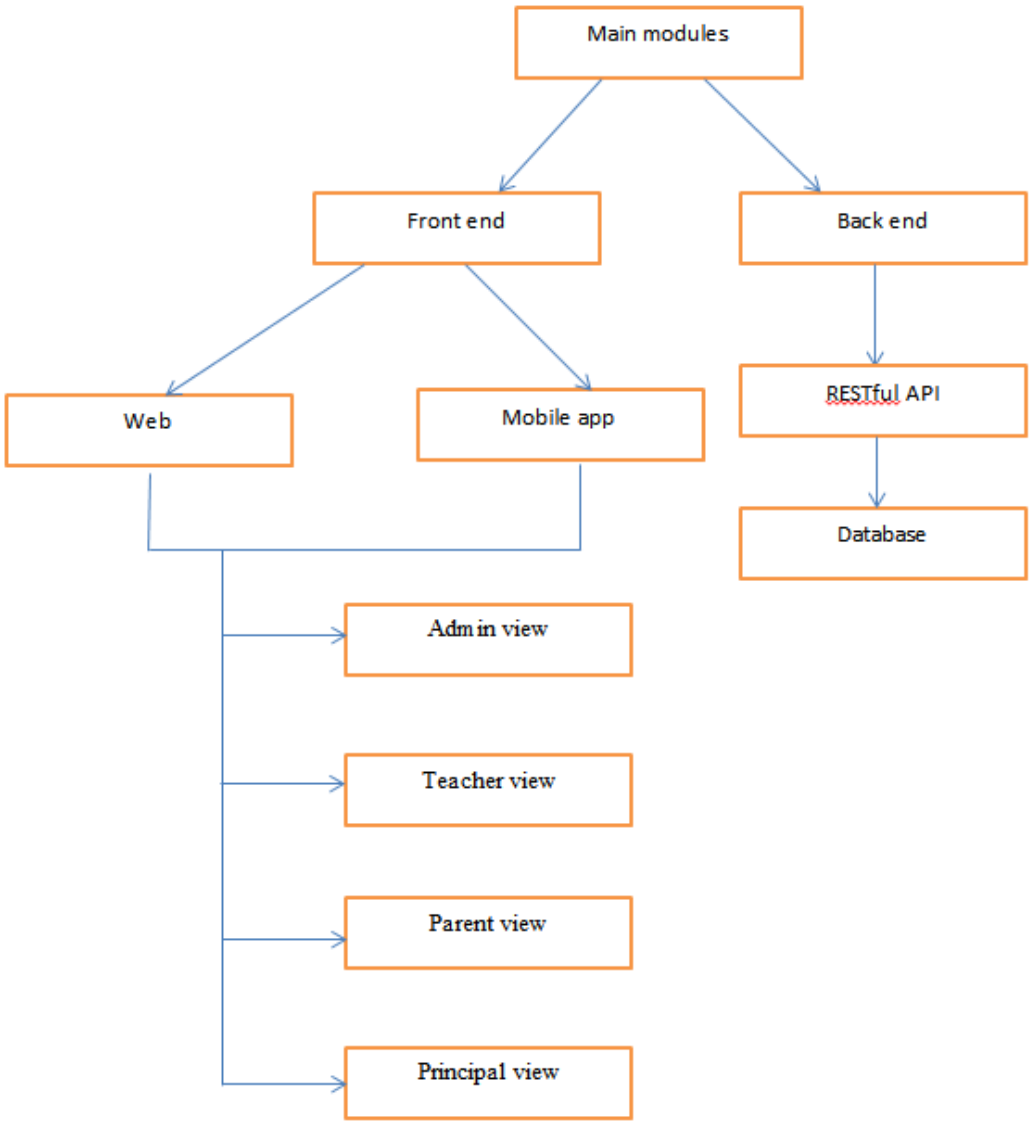

Figure 5.1 Design diagram of main modules

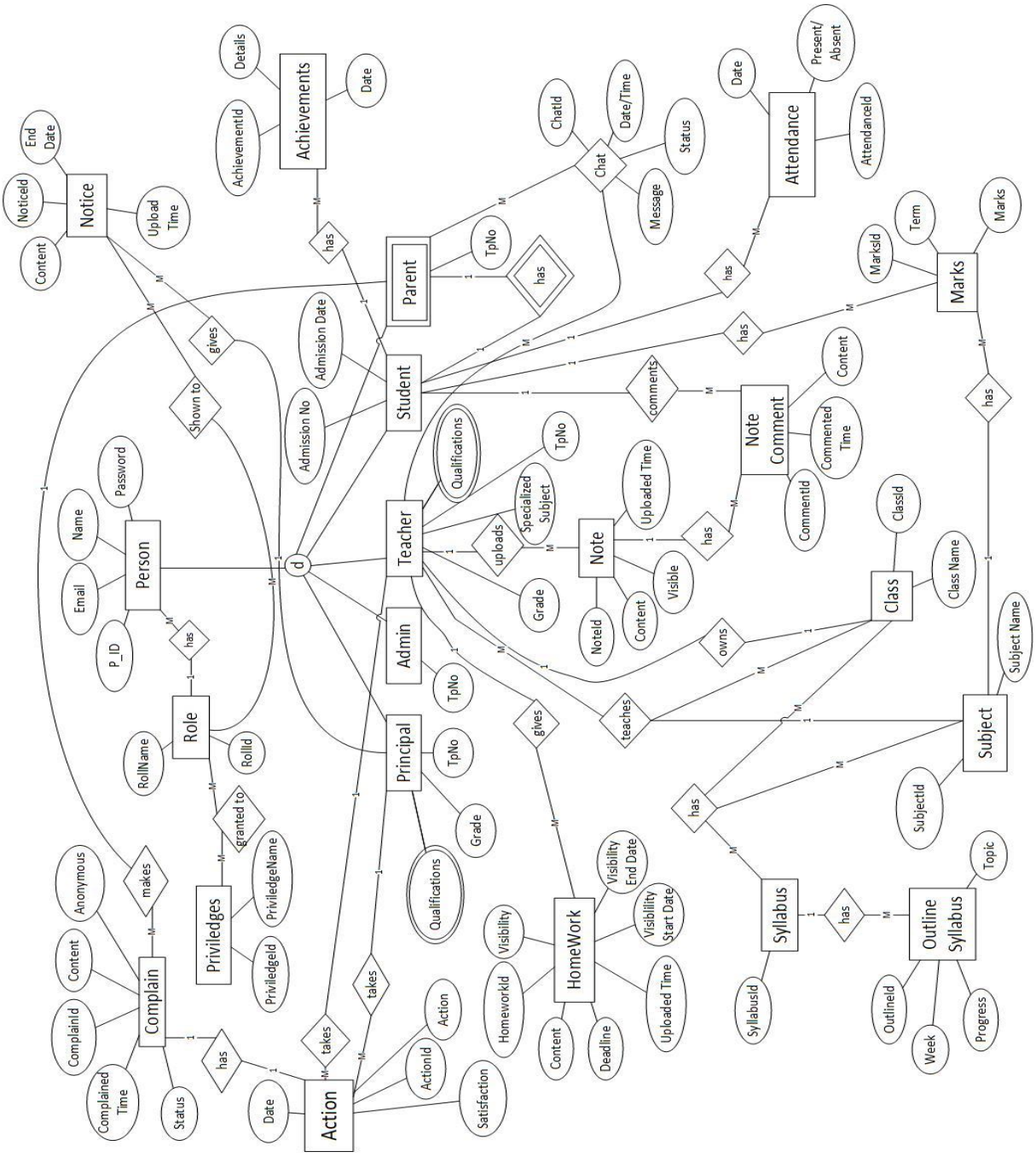

Figure 5 2 EER diagram

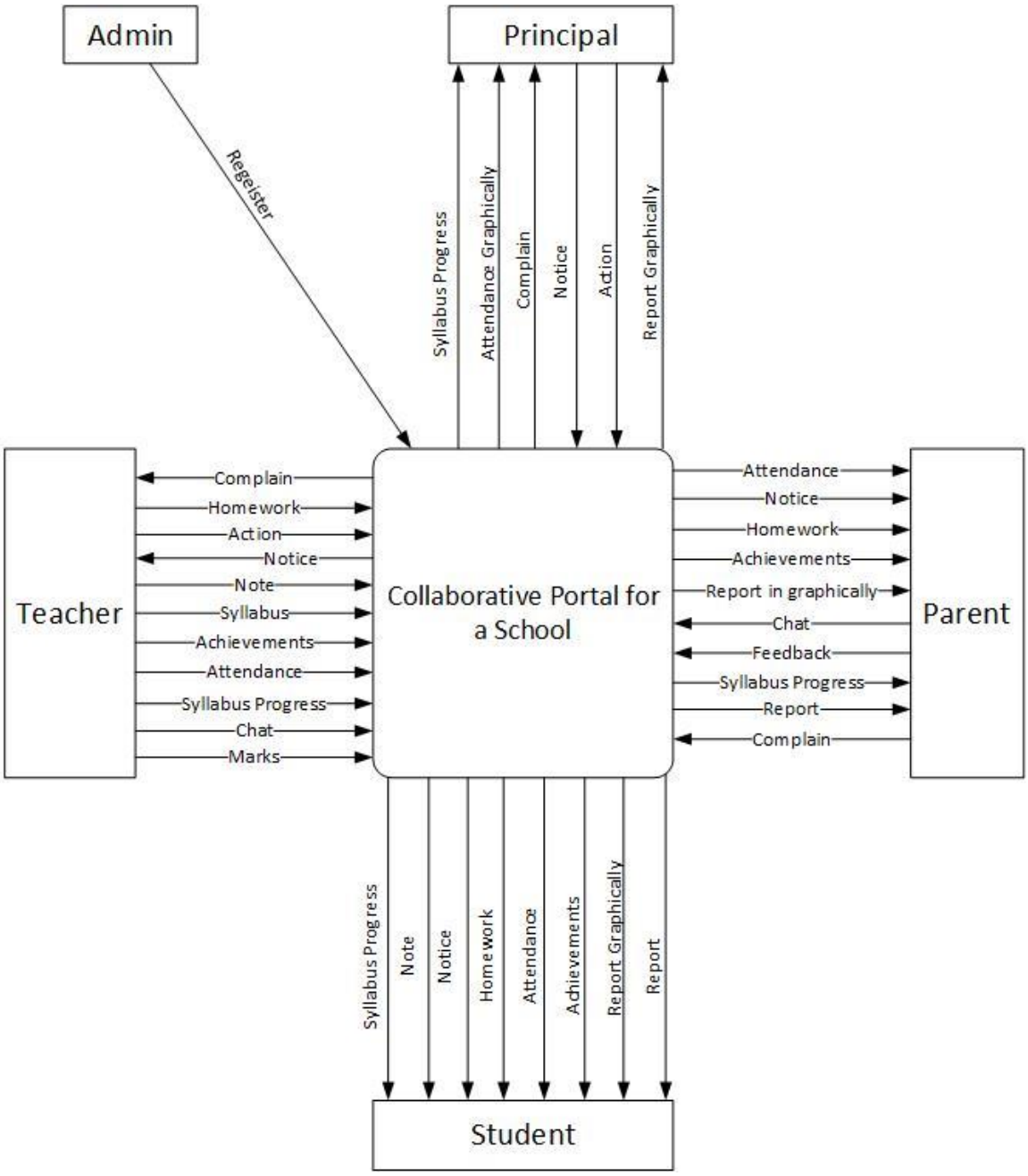

Figure 5.3 System diagram

5.4 UML Diagrams

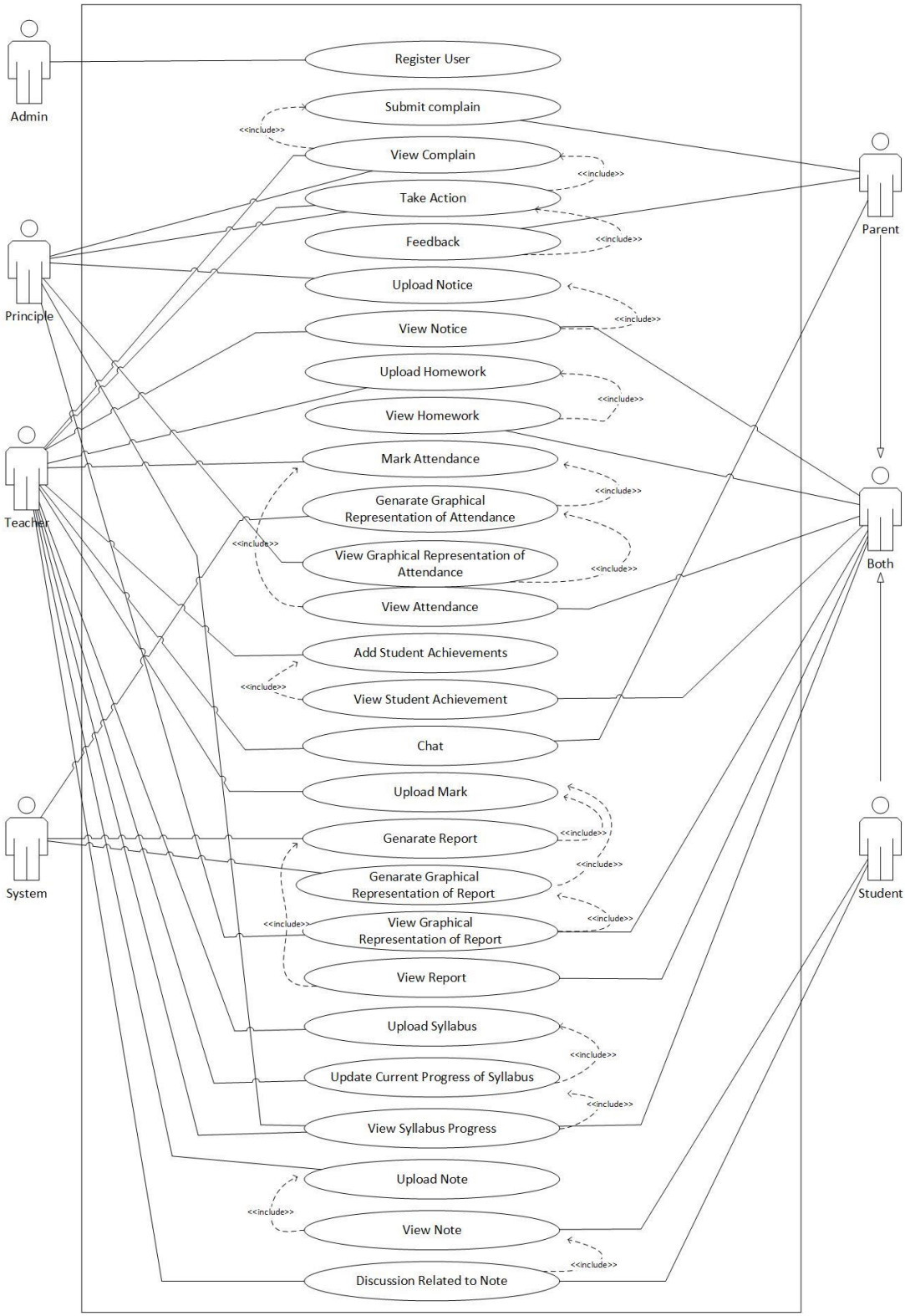

Figure 5.4 Use case diagram

5.4 Summary

The analysis and design phase of the software development process is discussed in this chapter. Modular organization and designing of each phase is discussed here.

Chapter 06

Implementation

6.1 Introduction

After the requirements were gathered and analyzed properly, based on the designs done we started our implementation phase in the software development life cycle. This chapter is to describe the implementation process of our system while the previous chapter was based on analysis and design process.

6.2 Implementation of the software

6.2.1. Web module

The web module basically focuses on developing a user friendly front end for the software solution. It provides a single platform for all the users to interact with the system. It was implemented using the visual studio 2017 IDE, Asp.net core mvc architecture, razor syntax; C# language, html .In addition jquery, bootstrap and JavaScript languages were used to add styles to the web pages.

The templates were loaded to views and controller classes integrated the views, models and API content together. Finally the total website was published to azure cloud service.

It includes interfaces for the following main functionalities.

- Attendance handling
- Complain handling
- Notice manipulation
- Homework handling
- Syllabus manipulation
- Note upload
- Achievements manipulation
- Login and registering

6.2.1.1 Attendance handling

This module was implemented with separate viewing interfaces for teacher, student and parent. Marking attendance, updating attendance and viewing the attendance of a child on a particular day were the features implemented. Validations were done to identify the logged in user and features to be displayed on the interface were decided based on that.

6.2.1.2 Complain handling

This module allows the parents to direct a complain to teachers and principal of the school according to their preference. The interfaces were created with different views for parents, teachers and principal including different features.

6.2.1.3 Homework handling

This was implemented with separate interfaces for teacher, parent and student .Teachers are given the options to upload homework as a pdf , assign visibility time out and etc. to their respective classes. Students are given options to view and download homework once logged in to the system.

6.2.1.4 Syllabus manipulation

Under this the interfaces were implemented with separate views to upload, update and view the progress of the covered lessons. Validations were done to deny access of students and parents to the views of teachers and users are authorized in the controller classes for specific tasks

6.2.1.5 Note upload

Note upload is achieved by allowing teachers to upload the notes of lessons and allowing students to view and download them .The users are allowed to comment on uploaded notes. This interface also provides different views with various options for different users.

6.2.1.6 Achievement manipulation

Under this module uploading achievements of students and viewing them by students, parents and teachers are allowed. Different views and validations were done to ensure consistency and security of the module.

6.2.1.7 Login and registration

Login of the system was designed using bootstrap templates with validations to track invalid or incorrect login details. Registration function is achieved by the admin and separate views were created to achieve it.

6.2.2 Mobile App

Mobile application was designed as a multi user application allowing access to teacher, parent, student and principal using android studio IDE. The application was implemented in such a way to store necessary data in the local storage when the user first logs into the system allowing the user to automatically log in when restarting

unless they logged out. Shared preferences was used for this. Real time chat function was implemented using real time database of firebase technology. In addition firebase technology was used for implementing notification functionality. All the http requests to connect with the Restful API were handled through retrofit which is a REST client for android. The facilities provided are as follows

Teacher

- Marking attendance
- Chatting with parents of the students in the classes he/she teaches
- Commenting on notes
- Viewing notices from principal
- Replying to complains

Parent

- Chatting with child's teacher
- Viewing attendance
- Viewing and downloading homework
- Viewing notices
- Viewing student achievements
- Complain handling

Student

- Viewing attendance
- Viewing and downloading homework
- Viewing notices from principal
- Viewing, uploading and downloading notes
- Commenting on notes
- Viewing achievements

Principal

- Complain handling
- Uploading notices

6.2.3 Restful API

Restful API is the intermediate through which the front end and the back end communicates with each other. This was implemented with Visual Studio 2017 software using codefirst, c# and ASP.net core mainly. When http clients request data from the back end they are directed through the Restful API to the back end data base and data relevant to requests are transferred to clients. To achieve this query expression were made using LINQ methodology. Postman tool was used to test the accuracy of Restful API queries. The API was hosted on azure cloud service.

6.2.4 Backend Database

Data related to each entity is stored in a back end database and retrieved whenever necessary via the API. The data base for the “Collaborative portal for a school” was implemented using codefirst entity framework approach in visual studio 2017.The data entries to the tables were achieved via the MSSQL server management studio. After requirements were properly gathered and analyzed the EER diagram was designed and then normalized. Based on that model classes were created using codefirst to represent the needed tables with the attributes and data types. Finally the data base was hosted on azure cloud service.The real time chat was implemented using firebase real-time database technology. This technology was used to implement both mobile and web based chat.

6.3 Summary

This chapter is basically based on the implementation details of the web application, database, mobile application and the Restful API of the collaborative portal for a school. Web application has been implemented using Asp.net core mvc architecture .The web application provides varied interfaces for different users. These interfaces have been developed using an open source style sheet language called bootstrap. The back end data base was implemented using visual studio 2017 , codefirst and MSSQL server management studio while the Restful API was implemented using ASP.net core, C# and LINQ. The mobile application was implemented using android studio IDE and the real time chat was implemented using firebase cloud technology. Azure cloud service was used for hosting the database, website as well as the RESTful API.

Chapter 07

Evaluation

7.1 Introduction

The previous chapter was based on the implementation details of each module of the collaborative portal for a school. This chapter is based on the testing and evaluating procedures regarding to the outcomes of the software solution.

7.2 Evaluation of the results

User centric and system centric evaluation methods were used for evaluating each component. Under user centric level the utility and the value of the system to the user were evaluated. Different test procedures were followed to mock the user interaction and the respective outputs were analyzed.

7.2.1 User centric evaluation for web application

Description	Test Procedure	Expected Output	Achieved/Not
User login	Not entering password	Display error message	Achieved
	Enter incorrect password	Display error message	Achieved
	Enter correct password	Redirect to the relevant page	Achieved
User registration	Enter already registered email address	Display error message	Achieved
	Enter invalid data	Display error message	Achieved
	Enter incorrect password	Display error message	Achieved
	Enter valid data with correct confirm	Registering the user	Achieved

	password		
Assign teachers to a class	Assign a teacher to a class already having a class teacher	Display error message	Achieved
	Assign a teacher to a class which hasn't a class teacher	Successfully assign a teacher	Achieved
Uploading photos and pdf	Trying to upload photos and pdf without login	Redirects to login activity	Achieved

7.2.2 System centric evaluation for web application

System centric evaluation was done under the following categories

- Performance –response time ,throughput etc
- Scalability

  Client side application and server side backend was separated in this project allowing further improvements in the future. The admin version can be extended to mobile app also.

- Availability

  Users are allowed to log into the system either by the mobile application or web application

- Reliability
- Security

7.2.3 User centric evaluation for mobile application

Description	**Test Procedure**	**Expected Output**	**Achieved/Not**
User login	Not entering password	Display error message	Achieved
	Enter incorrect password	Display error message	Achieved

	Enter correct password	Redirect to the relevant page	Achieved
	Empty fields for password and email	Display error message	Achieved
Connecting to API for http requests	Server is down or any kind of connection failure	Display error message	Achieved
	Server connection is successful	Successfully connected	Achieved

7.3 Summary

This chapter was based on the evaluation of software outcomes .Each module was tested against user centric and system centric evaluation methods to ensure whether the expected objectives were achieved. Under the user centric evaluation method different test procedures were used to evaluate the value of the system to the user. In this evaluation basic features like login, user registration, invalid inputs and etc were evaluated. When the system was evaluated using user centric method different input combinations were given and the system was checked whether it works only for correct combinations. In addition system centric evaluation procedures like scalability, availability, reliability and etc were carried on. The next chapter will be about future suggestions for further improvements of the system

Chapter 08

Conclusion and further work

8.1 Introduction

Through the previous chapter we discussed the evaluation procedures that were used to ensure that the objectives and expected functionalities of the system were achieved successfully.

This chapter is to give an overall conclusion of the system that we have implemented and gives descriptions about the uniqueness of our system over the other similar approaches that we investigated. In addition the methods that should be adopted to improve the system further are enlightened here.

8.2 Conclusion

The problems and inconveniences experienced in traditional school management procedure is the problem domain to which we found a software solution. The collaborative portal for a school was implemented with the aim to develop a system which creates a collaborative environment among teachers, parents, students and the principal of modern education systems.

After analyzing the similar projects on school management systems the importance of the addressed problem was confirmed and several gaps that have not been addressed so far were identified. Most of the prevailing systems which give solutions to similar problem domains do not focus on providing all the facilities like homework manipulation, complain handling and syllabus manipulation at once. Our system was designed incorporating all these facilities for teachers to upload the homework and parents as well as students are allowed to view them. Also parents can direct complains regarding various stuff to a specific teacher or to the principal either anonymously or with an identity. Another important feature that our system provides is the ability to upload daily covered syllabus so that teachers, parents and students can view them. All the four types of users are allowed to view the progress of the

syllabus coverage. These special features make our system uniquely outstanding among the other prevailing similar systems

The mobile application was designed focusing only four users ; parent, teacher, student and principal currently. The tasks of the admin are carried on only via the web application. When comparing our software solution over the other existing systems it is clearly viewed that our solution addresses a wide set of requirements of different users providing a wider range of facilities than the similar systems.

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8.3 Further work

Currently we have implemented the mobile app of the system to be used by only four types of users except the admin. This can be further improved by adding the admin functions to to the web application. We have assumed that a principal does not teach a subject. But we can develop the system for conditions where principals play the role of teachers also.

Currently the system allows parents to raise complains but it can be further improved so that students also can raise complains.

8.4 Summary

This chapter is a description about the software solution that we address in a nutshell. It includes a summary of the content in all the chapters that were discussed. The uniqueness of our software solution when compared with other systems available today is clearly mentioned here.

Chapter 09

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Appendix A

Individual Contribution

M.L.P Jayasekara 154051J

I am responsible for the implementation of the android based mobile application. For that I studied android based app development basics initially using the tutorials. I studied the android studio IDE and the functionalities provided by it to implement the mobile app. The application was implemented in such a way to store necessary data in the local storage when the user first logs into the system allowing the user to automatically log in when restarting unless they logged out. Shared preferences was used for this**.** While studying I learnt about different classes available in android and methods of using them. We are using a RESTful API in our system and JSON to communicate between RESTful API and mobile app. Then I found http requests to connect to the REST API are handled by retrofit and used it in my application. So I studied about connecting those technologies with android. The Real time chat which is accessible via the android app was implemented using firebase and I studied about the applications of that technology. Notifications were handled through firebase. Teacher, principal, student and parent can use the android mobile app. Interfaces for different users for different views and functionalities were implemented and integrated with the back end database. Validations were done to ensure consistency of the application. I also contributed in developing the EER diagrams , use case and class diagram initially.

The mobile app provides the following features.

- Handling notifications for all the users
- Complain handling
- Viewing reports
- Notice handling

- Ability to comment on notes uploaded by teachers
- Facility to view homework
- Entering and updating attendance record by teacher
- Real time chat

S.A.A.M.Weerasinghe 154133M

I am mainly responsible for three modules: profile handling, messages handling and attendance manipulation. I studied the basics on ASP.NET core mvc architecture. I studied about ASP.net core, c# and mvc pattern from the tutorials. Then using bootstrap, html, JavaScript and jquery I implemented the front end views for different users with different functionalities. In addition I also studied about JSON and razor syntax because data from the back end are transferred to the front end as JSON objects.

I had to implement the system as different users have different profiles with specific features. I am responsible for granting access control to each user and developing a configurable dashboard I also made validations at the front end to track invalid user inputs providing authentication for several tasks such as blocking students getting teachers' views for different function.

Initially I tested the functionality of the front end interfaces using a local database and then after confirming the accuracy of the codes I integrated with the back end data base hosted in azure cloud service via the RESTful API.

The real-time chat was implemented using firebase technology and I studied about that technology also. The real-time database of firebase was used to store chat messages and responses. In the messaging module parents and teachers should be able to chat privately using a chat box. Principal is able to send instant notices to selected roles.

I also contributed in drawing EER diagrams, sequence diagrams and activity diagrams of these modules

H.K.D.S Jayampathi 154048G

I am mainly responsible for implementing the database and RESTful API of the back end of the software solution.

I initially studied about ASP.net core and mvc architecture using video tutorials and documentation. In addition codefirst was used to implement the database using mvc pattern and learnt the basics related to that. Different controller classes, views and model classes were coded according to the normalized EER.. After drafting the tables with relationships the database was tested with simple get post methods.

I studied about C# and azure hosting mechanisms also. Data was entered using MSSQL and a RESTful API was implemented to ensure the communication between front end and back end.

I studied about LINQ methodology to code the queries. Queries were important when extracting data relevant to requests sent by http clients. To check the accuracy of the queries I used postman tool .Initially the database was created as a local database and tested the accuracy of foreign keys and relationships. Then it was hosted on azure cloud service and integrated with the back end via the API. Validations were established to trap invalid login details, access controls and etc to ensure the consistency of the application.

I contributed in designing usecase, sequence ,class and activity diagrams.

M.M.P. Madhubhashini 154144X

I am responsible for implementing the syllabus handling, report manipulation and homework module. I studied about ASP.net core and MVC architecture initially to implement the views, view models and controller classes related to each module.

For the coding c# language was used. In addition bootstrap was learnt to implement the front end views for the modules with separate functional features and options to different users. JavaScript, jquery, html were also used to implement the front end views. I also learnt Razor syntax to integrate c# content with html. Also I studied about JSON because data is received from the back end in JSON format and on the other hand data inputs from front end forms should reach the backend in JSON format.

Report manipulation module should allow teachers to enter marks and generate reports on input data. Separate interfaces were made for teachers and students and validations were done to control the functions and features to be displayed based on the logged in user. Syllabus handling module was implemented with separate interfaces to upload, update and view progress of the covered lessons of the syllabus with a options to mark the daily covered topics .It graphically represents the progress of syllabus coverage. Homework module was implemented with options to upload and view homework with separate views for parents , teachers and students. I also contributed in drawing the EER and use case, activity diagrams.

There is an option named achievements. Teachers can upload the achievements related to her/his class. If there is any student has any kind of achievements his/her achievements upload by their class teacher. After uploading those achievements save in the database. When parent or student log in to the system they can view students achievement. When selecting achievements view option the system send data to view interface from database.

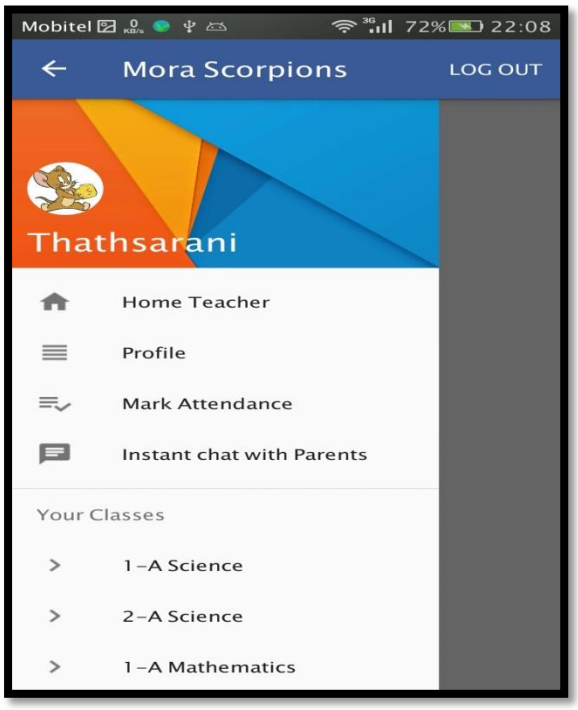
Notice uploading option can access by only principal. If principal needs to give any message to teachers, students or parents principal can give that as a notice. When he/she uploading the notice they should select which users should visible this notice. After uploading the notice, it save in the database. Then system send notifications to particular user. When users viewing the notice, database send data to the users view.

By using this system any parent can makes complain for any teacher or principal. When a parent log to this system there is an option button to make complains. After click that button parent can see a form. Then he/she can make complain and select is this complain for a teacher or principal. If the complaint for the principal, parent can send complain easily. But if the complaint for teacher then parent should select particular teacher. There is a field name anonymous. If parent need to show his/her name to the principal or teacher, parent should select anonymous. Then parent name will show to the particular teacher or principal. If parent don't need to mention his/her name can submit the form without selecting the anonymous field. After click the submit button all the data which fill in the form are send to database and save. When teacher or principal log to the system, they can view those complains. They receive notifications. It means complain data of the database receive to the teacher and principal views. After teacher and principal take actions for received complains and they can submit those actions to parents. Actions also save in database. When parents view actions the system get data from database.

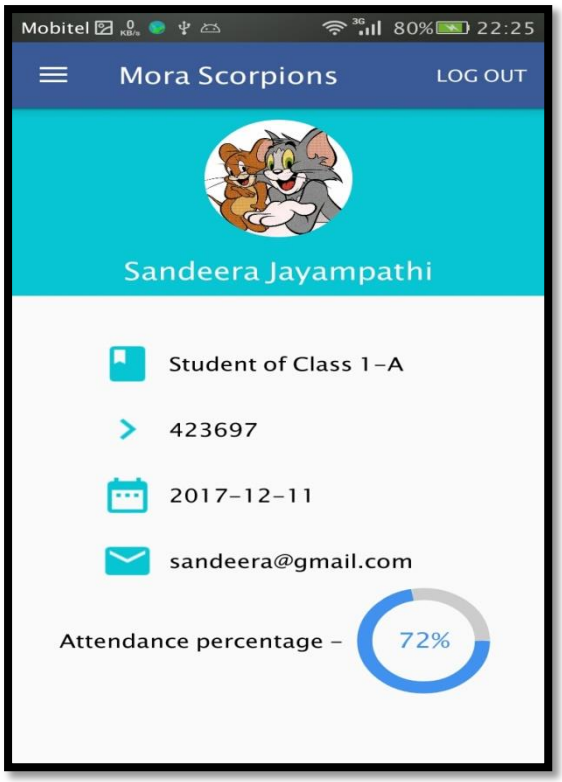
Appendix B

Screenshots from the Android Application

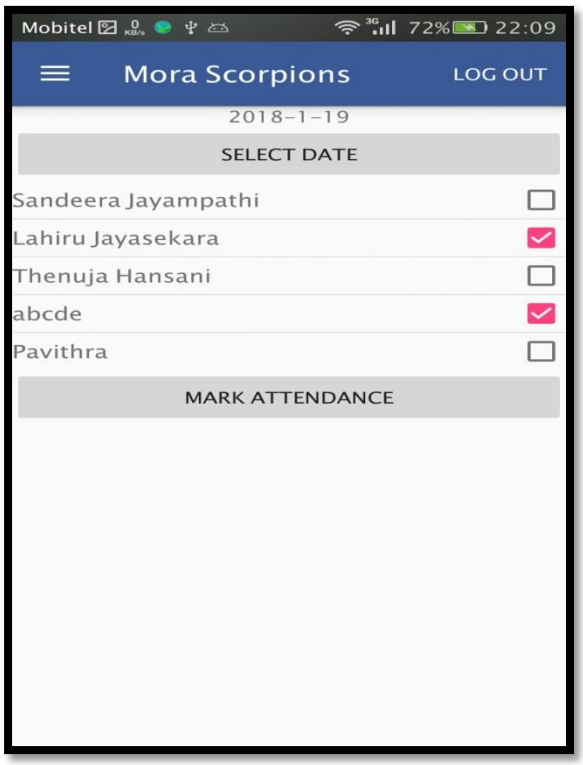
Figure_B 1: 1 Login Screen



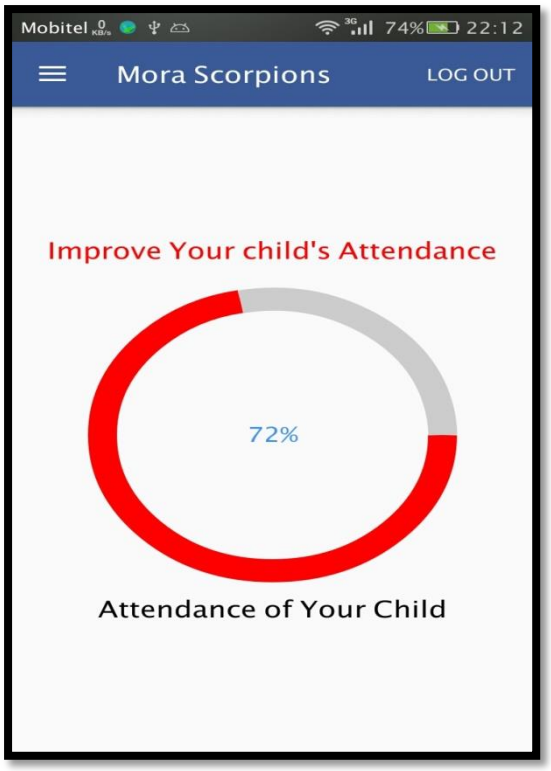
Figure_B 1: 2 Navigation



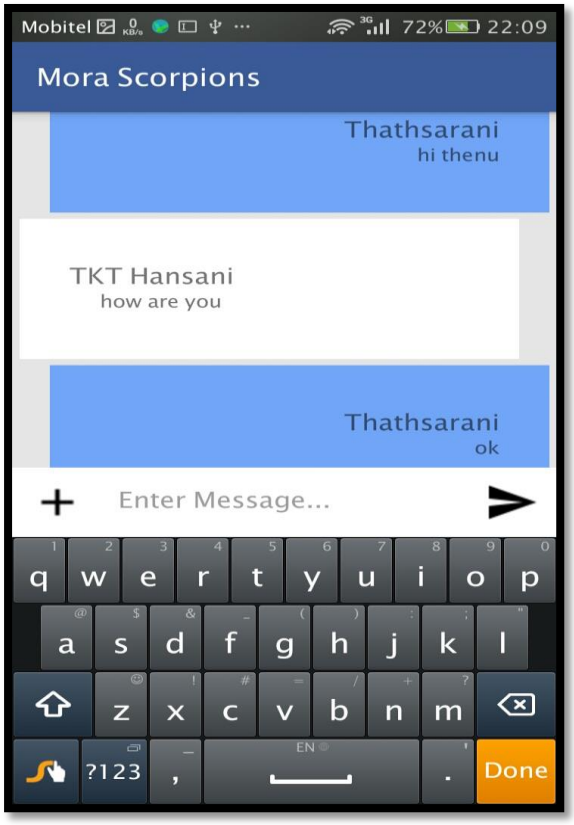
Figure_B 1: 3 Profile



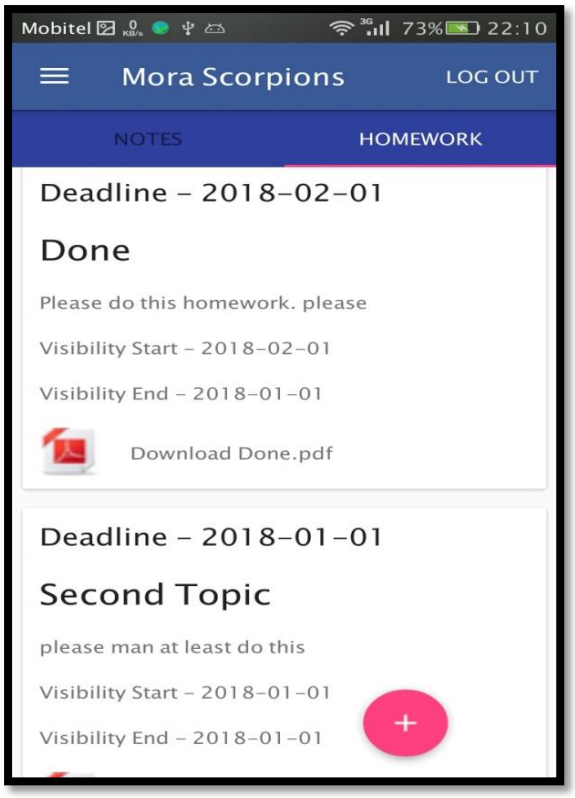
Figure_B 1: 4 Attendance Marking



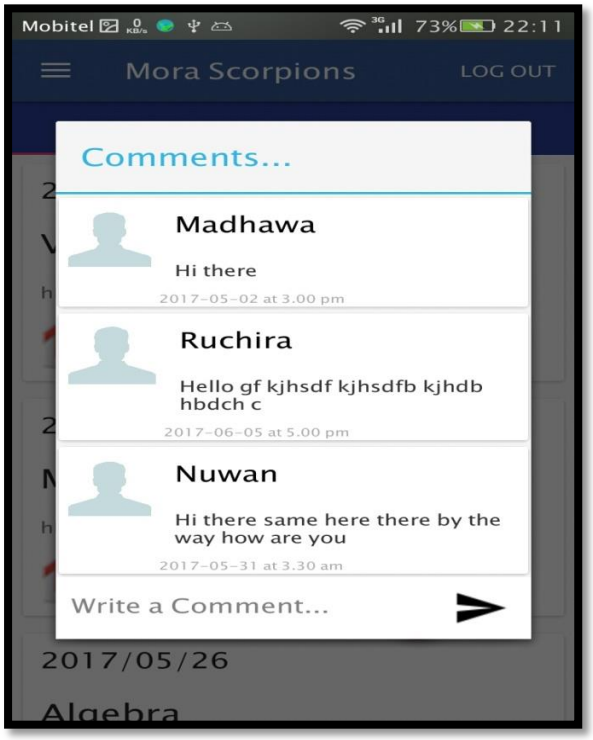
Figure_B 1: 5 Attendance Viewing



Figure_B 1: 6 Chat

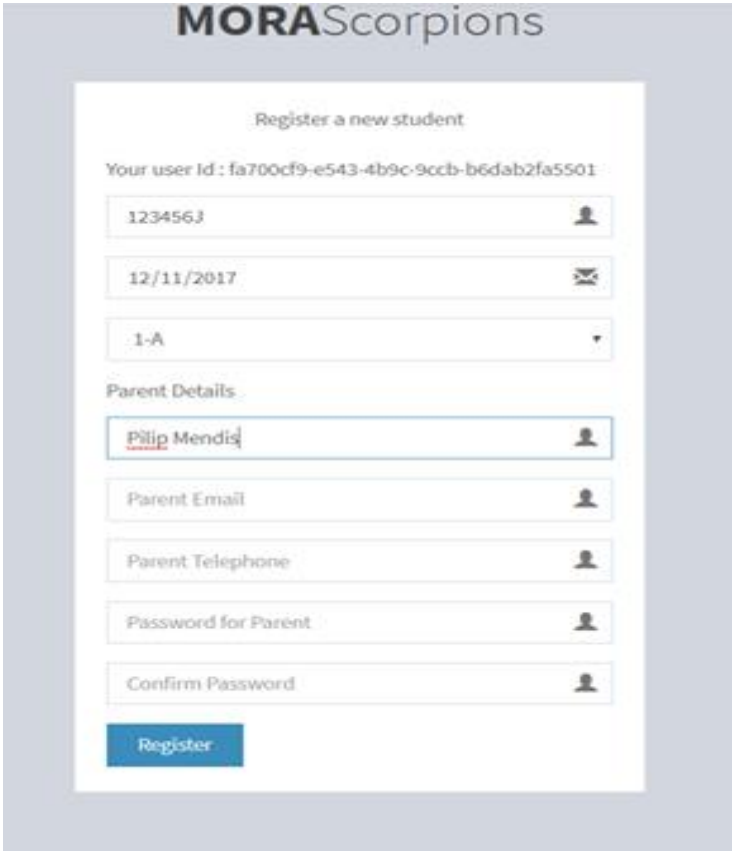


Figure_B 1: 7 Homework

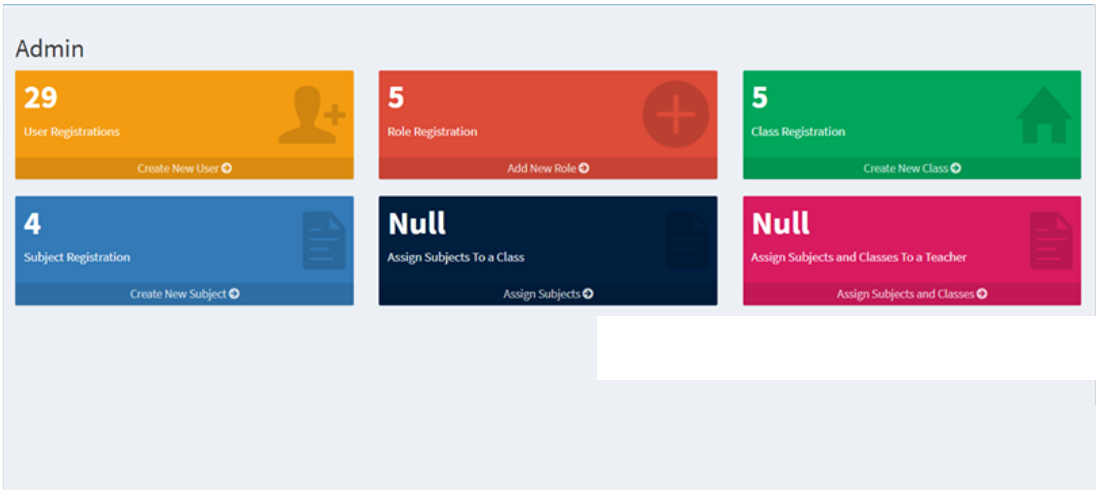


Figure_B 1: 8 Comments on notes

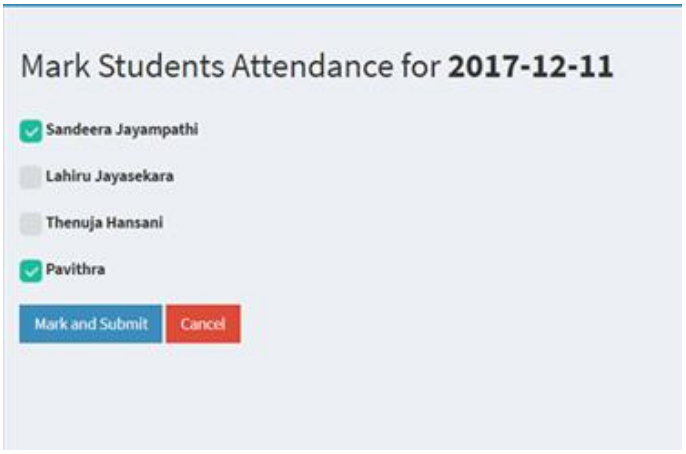
Screenshots of the web application



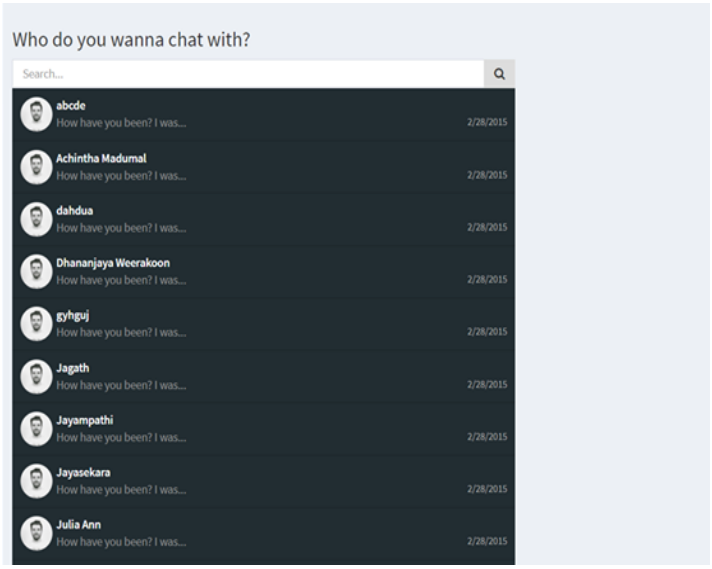
Figure_B 1: 9 Registering a new student



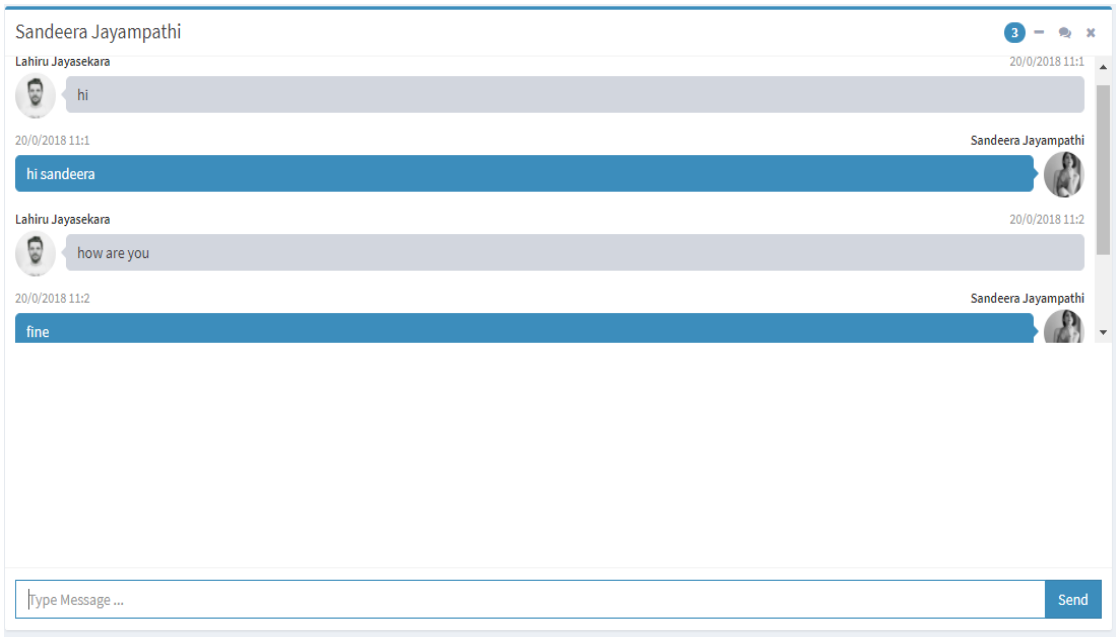
Figure_B 1: 10 Admin panel



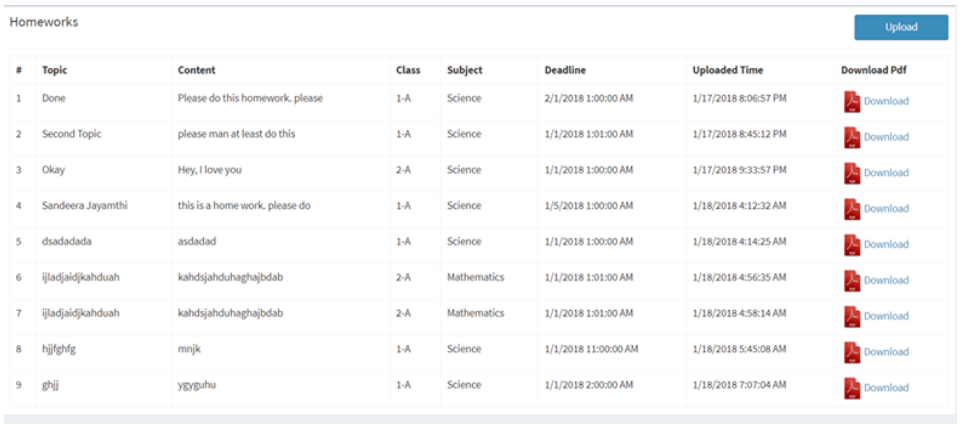
Figure_B 1: 11 Attendance Marking



Figure_B 1: 12 Chat list



Figure_B 1: 13 Chat


Homeworks
Upload
Topic Content Class Subject Deadline Uploaded Time Download Pdf
1 Done Please do this homework, please 1-A Science 2/1/2018 1:00:00 AM 1/17/2018 8:06:57 PM Download
2 Second Topic please man at least do this 1-A Science 1/1/2018 1:01:00 AM 1/17/2018 8:45:12 PM Download
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