Role of IT in Modern Classrooms

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ABSTRACT

Education is a platform used to train the future generations and help them become an asset to the nation, both professionally and humanly. It makes youth employable. In earlier times, education was only imparted for survival purposes. But after independence, India's education system focussed on memorization and hard work. Time was a factor always neglected. With time, the growth of technologies has brought in a lot of changes. Everyone wants efficient and less time consuming ways of managing different systems. Another tedious task related to the education field is Attendance. Marking and maintaining attendance takes in lots of effort. The Commune App will make this task effortless for the teachers and smooth. The proposed system is an android application that can be easily installed on to the mobile devices where the faculty can not only register himself, but also add subjects he teaches, add students enrolled in them, mark their attendance easily by tapping and download the list as per their requirements. It is developed using Kotlin at the backend and XML at the frontend. To save the data, Firebase is used as a database. Android Studio is the Integrated Development Environment(IDE) used to integrate the modules into a bundle that can be installed on every android device. The application will later on be developed into a complete system dedicated for different college purposes like student viewing their attendance, taking quizzes, file sharing, senior-junior interaction, prediction of every student performance using machine learning algorithms and more.

Keywords: Attendance, Android, Kotlin, XML, Firebase

1. INTRODUCTION

Education is a platform used to train future generations and help them become an asset to the nation, both professionally and humanly. It makes youth employable. In earlier times, education was only imparted for survival purposes. But after independence, India's education system focussed on memorization and hard work. Time was a factor always neglected. With time, the growth of technologies has brought in a lot of changes. In the last ten years, the Information Technology field has witnessed tremendous growth. In different walks of life, technology has helped humans in comforting their way of working. It unified the management systems with communication devices such as computers, laptops, mobiles, etc., and automated almost every other process which was time-taking and tedious before. Everyone wants efficient and less time-consuming ways of managing different systems.

An unexpected wave of changes approached with the COVID-19 pandemic. Businesses were shut, impacting the daily wage workers and middle-class people the most. Also, the present education system in India underwent its biggest shift ever. The classrooms shifted to online platforms like Zoom, Google Meet, and whatnot. It was all new, for both students and teachers. However, it is praise-worthy how efficiently and quickly they adapted to the new normal. Many tools have been developed so far to automate learning and assessment processes. Owing to these, learning opportunities are boundless with reasonable rates.

2. History of Classrooms

2.1. Ancient Education: In ancient times, education was imparted in an informal way like a father passed on knowledge to his child according to his experiences, mostly about his occupation and religion. Later, two systems were developed, Vedic and Buddhism. Both focussed on the exterior as well as interior selves. Buddhist education was conducted in Taxila and Nalanda Universities, attended by students worldwide. The children had to leave their houses at a certain age and live with their *Gurus* in Gurukuls. During this tenure, students were taught four Vedas, six Vedangas, the Upanishads, and other religious texts. Training of art forms and battle skills too were included. Basically, education was seen as a source to attain Moksha. There were no such classrooms. The knowledge was given in forests under the sky. These classes kept minds fresh and ready to absorb more knowledge. Gurus, in the end, asked for Guru Dakshina as fees for the entire education.
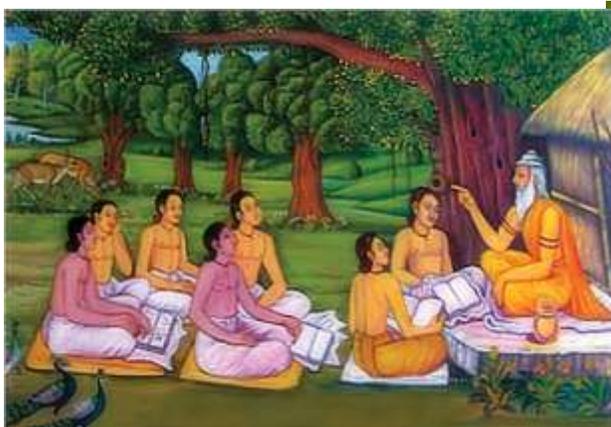
Fig 1. Guru imparting knowledge in ashram

http://www.reporter4public.com/education-system-in-ancient-india/

Fig 2. A painting depicting a Buddhist monk imparting knowledge to his disciples

https://theculturetrip.com/asia/india/articles/

what-did-the-ancient-indian-education-system-look-like/

2.2 Medieval Education: After the invasion of Mohammedans in India during the 8th Century, there was a great change in the education system of India. Many schools and libraries were built. It witnessed the spread of Islamic education. The main purpose of the education system was to spread Islamic beliefs, social

customs, and laws, i.e., instilling Islamic religion among people. The education was imparted at Maktabs and Madrassas. During preliminary education, the student went to Maktabs and then to Madrassas for higher education. They also gave scholarships. Provision of teaching Sanskrit to Hindus also pertained. They focussed on memorization with reading and writing. No examinations were conducted. The promotion was based on the teacher's opinion about the student. Private tuitions also emerged as a common practice because of the state's failed efforts for the public's education.

Fig. 3 Islamic Education in Medieval Times

https://oureducare.com/education/merits-and-demerits-of-muslim-education-in-india/

2.3. Pre Independence Education: British East India Company came to India with a profit-making motive. To ensure that they planned to educate people from the middle and upper classes. As per their needs, they introduced education through the English Language to develop a western culture in India. They wanted people to convert to Christianity. To train teachers, they started training schools. With the combined efforts of Christian Missionaries and Government, a large number of schools and colleges were established. This was the time when the present education system of India started taking its shape. The aim behind all the educational reforms was training poor people to use them as their instruments of trade. There were many posts in the company for which calling Englishmen from England was a bit expensive. No scientific or professional curriculum was designed.

Fig. 4 British encouraged English as medium of education

https://www.british-school.org/wp-content/uploads/2019/06/1968.png

Fig. 5 Scholars and Professors

https://www.esamskriti.com/e/History/Indian-History/
Indigeneous-Education-in-the-18th-century-1.aspx

2.4. Post-Independence Education: Independence after years of slavery came out as a ray of hope for Indians. The education was made available to more sections of the society rather than just to the middle and upper-class people. With the constitution coming into its role, many laws and policies rolled in as well. Various committees were set up to face the biggest challenge in the form of the education system. Their prime target was designing an education system for eradicating illiteracy and the overall development of students. A popular mission named Sarva Siksha Abhiyaan (Education to all) was launched by the Indian Government. Basic equipment that students used were slates and chalks, pens and pencils, books and copies to enhance their reading and writing skills. Teachers majorly used chalks to write on blackboards to explain concepts.

Fig. 6 Sarva Shiksha Abhiyan by Govt. of India

https://www.khabarindia.in/implementation-sarva-shiksha-abhiyan/

Fig. 7 Children in Primary schools

https://www.siliconindia.com/shownews/
is-our-education-system-heading-the-right-way-nid-88566-cid-29.html

2.5. Modern Education: For years, the same equipment has been used to convey the lectures. Gradually, technology started bringing in changes in the traditional system of education. The utilisation of technologies has improved the standard of education. In the last two decades, the teaching system has not been restricted to blackboards. Smart classrooms are being set up, not only in private schools but also in government-aided schools. Projectors and 3-D models help students in understanding the topics well. Also, these modern classrooms have made everything efficient and smooth including the systems related to it. From parent-teacher meetings to staff meetings, everything is possible.

Fig. 8 Projectors replaces blackboard in institutes

https://smartcity.eletsonline.com/

gateway-to-digital-learning-for-220-jk-schools/

Fig. 9 Digitalization of schools

https://india.smartcitiescouncil.com/article/edu-smart

With the unexpected hit of the pandemic, the times have been challenging for educational institutions across the globe. Students and teachers both had to make adjustments to adopt the new normal. In that time of the disaster, the techno-friendly only pulled through. Students and teachers used digital platforms and applications to connect. It was not easy and has several loopholes. This transition was quick and uncalled for both. Everyone does not have the proper tools to attend virtual sessions remotely. But the brighter side is, with time, they become comfortable.

Fig. 10 Online Classes during Pandemic

https://lexassisto.com/digitalization-of-modern-education-in-india/

3. Issues with the existing system

There have been many issues in the style of imparting knowledge lately in India. Firstly, the Indian Education System is not at all environment-friendly. Lots of papers and plastics are consumed by institutions every year. Also, the manual way of working is redundant for both students and faculties. From the attendance system to project work, they are required to put in a lot of effort and most importantly, time. It could have been channelized to do something new and better.

4. Information and Communication Technology(ICT) in Classrooms

Information and Communication Technology has revolutionized all the aspects of our lives. The waves of this storm can also be felt in the education system as well. During this era of Digitalization, we are compelled to think about the loopholes in the structure of the system, paving the way for upgradation. Age-old methods are being removed slowly and steadily, new technology-based methods are changing ways of teaching, learning and thinking. We cannot deny the fact that ICT has turned out to be a powerful tool for education to reach out to all sections of the population. Related to this, two new terms were coined- e-learning and blended learning. According to Tinio "e-learning encompasses learning at all levels, both formal and non-formal that uses an information network –the internet; an intranet(LAN) or extranet (WAN)-whether wholly or in part, of course delivery, interaction and or facilitation". Blended learning includes e-learning solutions with traditional classroom practices.

4.1. Various ICT Tools Used:

- **Online Digital Libraries/Repositories:** Many websites and applications are available with tons of books, research papers and other content, enough for someone to learn something new and dive deeper into a topic. They can be accessed by multiple users at the same time.
- **Massive Open Online Courses (MOOCs):** For extending education among all sections of society, online courses are really helpful. People need not to think about when, where and how to pursue a course. They can enroll themselves on various platforms such as NPTEL, Khan Academy, Coursera, Udemy, etc. providing a wide range of courses from great tutors across the world. Their future depends a lot upon how the traditional classroom system is going to cope with the varied needs of scholars.
- **Search Engines:** To learn and read about anything or everything, search engines have become a goto for every human. Whenever a thought or question crosses our mind, we jump to Google to find it. Popular search engines are Google, Yahoo, Bing, etc. Besides this, Google also provides many other ICT tools like Slides, Drive, Spreadsheets and Forms.
- **Video conferencing applications:** Pandemic has made everyone, from schools to companies, comfortable with video conferencing applications. Zoom, Google Meet, Webex, etc. are some of them.

4.2. Benefits of ICT:

The world of education is changing as the modern world continues to grow. With so much progress happening, it's important that education be able to reach students in new ways so that their students are prepared for the future. The scholars of today are the leaders, inventors, teachers, and businessmen (and women) of tomorrow. Without the right skills, these scholars will not have the preparation needed to survive.

1. Instructors can personalize the education experience: Tools like websites, apps, learning games, e-books, and virtual tutoring help the tutee learn at their own pace. Digital materials can support classroom learning topics, and introduce different teaching methods for every scholar's unique learning needs.

2. Instant Access to Knowledge: The web gives students instant access to answers beyond what's in their textbooks. The gift of the web to the classroom gives teachers the prospect to give their students a holistic view of any given subject while still giving students the guidance to seek the proper sources. In-classroom internet research gives teachers the chance to show their students how to assess the standard of the information they find online while removing the one-sided restrictions of a textbook.

3. Student Preference: Through a survey it is found that computers, tablets, smartphones, and the internet are the same tools that they use at home. Students are already comfortable using these tools to connect with their other mates, their instructors, and their institution. In fact, the Educause survey found that 54% of students would typically use a minimum of two devices simultaneously for school work.

4. Fostering Student Workplace Readiness: One among the benefits for technology within the classroom is fostering student workplace readiness. Mobility is currently the subsequent great movement within the workplace, and students who use technology in the classroom today are going to be more adapted thereto in the future. It promotes workplace soft skills like critical thinking, cross-technology proficiency, and research.

5. Proven Student Engagement: A piece of writing by the National Math and Science Initiative shows that blended learning styles keep students focused longer and makes them more excited to find out more, especially for STEM (Science, Technology, Engineering, and Math) subjects.

4.3. Challenges of ICT:

Although of great importance, integration of ICT in education is still in its infancy. One of the challenges is the high cost of installation, working and replacement of ICT. In the longer run, it can also lead to unemployment as it replaces human resources. Teachers now have to develop their capabilities and use ICTs effectively. Its reach in India is still limited because of restricted internet access. People living in rural areas do not have high bandwidth or no internet connection. Hence, they are not able to make good use of services provided by ICTs. Also due to lack of exposure, they can't use devices properly as the language of content is generally English.

5. Commune Application

The proposed system is an automated attendance system for any educational system with lots of future scopes. This project is an android application targeting students and faculty members of our as well as of other institutions. As the world is shifting to digitalization, we believe that this is a cumbersome task for our faculty members to note attendance after every session they take instead they can use our app to do the same task instead.

Commune App will automate various tasks associated with handling students' attendance and better organizing the stored information and optimum performance, thus helping the colleges to ensure smooth working of these processes. If needed, they can also download the attendance sheet from the application itself. It is a relatively fast approach to enter attendance, highly reliable and efficient. The scope of the project is the android mobile devices on which this application would be installed and it will work for a particular school or college or institution.

A teacher has to register himself using the Sign Up module. He has to verify his email by clicking on the link sent at the provided email address. Without it, he cannot log in to his account. After logging in successfully, he can add different subjects he teaches and the students enrolled under those subjects. He can mark the students present by tapping on the name of the student and absent by double-tapping on it. Thereafter, he can download the recorded attendance as per his requirements.

5.1. Characteristics of Proposed System

The manual systems are time consuming and unsafe. The proposed Android based attendance system is designed which is less time consuming, safe and easy to implement because-

- **User Friendly:** This software is user friendly as it is simple to use and the user doesn't need any special training to use this software. Data evaluation, data storing and retrieval is easy and doesn't need any heavy calculation or method. The UI is simple and easy to understand.

- **Easy and Fast report generation:** Reports are generated automatically fast in an easy way after each month for the teacher to keep a track on the students attendance record and notify the students with minimum attendance to attend classes.

- **Minimal paperwork:** There is no paperwork required. Data is stored automatically in the system. Evaluations are done automatically. Hence it is cost effective too.

- **Time Saving:** Data storing, data retrieval, data evaluation is done at minimum time hence it is time saving producing data with minimal errors.

5.2. Requirement Analysis: The Application developed follows the following steps of SDLC. Under which the SRS model developed for the system is as listed below. The SRS model contains:

- Functional Requirements.
- Non-Functional requirements

5.2.1. Functional Requirements of the System: The functional requirements parts discuss the functional behavior that should be possessed by the system. Each requirement maps to a high level function (f_i) that transforms the given set of input data (i_i) into output data (o_i). Different functional requirements possessed by the system are:

a. Register Description: Teacher can register himself using email address and password, choosing an appropriate username too.

Input: Username, Name, Email, Password

Output: Verification prompt

b. Verify Email Description: A verification mail is sent on the email address to authenticate the user.

Input: Click on the link received

Output: Email Verified

c. Login Description: The faculty will login into the application with the given user ID and password. If the user ID and password is correct, the user will be prompted to proceed with the option else an error message will be displayed.

Input: User ID and Password

Output: Prompt to "Proceed" option

d. Add Class Description: The faculty can add the class he teaches in.

Input: Year and Subject

Output: Class displayed on the screen

e. Add Students Description: Teachers can add students attending the particular subject.

Input: Roll Number and Name of the student

Output: Student name displayed on screen

f. Take Attendance Description: Faculty take attendance on a particular day by swiping over a student name to mark him absent.

Input: Mark student absent

Output: Confirmation message

g. Save Attendance Description: At the end of the month or at any time when faculty wishes, he can download the attendance details of a particular subject in the phone memory.

  Input: Click on Save Button

  Output: Confirmation message

5.2.2. Non-functional Requirements

a. Security: The teacher should provide a password to log on to the system. He/she should be able to see the record of his/her class and respective subjects.

b. Reliability: Due to wireless connectivity, reliability cannot be guaranteed.

c. Availability: The system should be available during college hours and even after that.

d. Maintainability: There should be a facility to add or delete or update teachers and students for each semester.

e. Reusability: There should be a facility to add or delete or update teachers and students for each semester.

5.3. Design Plan

The design phase emphasizes on the transformation of customer requirements as defined in the SRS document, into a form that is suitable for coding. The design phase can be broadly classified in two levels.

- Preliminary or high level design
- Detailed design

The preliminary design can be further divided into two sub categories:

- Function Oriented Software Design
- Object Oriented Software Design

5.3.1. Function Oriented Software Design: This design model can be represented by drawing the DFDs (Data Flow Diagrams) for the given SRS document. A data flow diagram is a graphical representation of the data flow through an information system which is used to model the process aspects of the system. DFD is the preliminary step used to create an overview of the system. DFD is used for structured design.

5.3.1.1. Context Diagram: A context diagram is a structured graphical tool used for identifying the functional areas and the processes which are performed within and between the system and outside the system. Context diagrams support a data-oriented approach for designing systems. It helps in investigating the output and the process requirement of the system. It helps in defining the boundaries of the proposed system. The symbols used in the context diagrams are for external entities, data storage and data flows and process.

Here in the following context diagram, we represent our attendance system which has one external entity i.e. user of the system namely Faculty and the data flowing in and out of the system is the attendance details.
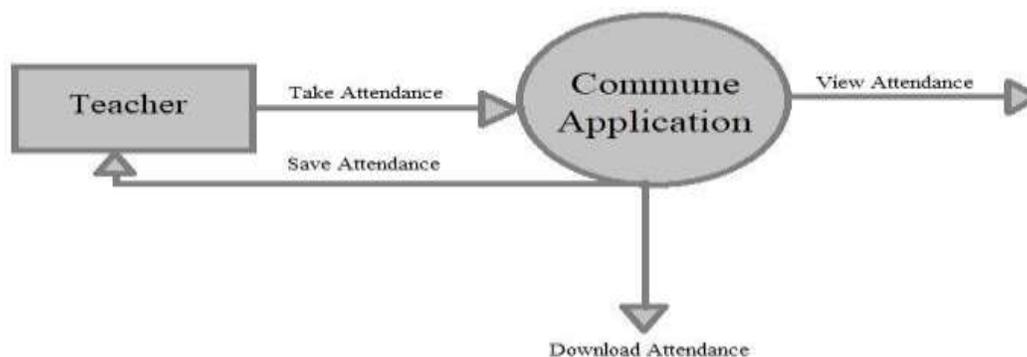
Fig. 11 Context Diagram

5.3.1.2. Level 1 Diagram: The context-level DFD is then exploded to produce a Level 1 DFD which models the details of the system. The Level 1 DFD shows how the system is divided into subsystems (processes), and how each process deals with one or more of the data flows to or from an external entity, and how the processes together provide all of the functionality of the system. The level 1 DFD also identifies the internal data stores which must be there for the system to do its job, and shows the data flow between the various parts of the system. In the below Level 1 DFD figure, the attendance system has been decomposed further into processes which are namely Register, Verification, Login, Add Class, Add Students, Take Attendance and Save Attendance. Each process is accessed by the Faculty and the storage used is the mobile's local memory.
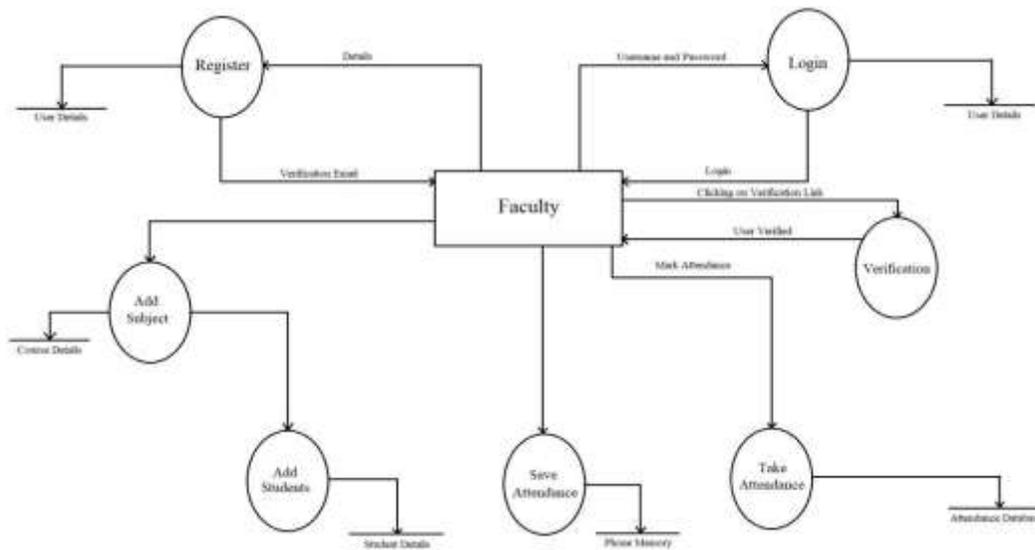
Fig. 12 Level 1 Diagram

5.3.1.3. Level 2 diagram: The Level 2 DFD is the further decomposition of Level 1 processes and subprocesses (sub-systems) which give detailed description of the data flow in each process. Here we have decomposed the process View enrolled student lists) in the sub-process Take attendance. The faculty selects the course ID and gets the details of the enrolled student and then he can take attendance for that particular course. The data storage used in this level is the Attendance list.
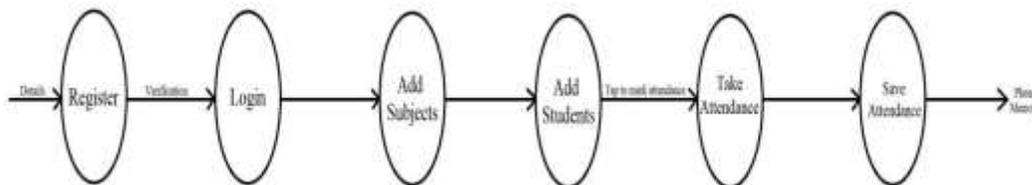

Fig. 13 Level 2 diagram

5.3.2 Object Oriented Software Design: In this design approach the system is viewed as a collection of entities (objects). Each object manages its own properties (attributes) and state.

5.3.2.1 ER Diagram: The entity-relationship diagram is a data modeling technique that graphically represents an information systems entity and the relationships between those entities. An ER diagram is a conceptual and representational model of data which is used to represent the system framework infrastructure. The ER diagram contains the following elements:

- Entities
- Relationships
- Attributes

In designing the ER diagram, we identify and define all the entities, determine the interactions between the entities and determine the cardinality of the relationship. The ER diagram for the attendance system represents all the entities namely User, Class, Student and Attendance and the relationship between these entities used in the system. The User entity contains the attributes Username, Name, Email and Password where the Username is its primary key. The Class entity contains the attributes Year and Sub_Name. The student entity has Roll_No and S_Name as attributes where Roll_No is the primary key. Last entity is Attendance with Roll_No, S_Name and Date attributes.
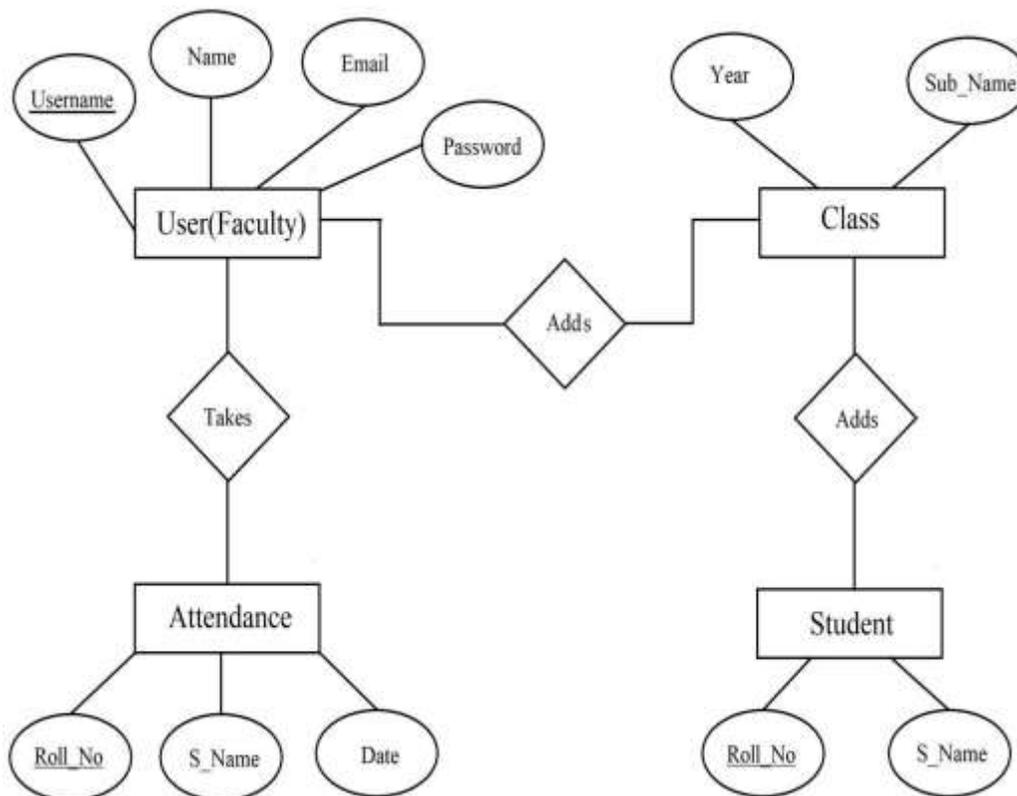
Fig. 14 E-R Diagram

5.3.2.2 UML Modelling: UML, as the name shows, is a modelling language. It is used to specify, draw, visualize and document the parts of the software. It provides a set of notations (such as rectangles, ellipses, lines etc.) to create the visual model of a system. This phase is used to design different UML diagrams corresponding to the application development.

5.3.2.2.1 Use Case Diagram: Use case diagrams are the diagrammatic representation depicting users' interactions with the system. This diagram shows different types of users and various ways in which these users interact with the system. Figure shows the use case diagram for a faculty. It shows all the different possible ways in which a faculty can use the attendance system. Every faculty can use the system through their mobile phones to take the attendance. The faculty after logging into the system can view the courses taken. Then he can view the list of enrolled students in a particular course and can take attendance for those subjects. The user can also view the attendance at a later stage. He can directly download the attendance details in his mobile phone.
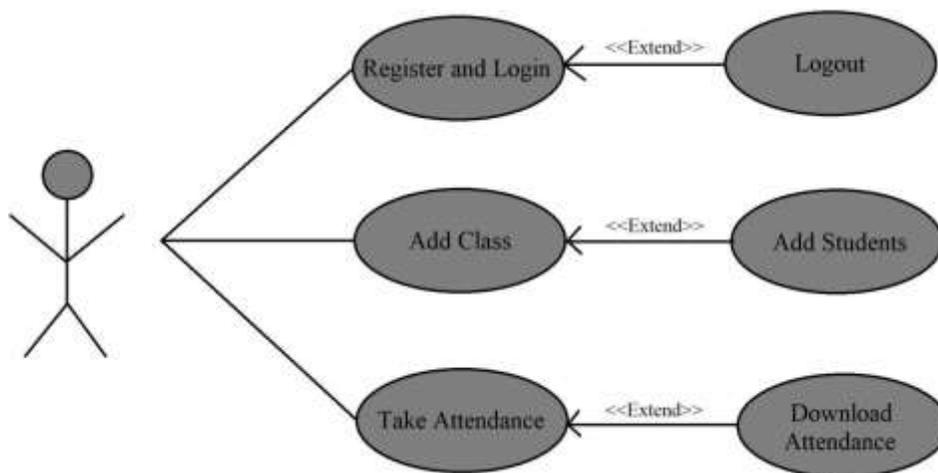

Fig. 15 Use Case Diagram

5.3.2.2.2 Class Diagram: Class diagram is a type of static structure diagram which describes the structure of a system by representing the classes of the system, their attributes, operations and the relationships among these classes. The figure below represents the class diagram for the attendance system. In this system, we have five classes namely Faculty, Student, Course, Course list and Attendance. The class Faculty can search the Course List, get the Enrolled Student List and take the Attendance. The class Faculty has many-to-many relationship with class Course List and Student and one-to-one relationship with class Attendance. The class Course List contains the details of the Course and has one-to-many relationship with class Course. Each class Student is enrolled in different courses. The class Student has many-to-many relationship with the class Course.
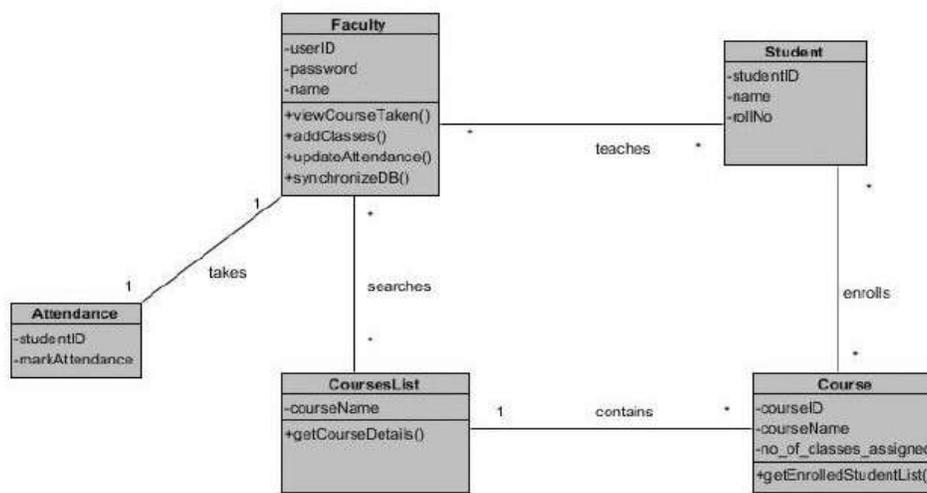
Fig. 16 Class Diagram

5.4. Future Proposals

- **Student Module:** The application developed till now is for teachers to manage attendance. It can be extended for the use of students. They can view their attendance.

- **File-Sharing:** The Commune App can also be used by administration and faculties as a file-sharing medium to share important documents like notices, notes, assignments, results, etc.

- **Senior-Junior Communication:** Students enrolled in the courses currently can take bits of advice from the passed-out students regarding career prospects and other queries through the application.

- **Quizzes:** Teachers can check the performance of their students through quizzes rather than tutorials.

- **Prediction using Machine Learning Algorithms:** The records of students can be fed to a machine learning algorithm. It will automatically predict how the student is actually performing throughout the semester, like in internals, tutorials, lab work, assignments, attendance, etc.

5.5. Benefits of Proposed Work

- **Better Accuracy:** Even when provided with computational devices, manual attendance is prone to human errors. Commune application ensures accurate data and minimizes inevitable errors during entry of data.

- **More Efficient:** Traditional attendance system is time consuming and laborious. It takes more time to take attendance and then appropriate calculation. With the use of proposed work, it is easy to register students under a subject and mark their attendance on a click.

- **Economic:** Although the manual system is under practice for years, have we given it a thought if it's economic? The application is certainly more economic as it does not require any paper. It is also economic in terms of human efforts and time.
- **Environment-friendly:** The proposed solution is a digitalized approach for attendance system and other school/college purposes. It entirely saves paper and plastic consumption.

6. CONCLUSION

An amalgamation of education and technology has led to the growth and betterment of the education system of the nation. Modern classrooms are acting as a medium to flourish the younger generation as absolute professionals, with a better understanding of global market demands.

Commune App can act as a complete attendance management system with real-time uses. Maintaining attendance is a tough task all together. Even though many devices can be used for this purpose, their costs in the market are quite high. The Android application is perfect for attendance tracking and helps effective management. By this system Attendance marking and report generation becomes easy. Less chances of malfunctioning are there. The system has reached a gentle state where all bugs are eliminated. The system is operated at a high level of efficiency and all the teachers and users associated with the system understand its advantage. It was intended to solve the requirement specification. In future this system can be implemented to automate most of the educational systems and it can be designed for cross platform. This project is intended to exchange the age-old system of attendance register with a digital register which may show its worthiness by its features and simple use. With due course of time we intend it to establish a connection with the college server so as to access and update the attendance over the college LAN. Features like sending warning messages to the students with low attendance, and a student portal to check their attendance are planning to get added.

7. Acknowledgements

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