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Management of Teaching and Learning Resources Application

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Abstract: ***This paper focuses on the effective management of teaching and learning resources in classrooms using mobile learning and biometric attendance systems. With the creation of mobile applications, learning has become more flexible and accessible. Mobile learning is a strong tool for supporting and increasing learning. Classroom management is also crucial for providing an environment that is favorable to learning, and the integration of proper note-taking strategies can aid in effective learning. Additionally, using biometric attendance can produce precise and trustworthy attendance records, guaranteeing the attendance of all students. Overall, developing a successful learning environment that encourages student engagement and achievement depends on effective management of teaching and learning resources.***
Keywords: Android application, Mobile learning, biometric attendance system, learning resources, and proper notes.

I. INTRODUCTION

Over the past few years, technology-based learning has become increasingly popular in the educational sector. Because it gives students flexibility, convenience, and accessibility, mobile learning is growing in popularity in recent years. To ensure that students obtain a high-quality education, however, effective management of teaching and learning resources is essential. This includes proper classroom management, access to learning resources, taking proper notes, and ensuring attendance through a reliable system such as biometric attendance. Students now have access to educational resources whenever and wherever they desire, which gives them the opportunity to tailor their education [1].

Proper notes are essential for students to retain and recall information. Access to learning resources such as textbooks, journals, notes, and research papers is also crucial for students to succeed academically. These resources should be easily accessible, up-to-date, and relevant to the course content. Biometric attendance is a reliable system that ensures accurate recording of student attendance. With the use of technology,

Biometric attendance systems are becoming more accessible, and their integration into mobile learning applications has made attendance management more efficient [2]. To make MTLR more accessible to the public, this research paper suggests creating a mobile application for the Android operating system. The choice of Android is based on statistics showing that India has the largest number of Android users and Android phones are reasonably priced and widely used by people of all ages and classes. The following functionalities will be present in the proposed application:

1) An authorized admin will be able to add, delete, and modify content.
2) Users can access and mark a particular document as a favorite and have permission to like and comment on it.
3) A biometric attendance system will be integrated.

Section 5 evaluated relevant publications, and Section 6 gives a thorough explanation of the system's functionality including technical specifics. A survey summary that highlights the necessity of our implemented MTLR application with a biometric attendance system is presented in Section 7. Section 8 outlines the challenges and potential future developments of our work. A concise summary of results concludes the paper.

II. ANDROID APPLICATION: AN OVERVIEW

An Android application, commonly referred to as an app, is a software program developed for the Android operating system. A variety of smartphones, tablets, and other mobile devices run on the Android operating system, which was created by Google. Java, Kotlin, and C++ are just a few of the programming languages that can be used to create an Android application. It can serve various purposes, including communication, entertainment, productivity, education, and gaming, among others. Android applications are designed to provide a user-friendly experience for users, with intuitive interfaces and easy-to-use functionalities.

They are typically available for download from the Google Play Store or other app marketplaces, and users can easily install and use them on their mobile devices.

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Applications for Android can be created for a variety of uses, including education. For instance, an Android application can be developed to facilitate the management of teaching and learning resources, as in the case of the research paper topic we have been discussing. Other educational applications can be developed for online learning, digital textbooks, language learning, and educational games, among others **[3]**.

III. BIOMETRIC ATTENDANCE SYSTEM: AN OVERVIEW

Biometric attendance is a system of recording attendance using biometric identification technology. With the help of biometric technology, people can be recognized by their distinctive physical characteristics, such as their fingerprints, faces, or iris scans. This technology is commonly used in access control systems and is now being widely adopted in attendance management systems as well. Compared with traditional methods of monitoring attendance, biometric attendance solutions have several significant benefits. They are more accurate, efficient, and secure. Unlike traditional methods, such as manual tracking or ID card systems, biometric attendance systems cannot be easily manipulated or falsified **[4]**.

A. Key Elements Of Biometrics

1) Biometric sensors
2) Data storage
3) Matching Algorithm
4) Attendance management software
5) Security

IV. TOOLS REQUIRED

1) *Laptop/PC-Requirements*

a) *Operating System:* Both Android Studio and Figma are compatible with Windows, macOS, and Linux operating systems.
b) *Processor:* A minimum of Intel Core i3 processors or equivalent is recommended for the smooth functioning of the software.
c) *RAM:* A minimum of 8GB RAM is recommended for both Android Studio and Figma. However, 16GB RAM is highly recommended for the smooth functioning and handling of large files.
d) *Graphics Card:* A dedicated graphics card with at least 2GB VRAM is recommended for Figma. However, Android Studio does not require a dedicated graphics card.
e) *Storage:* At least 500GB of hard disk storage or solid-state drive (SSD) is recommended to store large project files.
f) *Screen Resolution:* For both Android Studio and Figma, a screen resolution of 1366 x 768 is the minimum requirement. However, a higher resolution is preferred for a better user experience.

2) Android Studio: Android applications can only be made using the Integrated Development Environment (IDE) called Android Studio. It is offered by Google for free and is the official IDE for Android development [5].
3) FIGMA: A cloud-based design tool called Figma is used to create designs for user interfaces (UI) and user experiences (UX). It is a platform for collaborative design that enables designers to communicate their designs to stakeholders while working collaboratively in real-time. Figma provides a wide range of design features, including vector editing tools, image editing tools, and the ability to create and reuse design components [6].
4) Biometric Sensor: High-quality fingerprint sensors like the MFS100 are utilized for several tasks like attendance tracking, identification, and verification. This biometric device is simple to use and has an ergonomic shape. It contains an optical sensor that can quickly and accurately read fingerprints. The MFS100 fingerprint sensor is adaptable for a variety of applications because it works with several operating systems like Windows, Linux, and Android. Software development kits that come with the device make it simple for developers to include it into their applications **[7].**

V. LITERATURE REVIEWS

A type of online education known as e-learning enables the quick and affordable interchange of educational resources. It is a widely used online platform that can be used in the educational field. The architecture focuses on constructing a basic cloud e-learning system that allows students to join related sets of Institutes like colleges universities & Schools in order to provide a platform for sharing their learning data, written notes, etc. As a result, efficient and speedy teaching and learning techniques are possible **[8].**

Critical software programs known as learning apps are designed to run on mobile smartphones, desktop computers, and other portable devices. Although learning apps have advanced significantly, they are still in their infancy. One of the most important areas of instructional applications for modern breakthroughs is learning. Therefore, we can describe portable learning as education done over a network or the internet using a personal portable device, such as a tablet or smartphone. In the twenty-first century, learning apps enable education (offline or online) on portable devices **[9].**

In this study, the user's choices for web and mobile eLearning apps in educational institutions are examined. In particular, the present paper (research paper) contrasts websites with mobile apps in the context of e-learning platforms. As mobile phones have supporting features, mobile applications usually work better. They have also been shown to be economical because most don't require an internet connection. This paper has given readers a thorough understanding of the difficulties that come with e-learning in web apps and mobile apps. **[10].**

Cloud refers to services that are on-demand that utilize an infrastructure that's shared with numerous clients sharing the same resources and the internet as a medium. Installation, rapid implementation, increased expansion, and cost minimization are not necessary for cloud-based application services. It distributes to numerous people using Cloud Front. Everyone has access to browse content and make use of both free and paid services. Studying on smart E-learning application models will provide strategies that may be implemented immediately by various colleges and institutions to raise their quality for better learning and educating **[11].**

Mobile phones and tablets are extensively utilized in modern times. Students as well as educators can effortlessly embrace mobile phones and electronic gadgets because of social media platforms, which are growing more significant with Web 2.0 technology. The instructional use of mobile phone during and even after classes has a strong and positive impact on students' perspective towards their studies. Students feel more influenced and encouraged due to mobile learning. E-learning that is conducted on a mobile device is referred to as mobile learning. The concept of mobile learning is evolving, and this has an effect on it. Mobile learning is a readily accessible, selectively approachable form of learning that we can use to expand our knowledge, satiate our inquisitiveness, collaborate with others, and enhance the way we learn. **[12].**

The COVID-19 pandemic has an impact on several societies, including education and higher learning. Teaching was carried out in a traditional manner before the epidemic began, with teachers and students engaging in person in the classroom. Without taking into account the teachers' participation in the learning activities, this study expresses the opinions of the students. The COVID-19 pandemic halted activities around the globe, including education in Indonesia. Nevertheless, education must go on despite the pandemic, which necessitates the use of alternative teaching strategies. E-learning is the main approach towards academic achievement. Hence, it is important to adopt and support the use of simple and affordable online learning tools like Google Classroom. **[13].**

In an online environment, the exploratory research explored for elements of face-to-face collaboration modes. The review of students' involvement in online discussions suggests that effective teamwork can be achieved in this kind of environment. Although there are some significant variations, there are some similarities between the collaborative activities outlined in face-to-face environment settings and those examined in this research **[14]**.

The research being reported in this paper is an ongoing effort to determine the right role of technology in engineering education. The first section of the paper discusses the research literature on engineering student learning and how courses need to be changed to improve teaching and learning. The discussion then shifts to the use of technology to improve learning and address difficulties in the School of Aerospace Engineering at Georgia Institute of Technology (GIT). The assessment techniques that were created throughout this study are discussed. These tests' responses from students reveal the variability that learning styles research has predicted. Once more, the importance of technology for dealing with the unique learning preferences of each student is studied **[15].**

VI. IMPLEMENTATION OF OUR SYSTEM:

A. System Architecture

The system consists of two main modules. One for the Admin and another for the students. The admin section is for creating and updating the proper notes, books, and related information about the department. And another section provides several prominent features for the students (users) that will enable them to get the proper notes, books, and notices or relative information. This Android application can be used offline, but it needs the internet for updating and synchronization. The DFD (Data Flow Diagram) is shown in Fig 6.1.1, 6.1.2, and 6.1.3, and the ER Diagram is shown in Fig 6.1.4.

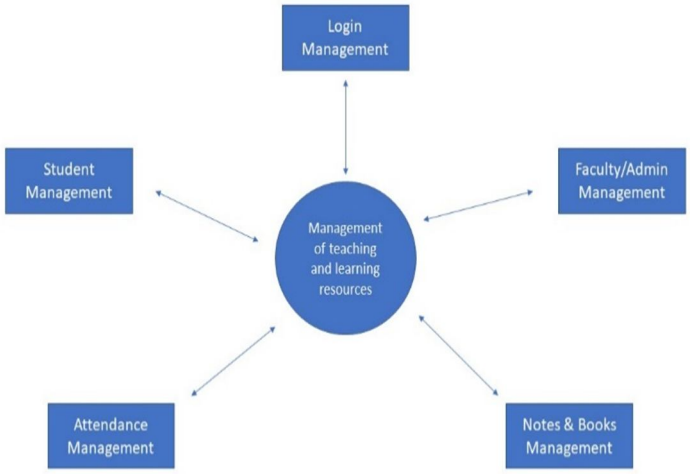


Fig. 6.1.1 Zero Level Data Flow Diagram (0 Level DFD)

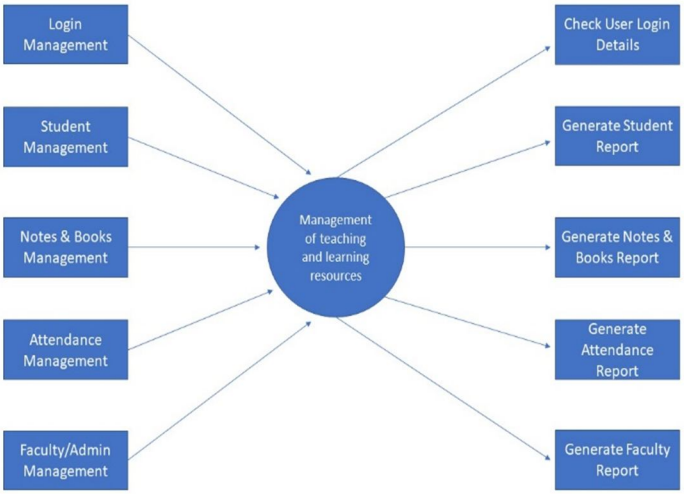


Fig. 6.1.2 First Level Data Flow Diagram (1st Level DFD)

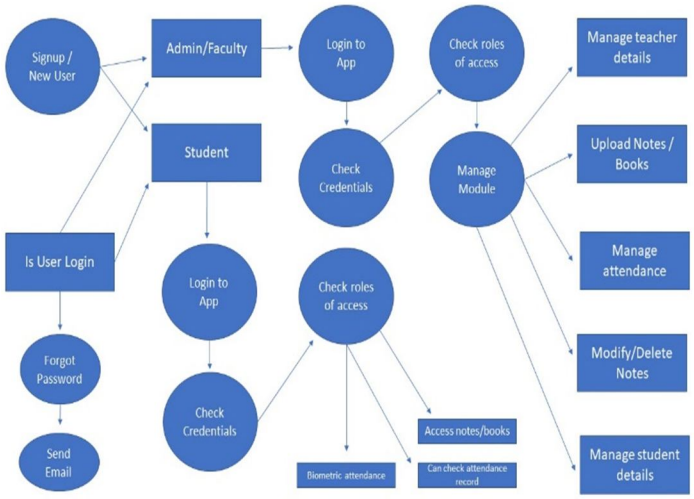


Fig. 6.1.3 Second Level Data Flow Diagram (2nd Level DFD)

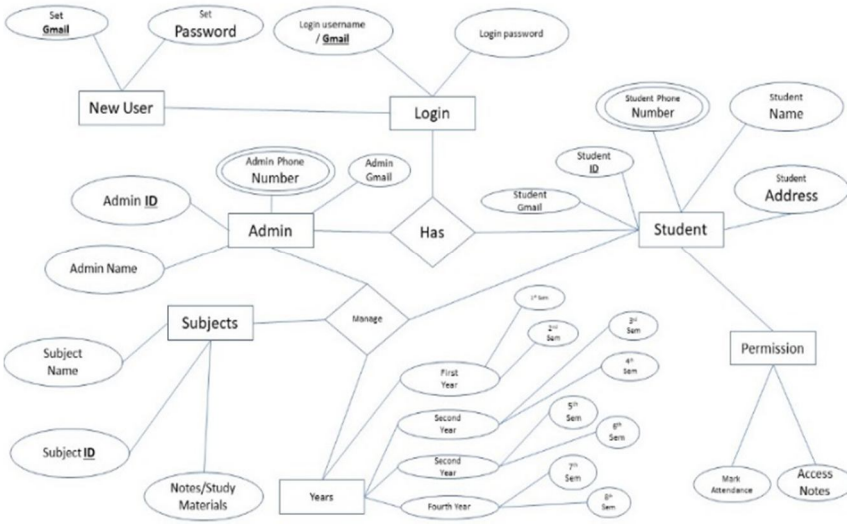


Fig. 6.1.4 ER Diagram

B. Mobile Application

The MTLR application is a mobile application developed specifically for Android users. Upon launching the application, users are presented with the MTLR logo and two options: login or continue without login as shown in **Fig 6.2.1**. If users choose to log in, they are redirected to the login page where they can enter their credentials to access their respective dashboard. The application has two different dashboards: one for the admin and the other for the user. Each dashboard has its unique features and capabilities.

When the admin or user decides to create a new account, they can use the signup option available on the startup page. This option will direct them to the "Create new account" page. On this page, some mandatory input fields need to be filled in, such as name, email, password, and confirm password. After providing all the necessary details, the admin or user can finally click on the "register" button to create their account as shown in Fig 6.2.2. In case they have forgotten their password, the application offers a "Forgot Password" option to help them recreate a new password. The same process applies to the admin as shown in Fig 6.2.2.

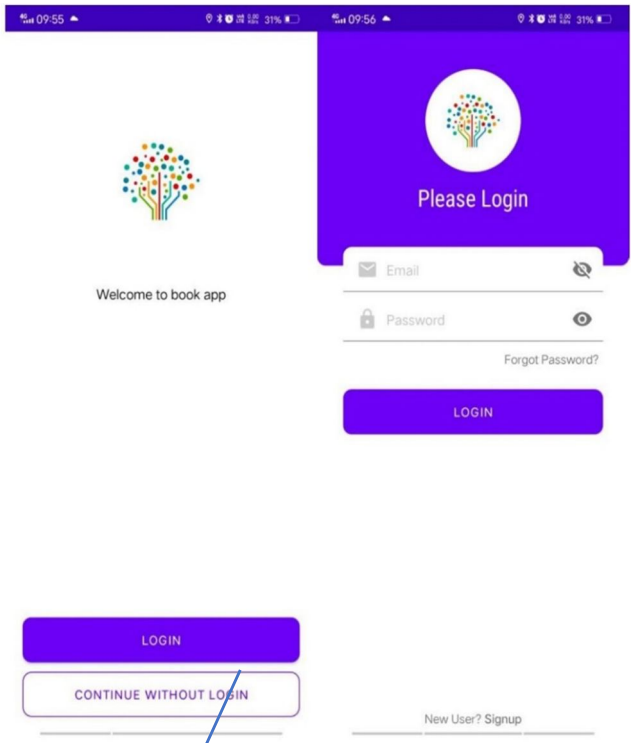


Fig. 6.2.1 Login, Without Login & Signup

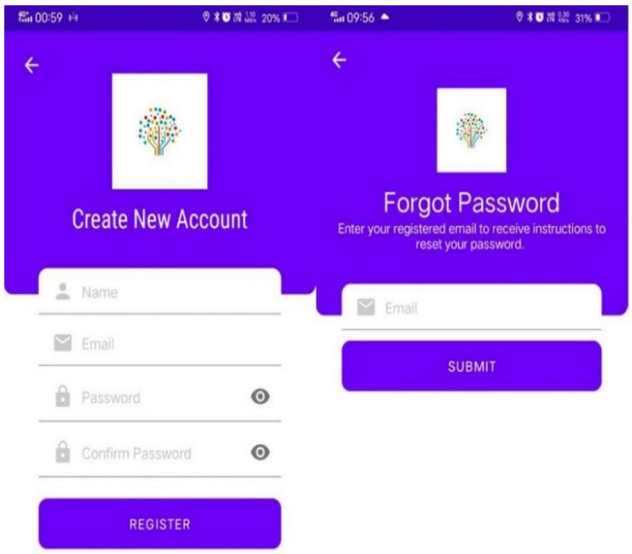


Fig. 6.2.2 Registration & Forgot Password

Once the admin login, they can access a range of features on their dashboard. The admin can update their profile by changing their name and profile picture in the profile section as shown in **Fig 6.2.3**. There is also an option to add a new category to the application by clicking on the "Add Category" button, which redirects them to a new page where they can input the category title and submit it. The new category will then be displayed in the admin dashboard as shown in **Fig 6.2.4**.

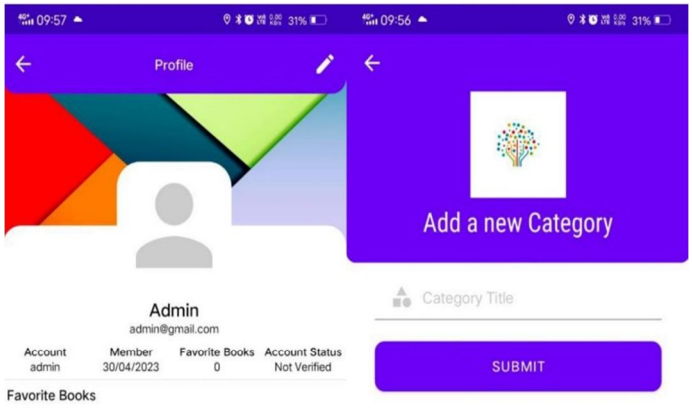


Fig. 6.2.3 Admin Dashboard

Furthermore, there is an option to add a new book to the application by clicking on the pdf icon. Upon clicking, the admin will be redirected to the "Add a New Book" page. Here, they can input the book title, provide a description, and select the appropriate category as shown in Fig 6.2.4. These are mandatory fields that need to be filled in before submitting the book. Once submitted, the book will be available for users to access.

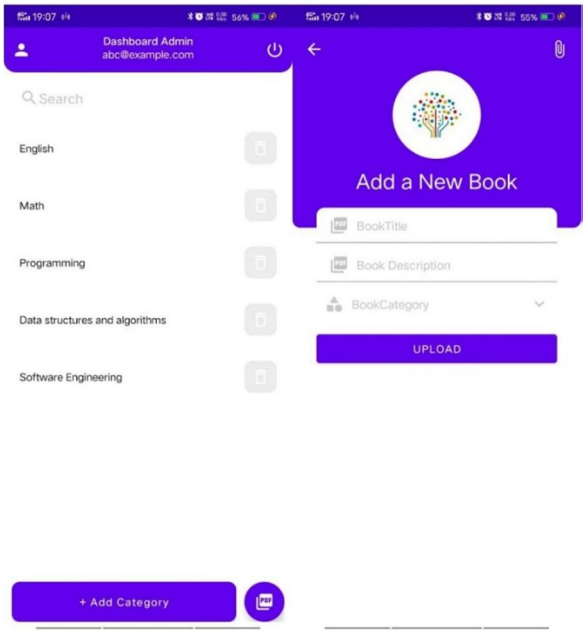


Fig. 6.2.4 Add a New Book

If the admin/user wants to log out of the application, they can easily do so by clicking on the icon located at the top right corner of the screen as shown in **Fig 6.2.5**. This will redirect them to the login page, ensuring that the account is securely logged out and preventing any unauthorized access to the admin dashboard. This feature provides an additional layer of security to the application and ensures the privacy of the user data. By logging out, the admin can also ensure that no one else can access their account, especially if they are using a shared device or public computer.

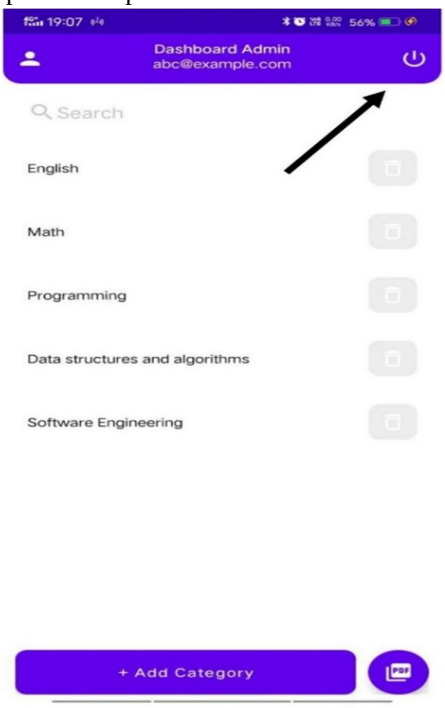


Fig. 6.2.5 Logout Icon

For users, logging in leads them to their dashboard where they can access all available categories and the respective books and notes as shown in Fig 6.2.6.

Fig. 6.2.6 User Dashboard

In the profile section, users can edit their profile details, including their name and profile picture, it implies in the admin profile section also as shown in Fig 6.2.7.

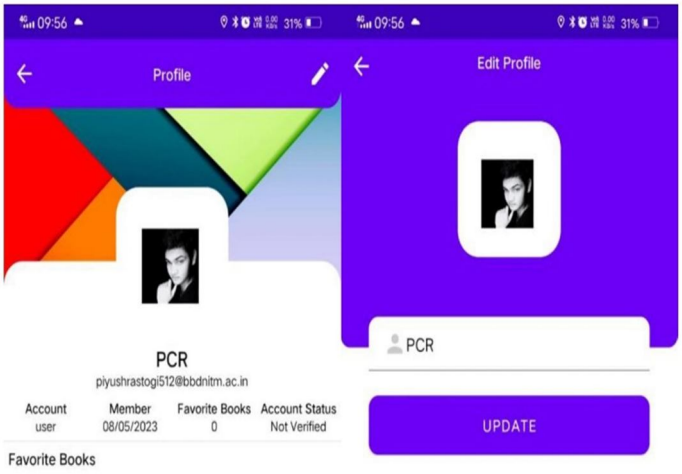


Fig. 6.2.7 User Profile Section

If a user wants to read a book or note, they can click on the desired book or note and be redirected to the book details page. Here, they can read, download, add to favorites, and comment on the book or notes as shown in Fig 6.2.8.

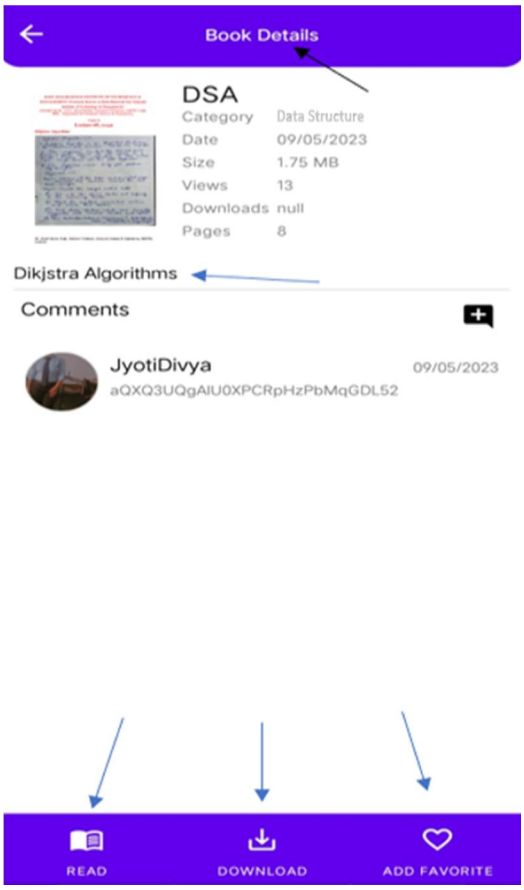


Fig. 6.2.8 Read, Download, Add Favorite, Comment

The book details page displays the category, date of publication, book size, number of pages, and the number of views and downloads as shown in Fig 6.2.9.

Fig. 6.2.9 Book Details

If a user wants to share their thoughts or opinions about a particular book or note, they can easily do so by leaving a comment on the book details page. This allows users to engage with other readers and share their perspectives on the content, creating a community-driven experience.

If a book or note is a favorite of a user, they can add it to their favorites. In cases where the user's internet connectivity is not optimal, the application provides the option to download books or notes for offline access. Users can easily download the desired books or notes by clicking on the download button, and once the download is complete, they can access the content without requiring an internet connection as shown in Fig 6.2.10. This feature allows users to read and study even in situations where internet connectivity is not available or unstable, making the application more convenient and accessible for users with varying connectivity levels.

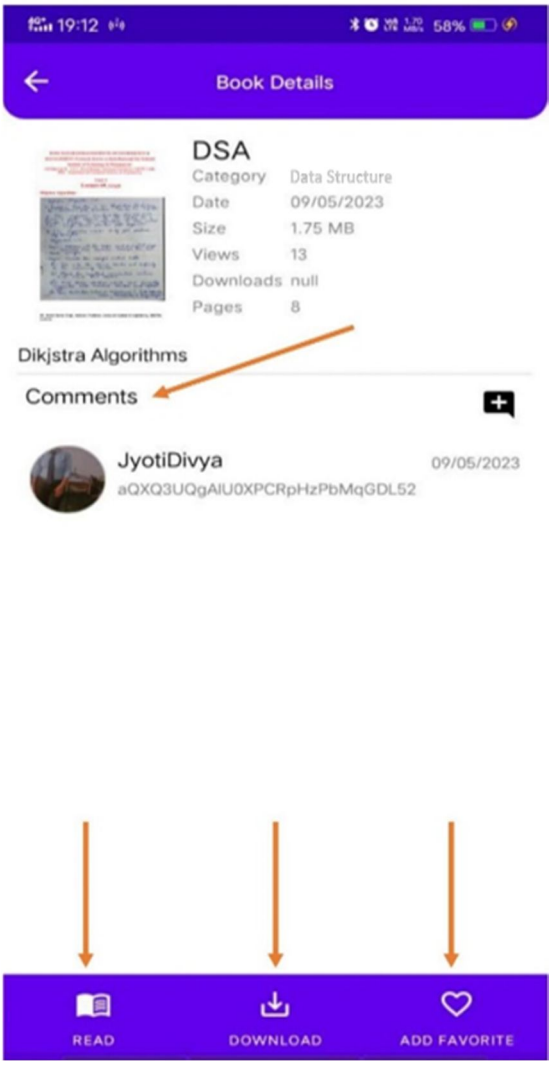


Fig. 6.2.10 Download for Offline Use

VII. EXPERIMENTAL RESULTS

A. Experimental Data

We collected data from various colleges to help users make informed decisions about choosing the right application for their academic needs. During our visits, we gathered information about the availability of learning resources that users may require. We used this information to customize our Android application to meet the needs of users. We also collected data on the attendance systems used by the colleges and found that most of them still relied on traditional systems. Based on this, we integrated a biometric attendance system into our application. With this system in place, students can easily mark their attendance without any hassle.

B. Measurement of Quality

We have considered user satisfaction in the application MTLR. We have surveyed to gather user feedback on the application's usability and overall satisfaction as shown in **Fig 7.B.1.**

User Satisfaction Score = (Total number of positive feedback / Total number of feedback) x 100%

This equation calculates the satisfaction score of the users who have used the application. The positive feedback could be based on factors such as ease of use, availability of learning resources, and effectiveness of the biometric attendance system.

According to the survey:

User Satisfaction Score = (10/12) *100

=83.33%

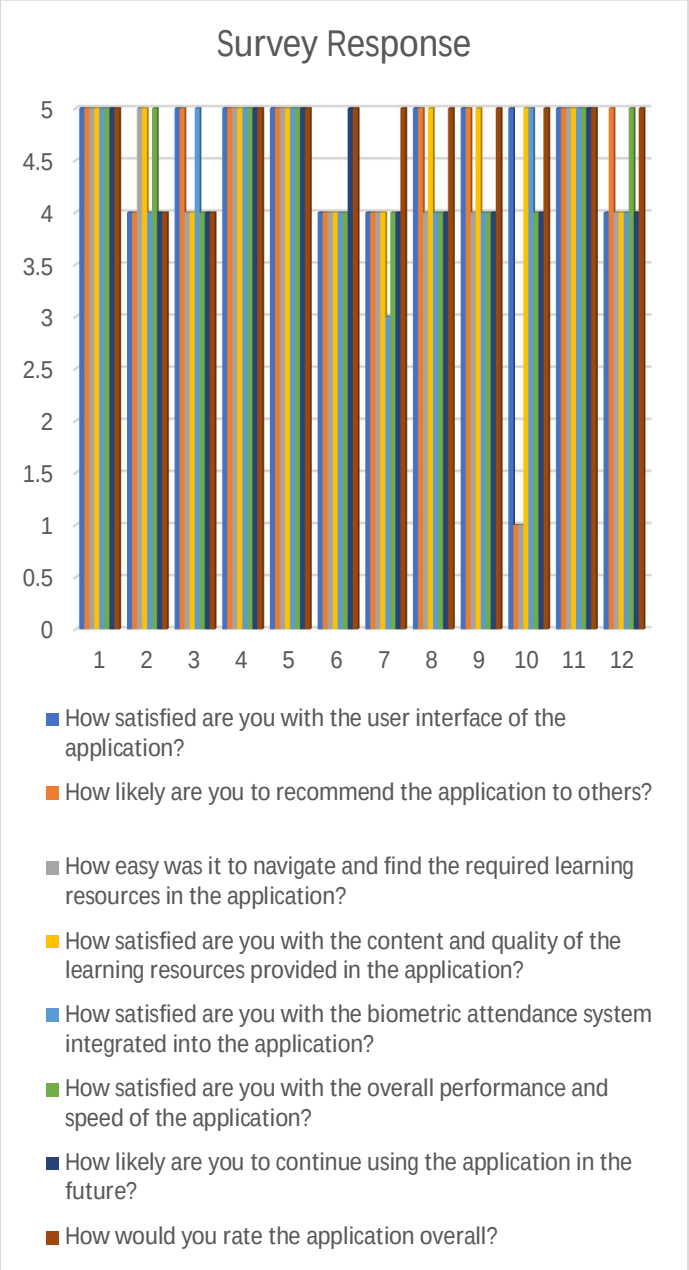


Fig. 7.B.1 Survey Response, User Satisfaction Score.

C. Survey Results

After implementing the application, we conducted an online survey via Google Forms. We asked them several questions about the problems they were facing and possible solutions according to their opinions. We recorded each of their answers, analyzed them, and arrived at our desired results. The list of questions is presented in a table format and the user responses are depicted graphically as shown in Fig 7.C.1.

1) *Question 1:* Do you want to have an application for college to get proper learning resources?
2) *Question 2:* Do you want a biometric attendance system in the application?
3) *Question 3:* Which of the following features should be in the teaching and learning resource management system with a biometric attendance system?
4) *Question 4:* Which of the following should be the main priority for the teaching and learning resource management system?

5) *Question 5:* Which of the following types of notifications should be available on the app?
6) *Question 6:* Which of the following types of resources should the app have for exam preparation?

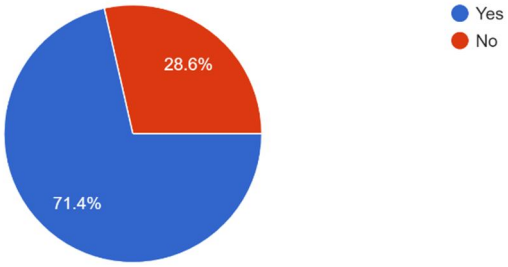
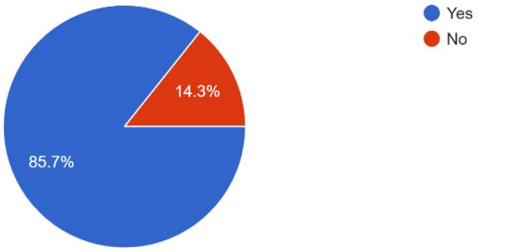
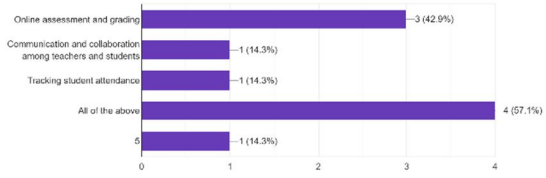
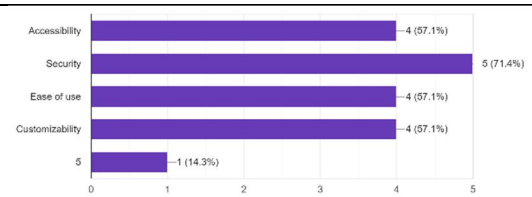
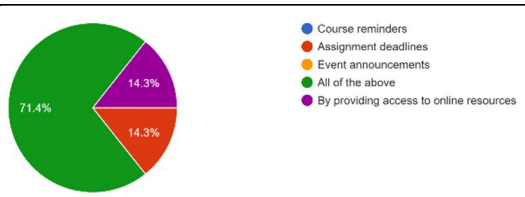
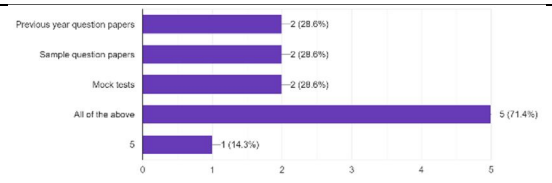
Questions	Options & Graphical representation
Question 1	
Question 2	
Question 3	
Question 4	
Question 5	
Question 6	

Fig. 7.C.1 Survey Response, Problem they were facing.

VIII. CONCLUSION

The research paper presents an investigation into the effectiveness of an Android application for the management of teaching and learning resources with a biometric attendance system in enhancing teaching and learning in colleges. The study aimed to assess the usability and functionality of the Android application among students, evaluate its impact on student engagement and learning outcomes, determine the satisfaction of Admin with the administrative privileges provided in the application, and investigate the effectiveness of the biometric attendance system.

The outcome of the research proves that the Android application for the MTLR is a useful tool for enhancing teaching and learning in institutes. The application was found to be user-friendly, and students reported that it helped them access learning resources easily and improve their engagement in the classroom. The biometric attendance system was found to be effective in managing attendance and reducing absenteeism. Moreover, HODs reported high levels of satisfaction with the administrative privileges provided in the application.

The study also identified some challenges and opportunities associated with the implementation of the Android application for the management of teaching and learning resources with a biometric attendance system. These included issues related to technology infrastructure, security, and privacy, as well as the need for training and support for students and faculty.

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[6] Ben Kopf, B. (n.d.). The Power of Figma as a Design Tool. Retrieved May 12, 2023, from https://www.toptal.com/designers/ui/figma-design-tool.
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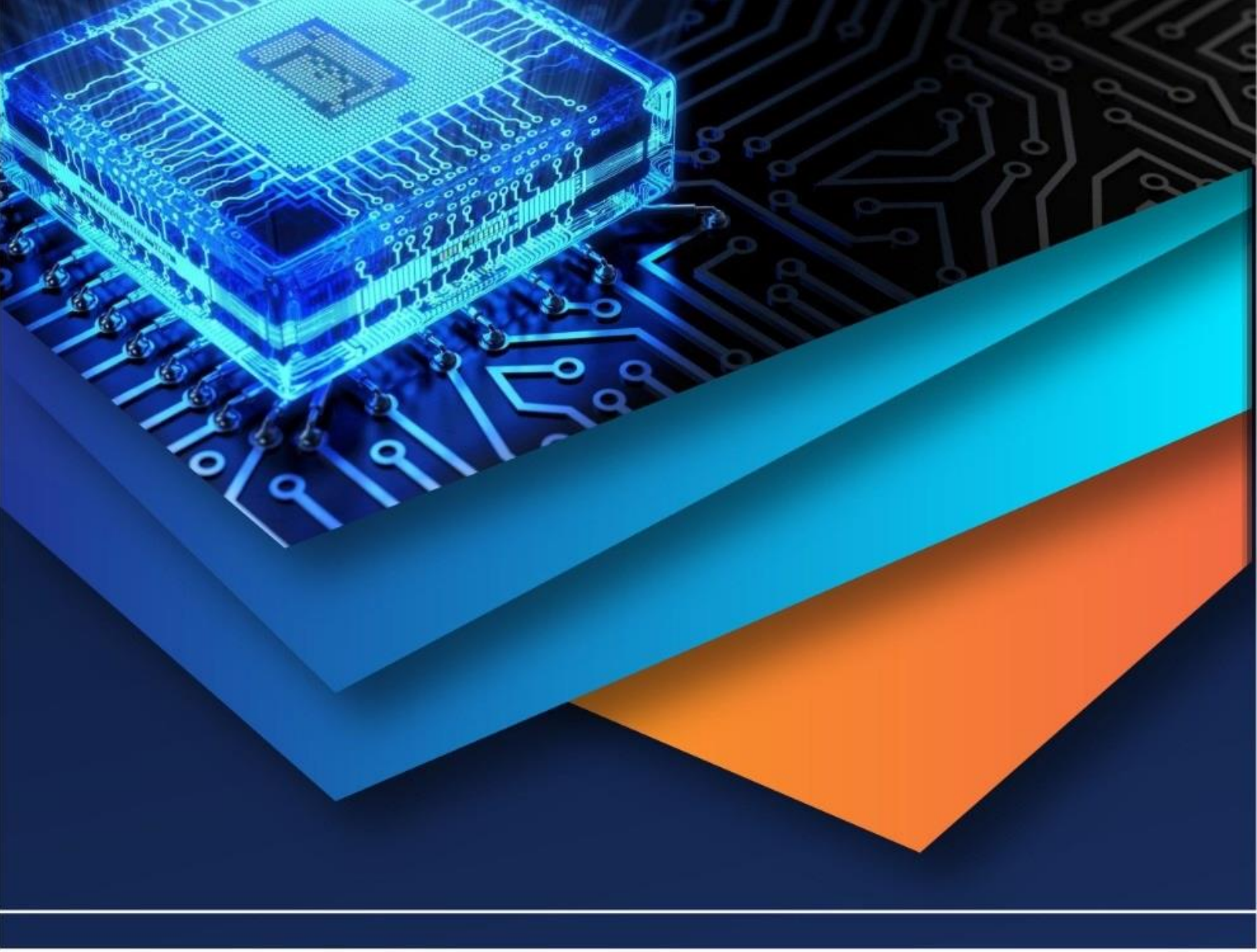

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