Managing the Activities of a University Department through Android Application

Imran Hossain[1*], S M Akram Ullah[2], A K M Mahmudul Haque[3]

[1]MSS, Department of Political Science, University of Rajshahi, Rajshahi- 6205, Bangladesh
[2]Professor, Department of Political Science, University of Rajshahi, Rajshahi- 6205, Bangladesh
[3]Professor, Department of Political Science, University of Rajshahi, Rajshahi- 6205, Bangladesh
Email: imranbd.ru@gmail.com

Abstract— *Mobile devices are playing an increasingly important role in university students' academic lives. The researcher aims to develop an Android application that can help students keep track of their academic, extracurricular, and other activities. This application was developed based on the Firebase database system. Android Studio was used to create the code for the application. Results of a survey indicated that the majority of users had a positive experience with the application and that most found it easy to use and efficient. The majority of users use this application to collect class materials and communicate with classmates and the teacher. Despite the benefits, there is still a need for improvement in campus bus tracking services. This application will allow students to easily view, track, and manage all of their activities in one place. The study indicates that this application will be very useful for both teachers and students. Students can use Bluetooth technology to automatically verify their attendance in the class. They can also locate where the university bus is. In an emergency, students can get in touch with their teacher, classmates, and other students. This application's security measures can help protect students' and teachers' data. Students can find job opportunities listed in the alumni catalog. Students can easily call the university's police or ambulance by using this app. This system also provides an efficient way to locate people who are willing to donate blood. This provides students with an opportunity to engage in conversations, learn from each other, and find inspiration from the stories and experiences of their peers. The Firebase Messaging System manages the database and allows real-time communication between users. This system will provide a secure and efficient means of communication between students, teachers, and school administrators.*

Keywords— Android Application; Student Management; Firebase; Bluetooth Attendance; Bus Tracking; Skill Development

1.0 Introduction

Students are increasingly drawn to mobile learning due to its convenience, adaptability, engagement, and interactivity. Many universities increasingly make use of mobile technology, designing websites that are mobile-friendly or developing standalone apps that can be purchased via mobile app stores (Park et al., 2011). Google created the Android operating system and development environment for smartphones and other mobile devices, such as tablets and smart watches (Krajci& Cummings, 2013). It is compatible with a variety of devices made by various manufacturers. (Gandhewar and Sheikh, 2010). For generating unique code and putting software modules together to create an app for Android users, Android has a software development kit (Hagos, 2018). It also offers a marketplace where the app can be sold. All in all, Android functions as a mobile app ecosystem (Butler, 2011). Additionally, there is a requirement for information to be sent more quickly due to advancements in time and technology. Due to the growing advantages of automated systems, many manual processes have been converted to machines. Universities and other educational institutions must ensure that their manual procedures are compatible with mobile computing platforms due to the current trend toward automated systems. With the help of databases and programs like the Student Information System, institutions can now use information technology (IT) advancements to centralize record access. The convergence of mobile technology is becoming more and more important to academic life for university students (Shrivastav et al., 2014). The usage of mobile technology in education will change how educators teach and learn (Heflin & Nguyen, 2017). Smart phones, tablets, and e-readers are just a few examples of gadgets that instantly connect users to the outside world, enhancing access to information and fostering social interaction. Users can discover and create content using the applications that run on these devices, in addition to consuming it. As a result, they continue to alter how college students' study and have an impact on their preferred methods of learning both inside and outside of the classroom (Shrivastav et al., 2014). Moreover, the use of Android technology has also started to expand throughout society, particularly among students and the upper and middle classes. Students that frequently use Android may desire to continue their study at the undergraduate level. Educational policy makers should consider approaches to maximize the use of new mobile technologies that are pedagogically successful in light of this transition (Yokus, 2016). According to the findings of the ECAR research study on students, many undergraduates bring their own digital gadgets to college, preferring lightweight models like smartphones and tablets. So, mobile technologies are playing an increasingly important role in college students' academic lives. Android devices are essential, though there are some challenges (Peng et al., 2012). There is currently no system in place that allows students to monitor their development and conduct independent analysis. In an emergency, colleges are unable to give students crucial information. This application is being created to address the common issues experienced by university students. It can deal with issues like attendance,

class materials, keeping track of the university bus, borrowing books from the library, and receiving information from the school. Ensure data security and integrity in a public setting (Kaufman, 2009). From the viewpoint of the students and teachers, the system being built is affordable. The fundamental strategy aims to create an Android-based smart phone application that may be utilized to make this process simpler and more secure.

2.0   Literature Review

For the management of campus activities, there are numerous applications already available. Every application has unique traits, drawbacks, and benefits. These applications (apps) were created by taking the requirements of a specific institute into account. These apps serve just one goal; hence, we need different apps for various institutional activities. Nearly all institutional activities are carried out with the aid of Android-based campus solutions. The Android Based Campus Solution app's proposed work was described by Nethaji et al. in 2019. The concept and methods used to develop the MOBILE-CAMPUS application were described by Bhattacharya et al. in 2013. Xhafa (2010) described and examined mobile phone-based learning strategies from both a technological and educational standpoint.

In order to automate attendance taking in universities and schools, Pathak et al. (2013) proposed a face detection and recognition system that needed the installation of two cameras in each classroom, one for sensing and the other for taking student images. A picture of the complete class is taken, and any student's presence or absence is noted using the positive and negative examples stored in the database. Due to the possibility of a huge class size, this system's error rate has been shown to be significant. Furthermore, for this system to be managed effectively, a sizable database is needed for each subject.

Satija (2012) proposed a method that involved sending the MAC address of the client's mobile phone to the faculty member's mobile phone. This method required students to carry metrics cards, and an RFID reader was used to collect student data that was then sent to a shared PC (Kumar, 2012). The teacher then utilizes Bluetooth to link his or her phone to the system and check the attendance of the students.

Bamane et al. (2012) proposed a client-server-based chat application that is very effective for interacting with people. The IP addresses of the server are transmitted to the clients who want to join the chat in order to keep track of the number of users that want to participate. The users have the ability to log in and exit. Every time a new user wants to sign in, he must first register by filling out the essential information. Registered users have access to the joining permissions. After a user logs in and establishes a connection with the server, the database is updated, adding the newly established connection. Registered and connected users can also see a list of online users. Users are free to share or build their own chat rooms.

Dhale et al. (2015) proposed a method for overseeing academic activities at a college using a mobile application, which introduced portability because a mobile phone can be taken almost everywhere. An efficient system for managing colleges was developed in this study, and it involves creating and storing student and teacher profiles in a single repository. Any faculty members or student's entry may be added, deleted, or authenticated by an administrator. Every teacher receives a distinct identifying key from the automatic registration process. A teacher can access his account using this key. After logging in, a teacher can also update their information. Students who have authorization to read are given access to the latest material online. Furthermore, while a student is in a one-on-one chat session for study or doubt clearing, teachers have access to all of the student's information. Every piece of information supplied by a teacher is accessible on a central server, whereas information shared by students is only accessible by the specific student and teacher. Dahlstrom (2012) developed a user-friendly interface for updating student information in a web-based student information management system. It might be used by colleges or educational institutions to easily maintain student records. In both universities and colleges, it is crucial to create and manage accurate, current information about a student's academic career. All types of student information, including academic reports, college information, course information, curriculum, batch information, placement information, and other resource information, are dealt with by the student information system.

Seilhamer (2013) develops a new technique for evaluating individual student variations in language learning environments. The SILL (Strategy Inventory of Language Learning) questionnaire items were the foundation for the system's questionnaire-style items. Researchers like Chapel (2009) & Andone et al. (2007) have concentrated on certain mobile learning applications. Chapel presented a case study of the implementation of the Campus Connect program at Montclair State University (MSU). This smartphone application combined academics, safety, and communication. The mobile Blackboard Learning System offered access to academic resources and delivered course material, including announcements, assignments, handouts, and access to podcasts and videocasts. In addition to supporting technological projects that serve the university's goal, MSU Campus Connect was implemented for the following reasons: to increase academic involvement, boost student retention rates, and foster "strong student participation in a more well-defined campus culture" (Chapel, 2009).

Extension of Volley to support Web Services can aid in the creation of Web Services applications and enhance Web Services access performance. Support for Web Services is realized by the construction of the HTTP stack interface and the expansion of JSON Object Request on the basis of analysis and research of the Volley, KSOAP2, and Java Web Services. The protocol supports SSL/TLS protocol requests with configurable parameters, sets or obtains the request header, and uses JSON format to send data. This plan has good interoperability, is simple to use, and can be used on the Android platform (Shulin, 2014).

The management of student information systems is already possible with some applications. However, every application has some restrictions. This study will try to find solutions to these kinds of issues and offer a special tool for supervising university department students.

3.0 Methodology

For developing this application, the researcher has chosen Android Studio. The researcher has also chosen Firebase for storing all the data. As Firebase is provided by Google, it is extremely safe and secure. Firebase also has a variety of features such as real-time database, authentication, analytics, and crash reporting. All these features of Firebase have been beneficial to the researcher while developing the application. Additionally, Firebase also offers features such as cloud storage, messaging, and notifications. All these features make Firebase a powerful platform for building applications, and it has become an invaluable tool for researchers. So, this application was developed based on the Firebase database system. The researcher also employs Java to ensure that programs run smoothly. The developer also used XML to design the application's user interface. XML, in particular, was useful for creating the user interface because it allowed for a greater degree of customization and integration with other programs. Most of the processes are done through Android Studio and the Firebase database system. Android Studio was used to facilitate the development of the application, while Firebase provided a cloud-based database system that allowed the user to store and access data securely. The Android Studio development environment was used to create the code for the application, while XML was utilized to design the user interface. After building this application, it also ran on a real device. In order to test the functionality of the application, various tests were performed on an emulator running the same Android version as was used to build the application. Once the application was built and deployed, user acceptance testing was performed to ensure that the application was working as expected. For live testing, a minimum of 20 and a maximum of 50 students are chosen at random to test the application's activity. Through the user acceptance testing, the developers were able to gain insight into how the users interacted with the application. A little survey has already been done by the researcher through a simple questionnaire. All the data was analyzed through SPSS software. The results of the survey indicated that the users had a positive experience with the application. User experience data is analyzed based on a frequency table. The frequency table showed that the majority of users had a positive experience with the application and that most users found it easy to use and efficient. The analyzed data is presented in a graph to help understand the application's use experience, which is done by the Microsoft Excel software.
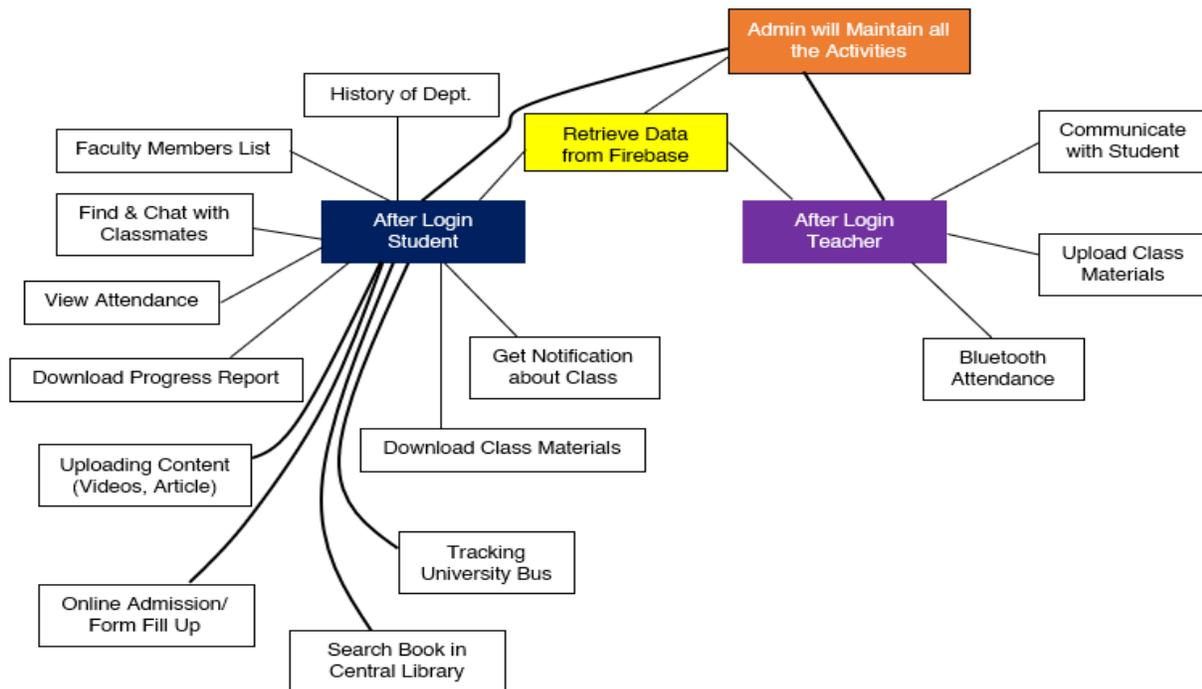

Fig.1. *Diagram of the Application*

4.0 Development of the Application

4.1 Authentication Process

4.1.1 Teacher Authentication

Each teacher who installs the application must submit their phone number according to their profile. Then, using Firebase Authentication, the teacher will receive an OTP (Moroney, 2017). The teacher had to enter a valid OTP code from a message before

setting their name and email address (See Figure 2&3). During the one-time registration process, he uploads a picture of himself for his profile. A Firebase database system will be used to store all the data (Moroney, 2017a). The administrator will validate all the information before giving the teacher access to this application. The teacher won't need to provide his name or email address the next time. The teacher will then be able to access the application and all its features without the need for further validation. Once the teacher's information is validated and stored in the Firebase database system, they will be able to access the application seamlessly. By allowing teachers to access the application without needing to provide their personal details every time, the administrator is helping to create an efficient and secure environment for teachers and students alike.

4.1.2 Student Authentication

The student profile subsystem requests the same information from enrolled students as the teacher profile does, including their email address, password, and phone number. Until a student's profile has been registered, he cannot use this application. This helps to ensure that only authorized people can access the application, allowing both teachers and students to be confident in the security of their information (Moroney, 2017). The student can access the application after the administrator verifies the student's information. The student profile subsystem provides an extra layer of security, by ensuring that the application can only be used by registered and verified users. If the login process is properly completed, users can access all application features. The student profile subsystem provides additional protection for the application by confirming the identity of the user.

4.2 Information of the Department

They can access a list of the department's faculty members and its previous chairman by logging in. This section is where users can find information about teachers. They have quick access to the teachers via phone, message, and mail. Users can find alumni and students by batch (See Figure 7). All student data is accessible to the user. He also notes each former departmental student's name and email address. Additionally, he or she can talk to their seniors about any support requirements. They can also view the job opportunities listed in the alumni catalog. With this information, the user can explore various alumni networks and determine if a particular school or jobopportunity is right for them. The user can benefit from this data in numerous ways (See Figure 4). since all the data will be kept in Firebase's real-time database. So, changing any data is really too easy. Firebase's real-time database is a great tool for users to use as it allows them to easily access and modify data in the database, giving them complete control over their information.

Fig. 2. *Input Number Screen*   **Fig.3.** *Profile Create*   **Fig.4.** *Information of the Dept.*   **Fig.5.** *Notification of the Dept.*

4.3 Notification (Class Schedule, Department Notice, Scholarships, Fellowships, and Extra-curriculum Activities)

This section contains a variety of important notices for students. The student will receive a notification alert if the department authority releases crucial information. The department can provide scholarships, fellowships, or other news in this way (See Figure 5). Through the notification system, students can remain informed of any department-related news, such as changes in the class schedule, notices of important events or deadlines, and announcements of scholarships and fellowships available to them. The Firebase system also controls this notification system. Additionally, students can receive an updated class schedule. Students will be informed of the class schedule if the teacher can post it. Additionally, a teacher may convey any unique information about a class or anything else to a group or an individual.

4.4 Emergency Assistance (Based on Location)

This app not only allows students to be informed of the class schedule, but it also provides useful information regarding emergencies. Students can easily call the university's police or ambulance by using this app (See Figure 6). This is especially useful for university students, as it provides them with up-to-date information on emergency assistance options available in their area. Users can use this application to get the support they need in an emergency. In addition, by letting their classmates know where he is, they can solicit assistance from them. Once his location has been disclosed, he can ask any of his classmates for help. He or she can then enlist the aid of classmates. This system was designed to be location-based.

4.5 Curriculum of the Department (Syllabus)

This application can also be used to access the course outlines and programs of study offered by the department.The department's course outlines for all years and semesters are available to students. Additionally, they can find information about his course. Through this application, they can download the department's curriculum as well. This is a convenient way for students to access all the information they need about their department's courses and programs in one place.

4.6 Find by Name, Blood & Student ID

Using a student's name, ID, and blood group, they can quickly locate any senior or classmate (See Figure 8). Blood donors are simple to manage for anyone. Within a very short period of time, users can obtain the donor's name and phone number. Search engines utilizing a student's name, ID, and blood group make finding senior or classmate information easier than ever before. This not only helps those who are searching for information about a classmate, but it also provides those who are looking for blood donors with an easy and efficient way to find people who can help.

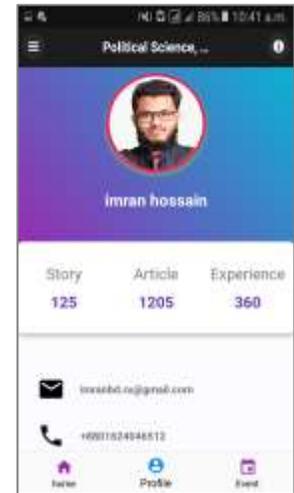**Fig. 6.** *Emergency Hotline*   **Fig.7.** *Student List by Batch*   **Fig.8.** *Find Student*   **Fig.9.** *Student Profile*

4.7 Track the University Bus's Location

This system not only provides an efficient way to locate people who are willing to donate blood, but it can also provide a great service to the university community by helping them track the university bus location (See Figure 11). It costs substantially more to use this system. Every campus bus should have a GPS system for this purpose, which should be provided by the university administration. This app will give the precise location of the bus by providing the GPS data that is required. So, users can easily track the bus by communicating with the GPS. The GPS system will not only help in tracking the university bus, but it can also provide useful information about traffic conditions and other route-related issues. Furthermore, this system can also be used to ensure the safety of the students travelling in university buses as well as allow them to plan their travel more efficiently.

4.8 Attendance System

Students are removed by easily selecting their name, enrolment number, or MAC address, and students are added by storing the MAC addresses of their individual mobile phones. The system keeps track of the students' attendance when the teacher and students turn on Bluetooth on their mobile devices. By requesting students to turn on their mobile devices' Bluetooth, this program enables teachers to take attendance at any time during the classroom hour (See Figure 10). This is accomplished by scanning and comparing the MAC addresses of all adjacent devices with a database of previously saved MAC addresses. A record is considered to be present if the name and MAC address match; otherwise, it is said to be absent.

4.9 Download the Course Materials

The necessary class materials will be offered by the teacher. From this application, students can download course materials. The class's components will all be kept in the Firebase database system. The Firebase database system will store all class components, including the necessary course materials that can be downloaded by students via the application. The Firebase database system ensures a secure environment to store and access the class components, allowing students to securely download the necessary course materials. In addition, the Firebase database system ensures that all class components are updated in real-time and can be accessed by students with no hassle. The class materials can therefore be downloaded at any time. Anytime during the day, users can download.

4.10 Report on Student Progress

Every course's progress report is available for students to download. Through this, they are able to pinpoint his or her weaknesses. Anytime during the day, users can download progress reports on their courses, allowing them to quickly identify areas of improvement. This provides students with an easily accessible platform to monitor their progress in courses, and allows them to stay organized and on top of their studies. The teacher will present this report on progress. This report is also kept in a fixed user ID firebase database system. This progress report can be invaluable for both the student and the teacher. This content can be accessed by the teacher in the fixed user ID firebase database system, allowing them to view student progress and better assess their overall understanding of the course material

4.11 Creating Content (by the Student)

Students are able to produce content, such as videos, and upload it to YouTube. After uploading to YouTube, they can use the video ID to upload the video using this app. The Firebase Store will reserve this video ID. Firebase Storage will then store the video and its associated meta data in the Firebase Database.
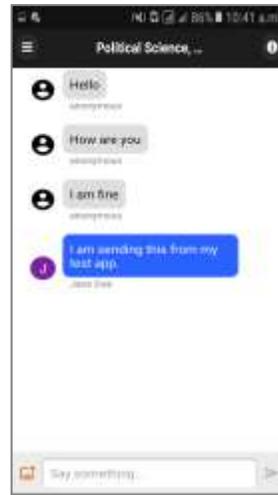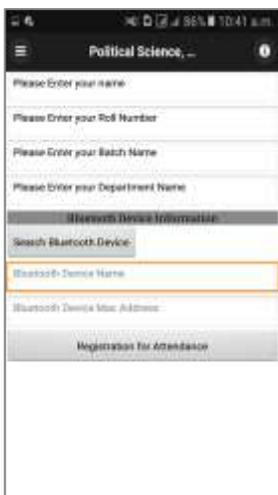

Fig. 10.*Attendance System* **Fig.11.***Bus Tracking Screen* **Fig.12.***Simple Chatting Screen* **Fig.13.***Simple Chatting Screen*

4.12 Share the Student's Knowledge (Article, Success& Motivational Story)

Through this app, students can share their success stories (See Figure 13). All of the department's students will be inspired by this. Anyone is able to write an article with a thumbnail image. Other students would benefit from this. Other students are invited to leave comments and provide feedback about the success story and article in this section. This provides students with an opportunity to engage in conversations, learn from each other, and find inspiration from the stories and experiences of their peers. By encouraging students to engage with each other in this way, they can learn from one another and find motivation to follow their dreams and achieve their goals. Through this system of communication and learning, students are able to come together to discuss their experiences and successes, as well as gain knowledge from each other.

4.13 Interface for Simple Chat with Classmates

Within a very short period of time, students can communicate with their classmates (See Figure 12). This kind of application will be very beneficial for corresponding with classmates and teachers. There will be a simple chat interface. Android Studio was used in the design of this interface. The Firebase Messaging System manages the database and allows real-time communication between users. The Firebase Messaging System works by syncing messages with the server and then delivering them to the users. The Firebase

Messaging System is extremely effective and user friendly, as it provides a smooth and efficient way for users to communicate with one another. Moreover, the Firebase Messaging System is highly secure, as all messages are encrypted with a unique key that only the intended user can access. This system will provide a secure and efficient means of communication between students, teachers, and school administrators.

4.14 Feedback

Obtaining Comments on the Application Students can comment on, complain about, or make suggestions for this application. This system will not only provide a secure and efficient means of communication between students, teachers, and school administrators, but it will also allow for feedback from the users. The administrator's email address will receive this suggestion.

5.0   Results and Discussion

A simple survey has been conducted by the researcher to understand the performance of the application. The survey was administered to a small sample of users who have already used the application, and the results of the survey have provided valuable insights into areas for improvement.
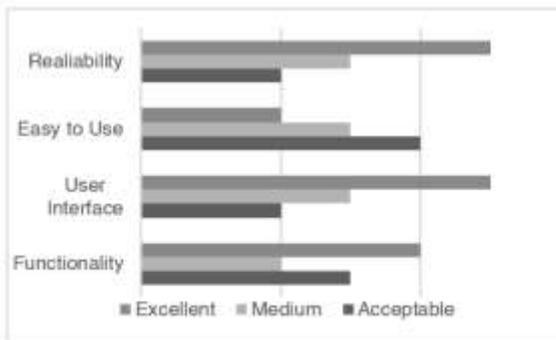
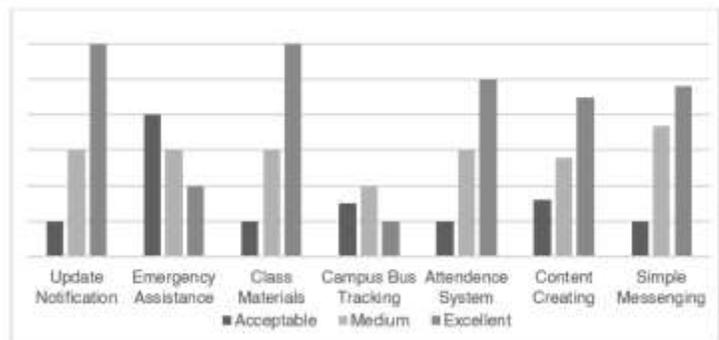

Fig. 14. *User Experience of the Application*

Fig. 15. *Most Used Function of the Application*

From Figure 14, it is evident that most of the users feel better for using this application. They also think that this application is very helpful for improving their academic results as well as their co-curricular activities. Furthermore, the survey results show that the majority of users prefer to use this application over other similar ones available in the market. These results indicate that the application is successful in delivering its promised purpose of helping users improve their performance and productivity. A large number of users have observed that this application is very reliable and secure. Its user interface is also very friendly. Its performance is also high. Despite the fact that this application cannot easily resolve some issues, we identify the application's most frequently used function to better understand the problems.

With its high performance, this application allows users to easily collect and organize class materials, communicate with classmates and teachers, as well as use other features. According to Figure 15, the majority of users use this application to collect class materials as well as communicate with classmates and the teacher. They also used this application to get various notifications related to their department. The department authority and teacher make extensive use of this application to inform a large group of students about class or other issues. This is an extremely beneficial feature of this application, as it ensures that all students are aware of any and all notifications from the department or the teacher. With this application, the department authority and teacher have a secure and reliable way of disseminating information to their students. Although campus bus tracking services have not improved significantly, most of the participants in this survey raised questions about these facilities. Despite the benefits of the application, many of the participants noted that there is still a need for improvement in campus bus tracking services. In this aspect, researchers usually use the Google Maps API system. With the introduction of the Google Maps API, researchers have access to a more cost-effective and reliable tracking service than using a GPS tracker. There are also a large number of respondents who argue that the attendance system has also been greatly improved. It also works at very high speeds. The attendance system is beneficial in many ways, most notably for its accuracy and speed. The feedback received from the survey participants regarding this application has been largely positive**.**

6.0   Conclusion

Technology for information and communication is prevalent today. Practically all of our daily activities now rely on technology. One of the best technological advancements is Android. Android is the world's most popular mobile operating system, and it powers billions of devices across the globe. By effectively utilizing this technology, we can gain knowledge and expertise regarding any issues. A large number of Android users is students. With the help of Android, students can make use of apps that are designed to assist them in learning a variety of topics. As a result, students can greatly benefit from using an Android device. In this aspect, the researcher tries to adopt new strategies for managing students' activities through an Android application. The researcher aims to develop an Android application that can help the students keep track of their academic, extracurricular, and other activities. This

application will allow students to easily view, track, and manage all of their activities in one place. The study indicates that this application will be very useful for both teachers and students. A teacher can quickly get in touch with a student. Both the attendance and daily activities of a student can be observed by the teacher. As a result, this application has the potential to make teaching and learning more efficient, allowing teachers and students to make better use of their time. Through this application, students can learn more about their faculty members, fellow alumni students, and the history of their department. Any notifications for a class or an upcoming departmental event are easily accessible to students. By providing such a platform for students and teachers, this application can provide a much more effective learning environment for both. With the increased amount of information, accessibility, and communication that this application provides, students will be able to gain a better understanding of their curriculum, professors' teachings, and the different resources available to them. They can also learn about different job, scholarship, and fellowship opportunities through this application. The most advantageous thing is that they can use Bluetooth technology to automatically verify their attendance in the class. They can also locate where the university bus is. This application offers chat functionality as a result. In an emergency, students can get in touch with their teacher, classmates, and other students for any kind of assistance. Within a short period of time, they can locate blood. They keep track of their locations and share them with others. Writing and uploading content to this application can empower students. Additionally, they receive comments on their articles, videos, success stories, and other items. The researcher used the Firebase database system for developing this application. So, it's highly secured. Firebase is a much more secure database. Firebase's security measures can help protect students' and teachers' data from any unauthorized access, while the user-friendly dashboard will make it easy for admins to monitor the activities of the application. Overall, this application is a tool that will make a revolutionary change in the management of students. By using this application, students as well as teachers will be greatly benefited.

References

[1] Kumbhar, A. A., Wanjara, K. S., Trivedi, D. H., Khairatkar, A. U. & Sharma, D. (April 2014). "Automated Attendance Monitoring System using Android Platform". *International Journal of Current Engineering and Technology, vol. 4, no. 2*, pp. 1096-1099.

[2] Satija, N. (November 2012). "Bluetooth Attendance System". *International Journal of Innovative Research in Engineering and Science, vol. 5, no. 1*, pp. 48- 52.

[3] Bamane, A., Bhoyar, P., Dugar, A. & Antony, L. (June 2012). "Enhanced Chat Application". *Global Journal of Computer Science and Technology Network, Web & Security, vol. 12, no. 11*, pp. 1-7.

[4] Joshi, L. M. (July 2015). "A Research Paper on College Management System". *International Journal of Computer Applications, vol. 122, no. 11*, pp. 32- 44.

[5] Dhale, A., Mistry, M. &Zore, T. (November 2014). "A Survey on "SMART CONNECT" an Android and Web Based Application for College Management System", vol. 3, no. 11, pp. 2919-2923.

[6] Bhise, A., Khichi, R., Korde, A., Lokare, D. (February 2015). "Attendance System Using NFC Technology with Embedded Camera on Mobile Device". *International Journal of Advanced Research in Computer and Communication Engineering, vol. 4, no. 2*.

[7] Arulogun, O. T., Olatunbosun, A., Fakolujo, O. A. &Olaniyi, O. M. (February2013). "RFID-Based Students Attendance Management System". *International Journal of Scientific & Engineering Research, vol. 4, no. 2*.

[8] Dahlstrom, E. (2012). ECAR Study of Undergraduate Students and Information Technology, *EDUCAUSE Center for Applied Research*.

[9] Seilhamer, R., Chen, B., & Sugar, A. (2013). "A Framework for Implementing Mobile Technology," in Handbook of Mobile Learning. *Z. Zane Berge and Lin Muilenburg, eds. (Routledge, 2013)*, pp. 382–394.

[10] Kumar, A., Aggarwal, A., Charu (2012). "Efficient Hierarhical Threshold Symmetric Group Key Management Protocol for Mobile Ad Hoc Networks". *International Conference on Contemporary Computing*, pp. 335-346.

[11] Kumar, A., Gopal, K., & Aggarwal, A. (2014). "Design and Analysis of Lightweight Trust Mechanism for Accesing Data in MANETs". *KSII Transactions on Internet and Information Systems, vol. 8, no. 3*, pp. 1119-1143.

[12]Zhi-gang Y., You-wei, Y. (2010). " The development and design of the student management system based on the network environment". *International Conference on Multimedia Communications*, 978-0-7695-4136-5/10.

[13]Shulin, Y., Jieping, H. (2014). " Research and Implementation of Web Services in Android Network Communication Framework Volley". *IEEE Computer Society*,978-1-4799-3134-7/14/ 2014 IEEE.

[14] Bhattacharya, Sagnik&Panbu, M. B. (2013) "Design and development of mobile campus, an Androidbased mobile application for university campus tour guide.". *International Journal of Innovative Technology and Exploring Engineering*, 3: 25-29.

[15]Nethaji, T. S. &Suganthalakshmi R. (2019). " Muti Utility Mobile Application." *Pacifier 24(1)*: 1-3.

[16]Xhafa, Fatos, Caballé, Rustarazo&Barolli (2010). Implementing a mobile campus Using MLE Moodle. *International Conference on P2P, Parallel, Grid, Cloud and Internet Computing*, pp. 207-214. IEEE, 2010.

[17] Butler M. (2011). Android: Changing the mobile landscape. *IEEE Pervasive Computing* 10(1), 4-7. Gandhewar N. & Sheikh R. (2010). Google Android: An emerging software platform for mobile devices. *International Journal on Computer Science and Engineering 1(1)*, pp. 12-17.

[18] Park, S. Y., Nam, M. W., & Cha, S. B. (2011). University students' behavioral intention to use mobile learning: Evaluating the technology acceptance model. *British Journal of Educational Technology*, *43*(4), 592–605. https://doi.org/10.1111/j.1467-8535.2011.01229.x

[19] Krajci, I., & Cummings, D. (2013). History and Evolution of the Android OS. *Android on X86*, 1–8. https://doi.org/10.1007/978-1-4302-6131-5_1

[20] Hagos, T. (2018). Android Studio. *Learn Android Studio 3*, 5–17. https://doi.org/10.1007/978-1-4842-3156-2_2

[21] Shrivastav, R., Sankhe, P., Punamiya, H., & Prasad, V. (2014). Android Application for College Management System. *International Journal for Scientific Research and Development*, *2*(2), 676–678. http://www.ijsrd.com/articles/IJSRDV2I2378.pdf

[22] Peng, B., Yue, J., &Tianzhou, C. (2012). The Android Application Development College Challenge. *2012 IEEE 14th International Conference on High Performance Computing and Communication &Amp; 2012 IEEE 9th International Conference on Embedded Software and Systems*. https://doi.org/10.1109/hpcc.2012.248

[23] Kaufman, L. M. (2009). Data Security in the World of Cloud Computing. *IEEE Security &Amp; Privacy Magazine*, *7*(4), 61–64. https://doi.org/10.1109/msp.2009.87

[24] Moroney, L. (2017). Using Authentication in Firebase. *The Definitive Guide to Firebase*, 25–50. https://doi.org/10.1007/978-1-4842-2943-92

[25] Moroney, L. (2017a). The Firebase Realtime Database. *The Definitive Guide to Firebase*, 51–71. https://doi.org/10.1007/978-1-4842-2943-93