

## **A REVIEW ON THE USE OF AUTOMATED ATTENDANCE MANAGEMENT SYSTEM FOR NIGERIAN TERTIARY INSTITUTIONS**

**Ogunje, B.F., Prof. Tukura, C.S., Dr. Sobowale, F.M., Dr. David, M., Ajala B.O.**

Department of Educational Technology,  
Federal University of Technology, Minna

### **Abstract**

*This paper presents a review on the use of automated attendance management system for Nigerian tertiary institutions. The review discussed the importance of students' attendance to lectures in tertiary institutions and the role of attendance management system. Common methods used in attendance tracking were highlighted which include: Manual attendance, Roll call software, Biometric attendance system, Radio Frequency Identification (RFID) or smart card systems and Mobile applications. The review also underscore the advantages of attendance tracking system which include: accuracy and time efficiency, data analysis, compliance, communication and report generation. The impact of information technology on attendance management system and importance of quick response were discussed in the review. The paper concluded by advocating further researches on the development of automated attendance system at different levels of education, allocation of more funds to conduct researches on automated attendance system in Nigeria by Government organisations, agencies and Non-Governmental Organisations, procurement of technologies that can enhance the use of automated attendance system in schools. More conferences, seminars and workshops should be organised for Nigerian educational stakeholders to keep them abreast with the global emerging technologies on automated attendance system. Research institutes in Nigeria should consider designing and development of more automated attendance system for lecturers and students.*

**Keywords:** Automated Attendance Management System, Information Technology, Nigeria, Performance, Tertiary Institutions

### **Introduction**

Globally, Information Technology (IT) has played a significant role in developing several aspects in academic sectors and domains such as student monitoring and management systems (Rjeib *et al.*, 2018). New technologies such as AI, machine learning, and educational software are not only changing the field of study, they also augment the role of a teacher, create philosophical shifts in approaches to teaching, and redesign the classroom. IT can be integrated to the management and maintenance of student information to ensure monitoring of students' performance and progress which can result in the development of automated attendance management system.

### **Importance of Students Attendance to Lectures in Nigerian Tertiary Institutions**

Attendance to lectures in tertiary institutions in Nigeria is a policy issue and its importance is specified in the students' information handbooks which is made available to all bona-fide students, as they complete their registration exercise. In most cases, the information on the importance of lecture attendance is included in the lectures delivered to fresh students during orientation programmes. An extract of such statements on lecture attendance, from the students' information handbook of the College of Education (C.O.E), Agbor is as follows: "A registered student for NCE (Nigeria Certificate in Education) programme must attain 75% attendance to be allowed to write the end of semester examination" (Amukahara & Asabor, 2020). A similar statement in the students' information handbook of the faculty of Education

of Delta State University (DELSU), Abraka is as follows. “To be eligible for any examination, a student is required to have attained 80% minimum contact hours before he/she is allowed to take the examination for the particular course” (DELSU, 2018). In the same vein, Amukahara and Asabor, (2020) reported that the minimum attendance which students must attain to qualify in writing examination in the University of Ibadan is 75%. This policy makes the keeping and use of records of students’ attendance to lectures a mandatory activity, so as to implement it during examinations. However, some lecturers have noted that the policy has not been strictly implemented in all situations, due to various challenges involved in the ways that attendance is been taken, which is mainly manual with paper and pens.

Where the students’ populations are large, taking attendance manually reduced the actual lecture period from the normal. At times impersonation at lectures could occur if the lecturer was not able to recognize all students. Hence, students easily skip lectures unnoticed. At present a record of average attendance ranging from 50% to 70% is a common phenomenon observed in tertiary institutions. Consequently, overall performances of students in various courses are adversely affected (Amukahara & Asabor, 2020). Students’ absenteeism from lectures has also attracted a wide range of studies in which stakeholders have sought explanations to the challenging trend by describing the factors responsible for it in various academic environments and possible solutions to it using various approaches (Ada *et al.*, 2019; Dommerlyer, 2017; Edwards & Clinton, 2019; Khan *et al.*, 2019).

Absenteeism is viewed as a poor motivation for learning which has adverse impact on students’ final academic performance. Consequently, it poses a serious challenge to the successful implementation of the curriculum of tertiary institutions which is a tool for the production of high- level manpower in the society. Sequel to these, lecturers and administrators in most developing countries have had to come up with ways to ensure a healthy participation from students, and make sure that the student-lecturer interactive relationship is kept intact. This in some cases have come in simple forms like roll calls, while in more interesting cases, can be formats like surprise quizzes, extra credit in class and so on. These strategies are however time consuming, stressful and laborious because the valuable lecture time that could otherwise been used for lectures is dedicated to student attendance taking and sometimes not accurate (Shete, *et al.*, 2018).

### **Attendance Management System**

Attendance capture and recording plays a huge part in the academic success of students. Low attendance in class most times leads to underperformance by students. By knowing these realities, attendance of a student ought to be given higher priority irrespective of the school’s categories (Khan, 2022). The increasing number of students in school nowadays makes attendance taking more tedious and therefore traditional method for taking attendance will not be relevant any longer. Producing reports (on daily, weekly or monthly basis) could be very tedious on the part of the teachers hence, the need for automated attendance system in institutions. The "Attendance Management System" refers to a system or process implemented in educational institutions to track and monitor the attendance of students and faculty members. It is a tool that helps in maintaining accurate records of attendance for various purposes, such as assessing student performance, ensuring compliance with attendance policies, and generating reports. The implementation of an Attendance System can vary depending on the institution's requirements and available resources (Kabir *et al.*, 2021). Some common methods used in attendance tracking include:

**Manual attendance:** This traditional method involves taking attendance by calling out names or using a paper-based attendance sheet. The lecturer or faculty member marks the presence or absence of each student manually. The existing conventional attendance system requires students to manually sign the attendance sheet every time they attend a class. As common as it seems, such system lacks of automation, where a number of problems may arise. This include the time unnecessarily consumed by the students to find and sign their name on the attendance sheet, some students may mistakenly or purposely signed another student's name and the attendance sheet may got lost (Akinola *et al.*, 2021).

**Roll call software:** Some institutions use specialized software or applications that allow lecturers to take attendance using a digital platform. The software may have features like student lists, check-in buttons, and options for generating reports. The digital roll call system refers to the ability to provide students with online sign-in, automatic, or manual roll call during teaching activities. This system can help teachers grasp students' attendance and absence in real-time. Teachers can use various roll call methods on the digital learning platform. In addition to the methods mentioned above, teachers can also use an APP with a roll call function to assist in obtaining students' attendance. The primary purpose of implementing roll call is to enable teachers to grasp students' attendance and understand their learning status instantly (Liao *et al.*, 2022). According to Ademola *et al.* (2018) attendance management system was meant to serve as a substitute for conventional attendance system to lessen the processing time and paper cost. Moreover, attendance is being taken daily at workplaces and in schools in developing and developed countries and this has made attendance recording an interesting research area; this has led to the different development and implementation of the student attendance system using various methods. Attendance capture and recording plays a huge part in the academic success of students. Low attendance in class most times leads to underperformance by students.

**Biometric attendance system:** utilizes biometric information such as fingerprints, facial recognition, or iris scans to accurately identify and record attendance. This method is considered more secure and eliminates the possibility of proxy attendance. Many industries and institutions are already using biometric in monitoring the attendance of employees which really saves time and prevents time theft that leads to cost saving. According to Zhang (2018) Biometric technology offers advanced verification of individual because it identifies people through measurements of unique human characteristics such as fingerprints. The use of biometrics for patient identification in the developing world has been explored in other contexts, including health clinics in South Africa, anti-retroviral therapy in Malawi, clinical trials in Vietnam, and tracking of nomadic pastoralists in Chad (Bhatnagar *et al.*, 2021). Furthermore, biometric is the tool which measures individual's unique physical or behavioral characteristics to recognize or authenticate their identity and it is most secure and convenient authentication tool. Individual's unique physical or behavioral characteristics cannot be borrowed, stolen, or forgotten and forging on the other hand is practically impossible. Common physical biometrics includes fingerprints, hand or palm geometry, retina, iris, and facial characteristics. Moreover, biometric technologies capitalize on unique, permanent, and scan-able human characteristics that is unique and no one can share it. All biometric devices take a number of measurements from an individual then digitally process the result of these measurements and save this representation of the individual's traits into a template. Templates are then stored in a database associated with the device or in a smartcard given to the individual.

**Radio Frequency Identification (RFID) or smart card systems:** This systems use ID cards with embedded RFID chips. Students or faculty members can swipe or tap their cards on a reader to register their attendance. RFID refers to a wireless system comprised of two

components: tags and readers. The reader is a device that has one or more antennas that emit radio waves and receive signals back from the RFID tag. RFID technology is superior to other identification technologies, because in reading or rewriting data on the RFID tag it does not require direct contact between the RFID tag and the reader, has the ability to send clean and reliable data needed as input for software on the attendance system, data can be read accurately in the reading range, and the design costs are low. Technology is currently needed by the campus; technology involvement is to reduce manual human activity in every activity on the campus. One of the activities on campus that needs to be involved with technology is teacher and student attendance activities. Radio Frequency Identification (RFID) technology is one technology that is able to identify certain objects (Kaur, *et al.*, 2021).

However, administrator may register every student with specific RFID card ID and finger ID to attend the lecture. Whenever a new student is registered to attend the lecture, an RFID tag is attached into the student ID card and his/her fingerprint is registered and saved in database, and the information of students such as student name, his/her card ID and finger ID, and personalities of student are also captured in the computer database. All information of teachers/students in that attendance lecture is stored in the computer database. Each teacher is registered and supplied with a username and password by the administrator as identification data for them. In this system, if teachers want to calculate students' attendance, they don't need to use manual roll call calculation. System will automatically calculate students' attendance by reading students' unique ID card with RFID tag number and finger ID number and comparing this RFID card ID number and finger ID number with information stored on the DBMS according to their ID's that we have assigned to them.

The student bio data (Matriculation number, Name, Gender and Date of Birth), card ID number and finger ID number are enrolled first into the database. Our aim is to create a system with one server to which PC's are connected, so all data will be saved in one data base, marking the monitoring of the information effortless. All classes must have a PC with a connected RFID reader that can read student RFID-cards, as well as a fingerprint reader that take their fingerprints. The fingerprint reader is meant to prevent a student from giving his/her RFID-card to classmate who attends the lecture, scanning the other student's RFID-card to make it appear as if he/she had also attended. When a student enters class, this RFID reader reads his/her student ID, and his/her finger must press on fingerprint reader. These RFID tag and fingerprint data send to a PC with a connected RFID-reader and fingerprint reader (Thein & Cmnhm, 2018).

**Mobile applications:** With the widespread use of smartphones, many institutions have developed attendance tracking apps. Students or faculty members can use these apps to mark their attendance, and the data is synced with the institution's database.

### **Advantages of Attendance Tracking System**

All of these modes of attendance tracking system have their own advantages which include:

**Accuracy and time efficiency:** An automated attendance system reduces errors and saves time compared to manual methods. It eliminates the need for paperwork, manual calculations, and data entry.

**Data Analysis:** Attendance systems provide data that can be used for various analyses, such as identifying patterns of attendance, monitoring trends, and assessing the impact of attendance on academic performance.

**Compliance:** An attendance system helps institutions ensure compliance with attendance policies and regulations. It allows lecturers to identify students with poor attendance and take appropriate actions to address the issue.

**Communication:** Some attendance systems can send automated notifications to parents or guardians if a student is absent without permission. This improves communication and enables timely intervention when necessary.

**Report Generation:** Attendance systems often include reporting features that can generate attendance reports for individual students, classes, or even the entire institution. These reports can be used for administrative purposes, evaluations, or audits. However among many technologies, such as WiFi, wireless sensor networks (WSNs), ultrasound, infrared, and video camera, have been proposed or used as the mechanism for localization and tracking. Radio frequency identification (RFID) is a promising technology for the purpose of identification and tracking of objects using RF signals. Among its many applications, RFID is widely used in enterprise supply chain management to improve the efficiency of inventory tracking and management.

### **Impact of Information Technology on Attendance Management System**

Information technology has had a significant impact on classroom attendance management systems, transforming traditional manual processes into efficient, accurate, and automated systems. Information technology allows for the automation of attendance tracking processes. Instead of taking roll calls manually, lecturers can use digital attendance systems to mark attendance quickly and accurately. This saves time and reduces the administrative burden on teachers (Ardebili *et al.*, 2022). With technology-enabled attendance management systems, attendance data is available in real-time. Lecturers and administrators can access up-to-date attendance records instantly, making it easier to identify patterns of absenteeism and take appropriate actions promptly.

Automated attendance systems minimize the chances of errors and discrepancies in attendance records. Manual recording can lead to mistakes, such as incorrect data entry or lost attendance sheets, but technology ensures data accuracy and integrity. However, many attendance management systems can integrate seamlessly with the school's Student Information System. This integration streamlines data management and ensures that attendance data is available alongside other student information, facilitating a comprehensive view of each student's academic progress. With technology-based attendance management, parents can receive instant notifications regarding their child's attendance status. Automated messages can be sent to parents when their child is absent, ensuring better communication between the school and parents. Information technology allows for the generation of detailed attendance reports and analytics. Schools can analyze attendance trends, identify patterns of chronic absenteeism, and devise strategies to improve overall attendance rates.

Similarly, automated attendance systems can help identify students who have a consistent pattern of absenteeism. This early warning system enables lectures and administrators to intervene and provide support to students who may be facing challenges that affect their attendance and academic performance. Technology-based attendance management promotes transparency and accountability. It helps schools to maintain a clear audit trail of attendance records, ensuring that accurate data is available for reporting and compliance purposes. Mobile applications and cloud-based attendance systems allow lecturers and administrators to access attendance data from anywhere, making it convenient for them to manage attendance even

outside the classroom (Ardebili *et al.*, 2022). Also by streamlining attendance management processes, schools can optimize resources, such as time and personnel, allowing educators to focus more on teaching and supporting students' academic needs.

### **Importance of Quick Response (QR) Coding**

QR code Attendance Management System is a combination of two applications. One is Mobile application and the other is Desktop application for taking and storing the attendance of the students on the daily basis in the faculty (Elbehiery, 2019). Here the Instructor, who is handling the subjects, will be responsible to generate the QR code of the subject. Each student will get a free mobile application that is used for taking attendance by him. The main objective of the automated attendance system is to computerize the traditional way of recording attendance and provide an efficient and automated method to track attendance in institutions. Using the QR code attendance system gives advanced features like: Providing better security, Maintenance of the system become easy and cost effective, Generating quick statistical results, Providing accurate and efficient data, and the system will be user friendly (Elbehiery, 2019).

### **Conclusion and Recommendation**

The use of automated attendance system in tertiary institutions offers tremendous benefits to lecturers and students as it also eases the demanding tasks of managing and maintaining of students information by lecturers and administrators of Nigerian tertiary institutions. Hence, need for further researches on the development of automated attendance system at different levels of education, allocation of more funds to conduct researches on automated attendance system in Nigeria by Government organisations, agencies and Non-Governmental Organisations, procurement of technologies that can enhance the use of automated attendance system in schools. More conferences, seminars and workshops should be organised for Nigerian educational stakeholders to keep them abreast with the global emerging technologies on automated attendance system. Research institutes in Nigeria should consider designing and development of more automated attendance system for lecturers and students.

### **References**

- Ada, M. J., Arop, P. O., & Okute, A. L. (2019). A Study of the Management of Learners' Absenteeism in School Organizations in Nigeria. *Research on Humanities and Social Science*, 9(18), 23-34.
- Ademola, A., Somefun, T. E., Agbetuyi, A. F., & Olufayo, A. (2019). Web based fingerprint roll call attendance management system. *International Journal of Electrical and Computer Engineering (IJECE)*, 9(5), 4364-4371.
- Akinola, N., Mohamed, S. A., Ul-Saufie, A. Z., Ahmat, H., & Alias, F. A. (2021). Enhancing attendance and student exam score based on mobile attendance application. *ESTEEM Academic Journal*, 16, 38-46.
- Amukahara, E. B., & Asabor, M. B. (2020). Reasons for students' absenteeism from lectures in selected tertiary institutions in Delta and Edo States of Nigeria: the students' views. *OIDA International Journal of Sustainable Development*, 13(8), 27-38.
- Ardebili, A., Latifian, A., Aziz, C. F., BinSaeed, R. H., Alizadeh, S. M., & Kostyrin, E. V. (2022). A comprehensive and systematic literature review on the employee attendance management systems based on cloud computing. *Journal of Management & Organization*, 1-18.

- Bhatnagar, N., Sinha, A., Samdaria, N., Gupta, A., Batra, S., Bhardwaj, M., & Thies, W. (2021). Biometric monitoring as a persuasive technology: ensuring patients visit health centers in India's slums. In *International Conference on Persuasive Technology* (pp. 169-180). Berlin, Heidelberg: Springer Berlin Heidelberg.
- Dommerlyer, C. J. (2017). Lecture capturing: It's effects on students' Absenteeism, performance and impressions in a traditional Marketing Research Course. *Journal of Education of Business*, 2(3), 388-395. <https://doi.org/10.1080/08832323.2017.1398129>
- Edwards, M. R., & Clinton, M. E. (2019). A study exploring the impact of lecture capture availability and lecture capture usage on student attendance and attainment. *Higher Education*, 77, 403-421.
- Elbehieri, H. (2019). Enhancement of QR code student's attendance management system using GPS. *IOSR Journal of Computer Engineering*, 21(4), 18-30.
- Kabir, M. H., Roy, S., Ahmed, M. T., & Alam, M. (2021). Smart attendance and leave management system using fingerprint recognition for students and employees in academic institute. *International Journal of Scientific & Technology Research*, 10(6), 268-276.
- Kaur, M., Sandhu, M., Mohan, N., & Sandhu, P. S. (2021). RFID technology principles, advantages, limitations & its applications. *International Journal of Computer and Electrical Engineering*, 3(1), 151-168.
- Liao, A. Y., Hsieh, Y. Y., Yang, C. Y., & Hwang, M. S. (2022). Research on a trustworthy digital learning roll call system. *International Journal of Network Security*, 24(4), 681-688.
- Rjeib, H. D., Ali, N. S., Al Farawn, A., Al-Sadawi, B., & Alsharqi, H. (2018). Attendance and information system using RFID and web-based application for academic sector. *International Journal of Advanced Computer Science and Applications*, 9(1).
- Shete, A., Nangare, P., & Thakre, R. (2018). IoT based portable attendance device using biometric system. *International Research Journal of Engineering and Technology*, 4(5), 2395-2416.
- Thein, M. M. M., & Cmnhm, T. (2015). Students' attendance management system based on RFID and fingerprint reader. *International Journal of Scientific & Technology Research*, 30-38.
- Zhang, D. (2000). *Automated biometrics: technnnologies and systems*. Springer Science & Business Media.