INNOVATIVE APPROACHES IN DIGITAL ATTENDANCE SYSTEMS: EVALUATING THE EFFECTIVENESS OF QR CODE, FACE RECOGNITION, AND GPS METHODS

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Abstract: Digital attendance is a soft device or application computer designed to monitor and record somebody's presence systematically. Application This replaces the traditional manual way of recording and tracking the presence of employees, students, and others using digital technology. Applications for digital attendance usually implement various feature technologies such as QR Code, fingerprint finger, introduction face, RFID (*Radio Frequency Identification*), or GPS (*Global Positioning System*) to entertain accuracy and security recording presence. The study aims to obtain information about the practical method development application of existing digital attendance. Research This uses the method of systematic literature review (SLR). Stage identifies the study, evaluates, and interprets all the existing research results. This study finds three effective ways to develop application digital attendance: QR code, fingerprint finger, and RFID. In addition, there are fewer effective ways to build an application with digital time and presence, such as introducing face and GPS. Methods This vulnerable error needs investigation to get a percentage of high database results. Lack of availability time is influenced by factors deep data research determines results database system is inhibiting development application logger time and digital presence. Therefore, a step further in application absence is to apply a method proven to be effective so that the stage development application study is fluent.

Keywords: Digital Attendance, Systematic Literature Review (SLR), QR Code, Fingerprint Recognition

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INTRODUCTION

Development technology is experiencing very rapid progress in this era (Huda et al, 2020). There are several digital platforms, applications, and systems information. For access and simplify clarification, a job can be beneficial for users. Moderate technology is developing at the moment. This is used by business people, agencies, institutions, educators, and social media users. From the start, online transactions, communication, facilities reading, audio media, data storage, counter income, and so on (Nuerita Maharani dkk., 2021). With more progress in technology information development, everyone can create various types of equipment as tools to help carry out supporting activities on a job. However, technology is still rarely used to help work and fulfill needs. Still, the number of jobs that should be already done utilizes technology, but conventional things are still used to do work and collect the required data (Khoiriyah dkk., 2023).

The smartphone is the result of development technology, with features that are sophisticated and easy to operate and access information for all users. Acquiring previous information takes a long time; now, it can be done quickly. The phone features intelligent

features like a selfie camera, fingerprint finger, and GPS. Global Postingan System "GPS" is a tool or system that allows users to know the world's existence. Now, modern absence allows us to carry out the process using smartphone media such as GPS to know the location of anywhere (Apriadi & Sutrisna, 2023).

The use of technology in education has become a fundamental need to improve the quality of the learning process. Technology information often comes from many institutions that maximize work, specifically in education (Wahyudin & Rahayu, 2020). Information technology has become essential for students and teachers in activity study , and setting the main task as an academic activity assists in facilitating the absence process and damages data absence , which does not add to it.

The attendance system plays an important role in daily life, especially in schools, universities, offices, and other places that use attendance as a sign of presence. (Ayu & Mustofa, 2019). In line with the development of technology, the attendance system in education is generally still manual, including school attendance. This is inefficient because attendance information can be fraudulent by students or teachers who are wrong in marking student attendance. Therefore, it is necessary to implement a technology that can help the attendance process in schools and improve the system's quality of student attendance services.

Attendance data moments are noted manually by filling in the list of names provided by the community academics. Students who do not present can sign several Names when attending learning. Students who do not present can ask for one student who attends learning to help him guard his presence (Mulia, et al. 2020). According to Gustini et al. (2023), manual attendance can cause fraud to be committed by students. In addition, monitoring the presence of students manually requires caution. Besides that, monitoring the presence of students manually loads power administration to enter data into the computer (Dimyati Ayatullah dkk., 2019).

This review of the systematic literature (SLR) is to determine the effectiveness of digital attendance in education. The study aims to analyze to what extent the application of digital attendance contributes to activity in environmental education and to determine which method is the most effective for allocating digital attendance. Effectiveness This is usually measured based on the performance of students and staff and the level of attendance determined by each institution. On the other hand, researchers have previously proved that presence relates to discipline activity in study teaching.

METHOD

This research uses the System Literature Review (SLR) method; the author uses this method because it can answer the objectives of the research. With stages of identification, review, evaluation, and interpretation of all available research. The literature review is a concept that classifies facts from research that has been done previously. In this method, the researcher conducts a review and identifies journals in a structured way, following the steps taken (Choiri et al., 2021). The literature Review aims to obtain runway theory to support a breakdown problem. A study was done by comprehensively interpreting relevant literature with a topic. The data collection and analysis process was carried out with a structured approach, reflecting the method used to analyze the data.(Bagus Arisena et. al, 2023) . The following several stages of study use method literature review;
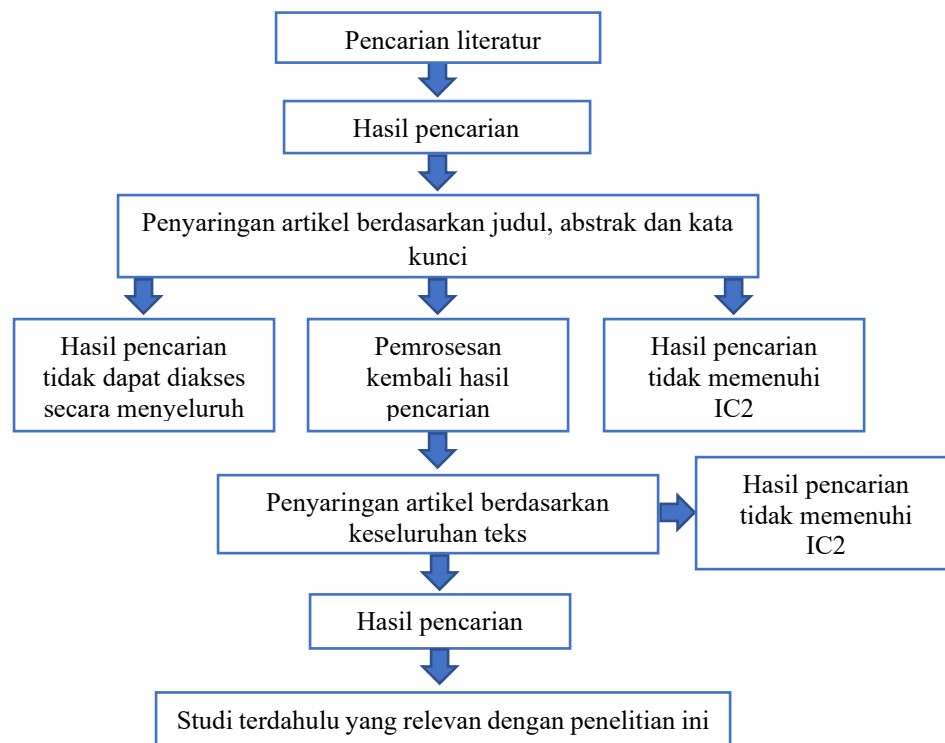
Figure 1. Stages of the SLR Method

Stages search literature covered determination criteria eligibility documents, which are determined by criteria inclusion (IC). There are two criteria for article eligibility for the study:

IC1: Articles are results of research and search in Language Indonesia.

IC2: The article aims to study the effectiveness of using digital attendance in various types of methods and its development.

1. Selection steps literature, which is done that is:
2. Determine the keywords to be chosen.
3. Choose articles, select titles, abstracts, and keywords on articles obtained at the stage of determining eligibility criteria.
4. Read the article. Then, determine whether the article is worthy of being included in the study.
5. Other relevant studies will be conducted by reviewing the reference list of selected articles.
6. The keywords used to determine selected articles included attendance, application digital attendance, digital attendance, and effectiveness.

At the data collection stage, articles with a study are completed. Then, the data is analyzed and summarized. This article discusses the study's results comprehensively.

RESULTS

The author's results of *the Literature Review* on the articles that have been reviewed. Based on the results of the articles collected related to the Effectiveness of user Application Digital Attendance. The articles reviewed by the author are in the table below:

Table 1. Research Results on Effectiveness of Digital Applications

No	Researcher	Title	Research result
1.	(Nuerita Maharani et al ., 2021)	Utilization of Fingerprint Sensor For Absence students of SMKN 1 Pulo Ampel	Research result show that implementation system absence using fingerprint sensor fingers at SMKN 1 Puloampel is very efficient . The system This capable generate attendance data student with level high accuracy, where the level success verification fingerprint finger reaches 100% for part big respondents. There are only a number of respondents who indicated level failure around 12.5%. With Thus, the system This No only increase efficiency in recording absence, but also reduces possibility fraud in presence student.
2.	(Syansudin & Raswa., 2022)	Real-Tome School Gate Monitoring Via OSIS E-CARD	Research result show that gate monitoring system school using OSIS E-Card and UHF RFID technology effectively in increase security and surveillance students. System This allow real-time monitoring of presence students and visitors, as well as reduce risk security in the environment school. Testing show that RFID Reader can detect tags in distance of 1 to 6 meters, and the system can manage access data with Good without happen queue on server. History data presence students can also save and accessed for report to parents or guardian students, so that increase transparency and accountability in management presence.
4.	Nuerita Maharani., (2021)	System Information Absence Use Android Based Barcode Scanner Technology	Research shows that the online attendance application at Danez Health Care developed using the Scrum and Laravel methods has succeeded in increasing employee discipline and efficiency in managing attendance and payroll

No	Researcher	Title	Research result
			data, with a user satisfaction rate of 86%.
5.	Khoiriyah., (2023)	QR Code Recognition With Selfie And Location On Attendance Employee Android Based	Research result This is development QR Code application that makes it easy employee in the process of attendance. Application This designed for recognize identity and location employee moment do absence using an Android -based smartphone. The method used is Waterfall, with black-box testing for ensure interface easy user used. With application this, employee can do absence with more effective and efficient, while the admin can with easy make report accurate and precise attendance.
6.	Mulyana, et.al. (2022)	Application of Face Recognition With Haar Cascade Algorithm For System Attendance at the Jakarta Child Development Center Foundation	Research result show that implementation system absence use detection face with Haar Cascade algorithm can increase efficiency and accuracy in recording presence. System This succeed reach level accuracy between 80%-89% in detect face. Research this also highlights a number of factors affecting detection face, such as corner slope face, distance between the webcam and the object, as well intensity light. In addition, the system This expected can reduce use paper and tackle problem frequent loss of attendance data occurs in manual methods.
7.	(Tamba, 2022)	Design Application Absence Employee With Face Detection Using Engenface Method	Research result show that system absence webcam based which uses eigenface method can in a way effective do identification face employee For needs absence. System This No only increase accuracy in recording absence, but also prevent manipulation absence by employees, so that increase efficiency management source Power humans in the company. With Thus, the application This can become valid and practical

No	Researcher	Title	Research result
			solutions For management absence employee.
8.	Dimyati Ayatullah et. al. (2019)	Design Get up Absence Based on student Fingerprint Based Using Communication Wireless	Research result This show that system absence student fingerprint based connected with wireless network can increase efficiency supervision presence in real-time. The prototype developed using Raspberry Pi as a mini computer, fingerprint sensor, and Wi-Fi connection to communicate with database server. Attendance process done with match fingerprint finger users, who then generate template ID for search data in database. Average time required for enrollment and attendance process is about 4 seconds. System this also addresses problem cheating and trouble in frequent supervision occurs in the system manual attendance.
9.	Aisyah et.al, (2022)	Design Application Real Time Lecturer Presence Using Global Positioning System (GPS) and Electronic Location Based Service (LSB) Methods Sriwijaya State Polytechnic	The research results of this article show that the lecturer attendance application designed using the web-based Global Positioning System (GPS) and Location Based Service (LBS) methods can improve employee discipline and provide convenience in managing attendance data, as well as make it easier for admins and leaders to monitor employee attendance.
10.	Apriadi & Sutrisna, (2023)	Mobile-Based Employee Absence Application Design Using GPS	Research result show that design application absence web based using Global Positioning System (GPS) and Location Based Service (LBS) methods in the Electronic Engineering Department Sriwijaya State Polytechnic is very profitable. Application This allow absence done in real-time, improving attendance data accuracy employees, and makes it easier for admins as well leader in monitor presence. With system this, problem discipline employee can

No	Researcher	Title	Research result
			minimize, and the process of managing absence data become more efficient and effective
11.	Wardana et. al, 2023)	Design REID prototype design on presence student using KTM in study program system UINSU information	Based on research results show that system absence students in the Systems Study Program Current UINSU information This Still use manual method, which involves filling presence with sign hand. Study recommends implementation RFID technology for increase efficiency and accuracy system attendance. With RFID, students only need do scan card for take notes presence, which will speed up the process and reduce error. The research method used is qualitative, with data collection through interviews and observations for understand condition existing systems and needs user. This result expected can become base for development system more absences good in the future.
12.	(Ayu & Mustofa, 2019)	System Application Use Android Based Barcode Scanner Technology	This article discusses the development of an Android-based attendance management system using barcode technology for higher education institutions. This system aims to overcome problems with manual attendance recording, providing a more efficient and practical solution for recording and managing student attendance. By implementing this technology, the attendance tracking process becomes faster, more accurate, and less prone to errors, benefiting both students and administrative staff.
13.	Karaman et. al, (2024)	Design Get up System Absence Website Based At Muhammadiyah 3 Dolopo Vocational School	Based on the results of this article discusses the development and implementation of a web-based attendance system for SMK Muhammadiyah 3 Dolopo, which aims to replace the manual attendance system that is time-consuming and prone to errors.

No	Researcher	Title	Research result
			Using the Rapid Application Development (RAD) methodology, this system is designed to improve the quality of learning and services to students through fast and accurate attendance tracking. This system includes user interfaces for various roles (admin, teacher, and student) as well as important features such as class schedule management and attendance records. The implementation of this technology is expected to improve attendance management and overall educational effectiveness.
14.	Dea Amallia, (2024)	Design System Absence Web Based At Wira Kesuma Jata Vocational School	Based on the results of this article discusses the development of a web-based attendance system at SMKS Wira Kesuma Jaya using the waterfall model. The results show that the system designed with PHP and MySQL improves data management efficiency and meets user needs for easy access and good functionality, although there are challenges in design flexibility.
15.	The Greatest Showman (2023)	Implementation of Augmented Reality Technology for User Experience in Educational Applications	This study shows that Augmented Reality (AR) technology has great potential in education by increasing students' understanding, information retention, engagement, and interactivity through interactive visualization and gamification elements. Despite challenges such as high cost, device availability, and user readiness, the benefits of AR in creating immersive learning experiences are significant. This study also recommends resource allocation and training for teachers and students to maximize the implementation of AR in the educational curriculum.

DISCUSSION

Based on the results of the 15 articles reviewed in Table 1, the review literature systematic show that the use of fingerprint sensor finger on the system time and

attendance, as well as the implementation of system card electronic using RFID, was found to be very effective in increasing security and accuracy time become effective (Wardana et al., 2023). System presence in the environment education. Using fingerprint sensors is very effective because technology allows accurate and fast identification and can be integrated into the system overall. Human fingerprints are so unique that no one has fingerprints that are identical to another person, even between twins; in addition, the application of system cards with RFID is also a practical technology. This allows school monitoring in real-time and helps increase security by identifying students and visitors entering and leaving the school.

However, a system is present that uses fewer methods for detecting the faces (Wardana et Al., 2023). This is because the results of our analysis show that the technique of making absence using a face works well on a webcam (Apriadi et al., 2023). Although the GPS method can determine the user's location, it has limitations (Apriadi & Sutrisna, 2023). To determine location, what we can be sure of is that it is undoubtedly vulnerable to fake GPS. Although the method Has potential, development is Still required To increase the effectiveness of implementing the f.

Implementing a digital checking presence has already become urgent in the rapidly developing technology. Along with development technology, manual time and attendance systems must be updated to fulfill the needs of the times (Sutrisna, 2023). In addition, using QR codes for mobile attendance has also proven effective in increasing the efficiency and effectiveness of the attendance process. Besides that, using QR codes for mobile attendance has also proven effective in increasing the efficiency and effectiveness of the attendance process (Khoiriyah., 2023).

CONCLUSION

In conclusion, the effectiveness of the application Painter's digital time and presence depends on method development and practical application moment. This is because the development and maintenance process does not need much time. However, some methods need excellent data results. Moreover, they are slow to process and require long use. This is shown by conducting a review and identifying journals in a structured format, as many as 15 journals later being taken to a conclusion. Many methods, such as QR codes, fingerprint fingers (fingerprints), and RFID, are still used effectively. Because its risk relative errors and maintenance are low, it is very effective for developing application logger time and digital presence because of the vulnerable error compared to the introduction of face and GPS. In addition, research is also needed to get a percentage of high database results. Lack of availability time is influenced by factors such as deep data research determining results. The database system is inhibiting development application logger time and digital presence. This ensures that application presence uses technique development is proven and effective to ensure the smoothness phase of the development application.

REFERENCES

Aisyah, A., Permata Sari, D., & Kusumanto, K. (2022). Design of Real Time Lecturer Attendance Application with Global Positioning System (GPS) Method and WEB Based Location Based Service (LSB) in Electronic Engineering Department, Sriwijaya State Polytechnic. *Journal of Locus Research and Community Service*, *1* (5), 341–347. https://doi.org/10.36418/locus.v1i5.73

Apriadi, P., & Sutrisna, E. (2023). Mobile-Based Employee Absence Application Design Using GPS (Case Study of PT. Trans Retail Indonesia). In *JACIS: Journal Automation Computer Information System* (Vol. 3, Number 1).

Aribowo, D., & Hardani Putra, T. (2022). *Utilization of Fingerprint Sensors for Student Attendance At Smkn 1 Puloampel . 9* (2).

Ayu, F., & Mustofa, A. (2019). Attendance Application System Using Android-Based Barcode Scanner Technology. *IT Journal Research and Development*, *4* (2). https://doi.org/10.25299/itjrd.2020.vol4(2).3642

Balqis Nuerita Maharani, R., Irwan Padli Nasution, M., & Islam Negeri Sumatera Utara, U. (2021). Employee Payroll Information System with QR Code Attendance. *Journal of Informatics and Educational Technology* , *1* (1), 23–35. https://doi.org/10.25008/jitp

Dea Amallia. (2024). Design of Web-Based Attendance System at SMKS Wira Kesuma Jata School. *Saturnus: Journal of Technology and Information Systems* , *2* (4), 354–370. https://doi.org/10.61132/saturnus.v2i4.411

Dimyati Ayatullah, M., Ariyanto Sandi, E., & Hendra Wibowo, G. (2019). Design and Construction of Fingerprint-Based Student Attendance Using Wireless Communication. *Informatics Journal: IT Development Journal* , *4* (2), 152–158. https://doi.org/10.30591/jpit.v4i2.1123

Duisenova, M. (2024). The Impact of Gamified Educational Applications on Secondary School Students' Achievement in Learning English as a Foreign Language. *H. Dosmuuhamedov atyndagy Atyrau memlekettik universitetiniņ habarsysy* , 97–107. https://doi.org/10.47649/vau.24.v74.i3.09

Gunawan, T. (2023). Application of Augmented Reality Technology for User Experience in Educational Applications. *Journal of Education and Teaching Review* , *6* (4). https://doi.org/https://doi.org/10.31004/jrpp.v7i2.28013

Hamid, R., & Barzenji, Z. (2024). Evaluating the Effectiveness of Gamification in Online Education: Strategies for Promoting Active Learning and Student Retention. *International Journal of Post Axial: Futuristic Teaching and Learning*, *2* . https://doi.org/https://doi.org/10.59944/postaxial.v2i2.302

James, W., Oates, G., & Schonfeldt, N. (2024). Improving retention while enhancing student engagement and learning outcomes using gamified mobile technology. *Accounting Education*, 1–21. https://doi.org/10.1080/09639284.2024.2326009

Karaman, J., Miya Gunawan, P., Firdhossiah, S., Mustikasari Mahardhika Fitriani, L., & Indriati, R. (2024). Design and Construction of a Website-Based Attendance System at Muhammadiyah 3 Dolopo Vocational School. In the *Journal of Computer Science and Information Technology E-ISSN* (Vol. 4, Number 1).

Khoiriyah, AN, Hasibuan, SA, & Syahfitri, W. (2023). *Application of QR Code with Self Photo and Location on Android-Based Employee Attendance.*

Lutfi, A., Aftinia, F., & Permani, BE (2023). Gamification: Games as A Medium for Learning Chemistry to Motivate and Increase Retention Of Students' Learning Outcomes. *Journal of Technology and Science Education*, *13* (1), 193–207. https://doi.org/10.3926/jotse.1842

Marisa, F., Maukar, AL, Aris Widodo, A., Iqbal Muzakki, M., & Dio Raka Wisnu, A. (2022). Analysis of the Effect of Learning Motivation on Gamification Model Learning During the Covid-19 Pandemic. *JIPI (Scientific Journal of Informatics Research and Learning)*, *7* (2).

Using, R., Uhf, D., Esp32, R., & Syamsudin, MS (2022). Real-Time School Gate Monitoring Through Osis E-Card. *8th National Seminar on Applied Innovative Research (SENTRINOV) ISAS Publishing Series: Engineering and Science*, *8* (1).

Mulyana, DI, Yanti, Y., Saputry, A., Ramadan, A., Saragih, S., Tinggi, S., Komputer, I., & Karya Informatika, C. (tt). *Application of Face Recognition with Haar Cascade Algorithm for Attendance System at Jakarta Child Development Center Foundation*.

Nathaniel, V. (2023). Application of Gamification in the Mathematics Learning Process for Elementary School Children to Increase Student Learning Motivation. *ICTEE Journal* , *3* (2), 46–50. https://doi.org/https://doi.org/10.33365/jictee.v3i2.2300

Proceedings of SEMNAS INOTEK (National Seminar on Technology Innovation) 277 Development of Student Attendance Information System with Barcode Model. (tt).

Smirani, L., & Yamani, H. (2024). Analyzing the Impact of Gamification Techniques on Enhancing Learner Engagement, Motivation, and Knowledge Retention: A Structural Equation Modeling Approach. *Electronic Journal of e-Learning*, *22* (9), 111–124. https://doi.org/10.34190/ejel.22.9.3563

Srimulyani. (2023). Using Gamification Techniques to Enhance Student Learning and Engagement in the Classroom. *EDUCARE: Journal of Education and Health*, *1*, 29–5.

Tamba, S. (2022). Employee Attendance Application Design With Face Detection Using Eigenface Method. In *Journal of Informatics, Electrical and Electronics Engineering* (Vol. 2, Number 1). https://djournals.com/jieee

Wahyudin, Y., & Rahayu, DN (2020). Analysis of Website-Based Information System Development Methods: A Literature Review. *Interkom Journal: Journal of Scientific Publication in the Field of Information and Communication Technology*, *15* (3), 26–40. https://doi.org/10.35969/interkom.v15i3.74

Wardana, A., Azzahra Batubara, A., Wanandi, B. S., Muzaddidah, C., Andrea, K., & Hafizh, M. A. (2023). *207 Rancangan Desain Prototype RFID Pada Presensi Mahasiswa Menggunakan KTM Di Prodi Sistem Informasi UINSU* (Vol. 1, Nomor 3). Online.