iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 14 **Issue:** IV **Month of publication:** April 2026

DOI: https://doi.org/10.22214/ijraset.2026.79636

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 14 Issue IV Apr 2026- Available at www.ijraset.com

A Study on Student Attendance Management System

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Abstract: ***Smartphones are becoming more preferred companions for users than desktops or notebooks. Knowing that smartphones are most popular with users at the age around 26, using smartphones to speed up the process of taking attendance by university instructors would save lecturing time and hence enhance the educational process. This paper proposes a system that is based on a QRcode, which is displayed to students during or at the beginning of eachlecture. The students will need to scan the code in order to confirm their attendance. The paper explains the implementation details of the proposed system. It also discusses how the system verifies student identityto eliminate false registrations.***
Keywords: QR Code, Attendance System, Automation, Educational Technology, Real-Time Monitoring.

I. INTRODUCTION

Attendance tracking plays a vital role in evaluating student engagement and academic success. Traditional methods such as roll calls and sign-in sheets are time-consuming and error-prone. With advancements in mobile technology, automated systems have become increasingly popular. QR (Quick Response) codes provide a fast and reliable way to encode and retrieve information. Many recent studies highlight the effectiveness of QR-based attendance systems in improving efficiency and reducing administrative effort.
Takingstudents'attendancebyuniversityinstructorsduring each classisatimeconsumingprocessespeciallywhen classes are big. Somefacultypoliciesrequirethistasktobeperformed bytheinstructor ineachlecture.Inotherwords,outofthetotal hours that are assigned to a given course, which is typically forty-five hours per semester, up to eight hours may be lost to perform this process that usually takes around ten minutes per lecture.The code along with the student's identity taken by the application will confirm the students'attendance.This way, the system will save not only time but also effortsthat were supposed to be put by instructorsduring each lecture. It will speed up the process of taking attendance and leave more time for the lecture to be given properly.The proposed system also takes care of preventing unauthorized attendance registration using multi-factor authentication. That is, it considers "Something you know", "Something you have", and "Something you are" to confirm the student identity.
In what follows, we will discuss some related work in section 2. In section 3, we will give an overview of QR codes. Insection4,wewillexplainhowthesystemworks,andfinally in section 5, we will conclude the paper. Overall, the QR code-based student attendance management system offers a smart, fast, and paperless alternative to traditional methods, making it highly suitable for modern educational environments.

A. QR Code: Quick Response Code

A student attendance management system based on QR code works by allowing the teacher to generate a unique QR code for each class session, which contains encoded information such as the class ID, date, and time. This QR code will then be displayed to students in the classroom. Each student logs into the attendance system using a mobile app or web application and scans the QR code using their device's camera. Once scanned, the system decodes the QR data and verifies the student's identity, ensuring they are registered for that class. It then records the attendance along with the timestamp in a database. To prevent misuse, the QR code can be time-limited or dynamically refreshed so that students outside the classroom cannot mark attendance later. The system automatically updates attendance records and allows teachers to view reports, track student participation, and export data when needed, making the process faster, more accurate, and paperless.

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Fig.1.QuickResponseCode

B. The proposed system

The proposed system is a QR code-based student attendance management system designed to automate and simplify the traditional attendance process. In this system, the teacher or administrator generates a unique QR code for each class session, which contains essential information such as the subject, class ID, date, and time. This QR code will be displayed to students at the beginning of the lecture. Students use their smartphones to scan the QR code through a mobile or web-based application after logging into their accounts. Once scanned, the system decodes the QR code and verifies the student's identity and enrollment details. If the student is authorized, their attendance is automatically marked along with the exact timestamp and stored in a centralized database.

To ensure security and prevent proxy attendance, the QR code is dynamic and valid only for a limited period. Additional measures such as location verification or device authentication can also be implemented. The system provides a user-friendly dashboard for teachers to monitor attendance records, generate reports, and analyze student participation. Overall, the proposed system reduces manual effort, minimizes errors, prevents fraudulent attendance, and improves efficiency by offering a fast, reliable, and paperless solution for attendance management. The system stores all attendance records in a centralized database, which can be easily accessed by teachers and administrators. It provides features such as viewing daily attendance, calculating attendance percentages, generating reports, and exporting data in formats like Excel or PDF.

To enhance security and prevent fraudulent practices such as proxy attendance, the QR code is dynamic and valid only for a short duration. The system may also include additional verification methods such as GPS location tracking, device authentication, or one-time scan restrictions to ensure authenticity.

C. Server Module

The Server Module is the core component of the QR code-based student attendance management system, responsible for handling all backend operations, data processing, and communication between users and the database. It ensures that the system functions smoothly, securely, and efficiently. The server receives requests from both the teacher (admin) and students through the application. When a teacher generates a QR code, the server creates and stores the encoded data, including class details, subject, date, and time. This data is then used to generate a unique and time-sensitive QR code for each session. When a student scans the QR code, the scanned data is sent to the server. The server verifies the information by checking the student's identity, login credentials, and enrollment status in the database. If all details are valid, the server records the attendance along with the timestamp.

It also ensures that duplicate attendance entries are prevented by allowing only one successful scan per student per session. The server module also manages the database, where all student records, attendance logs, and class details are stored. It performs operations such as data insertion, updating, retrieval, and deletion. Additionally, the server generates reports, calculates attendance percentages, and provides this information to the teacher through a dashboard interface. Security is an important function of the server module. It implements authentication and authorization mechanisms to ensure that only authorized users can access thesystem. It also handles features like QR code expiration, data encryption, and optional location verification to prevent misuse and ensure data integrity. Overall, the server module acts as the backbone of the system, coordinating all activities, maintaining data accuracy, and ensuring secure and efficient attendance management.

II. LITERATURE SURVEY

[1] This paper presents the design of a smart student attendance system using QR codes to automate the attendance process. The system generates a unique QR code for each lecture session, which is scanned by students using a mobile application. The scanned data is transmitted to a server for validation and storage. The proposed system reduces manual errors and improves efficiency in attendance management. It also provides real-time monitoring for instructors.

[2] This research introduces an efficient attendance system that combines QR codes with device identifiers for enhanced security. Students scan a QR code and their device ID is simultaneously verified to ensure authenticity. The system prevents proxy attendance by restricting access to registered devices only Attendance data is securely stored in a centralized database. The approach improves trust and accuracy in attendance recording. The study emphasizes security as key component of digital attendance systems.

[3] This paper focuses on a QR code-based attendance system designed for ease of use and quick implementation. In this system, instructors generate QR codes for each class session. Students scan the code using their smartphones to mark attendance. The data is processed and stored automatically without manual intervention. The system reduces time consumption compared to traditional methods. The study demonstrates improved efficiency in classroom management.

[4] The eSAM attendance system uses QR codes to streamline attendance tracking in educational environments. It allows students to scan QR codes through a dedicated application. The system records attendance in real time and updates it in a centralized database. It also provides reporting features for instructors to analyze attendance patterns. The solution minimizes paperwork and human errors. The study shows how digital systems enhance academic administration.

[5] This research develops a student attendance application using QR codes with a focus on educational and practical considerations. The system is designed to be user-friendly for both students and teachers. QR codes are generated and scanned to record attendance efficiently. The application also considers usability and accessibility factors. It supports real-time data updates and reporting features. The study highlights the importance of practical implementation in academic settings.

[6] This paper proposes an online attendance monitoring system using QR codes for automated tracking. Students scan QR codes to register their attendance during lectures. The system verifies and stores the data in an online database. It enables instructors to monitor attendance remotely. The approach reduces manual workload and increases transparency. The study emphasizes the benefits of integrating QR technology into education.

[7] This study explores the use of QR codes for virtual learner evaluation and attendance monitoring. It is particularly useful in online or hybrid learning environments. Students scan QR codes to confirm their participation in sessions. The system records and analyzes attendance data for evaluation purposes. It supports digital learning platforms and remote education. The research highlights adaptability in modern education systems.

[8] The QR Class system applies QR code technology for concurrent self-identification in attendance recording. Students independently scan QR codes to mark their presence. The system allows multiple users to access and record attendance simultaneously. It ensures fast and efficient processing in large classrooms. Attendance data is stored and managed digitally. The study demonstrates improved scalability and performance.

[9] This paper presents a smartphone-based QR code attendance recording system. Students use their mobile devices to scan QR codes generated by instructors. The system automatically records attendance and stores it in a database. It eliminates the need for manual registers. The approach is simple, cost-effective, and easy to implement. The study shows increased convenience and efficiency in attendance management.

[10] This research focuses on the design and utilization of QR codes in student attendance applications. The system generates QR codes for each session and allows students to scan them for attendance. Data is processed and stored in a centralized system. It provides real-time access to attendance records for instructors. The solution improves accuracy and reduces time consumption. The study demonstrates the effectiveness of QR-based digital attendance systems.

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III. METHODOLOGY

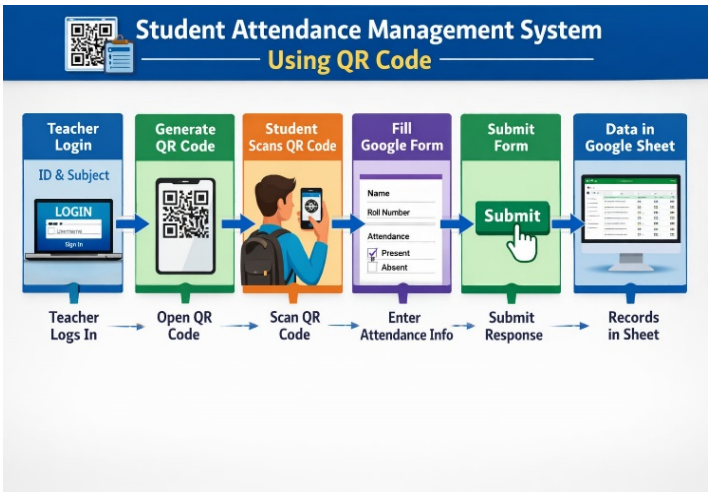


Fig 2. System Architecture

The process of the QR code-based student attendance management system begins when the teacher logs into the system using their ID and subject details. After logging in, the teacher generates a unique QR code for that particular class session and displays it to the students. Students then use their smartphones to scan the QR code, which directs them to an online form, such as Google Form. In this form, students enter their details like name, roll number, and attendance status. After filling in the required information, they submit the form. Once submitted, the data is automatically recorded and stored in a connected database, such as a Google Sheet. This allows the teacher to easily access, manage, and review attendance records in real time, making the entire process quick, accurate, and paperless.

IV. ADVANTAGES

1) The QR code-based student attendance management system has a wide range of applications across different fields where attendance tracking is important. It provides a fast, accurate, and automated solution, making it useful in various environments.

2) In educational institutions such as schools, colleges, and universities, the system is primarily used to record student attendance efficiently. Teachers can quickly generate QR codes for each class, and students can mark their attendance within seconds, reducing time and manual effort.

3) In coaching centers and training institutes, the system helps manage attendance for multiple batches and sessions. It ensures proper tracking of student participation and simplifies record maintenance.

4) The system can also be applied in corporate offices and organizationsto track employee attendance during meetings, training programs, or daily work sessions. Employees can scan QR codes to mark their presence, making the process smooth and transparent.

5) In seminars, workshops, and events, QR code-based attendance systems are highly useful for managing large numbers of participants. Organizers can easily monitor attendance and generate reports for analysis.

6) Additionally, the system can be used in online or hybrid learning environments, where QR codes are shared digitally, allowing remote students to mark attendance securely.

V. FUTURE SCOPE

The QR code-based student attendance management system can be further enhanced by integrating advanced technologies to improve its efficiency, security, and usability. One of the major future improvements is the incorporation of biometric authentication such as facial recognition or fingerprint scanning to ensure a higher level of identity verification and eliminate proxy attendance completely.The system can also be integrated with GPS-based location tracking to confirm that students are physically present in the classroom while marking attendance. Additionally, the use of Artificial Intelligence (AI) can help in analyzing attendance patterns, predicting student performance, and identifying irregularities or absenteeism trends.

Another potential enhancement is the development of a dedicated mobile applicationwith real-time notifications, allowing students and teachers to receive instant updates about attendance status, class schedules, and reports.

Integration with Learning Management Systems (LMS)can further streamline academic processes by linking attendance with assignments, grades, and course materials.Cloud-based storage and data analytics dashboards can be implemented to provide more detailed insights, visual reports, and long-term data management. The system can also be expanded to support multi-institution scalability, making it suitable for universities with multiple campuses.Furthermore, incorporating blockchain technology can improve data security and transparency by ensuring that attendance records are tamper-proof. The system may also support offline functionality, allowing attendance to be recorded without internet access and synced later.

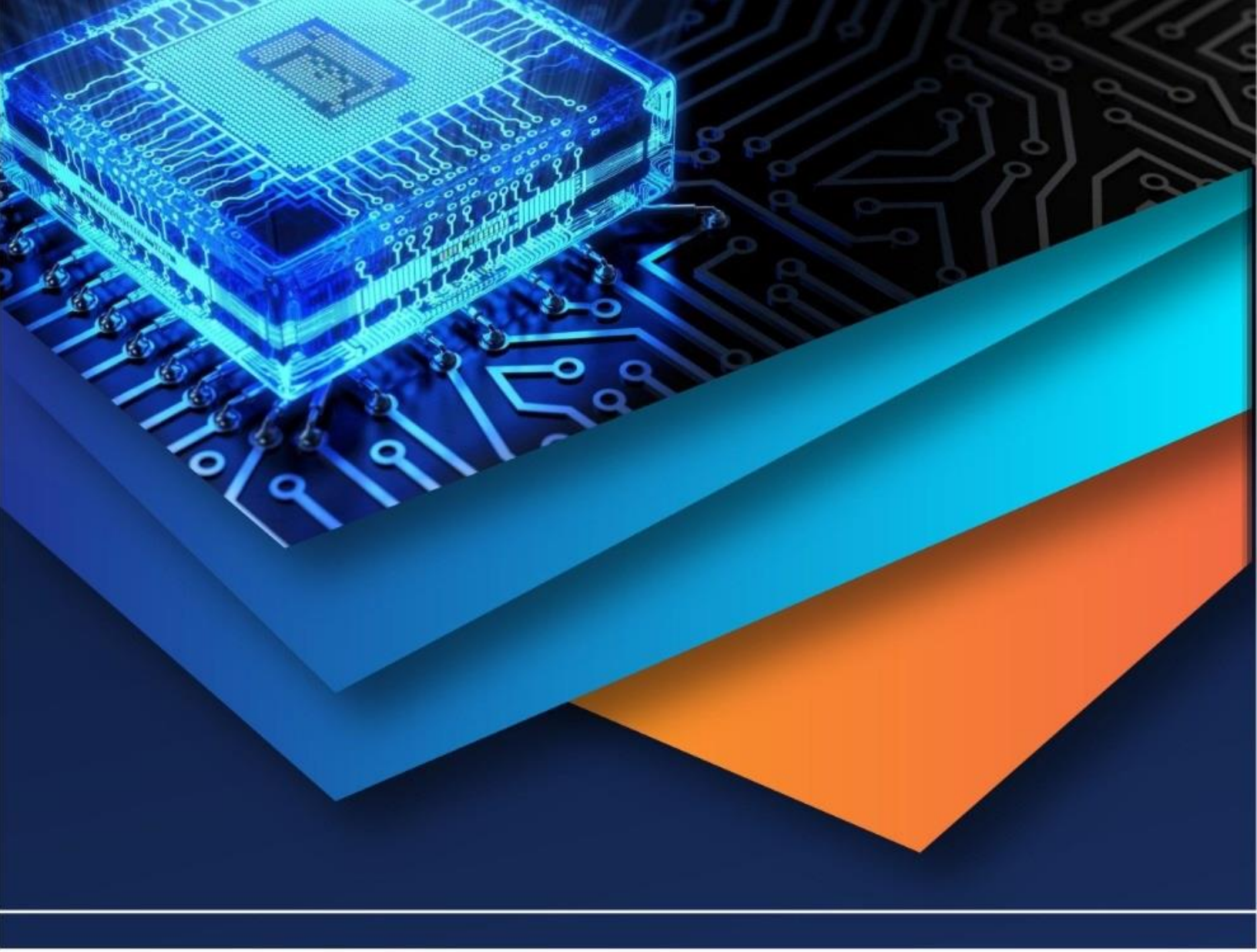
VI. CONCLUSIONS

The QR code-based student attendance management system provides a modern, efficient, and secure solution for tracking attendance in educational institutions and other organizations. By automating the attendance process, it eliminates the challenges of manual record-keeping, such as time consumption, human error, and proxy attendance. The system allows teachers and administrators to generate unique, time-sensitive QR codes for each session, which students scan to mark their presence. Attendance records are stored digitally in a centralized database, making it easy to manage, analyze, and generate reports. This system not only saves time but also improves accuracy, transparency, and accountability. Its applications extend beyond classrooms to corporate offices, training centers, seminars, and online learning environments, making it a versatile tool. With added features like QR code expiration, authentication, and optional location verification, the system ensures security and prevents misuse. Overall, the QR code-based attendance system represents a reliable, cost-effective, and paperless approach that enhances efficiency and modernizes attendance management.

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