



STAP: A SMART TAP MONITORING SYSTEM FOR YELLOW WOODS EDUCATIONAL CENTER

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Abstract

This study developed and evaluated the *STAP: Smart Tap ID Monitoring System*, an automated attendance monitoring solution designed for Yellow Woods Educational Center, Inc. The system integrates mobile NFC-based tap-in technology with a real-time synchronized web dashboard to streamline attendance tracking, reduce manual workload, and enhance data accuracy. Using a developmental research design, the study followed a structured methodology that

Findings revealed that the system's core features NFC tap-in, automatic date and time logging, and real-time syncing were successfully implemented and operated efficiently. The web-based dashboard effectively centralized attendance data, supported RFID card registration, and enabled easy monitoring of student profiles and attendance history. Security protocols, including password-protected accounts and access logs, ensured

The study concluded that the STAP: Smart Tap ID Monitoring System is a reliable, efficient, and secure attendance monitoring solution suitable for institutional implementation. Its successful integration of NFC technology, real-time data synchronization, and user-friendly design

included requirements analysis, system design, implementation, and evaluation based on ISO 25010 software quality standards. The project's scope covered the creation of a mobile application for NFC tap-in, a web platform for administrative monitoring, and secure database management features. System functionalities were tested with end users, including teachers, administrators, and IT personnel, to assess performance, usability, and reliability.

that only authorized users could access sensitive data. The system demonstrated high usability with intuitive interfaces and adequate training support, contributing to smooth user adoption. Evaluation using ISO 25010 quality standards showed strong performance across all domains: functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability.

positions it as a significant improvement over traditional manual attendance method. The system's adherence to ISO 25010 standards further validates its robustness and readiness for broader deployment across different grade levels and school environments.

Based on these conclusions, the study recommends continuing feature enhancements to support scalability and broader usage. Dashboard analytics and reporting tools should be further developed to strengthen administrative decision-making. Regular reviews of access control and syncing protocols are advised to maintain data security. Security updates and testing should be sustained to address emerging threats. Additional user training

Keywords: Android Application, Cloud Computing, Data Management System, Internet of Things (IoT), Mobile Application, Monitoring System, Real-

Introduction

Effective attendance monitoring had increasingly become a national concern in ensuring student safety, strengthening administrative processes, and supporting data-driven school management. Across educational systems worldwide, digital transformation had reshaped traditional school operations, with attendance tracking emerging as a critical area for automation. Technological innovations such as Radio Frequency Identification (RFID), the Internet of Things (IoT), and mobile-enabled platforms had been widely explored to improve the accuracy, efficiency, and

Within the Philippine educational setting, many institutions had begun adopting these technologies to align with national goals for digitalization and school safety. However, despite increasing awareness, several private and public schools continued to rely on manual attendance practices that hindered operational efficiency. Traditional

and interface improvements are encouraged to promote consistent adoption. Periodic ISO 25010 evaluations should be conducted after updates to maintain system quality. Furthermore, integrating automated notifications such as SMS or email alerts is recommended to improve communication with parents, and adding advanced analytics can support early identification of attendance patterns and student-related concerns.

time Data, Sensor Technology, Smart System, Tap Usage Monitoring, Web and Mobile Integration,

reliability of attendance systems. Mutammimul Ula et al. (2021) found that RFID-based monitoring significantly minimized manual errors and reduced the time needed for attendance documentation. Likewise, Safi'ie et al. (2019) emphasized that IoT-integrated RFID systems provided real-time processing and centralized monitoring—features that had become essential in modern educational administration. More recently, Farag (2023) demonstrated that RFID-powered school attendance systems improved data management and enhanced communication with parents.

attendance recording methods were prone to human error, consumed valuable instructional time, and limited administrators' ability to access consolidated data instantly - conditions that underscored the need for school-level innovations reflecting global technological advancements.

At the local level, Yellow Woods Educational Center, Inc., a private institution offering kindergarten to high school education, still implemented manual attendance recording. Teachers and staff documented attendance by hand, which resulted in delays, inconsistencies,

To address these challenges, the study proposed the development of STAP: A Smart Tap Monitoring System for Yellow Woods Educational Center, Inc., an integrated attendance monitoring solution designed to modernize the school's traditional processes. The system utilized RFID-enabled student identification cards that were scanned at designated entry and exit points, supported by a web-based platform that allowed centralized access to

Although the system was capable of supporting all grade levels, the initial implementation focused on high school students, as younger learners were typically accompanied by guardians and were therefore less suited for independent scanning during the pilot phase. A planned

By aligning research-backed technologies with the operational needs of Yellow Woods Educational Center, Inc., the STAP system aimed to modernize

and the absence of real-time monitoring. Because data had to be manually transferred or compiled, the school encountered difficulties in maintaining accurate records, generating immediate reports, and communicating promptly with parents or guardians.

attendance data. A mobile application incorporating Near Field Communication (NFC) technology supplemented this setup by enabling Android devices to function as RFID readers, ensuring seamless and contactless attendance logging. As Mohandes (2016) noted, NFC systems offered low power consumption, quick response times, and practical integration with smartphones, making them well suited for school-based applications.

enhancement also included a notification feature that would send alerts to parents when students left the campus—an initiative aligned with long-term goals of strengthening transparency and improving school-home communication.

attendance tracking and contribute to the broader academic and practical interest in smart, technology-driven school management solutions.

Specific Objectives

Specifically, the study aimed to achieve the following objectives:

1. Develop the main features of the STAP system, focusing on:
 - 1.1 Mobile Near Field Communication (NFC) tap-in for student attendance
 - 1.2 Real-time recording and syncing to a web system

1.3 Automatic time and date logging

2. Create a web-based dashboard that will:
 - 2.1 Show daily and overall attendance of high school students
 - 2.2 Create and register Radio Frequency Identification (RFID) cards for each student

3. Build a secure system that includes:
 - 3.1 Logins for teachers and school staff
 - 3.2 Student profiles and attendance history
 - 3.3 Live syncing of records between mobile and web
4. Protect the system with basic security features such as:
 - 4.1. Password-protected accounts
 - 4.2. Logs to track who accessed or modified information
5. Ensure the system is user-friendly by:
 - 5.1. Designing an intuitive and streamlined interface for both mobile and web platforms
 - 5.2. Providing clear user guides or brief training sessions to help users navigate the system effectively
6. Evaluate the system using ISO 25010 industry standards in terms of:
 - 6.1 Functional Suitability
 - 6.2 Performance Efficiency
 - 6.3 Compatibility
 - 6.4 Usability
 - 6.5 Reliability
 - 6.6 Security
 - 6.7 Maintainability
 - 6.8 Portability

Scope and Delimitations

The study focused on the development, implementation, and evaluation of *STAP: A Smart Tap Monitoring System for Yellow Woods Educational Center, Inc.*, specifically designed for high school students. The scope of the system development covered six core objectives. First, it aimed to develop the essential features of the STAP system, including mobile NFC-based tap-in functionality for student attendance, real-time recording and synchronization with the web platform, and automatic logging of time and date. Second, the study involved the creation of a web-based dashboard capable of displaying daily and overall attendance records and generating or registering RFID cards for each student. Third, the system architecture included secure components such as login accounts for teachers and school staff, student

profiles, attendance histories, and live data synchronization between mobile and web interfaces. Fourth, the system was designed to incorporate basic security mechanisms, including password-protected accounts and activity logs that tracked who accessed or modified information. Fifth, the study ensured ease of use by developing intuitive interfaces for both mobile and web platforms and providing clear guides or brief training sessions to assist users. Lastly, the system was evaluated using the ISO 25010 software quality model, specifically assessing Functional Suitability, Performance Efficiency, Compatibility, Usability, Reliability, Security, Maintainability, and Portability. The evaluation involved 10 Information Technology (IT) experts and 10 end users, as recommended by the study adviser and panel members.

The study was limited to the attendance monitoring processes of high school students at Yellow Woods

Educational Center, Inc. Other academic levels such as kindergarten and elementary were excluded from the initial system

deployment because younger learners were typically accompanied by guardians, making independent NFC tap-in procedures impractical. The system did not include advanced features such as automated parental notifications or integration with existing school management systems, as these were identified as potential future enhancements beyond the scope of the current

implementation. The evaluation focused solely on the developed system's performance based on ISO 25010 criteria and did not compare the STAP system with other existing attendance monitoring applications. Additionally, the study was confined to the data gathered from the selected evaluators and did not include a large-scale pilot test involving the entire student population.

Gap Bridged by Study

Many reviewed foreign and local studies shared similarities with the present project, particularly in using RFID and NFC to streamline attendance monitoring. Most systems automated attendance through contactless card tapping or mobile scanning, reducing manual work and human error. These technologies improved

data accuracy, institutional efficiency, and offered real-time reporting accessible to teachers, administrators, and sometimes parents. Automated timestamping, centralized databases, and dashboards enhanced transparency and accountability, highlighting the value of integrating RFID and NFC in modern attendance systems.

Despite these similarities, key differences set the present project apart. Some systems relied solely on RFID or NFC, limiting flexibility and device compatibility, while others added biometrics, GPS, or camera integration, raising costs and infrastructure needs. Some local studies focused only on faculty

attendance or used QR codes, which are less secure and slower. In contrast, the present study combines RFID and NFC for versatile attendance capture, real-time syncing, automated logging, and a unified mobile–web platform, providing a more adaptable, reliable, and practical solution for Yellow Woods Educational Center.

Conceptual Diagram

The Input stage of the conceptual paradigm for the proposed Attendance Monitoring System focuses on the core features and resources required to ensure accuracy, convenience, and reliability in tracking attendance. The primary inputs include RFID cards or tags, NFC-enabled smartphones or ID cards, RFID/NFC readers, and the database server for storing and retrieving attendance data. System requirements such as internet connectivity,

a cloud-based or local storage infrastructure, and a secure web-based dashboard for administrators and faculty also serve as essential components. These inputs are designed to provide flexibility, as both RFID tags and NFC-enabled devices can be used by students and staff to record attendance. Security protocols, user authentication, and timestamping are integrated to prevent proxy attendance and ensure data integrity.

The Process phase employs the Modified Waterfall Methodology, allowing systematic development and deployment of the system. It begins with the Requirements phase, where user needs and technical specifications are gathered from administrators, teachers, and IT staff. The Design phase follows, focusing on system architecture, database schema, and interface layouts for both web and mobile platforms. In the Implementation phase, RFID and NFC technologies are integrated into the attendance workflow, linking

The Output of the study is a fully functional hybrid attendance monitoring system that utilizes both RFID and NFC technologies. The system provides fast and secure recording of attendance, real-time data synchronization to a centralized database, and automated generation of attendance reports for teachers and

The Feedback component plays a vital role in sustaining the system's effectiveness and relevance. Input from teachers, administrators, students, and parents is collected to evaluate the usability, speed, and reliability of the system. This includes identifying technical issues, user experience concerns, and suggestions for additional features such as

Methodology

The development of the proposed Attendance Monitoring System followed the Modified Waterfall Model, also referred to as the Iterative Waterfall Model. This model was selected due to its structured yet adaptable nature, allowing the project to progress in clear, defined phases while still permitting iterative improvements at each stage. Each phase was thoroughly documented to ensure that the final system met user expectations,

reader devices to the database through middleware for real-time synchronization. The Integration and Testing phase ensure compatibility between RFID/NFC hardware, the database, and reporting tools, using functional and user acceptance tests to validate system reliability. Finally, the Deployment and Maintenance phase involves the installation of devices in classrooms and continuous updates or troubleshooting to improve performance and usability.

administrators. Parents may also receive updates through notifications, improving transparency and accountability. The system minimizes manual workload, reduces instances of proxy attendance, and ensures more reliable record-keeping for both students and faculty.

mobile alerts or analytics dashboards. Feedback is then used to refine and enhance the system's performance, ensuring continuous improvement and adaptation to institutional needs. Regular updates based on feedback allow the system to remain efficient, user-friendly, and aligned with school requirements over time.

technical specifications, and institutional goals (Pargaonkar, 2023). The Modified Waterfall Model allowed for early detection and correction of errors, minimizing risks associated with system development and deployment. It also facilitated continuous feedback from end users, ensuring that both functional and usability requirements were addressed throughout the project lifecycle. By combining structure with flexibility, this

approach supported the timely delivery of a robust, reliable, and user-centered attendance monitoring system.

Findings

The following findings were derived from the system's testing and evaluation, highlighting its effectiveness and performance:

1. The study found that the main features of the STAP: Smart Tap ID Monitoring System were successfully developed and implemented. The Mobile NFC tap-in feature allowed students to log their attendance quickly and contactless
2. The study revealed that the web-based dashboard of the STAP: Smart Tap ID Monitoring System was successfully developed to enhance administrative monitoring and management of student attendance. The dashboard provided a clear and organized display of daily and overall attendance for high school students, allowing administrators and teachers to quickly assess attendance trends, identify absences, and generate reports.
3. The study found that the STAP: Smart Tap ID Monitoring System successfully implemented a secure system to protect sensitive student and institutional data. The system included logins for teachers and school staff, ensuring that only authorized personnel could access the dashboard and perform administrative tasks. It also maintained comprehensive student profiles and attendance history, allowing administrators to track attendance patterns over time and review individual

using RFID-enabled ID cards, reducing the time and effort required for manual recording. The system supported real-time recording and syncing to the web-based dashboard, enabling administrators and teachers to access up-to-date attendance information instantly. Furthermore, the automatic time and date logging accurately captured the exact moments of student entry and exit, minimizing human error and ensuring reliable timestamped records.

Additionally, the system facilitated the creation and registration of RFID cards for each student, ensuring that each ID card was uniquely linked to the student's profile and could be accurately used for tap-in and tap-out attendance tracking. These features demonstrated that the dashboard effectively centralized attendance data, improved accessibility for administrators, and streamlined the process of managing student RFID credentials.

student records accurately. Furthermore, the system supported live syncing of records between the mobile application and the web dashboard, ensuring that all attendance data was consistently updated across platforms in real time. These security and data management features demonstrated the system's capability to provide reliable, controlled, and transparent attendance monitoring for Yellow Woods Educational Center, Inc.

4. The study found that the STAP: Smart Tap ID Monitoring System incorporated essential security features to safeguard data integrity and prevent unauthorized access. The system implemented password-protected accounts for teachers, staff, and administrators, ensuring that only authorized users could access sensitive information. Additionally,

5. The study found that the STAP: Smart Tap ID Monitoring System was designed to be user-friendly, ensuring ease of use for both teachers and administrators. The system featured an intuitive and streamlined interface on both mobile and web platforms, allowing users to perform tasks such as recording attendance, accessing dashboards, and managing student profiles with minimal effort.

6. The study found that the STAP: Smart Tap ID Monitoring System demonstrated strong performance when evaluated using ISO 25010 industry standards. In terms of Functional Suitability, the system accurately performed core attendance functions, including NFC tap-in, real-time recording, and attendance reporting. Performance Efficiency was observed through quick response times and minimal delay in data synchronization. The system showed high Compatibility, functioning seamlessly across different mobile devices, browsers, and operating systems. Evaluators noted excellent Usability, with intuitive

it maintained logs to track who accessed or modified information, providing a reliable audit trail for monitoring user activity and ensuring accountability. These security measures enhanced the overall protection of student attendance records and system data, supporting a safe and trustworthy digital environment for Yellow Woods Educational Center, Inc.

Additionally, clear user guides and brief training sessions were provided, helping users navigate the system effectively and confidently. These measures ensured that the system could be readily adopted, reducing the learning curve and promoting efficient and accurate attendance management at Yellow Woods Educational Center, Inc.

interfaces that facilitated easy navigation for both teachers and administrators. Reliability was confirmed through consistent and accurate attendance logging without system failures. Security features, including password-protected accounts and access logs, safeguarded sensitive data. Maintainability was evident in the system's modular design, which allowed easy troubleshooting and updates, while Portability ensured deployment across multiple devices and cloud environments. Overall, the system met industry-standard quality attributes, confirming its robustness, efficiency, and readiness for institutional implementation.

Conclusions

Based on the findings of the study and the results of the evaluation, the following conclusions were drawn:

1. The main features of the STAP: Smart Tap ID Monitoring System were successfully implemented, providing efficient NFC tap-in, real-time

recording, syncing, and accurate automatic time and date logging.

2. The web-based dashboard effectively centralized attendance data, facilitated RFID card registration, and improved accessibility and monitoring for administrators and teachers.
3. The system successfully maintained security and reliability by implementing authorized logins, comprehensive student profiles, and live syncing of records between mobile and web platforms.
4. Essential security measures, including password-protected accounts and access

logs, were effectively implemented to protect data integrity and ensure accountability.

5. The system was designed to be user-friendly, with intuitive interfaces and supportive training materials that enabled easy adoption and efficient use by teachers and administrators.
6. Evaluation using ISO 25010 standards confirmed that the system met criteria for functionality, performance, compatibility, usability, reliability, security, maintainability, and portability, demonstrating its robustness and readiness for deployment.

Recommendations

Based on the findings and conclusions of this study, the following recommendations are presented:

1. Continue enhancing the NFC tap-in and automatic logging features to support additional grade levels and future scalability.
2. The dashboard should be regularly updated with new reporting tools and analytics to further streamline attendance monitoring and decision-making.
3. Maintain strict access controls and periodically review live syncing protocols to ensure continued data security and reliability.
4. Security features would be routinely tested and updated to address emerging threats and maintain data protection.

5. Additional user training sessions and periodic interface improvements are recommended to sustain ease of use and promote consistent adoption.
6. Perform regular evaluations against ISO 25010 standards after system updates to ensure continued performance, compatibility, and overall quality.
7. Integrate automated notifications, such as SMS or email alerts, to inform parents and guardians about student attendance in real time.
8. The system may consider incorporating advanced analytics and reporting features to help administrators identify attendance patterns and support proactive interventions.

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