

## Automated Attendance Monitoring System for Primary Schools

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**Abstract:** For centuries, the practice of marking attendance has played a vital role in recording and monitoring the presence of students in educational institutions such as schools and colleges. In universities or institutions, it can be challenging to control students' attendance, particularly in large classes where their attendance is checked using a manual process which takes time and effort to identify or recall their faces. Automated Attendance Monitoring System for Primary Schools (AAMS-PS) is developed to solve these issues. The principal aim of AAMS-PS is to create a web-based attendance recording system compatible with any device equipped with a web browser. This objective seeks to reduce reliance on paperwork, facilitating a more efficient and streamlined process for producing precise attendance results. The system focuses on providing a user-friendly interface to enhance usability. Furthermore, it enables the generation of efficient reports that cater to various requirements, such as viewing attendance on a yearly or monthly basis. This system is designed to benefit both teachers and administrators. It allows them to easily access and monitor attendance records based on specific dates or individual needs. Moreover, administrators have the flexibility to update student profiles and corresponding attendance records as required. In summary, the proposed solution addresses the challenges by offering a system that reduces paperwork, saves time, and ensures accurate attendance tracking.

**Keywords:** Agile, Automated Attendance, Education, Smart School

### 1 Introduction

Effective attendance is essential to the education process. Teachers and school administrators need to know how much time each student spends in the classroom. An attendance system can typically come in two forms: manual attendance systems (MAS) and automated attendance systems (AAS) [1]. Most universities and schools apply manual attendance system [2]. This system has many disadvantages which includes requiring a lot of time and effort. This system also has many limitations and cannot detect any misbehaviour in student attendance. As a result, manual system is not effective, inefficient, and prone to human error [3]. Hence, AAS is the better way of taking student attendance because it can save time and space by enabling schools to register and track students without the need for physical identification cards or teachers. A good attendance system helps school administrators maintain proper attendance records for each pupil [4].

In the context of this project, the objective is to develop a web-based attendance system that allows attendance to be recorded through any device capable of opening a web browser, such as desktop computers, laptops, and mobile phones. By embracing this approach, the system aims to provide teachers with a flexible and convenient tool for managing attendance records pertaining to their respective courses.

By leveraging the web-based infrastructure, the system ensures that attendance records are stored accurately and are easily accessible to authorized faculty members. Moreover, the web-based

nature of this attendance system facilitates seamless integration with other educational management systems, enabling comprehensive data analysis and report generation, and promoting overall efficiency in attendance management processes. This integration provides a holistic view of student attendance, empowering educational institutions to make informed decisions and optimize their operations.

Concisely, the web-based attendance system being developed in this project aims to revolutionize traditional attendance tracking methods. By leveraging the power of web browsers and databases, it offers a modern, efficient, and user-friendly solution for teachers to manage attendance records, contributing to improved productivity, data accuracy, and student engagement within educational institutions.

## 2 Existing Systems

Numerous automated attendance systems have been developed [5]-[6]. In [5], student attendance is recorded through a keypad-based device. However, this system lacks user authentication capabilities, making it susceptible to manipulation unless operated by an authorized individual. Moreover, the database associated with this system does not facilitate data analytics. Additionally, the system is unable to identify abnormalities in student attendance records.

A different scholar has developed an attendance recording system reliant on fingerprint identification [7], chosen for its reliability and distinctiveness. This system effectively identifies students with attendance irregularities and has the capability to notify instances of misbehavior. Employing an Internet of Things (IoT) architecture akin to the one detailed in [8], the design encompasses multiple layers of IoT infrastructure, including the application layer, network layer, and perception layer [9-10]. This strategic approach incorporates intelligence into the attendance system [8]. Furthermore, this section below provides a review of several other existing methods.

### A *Smart School*



Figure 1: Smart School Home Page.

Figure 1 shows the *Smart School* homepage [12]. This system consists of school attendance software, provides management and parents with monitoring and tracking capabilities. It is designed to accommodate all parties involved in the educational system. With automated reports, the system can be used to track students who arrive late, leave early, stay over, and other events. This system is able to

automatically create pertinent reports about students' attendance, in which presence calculations can be produced.

**B SmartX**



Figure 2: SmartX Home Page

Figure 2 shows the *SmartX* homepage [13]. It is a simple-to-use web-based time and attendance system. This system has two biometric (fingerprint) and RFID card terminals. The terminals are placed close to the building's entrance, where personnel enter and exit. For access to the system, each employee is given a card or has their fingerprints registered by the administrator. Every time an employee leaves for work or returns from work, they must use the system source.

**C Amizone**

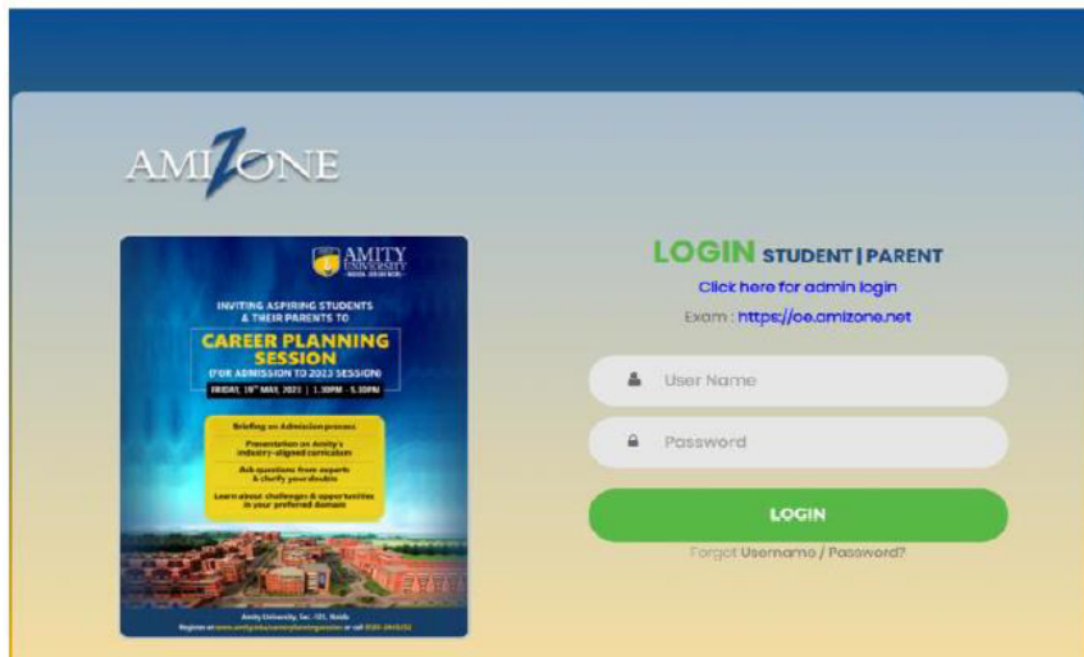


Figure 3: Amizone Login Page

Figure 3 depicts the login page of Amizone [14], an Android-based application. This system serves as a replacement for the traditional method of taking attendance, which can be time-consuming for teachers who need to sift through paper records. The application offers features such as attendance logs, timetables, courses taken, notice boards, and an attendance decision maker. The decision maker functionality is one of the system's notable strengths. Each semester, students have a required attendance percentage to meet in order to pass the semester. The application assists students in achieving this goal. For instance, if a subject has 16 classes, the student must attend at least 12 classes to pass the semester. The application provides a note stating, "You can miss four classes to maintain 75.0%". As absences accumulate, the note is adjusted accordingly.

#### D Comparison Among Existing Systems

Table 1 shows the comparison between the existing systems discussed in section 2 A – C. Amizone provides many advantages such as timetable management that provides features to students to access timetables, offer information about their courses and notice boards that can be used to disseminate important announcements or updates to students. Next, the Smart School system have features such as monitoring and tracking capabilities that allow both the school management and parents to monitor and track student attendance, provide automated report and pertinent attendance reports that are relevant and meaningful for attendance management. Finally, the SmartX system provides a simple-to-use web-based system, biometric and RFID technology that utilizes biometric (fingerprint) and RFID card terminals and real-time attendance tracking.

Table 1: Comparison Studies

Name	Amizone	Smart School	SmartX
1. Type of system	Android-Based	Android-Based	Web-Based
2. Platform	Android	Android	Any Platform
3. Features	-Take attendance -Attendance	-Take attendance -Complex user interface -Student tracking	-Take attendance -Has the least features compared to the other systems
4. Mobile Version	Yes	Yes	No
5. Database Access	Web Server	Web Server	Web Server
6. User Access	Yes	Yes	Yes

However, there are also disadvantages for each of these existing systems. For example, SmartX system relies on biometric data. It raises concerns regarding privacy and security as well as technical limitations and issues. The susceptibility of the SmartX system to faults or malfunctions arises from its dependence on biometric and RFID card terminals. Smart School, on the other hand, can increase vigilance and monitoring. Although the Smart School attendance software's monitoring and tracking features can be useful, some people might find them to be overly invasive and there is a possible abuse of attendance information. This system can produce automatic reports and attendance data that contain sensitive information. The possibility of unauthorised access or improper use of this data exists if it is not adequately secured and safeguarded. Last but not least, the Amizone application overvalues a student's attendance in classes.

In conclusion, all these systems are usually suitable for students in higher learning institutions. Hence, this system is focused on developing a web-based Automated Attendance Monitoring System for Primary Schools that combines the features in existing systems such as can

develop a computerized attendance system for school and generate attendance report. The purpose of this system is to provide a cost-effective solution to the conventional technique of primary school attendance management.

### 3 Methodology

The Agile method has been selected for the development of the Automated Attendance Monitoring system, based on available resources. This choice was made due to the numerous advantages associated with this method. The Agile software development life cycle is shown in Figure 4 [15]. One key advantage is its ability to minimize the risk of failure during software implementation phase. Additionally, in the event of system failure, expected losses would be reduced. The system should allow administrators to add students, teachers, sessions and terms, class representatives, and classes. It should be possible for the teachers to see student data, take attendance, view attendance records, and generate attendance reports. The system's priority is to create a management interface that enables the addition and management of information about students, teachers, sessions, terms, classes, and class representatives and to create a teacher interface that allows teachers to monitor student data, take attendance, view attendance records, and generate attendance reports.

In developing iteration, for sprint 1, construct the administrative interface for adding and managing information about students, teachers, sessions, terms, classes, and class representatives. Apply the relevant data permissions and validations. Build the teacher interface in sprint 2 so that they can view student data, take attendance, view attendance records, and generate attendance reports. Add tools for searching and filtering student records. Always get feedback on the usability and functionality of the interfaces, hold feedback sessions with administrators and teachers. Consider their suggestions and make the required adjustments to improve system performance and user experience. Always do testing and integration to seamlessly integrate modifications and updates into the attendance monitoring system. Use continuous integration procedures. Conduct testing often to find and fix any flaws or problems, ensuring accurate and dependable system operation. The system's functionality should be modified and improved based on feedback from administrators and teachers. Administrators, teachers, and the development team need to collaborate and have open communication between them. Inform stakeholders, include them in decision-making, and respond to any issues or suggestions that may come up.



Figure 4: Agile Software Development Life Cycle

#### A Functional Requirements

##### Authentication Module

- Users should be able to login into the website of Automated Attendance Monitoring System to access the attendance module.
- The system will be able to authenticate user which consist of admin and teacher.

### Attendance Module

- The system should allow admin to add classes, class representatives, teachers, students, and sessions into the database.
- The system's features allow users to view student information, track attendance, access each student's attendance records and create reports for students that are only available to teacher's accounts.
- The system should be able to monitor and obtain each student's individual attendance records.

### ***B Non- Functional Requirement***

The effectiveness and quality of the system in satisfying user needs is ensured by these non-functional requirements, which also provide additional criteria. These requirements include, among other things, availability, usability, and security.

#### Reliability

- The ability of a system to operate continuously for a long time without any component failures or disruptions is referred to as reliability.

#### Availability

- The term "availability" describes a system's capacity to function continuously for an extended period without interruptions or downtime.

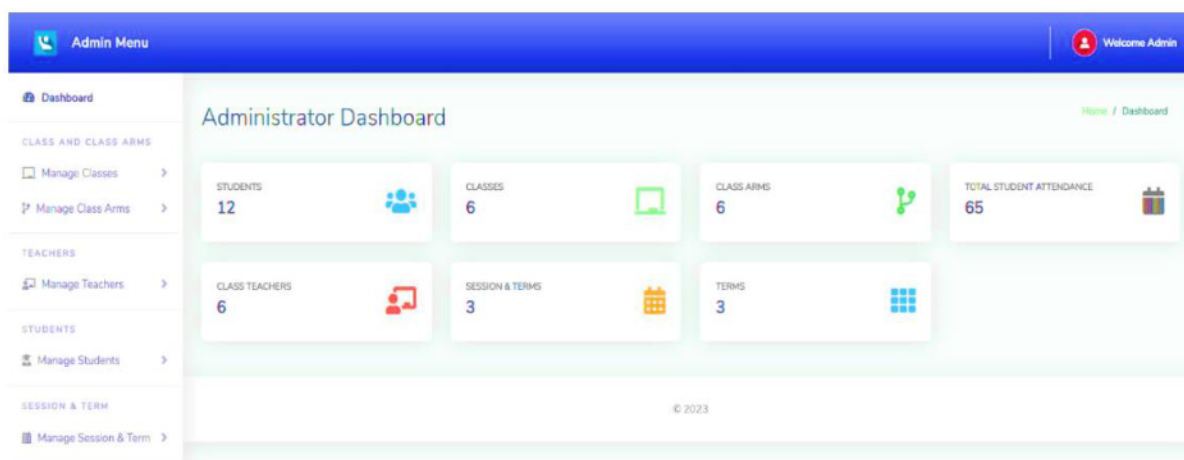
#### Usability

- Computer with at least 8GB RAM
- Android emulator
- Smartphone with an operating system of at least Android 5 (Lollipop)

## 4 Results and Discussion

This section displays the interface of Automated Attendance Monitoring System for Primary Schools. It shows the features for each user which are teachers and the admins. Each user has unique roles and responsibilities.

### ***A Admin***



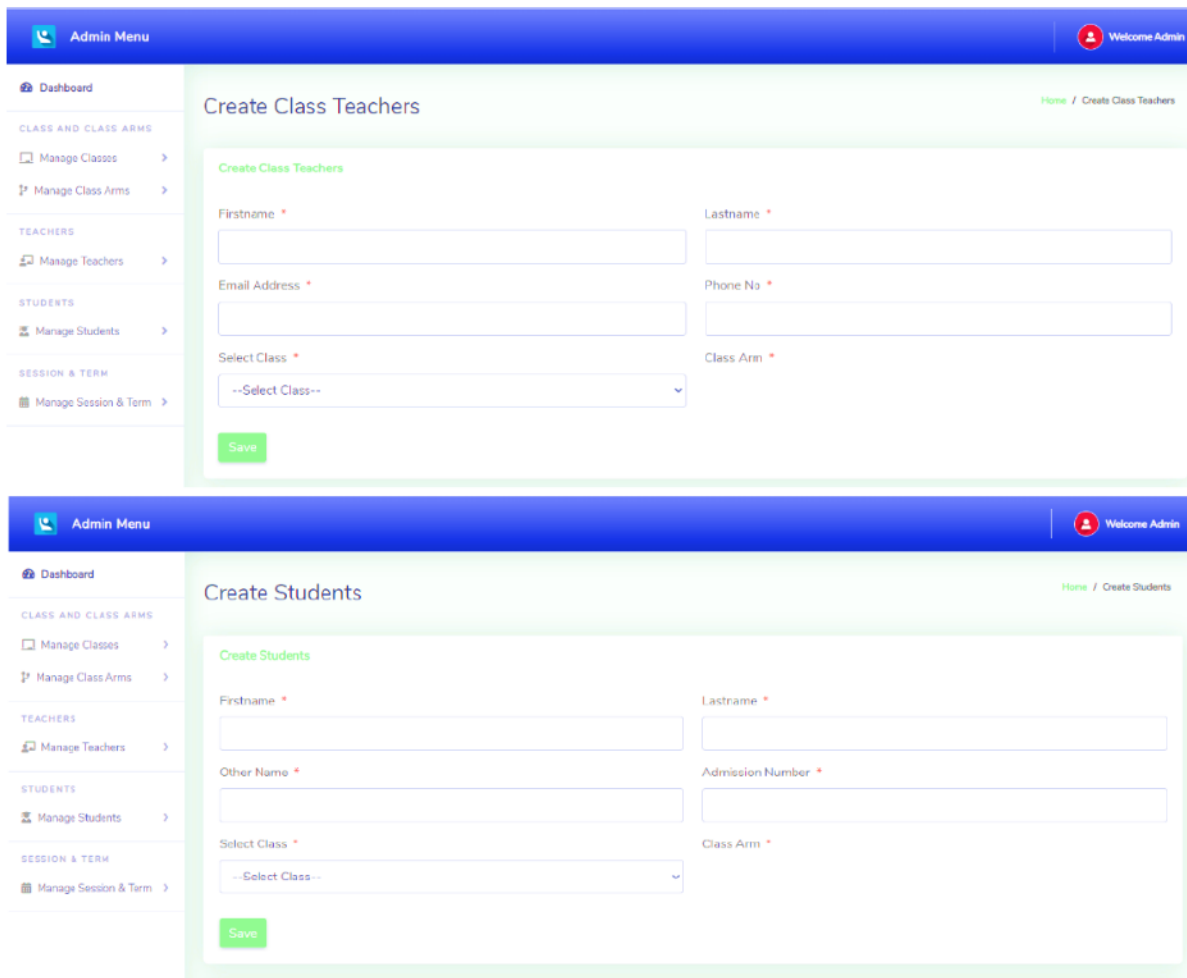


Figure 5: Admin's Homepage

Figure 5 shows the homepage for *Admin*. As shown in the figure above, admins can manage existing classes, class representatives, teachers, students as well as sessions and terms. Admins can also register new teachers and students. Only admins can add another admin in this system.

## B Teachers



The image shows two screenshots of a web application interface for a teacher's dashboard. The top screenshot is titled 'Take Attendance (Today's Date : 06-24-2023)'. It features a sidebar with 'Teacher Menu' and options like 'Dashboard', 'Manage Students', and 'Manage Attendance'. The main content area shows a green notification 'Attendance Taken Successfully!' and a table of students with checkboxes for attendance. The bottom screenshot is titled 'View Class Attendance'. It has a similar sidebar and a main area with a date selection field, a 'View Attendance' button, and a table of class attendance records.

**Take Attendance (Today's Date : 06-24-2023)**

All Student in (ELITE - NATALIA) Class Note: Click on the checkboxes besides each student to take attendance!

Attendance Taken Successfully!

#	First Name	Last Name	Other Name	Admission No	Class	Class Arm	Check
1	NUR NAJWA	FADZLEY	WAWA	2020844225	ELITE	NATALIA	<input checked="" type="checkbox"/>
2	NOR AINA	BASIRAH	AINA	2020844224	ELITE	NATALIA	<input checked="" type="checkbox"/>

Take Attendance

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**View Class Attendance**

View Class Attendance

Select Date \*

mm/dd/yyyy

View Attendance

Class Attendance

Show: 10 entries

Search:

#	First Name	Last Name	Other Name	Admission No	Class	Class Arm	Session	Term	Status	Date
1	NUR NAJWA	FADZLEY	WAWA	2020844225	ELITE	NATALIA	2021/2022	First	Present	2023-06-24
2	NOR AINA	BASIRAH	AINA	2020844224	ELITE	NATALIA	2021/2022	First	Present	2023-06-24

Figure 6: Teacher's Page

Figure 6 illustrates the dashboard for a teacher. The dashboard shows the data that is already in the database. For example, two students are already enrolled in the class, and there are a total of 6 class representatives. A teacher can view all students who are already enrolled in her class, take attendance of the students, and view the attendance. The teacher only needs to select which date she wants to view the attendance of the student. Lastly, the teacher can generate a report for her class attendance by clicking the "Generate Report" button.

## 5 Conclusion

The Automated Attendance Monitoring System has been specifically developed to cater to teachers and students, providing a modernized alternative to the conventional manual attendance tracking process. This innovative system aims to streamline and simplify the attendance-taking procedure and offering numerous benefits for teachers. By implementing this system, teachers can significantly reduce the time and effort required to record attendance during class sessions.

Continuous improvement is a crucial aspect in the system development life cycle, and every limitation encountered should be addressed for future advancements. To enhance the system, it is



imperative to extend its scope and capabilities. One possibility is the inclusion of functionalities that allow monitoring and tracking of attendance for students from different classes. Additionally, integrating a biometric system, such as requiring students to take a selfie as proof of attendance, would further refine the system's accuracy and security. Moreover, the introduction of QR code features could facilitate easy scanning for students, streamlining the attendance process and ensuring convenience for all users.

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