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THE MAKING OF AN AUTOMATIC AND COMPUTER-BASED ATTENDANCE CHECKER SYSTEM WITH THE USE OF RADIO FREQUENCY IDENTIFICATION (RFID)

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ABSTRACT

Improving the existing means of classroom attendance checking of students in school, this study aims to develop an automatic and computer-based attendance checker system using Radio Frequency Identification (RFID) Technology. Using arduino nano, RFID readers, tags, and programming languages for a virtual portal, the Automatic Attendance Checker System was created. The results and findings indicate that the automatic attendance checker system needs a database to store the students' data, such as student ID number, name, grade, section, sex, and the date and time they logged in or out of the system. The average time for processing timing in was 0.53s while for timing out was 0.34s. Comparing it to manual attendance checking, the average time took only 22.29s while manual attendance checking took 88.3s. It also shows that the product is efficient in detecting whether a student is late, on time or absent. In conclusion, it is feasible to create an automatic attendance checker system with the use of Radio Frequency Identification (RFID) technology that is more efficient and accurate. Therefore, it is recommended to use and employ this product for tracking the attendance of students.

KEYWORDS: Radio Frequency Identification, Attendance Checker System, Attendance Checking

I. INTRODUCTION

In various work and learning environments around the world, attendance checking is an important aspect. Classroom attendance checking is a contributing factor to student participation and it defines the final success in the courses (Samet & Tanriverdi, 2017). It is also critical to make sure one arrives and goes at

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the appropriate times with an intact record. To make it more useful and efficient for the students, teachers, and in other organizations attendance monitoring could be enhanced.

In context, the learning institution's normal practice in checking attendance is that the teachers or respective class secretaries record the students' attendance daily. While having someone assigned to do it helps ensure that it is done correctly, it can still pose some issues. The manual attendance record system is not efficient and requires more time to arrange, record, and to calculate the average attendance of each student (Patel & Priya, 2014). In a study entitled "Attendance and Information System using RFID and Web-Based Application for Academic Sector" by Rjeib et al. (2018), created a similar product for students which proves that it is feasible to create an automatic attendance checker system with the use of RFID technology.

The variables of the study, namely the independent and dependent variables are the RFID Reader and the Automatic Attendance Checker System respectively. The independent variable, the RFID Reader is a scanner that detects radio frequency waves and uses it as an identification method. The researchers planned to use this to make an Automatic Attendance Checker System for the students of Philippine School Doha.

The product's ability to automate and improve the attendance-taking procedure is what makes it innovative. It was possible through the installment of RFID (Radio Frequency Identification) technology. In a study entitled "RFID-Based Student Identification Card Attendance Monitoring System" by Awotunde et al. (2023), found that a less costly and effective automated approach is an RFID-based contactless system for tracking attendance. When a student enters a classroom, the student is expected to scan their identification card through an RFID reader to record their attendance. This removes the need for manual roll calls, lowers the chance of human error, and saves both the teachers and students a lot of time. Overall, compared to the current methods, the researcher's system offers a more dependable, practical, and time-saving solution for attendance monitoring.

The testing procedures were done at the Philippine School Doha Campus, and the researchers were the ones who tested the product. The first step is to collect the data and enter it into the system. The RFID Attendance System would next be put through a week-long trial. The system would record each student's attendance throughout this time when they check in and out. The product's effectiveness was evaluated based on how well it automates the procedure and how accurate the attendance records are. This testing method is essential for confirming the system's functionality, demonstrating its effectiveness as an accurate attendance monitoring system.

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The use of RFID technology for attendance tracking has the potential to simplify as well as enhance attendance tracking procedures in educational institutions. Increased effectiveness, clarity, and convenience may result from this. First off, by easing attendance monitoring, a system like this may significantly increase efficiency while saving teachers time and effort. Additionally, compared to manual techniques, RFID-based systems are effortless, quicker and protected (Koppikar, 2013). The RFID attendance data that has been gathered can also be used to examine attendance patterns, which in turn can help identify at-risk students and inform improvement efforts for student engagement.

Finally, by improving attendance tracking and lowering the possibility of attendance conflicts, such a system can considerably improve the overall processes of attendance monitoring and checking. RFID readers as an automatic attendance checker system could be an essential step towards modernizing attendance management, with advantages including increased efficiency, better data accuracy, and security. It adds to the body of knowledge by encouraging innovation in attendance management systems, advancing the integration of RFID technology in educational contexts, and possibly resulting in greater use of RFID technology in education. Radio frequency identification (RFID) technology can be used to create an automatic system that would improve the effectiveness and precision of attendance tracking.

The author's study is crucial since it simplifies attendance tracking and lessens the workload. It affects improving precision, effectiveness, and safety. By automating attendance tracking and assuring an accurate assessment, the outcomes would benefit students. Tiwari et al., (2014) the implementation of a time and attendance system has a lot of advantages for the manager. Additionally, students would be able to quickly and independently check their attendance. This innovation represents a paradigm shift in the way that attendance is typically checked and monitored because it guarantees a more accurate and efficient way being an essential part of daily classroom management.

RESEARCH QUESTIONS

The objective of this study was to create an Automatic Attendance Checker System using Radio Frequency Identification (RFID). Specifically, it sought to answer the following questions:

1. What data are needed for every attendance entry in terms of:
    - 1.1. student ID No;
    - 1.2. name;
    - 1.3. sex;
    - 1.4. grade and section; and
    - 1.5. login and logout date and time?

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2. How accurate is the Automatic Attendance Checker System in terms of:
   2.1. processing attendance;
   2.2. tardiness of students;
   2.3. absenteeism of students; and
   2.4. time difference between manual and automatic attendance checking?

HYPOTHESIS

H1: It is feasible to make an RFID Automatic Attendance Checker System.

II. METHODOLOGY

The study utilized a quantitative experimental research design. Quantitative research sets out to gather data using measurement, to analyze this data for trends and relationships, and to verify the measurements made (Watson, 2015). A quantitative research method deals with quantifying and analyzing variables to get results (Apuke, 2017). The independent variable of the study is the Radio Frequency Identification (RFID) reader and the dependent variable, the automatic attendance checker system. Therefore, quantitative research involves measurement and assumes that the phenomenon under study can be measured.

The procedure includes the step-by-step process in making an RFID reader. First, ensuring adequate protection and maintaining safety was realized. Then, wearing protective equipment like gloves and goggles. The researchers also made sure to be in a well-ventilated area to let smoke out from soldering. Next is the assembling of RFID reader, then the programming of arduino nano using the designated codes

III. RESULTS

Results and interpretation of data that were collected from the making and testing of the product.

1. Required data for each attendance entry

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Table 1: The data required for each attendance entry

Data	Pictures
Student ID Number, Date, Login and Logout time, and Status (Present, Late or Absent)	rfid | student_id | attendance_date | status | time_in | time_out | tardiness | overtime 23 91 82 33 | ST006350 | 2024-01-14 10:49:14 | Present | 2024-01-14 10:49:14 | 2024-01-14 10:49:19 | NULL | NULL B2 0F A4 1D | ST004196 | 2024-01-14 10:49:14 | Present | 2024-01-14 10:49:14 | 2024-01-14 10:49:26 | NULL | NULL 80 77 C8 26 | ST002592 | 2024-01-14 10:49:14 | Present | 2024-01-14 10:49:14 | 2024-01-14 10:50:45 | NULL | NULL 23 91 82 33 | ST006350 | 2024-01-28 10:30:49 | Present | 2024-01-28 10:30:49 | 2024-01-28 10:54:54 | Late | Late
Full name, Grade, Section, Sex	student_id | student_fname | student_gname | student_mname | gender | level | section ST001904 | Abdurasid | Zeyad | Abdurahsi | Male | 10 | Einstein ST004018 | Amilao | Rufino Uriel | Salcedo | Male | 10 | Einstein ST001715 | Apostol | Wilzen Edric | Calibat | Male | 10 | Einstein ST005860 | Casabuena | Wil Princeton | Lacsamana | Male | 10 | Einstein

Table 1 shows the necessary information for each attendance entry, including the student's identity session information, and attendance status. Accurate tracking of student attendance is ensured through precise and accurate time by the fields that contain Student ID no., Date, Login and Logout times, and status like present, late, or absent. The data that should be collected are the names of the students, their sections, and sex (Olanipekun & Boyinbode, 2015). The researchers used this as a basis to identify the necessary data needed from each student for every attendance entry and programmed the automatic attendance checker system to collect the mentioned data.

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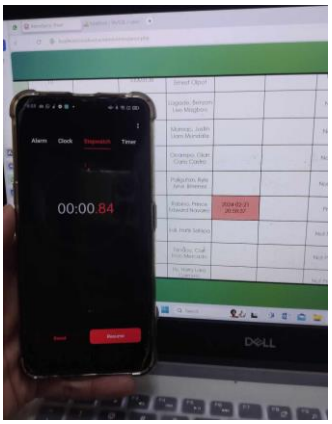
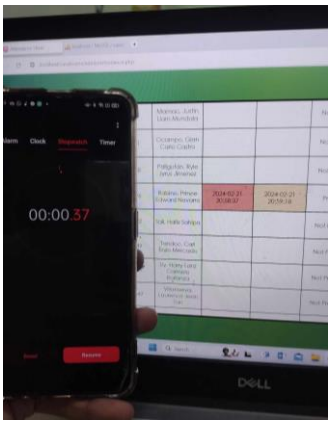
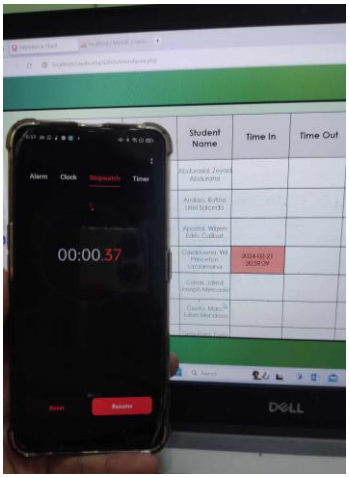
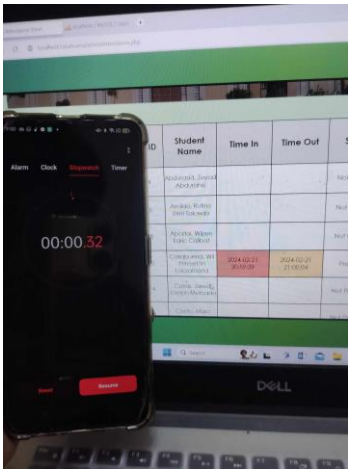
2. The accuracy of the Automatic Attendance Checker System in terms of measuring the following factors:

2.1. processing attendance

Table 2: Trials for Attendance processing duration

Trial 1	**Time In**	**Time Out**
Picture		
Time (seconds)	0.84s	0.37s
Trial 2	**Time In**	**Time Out**
Picture		

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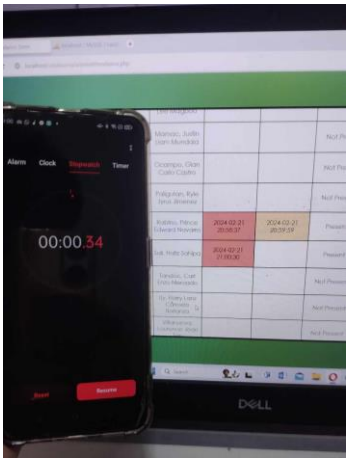
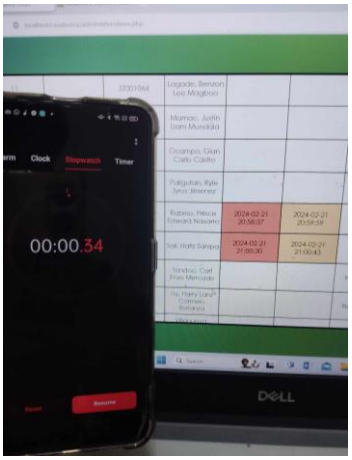
Time (seconds)	0.37s	0.32s
Trial 3	**Time In**	**Time Out**
Picture		
Time (seconds)	0.34s	0.34s

In Table 2, the researchers had an assessment and estimated how long would it take for the RFID to read and register the Time IN and Time OUT of the student's ID into the researcher's system. The researchers timed the trials by starting the stopwatch and stopping it as soon as the researchers saw the information recorded on the database. With a time-in duration of 0.52s, and an average time-out duration of 0.34s. This concludes that the RFID and the researchers study system was effective & functioned well in registering the student's attendance. To be able to apply RFID technology, the researchers have to take into consideration the time-saving and efficiency of the system (Al-Naima & Ameen, 2016). In this procedure, it was assessed that the processing duration of the Automatic Attendance Checker System is very short and fast, which concludes that it is efficient and time-saving.

2.2. tardiness of students

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Table 3: Trials for Punctuality of Students

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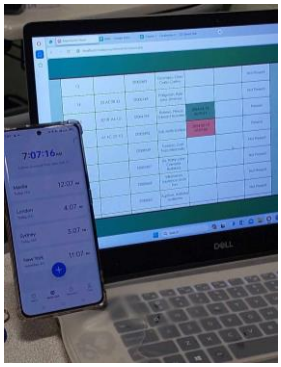
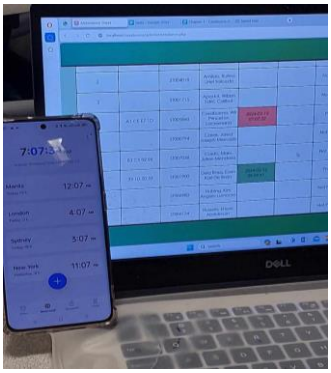
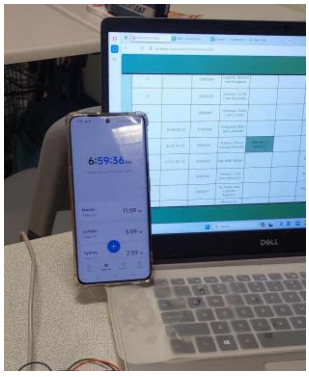
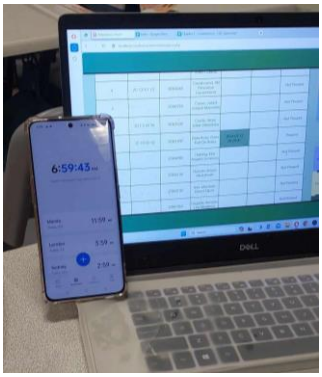
Trials	**1st**	**2nd**
Picture		
Time Recorded	7:07:16 AM	7:07:34 AM
Detection/Registered in System	Late	Late
Trials	**1st**	**2nd**
Picture		
Time Recorded	6:59:36 AM	6:59:43 AM
Detection/Registered in System	Early	Early

In Table 3, the researchers compared trials for the student's punctuality. Students who timed in past 7:06 AM were considered late; the Automatic Attendance Checker System can detect anything past that, and label the student's attendance as present but late. The trials were done by having two sets of students record their attendance before 7:06 AM and after 7:06 AM. The time was successfully

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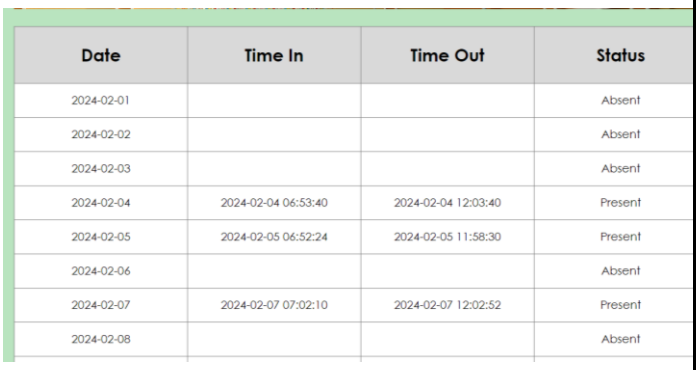
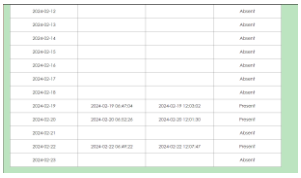
read, and the Automatic Attendance Checker System was able to record the students with their proper punctuality, either early or late. It is important to include the date and time a student logged in using the automatic attendance checker system (Yadav & Nainan, 2014). The researchers implemented the system to record the time a student logs in to determine whether they are late or on time.

2.3. absenteeism of students

Table 4: Trials for Absenteeism of students

Trial 1	**Student Attendance**
Picture	
Detection/Registered in System	**Absents Detected**
Trial 2	**Student Attendance**
Picture	
Detection/Registered in System	**Absents Detected**

Date	Time In	Time Out	Status
2024-02-01			Absent
2024-02-02			Absent
2024-02-03			Absent
2024-02-04	2024-02-04 06:53:40	2024-02-04 12:03:40	Present
2024-02-05	2024-02-05 06:52:24	2024-02-05 11:58:30	Present
2024-02-06			Absent
2024-02-07	2024-02-07 07:02:10	2024-02-07 12:02:52	Present
2024-02-08			Absent

Table 4 shows the trials for students being absent. It highlights the attendance of a student for the previous month. If a student does not have an existing attendance record for a day, they would be marked absent automatically. To test it, the researchers recorded their attendance with the Automatic Attendance Checker System for a few days, and left out some of the days. With this, the researchers

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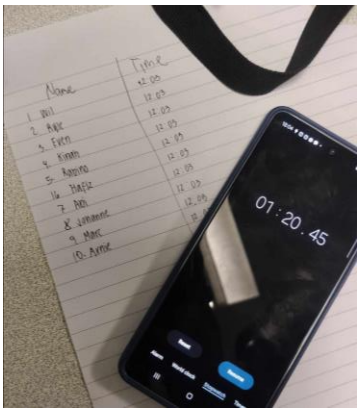
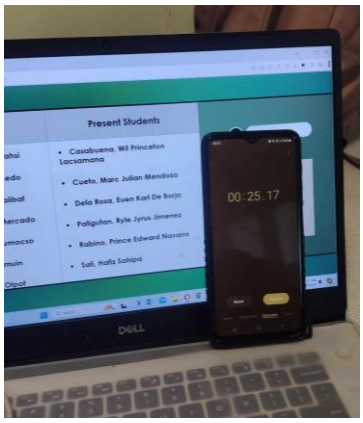
noted that the days they didn't record their attendance, were marked blank and absent. The researchers added a feature which detected the total absences a student has on a specific lecture (Al-Naima & Ameen 2016). The researchers added absences as data the automatic attendance checker system should record as it is necessary for recording attendance.

2.4. time difference between manual and automatic attendance checking?

Table 5: Trials for Time it takes to record 10 students

Trial 1	**Manual**	**Automatic**
Pictures		
Time (seconds)	80.45s	25.17s
Trial 2	**Manual**	**Automatic**

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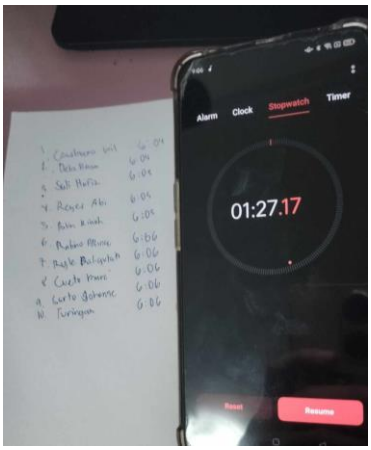
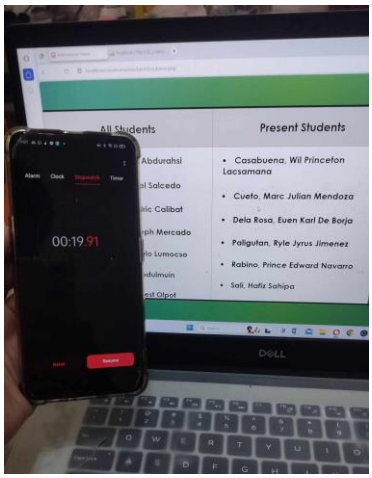
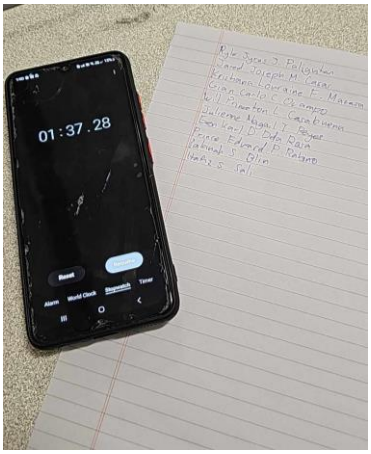
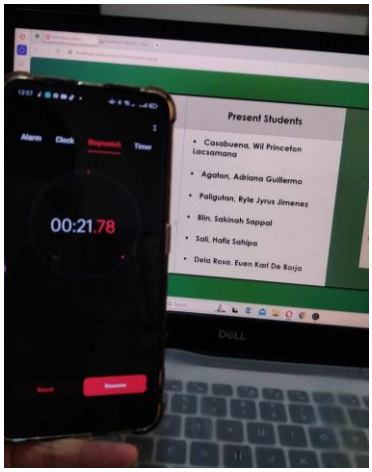
Pictures		
Time (seconds)	87.17s	19.91s
Trial 3	**Manual**	**Automatic**
Pictures		
Time (seconds)	97.28s	21.78s

Table 6 shows the comparison between the time it takes to record 10 students with the Automatic Attendance Checker System, and Manual Attendance Checking. The way of measuring the manually checked attendance is by students writing down their names, and the time they timed in. Meanwhile, the automatic attendance checker system is just tested by letting the students tap in one by one. With the manually checked attendance having an average time of 88.3, and the automatically checked attendance having an average time of 22.29s, the researchers can say that the Automatic Attendance Checker System is more efficient than manually checking attendance. Teachers spend their valuable

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time taking attendance by (Hajri et al., 2019). Therefore, it is important that the researchers' Automatic Attendance Checker System could be considered more efficient and time-saving than manually checking attendance. The average time for the researchers' Automatic Attendance Checker System was shorter than manually checked attendance. The researchers concluded that they have successfully made a more efficient Attendance System.

IV. DISCUSSION

The current means of attendance checking in school needs to be improved and made more efficient for the sake of students. There are many ways to solve this, one of which is by the use of Radio Frequency Identification (RFID) technology. With the help of this technology, the current way of attendance checking will be improved. This study's objective was to create an Automatic Attendance Checker System, with the use of RFID Technology. The researchers aimed to empower individuals in using the automatic attendance checker system responsibly with the use of this product. The automatic attendance checker system was made with the use of RFID Tags, Arduino wires, wood for the checker/scanner, and programming languages.

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