

# **IoT Smart Entry System of RFID Attendance with Face Mask Detection and Body Temperature Monitoring for Starlord Delivery Services**

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## **Abstract**

Businesses from every sector in the world require to be cost-efficient and organized. With the rise of IoT or Internet of things, a variety of systems can be created in order to aid businesses with the use of small devices that are connected to a core system such as Raspberry Pi. The monitoring of attendance is a huge part of everyday business, like when employees log their attendance every day for work. Teachers take attendance of their students in schools every day. Many of them still use the traditional way of doing the attendance with the use of pen and paper. To usher them into the modern world, the researchers have utilized IoT technologies to create an attendance system that is capable of reading RFID tags, detecting face mask, and body temperature. To make things organized, a user interface was created in order to track data in real-time. Data such as names, contact, numbers, and email addresses, are all important in the everyday operations of a business. Based on the findings of this research, it is suggested that the digitization of the traditional method of taking attendance greatly improves the efficiency, cost-reduction, and overall morale of a business.

## **Keywords**

Contactless Entry, Attendance Monitoring, Facemask Detection, Temperature Screening, Sensors.

## **1. Introduction**

Maintaining a well-ordered attendance and punctuality is essential especially when it comes to work and business. Understanding the significance of attendance every day for a job contributes to a successful career. Monitoring of the employees' attendance using their RFID tag will assist the Starlord Delivery Services in monitoring their employees' time in and time out. One of the best ways in monitoring the time in and out is by using RFID tags. Aside from it being convenient, system monitoring solutions can be integrated with RFID technology (Gabatbat 2021). Furthermore, the proposed system has a function that detects face masks and monitors the body temperature. The detection of face masks and monitoring of the body temperature is an additional function for the proposed system for the safety protocols implemented at Starlord Delivery Services. Smart Entry System (SES) is a device with real-time attendance monitoring with the help of RFID tag and has a face mask detection function, while also monitoring the body temperature. The researchers pursued to develop this system of RFID attendance with face mask detection and body temperature monitoring that would be used by the client Starlord Delivery Services in Minalin, Pampanga.

The utilization of custom built IOT systems has been growing steadily in its use in businesses. Today, many businesses in various industries utilize IOT systems to enhance and optimize the traditional way of monitoring the attendance of employees. However, the delivery service company, Starlord Delivery Services, currently uses the traditional pen and paper method of recording the attendance resulting in problems such as errors in the entry of data, employees committing time theft, time consuming for employees since it is manual. Starlord Delivery Services would also like to monitor the body temperature of their employees and to make sure they are also wearing face masks. Based on the interviews, the researchers have come up with an idea to develop an IOT attendance system called Smart Entry System,

that is capable of monitoring the attendance of employees real-time in a database that can be accessed by the client through a website. The functionality of the system is as follow: (1) every employee will be given an RFID tag that is unique to them; (2) the employee will simply scan the RFID tag on the system's RFID scanner; and (3) the name, date, time, and picture will be recorded in the database that is accessed by the client through a user interface. The system will also have body temperature monitoring and face mask detection.

Starlord Delivery Services is facing several challenges with regards to its employee attendance monitoring system. Currently, the company lacks a real-time system for monitoring employee attendance, which can lead to inaccuracies and potential time theft. Furthermore, Starlord Delivery Services relies on the traditional method of pen and paper for recording employee attendance, which is time-consuming and prone to errors. Finally, in the current pandemic situation, it is important for companies to have a way to detect face masks and body temperature to ensure the safety of their employees and customers. Starlord Delivery Services does not have such a system in place, which can put both its employees and customers at risk. Overall, these issues highlight the need for Starlord Delivery Services to invest in a more efficient and secure system for monitoring employee attendance, which can help improve accuracy, save time and money, and ensure the safety of its employees and customers.

### **1.1 Objectives**

The purpose of this study is to create a system that the client can use at their workplace to monitor staff attendance, as well as a precaution to combat virus transmission, particularly the coronavirus disease, or Covid-19. The system must also save the data it generates in a database system. The objectives were divided into two categories: General objectives which summarize the whole purpose of the study, while specific objectives are procedures or the steps needed to comply and come up with the purpose of the study. The general objective of the study is to develop the IoT Smart Entry System of RFID Attendance with Face Mask Detection and Body Temperature Monitoring for Starlord Delivery Services. The specific objectives are to identify the problems encountered in manual recording of the time attendance of the employees of Starlord Delivery Services. Supervise and record employees' time logs as a basis in payroll and identify employees' identification through the registered employees' information in the database with the use of the RFID tags. Monitor the range of body temperature of the employees through a temperature scanner according to the normal body temperature to assess a person with fever and detect outwear face masks. Evaluate the performance of the developed system based on the user's acceptability using ISO/IEC25000 or the internal software development evaluation in terms of functionality, performance efficiency, usability, accuracy, portability, and maintainability.

## **2. Literature review**

This chapter provides the review of related literature and studies which shows wide range ideas, concepts and generalizations about the system. The researchers used this as a guide for developing the system. Furthermore, this chapter gives the readers information that is relevant and related to the study.

Student attendance monitoring using RFID

Ahmad et al. (2021), describe the usefulness of developing and implementing a RFID and database-based attendance management system. The benefits of the system such as being accessible anywhere at any time helps staff and teachers keep track of the student's attendance. By implementing the system in the entire university, the quality of teaching and the performance of the students improve. This paper will help the researcher's study since it can be implemented in a business setting that also faces similar problems.

Almost 3 years ago, a deadly virus called Covid-19 has emerged. On December 31, 2019, the first ever report of an infection came from Wuhan, China where the virus originated from. Since the outbreak of the virus, the death toll worldwide caused by the virus has amounted to 6 million deaths, while also having 457 million cases. The WHO has been monitoring the spreading of the virus called Covid-19 around the whole world, with that, the WHO agency decided to announce that Covid-19, is characterized as a global epidemic. (Cui et al. 2022) The paper fits our project since we are creating an IoT based system that reduces the spread of Covid-19. As a result of the pandemic, the government has responded with many safety mandates such as wearing of face mask as a way to stop spreading the virus around us, Therefore, monitoring and detecting face masks and body temperature is important. Investigation by the researchers have concluded that human-human transmission of the virus is achieved through sneezing, spreading of respiratory droplets, and coughing as the main forms of infecting people. Furthermore, the virus can also spread

indirectly by objects that are contaminated and even airborne contagion. The Covid-19 virus is extremely contagious compared to other illnesses due to the fact that its droplets can travel distances of over 6 feet while having the ability of being suspended in the air for up to 3 hours. (Lotfi et al. 2020)

**Infrared Thermometers** - Infrared thermometer is a device that uses infrared radiation to calculate the exact temperature of materials without the need for physical interaction. There are factors that can alter the accuracy of temperature readings produced by Infrared thermometers. The first is the sensor's inaccuracy in estimating the temperature. The second issue is the algorithm's inaccuracy in predicting the reference body site temperature. The third factor is the user, who is responsible for inaccuracies in the temperature of the skin surface due to user mistakes like inappropriate distance and angle between the device and the surface of the skin. Finally, there is the environmental component, which is the inaccuracy in the skin surface temperature caused by external variables such as sweating, sun exposure, and wind currents cooling or heating the forehead skin surface (Sullivan et al. 2021).

When using a non-contact infrared thermometer as a screening tool, users should be mindful of the repercussions of false negatives and false positives. To ensure accuracy, a person should read the manufacturer's guide and understand the factors of having an accurate reading from NCITs. In creating a temperature measurement protocol and screening guideline, they should consider the factors that affect the NCIT temperature results (Sullivan, et al., 2021). In the future, NCIT will develop as technology evolves, which means we could have better equipment and tools to create more accurate and sophisticated NCITs.

**Internet of Things (IOT)** - In the 21st century, IOT has seen its rise through applications in agriculture, medicine, security, automation, home appliances, and smart cities. An IOT system usually includes physical devices and sensors that are used to collect data in their environment. The study of Lin et al. (2021), proposed a system that utilized IOT and cloud services for the measurement of body temperature to combat the Covid-19 pandemic. Their system is called Intelligent pandemic prevention temperature measurement system (ITMS). The components found in the temperature gun were infrared distance sensor, RFID reader, body temperature sensor, and a power supply. To elaborate, an Internet-of-Things (IOT) is a system that is made up of four (4) physical layers: the sensor nodes, IOT gateways, network servers and the web servers that help the system exchange and connect data to the system over the internet. In this study, IOT or the Internet-of-Thing is a system that helps with monitoring body temperature and is very useful in reducing the spread of Covid-19 (Koolstra & Berreth, 2021).

**Web User Interface System** - A powerful and effective computing system must have a user-friendly user interface with attractive usability components that provide a fantastic user experience. Therefore, if interactive systems are to be designed with the optimal user experience, a creative iterative strategy is needed. It takes work to create beautiful designs. There isn't much information on the cutting-edge design techniques employed by top software developers. This presents one of the difficulties in comprehending and utilizing new design methodologies. Several historical customs are examined in this study, and a set of guidelines for developing good user interfaces. It also demonstrates how user interface elements can be connected to use cases to enhance UML use case diagrams (Dey et al. 2019).

**Database Management System** - Managing the workload is the practice of efficiently monitoring, regulating, and the management of workflow in computer systems. The major aims of database management systems (DBMSs) in workload management are to keep the database management systems (DBMSs) working optimally, that is, not over or under loaded, to guarantee that all workloads achieve their performance requirements, and to balance resource use. Managing workloads in a DBMS have become more crucial in helping systems reach their performance goals as data bases expand in size and complexity (Zhang et al. 2018).

**Improving Employee Productivity by Keeping Attendance System** - Employee productivity in the workforce is also essential. The benefits of maintaining a web-based attendance system are to enhance employees' efficiency. Using an attendance system, the business can monitor all of the employees' actions and seek to enhance service. Employees are also connected to other human resource software like payroll and other HR activities such as leave management and accounting This seamless interface improves data quality, protects personal information, and eliminates payroll errors while also saving employees' time. One of the most successful approaches is keeping precise attendance records (Sun and Yongliang 2022). In regards to the study, keeping and monitoring an attendance system is a crucial feature of any HR department. It may be difficult for HR to keep monitored and manage employee attendance without a time and attendance system in place. If the intended system is implemented, it will be more helpful to all aspects of the company. Owners of a business during Covid-19 have suffered financial losses and are currently facing problems such as the

infection of employees in the workplace. It is important for an owner of a business to monitor and ensure the safety and health of each of their employees. That is why it is important to implement a contactless IOT system that enables the user to safely monitor their employees before entering the workplace.

In a study conducted during March 16 - April 25 of employees at a meat processing facility, the researchers have discovered that 929 or 25.6% of employees in the facility have been infected with Covid-19, plus another 210 people were infected that were in contact with them. The factors they have found to be the reason in the spread of the virus are high employee density at the workplace and common areas, prolonged closed contact with employees during the shifts. Furthermore, the spread of Covid-19 was also due to the lack of health monitoring of their employees. (Steinberg et al. 2020).

**Facial Recognition Technology-** Facial recognition technology works by capturing images of human faces and learning to identify how they look. Then, after the images have been captured, they will be used to train software that uses deep neural networks and machine learning algorithms to detect facial landmarks such as the nose, eyebrows, mouth, and eyes gap etc. After it has captured the mentioned data, the software will begin to recognize the faces movements and facial expressions, this is what we call Face print, which is similar to fingerprint (Fu 2021). However, this technology does have its limitations such as the threat to individual and societal privacy, invasion of personal freedom, invasion of personal rights, data vulnerabilities, and the opportunity for fraud and crimes. (Gargaro 2021). **Machine Learning (ML)**, a technique of analyzing data to automate models that are analytical, is a system that can learn from data, identify and learn patterns, with little intervention from humans then make decisions known as **Artificial Intelligence (AI)**. It is a system when a computer adapts from an enormous set of data and applied algorithms to be trained and educate themselves in making predictions. Machine Learning has two main components, unsupervised and supervised learning. Supervised Learning is when the data input is given to the model along with its output, while in Unsupervised Learning only the data input is given for the model.

During this technological generation cyber-attacks in the network makes the computer under constant threat. Detecting real-time attacks are proven to be difficult to monitor (Santana et al. 2018). Techniques in Machine Learning such as face and voice recognition, mapping of temperature, and others that are within the domain of intelligence have been developed. These methods were applied socially and politically to solve problems (Varona et al. 2020). Futuristic approaches in the hardware-aware machine learning can be efficiently explored with training and orienting application models that can be compressed (Ding 2020). The human intelligence simulation through machines, well-known as Artificial Intelligence (AI), mimics the thinking of a human. AI has various techniques on how a system technically perceives their environment, functions with what they recognize, provides solutions to problems, and takes initiative to achieve a specific objective. There are four types of Artificial Intelligence: Reactive Machines, Limited Memory, Theory of Mind, and Self Aware. Although processing of information has many methods, this became a subject for limitations that revolved around the ecosystem of information. These are limitations caused by the challenges associated with the processing of information combined, and selection pressure tradeoffs. The analysis of these states that the existing difficulties with AI identifies the required principles that can resolve the limitations when implemented in an organization (Walton 2018). The AI field constantly expands its consciousness in between its gap to human consciousness (Wright 2020).

### **3. Methods**

This chapter provides the methods and procedures used by the researchers to design a system for the client. Furthermore, this chapter will cover the research method, population and samples, research instruments, data collection procedure, and statistical data treatment for accurate data analysis and interpretation.

#### **3.1 Project Design**

The researchers used a framework called Design Thinking Process. It is a methodology that helped the researchers solve complex problems and create solutions for the client. A Design Thinking Process is a useful method that project teams use when designing systems because it is a solution-based approach when solving a problem. The Design Thinking Process is useful in solving complex problems that are new and unknown, understanding what the client needs, re-imagining the problem in a human-centric way, coming up with various ideas through brainstorming, and adopting a hands-on approach in prototyping and testing a system. In this study, the Design Thinking Process explained the many phases of designing an IOT System with RFID Attendance Monitoring, Body Temperature Monitoring, and Face Mask Detection for Starlord Delivery Services.

Below will elaborate the phases the researchers went through for this project:

1. **Empathize** - was the first phase of Design Thinking Process; The researchers have conducted an interview with the client; to discuss the problems the business is facing. With that, the researchers used the data collected to help with developing a system.
2. **Define** - this phase will show the researchers, based on the interviews, the kind of system that the client requires. The researchers continued to do interviews so that the client can offer more details that can be implemented in the system.
3. **Ideate** - in the conclusion of the interview with the client, the researchers proposed a IOT attendance system with body temperature and face mask detection to address the problems the client is having.
4. **Prototype** - The system features a Raspberry Pi as its core and is fitted with modules such a RC522 RFID Reader, temperature sensor, camera module, database, RFID tags, and a user interface.
5. **Test** - For this phase, the researchers and client tested the IOT attendance system in the employees work place. The test was done on a working day and involved the researchers, client, and employees.
6. **Implementation** - After the testing phase, the system was implemented in the workplace for full operational use for the client.

#### **4. Data Collection**

The researchers gathered data through these methods:

- **Interview** - The interviews with the client have given the researchers the necessary data to identify the needed features, hardware, and software for the system. The data served as the guide for developing the system.
- **Internet Research** - The researchers did further research through the internet to improve and enhance the system needed. Furthermore, the researchers only selected sources that are credible such as academic journals from reputable authors and websites.
- **Library** - The researchers have been granted free access to EBSCO which is a large library that consists of various academic journals and previous research papers conducted before; and served as a guide in the development of the system.
- **Survey** - The researchers conducted a survey for the employees and staff; who are the main targets of the system, to understand if the system will be reliable, effective, and to know where to improve.
- **Consultation** - the researchers reached out to professionals who are experienced in the fields of IoT systems and python to gain more knowledge in the development of the system.

##### **4.1 Data Analysis**

Based on the interviews, the client has discussed many problems the business faces, and has asked the researchers to develop a system to address the problems. The client explained that the nature of the business, a delivery service, requires his drivers to travel large distances while also interacting with many individuals and handling cargo. Furthermore, he explained that the traditional pen and paper method of recording the attendance has many drawbacks such as inaccuracy with the employees' details due to human error, records being misplaced, records getting damaged by liquid spillage, and not being able to view it in real time. This causes frustration to the client as the handling of the attendance is very unorganized and unsecured. Hence, the researchers proposed a system that is able to monitor and record attendance in a database, and-can also be managed through a user interface. The researchers also conducted a survey on May 29, 2022 to the staff and employees of Starlord Delivery Services to determine the problems that they encounter regarding the current system. The survey consisted of five (5) multiple-choice questions measured on a 5-point Likert scale. The specified clients in this study are employees, staff, and Human Resources. Participants were given time to fill in the survey and twenty (20) responded. The respondents include the supervisor, human resource,

drivers, and helpers. The most common problems that the respondents encountered were incorrect entry of time, manual time entry is time consuming, employee time theft, cost of paper and pen, and additional workload finishing the payroll. The respondents also gave suggestions for improving the current attendance system of Starlord Delivery Services. The most common suggestions were implementing an IoT system with real-time monitoring of attendance instead of the traditional method of paper and pen, measuring body temperature and face mask detection. In conclusion, the current system of Starlord Delivery Services should be improved because their system is not adequate based on the survey results. A second survey was conducted about the system's functionality, performance efficiency, usability, accuracy, portability, and maintainability. The researchers used the Likert Scale System to collect the ratings assessed by each of the respondents.

WHERE: **WM** = Weighted Mean

**w** = Number of each category, **f** = Number of respondents in each category, **N** = Total number of responses

Table 1. Likert Scale Weighted Mean

Rate	Verbal Interpretation	Score Range
5	Strongly Agree	4.21-5
4	Agree	3.41-4.20
3	Neutral	2.61-3.40
2	Disagree	1.81-2.60
1	Strongly Disagree	1-1.80

FORMULA:  $WM = \frac{\sum wf}{N}$

## 5. Results and Discussion

This chapter presents the result of the study. This includes the discussion of analysis and interpretation of the data gathered.

### 5.1 Discussion and Statistical Evaluation

The problems encountered in tracking of attendance were being surveyed and respondents of the study gave their opinions.

Table 2. The problems encountered in tracking of attendance at Starlord Delivery Services.

Indicators	WM	Interpretation
1. Employees can commit time theft	4.75	Strongly Agree
2. Manual time entry is time consuming	4.5	Strongly Agree
3. Incorrect entry of time	4.75	Strongly Agree
4. Additional cost for materials such as papers & pens.	4.6	Strongly Agree
5. Additional workload to finish the task in payroll.	4.85	Strongly Agree
<b>GRAND MEAN</b>	<b>4.69</b>	<b>Strongly Agree</b>

Table 2 presents the interpretation of the problems encountered by Starlord Delivery Services. The problems encountered gained a grand mean of 4.69 with an interpretation of "Strongly Agree", as shown in the table. This implies that the most problem encountered of Starlord Delivery Services in tracking time attendance of their employees are the possibility of committing time theft, time consuming of manual time entry, the possibility of

incorrect entry of time, additional cost of materials such as papers and pen and additional workload to finish the task in payroll which are seriously experienced.

To evaluate the effectivity and performance of the developed system, the Mean and Standard Deviation were used to describe the performance of the system based on the international standard of software evaluation or ISO/IEC25000 in terms of Functional Suitability, Performance Efficiency, Usability, Accuracy, Portability, and Maintainability.

Table 3. Performance of the System based on the International Standard of Software Evaluation or ISO/IEC25010 in terms of Functionality

Items	M	Descriptive Interpretation
The system functions all of the specified tasks and objectives.	4.8	Highly Acceptable
The system provides accurate results based on the input data.	4.9	Highly Acceptable
Overall Mean	4.85	Highly Acceptable

As shown from the table above, the overall performance of the system in terms of Functionality ( $M = 4.85$ ) based on the International Standard of Software Evaluation or ISO/IEC25010 is highly acceptable by the respondents of the research.

Table 4. Performance of the System based on the International Standard of Software Evaluation or ISO/IEC25010 in terms of Performance Efficiency.

Items	M	Descriptive Interpretation
1. The system speedily uploads and reloads with the maximum seconds or processing time required.	4.7	Highly Acceptable
2. The system works properly with its purpose and intended use.	4.9	Highly Acceptable
Overall Mean	4.8	Highly Acceptable

As shown from the table above, the overall performance of the system in terms of Performance Efficiency ( $M = 4.8$ ) based on the International Standard of Software Evaluation or ISO/IEC25010 is highly acceptable by the respondents of the research.

Table 5. Performance of the System based on the International Standard of Software Evaluation or ISO/IEC25010 in terms of Usability.

Items	M	Descriptive Interpretation
1. The system can be understood easily by the user and learn the use of the system.	4.6	Highly Acceptable
The system is easy to operate, manage and control purpose and intended use.	4.55	Highly Acceptable
Overall Mean	4.57	Highly Acceptable

As shown from the table above, the overall performance of the system in terms of Usability ( $M = 4.57$ ) based on the International Standard of Software Evaluation or ISO/IEC25010 is highly acceptable by the respondents of the research.

Table 6. Performance of the System based on the International Standard of Software Evaluation or ISO/IEC25010 in terms of Accuracy.

Items	M	Descriptive Interpretation
1. The system provides accurate data.	4.85	Highly Acceptable
2. The system, in the event of malfunction or interruption, can recover or retrieve the data when re-establishing the normal state of the system.	4.7	Highly Acceptable

Overall Mean	4.77	Highly Acceptable
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As shown from the table above, the overall performance of the system in terms of Accuracy ( $M = 4.77$ ) based on the International Standard of Software Evaluation or ISO/IEC25010 is highly acceptable by the respondents of the research.

Table 7. Performance of the System based on the International Standard of Software Evaluation or ISO/IEC25010 in terms of Portability.

Items	M	Descriptive Interpretation
1. The system can adapt or operate to different devices and working environment.	4.7	Highly Acceptable
2. The system can install or uninstall different devices required by the subject company.	4.6	Highly Acceptable
Overall Mean	4.65	Highly Acceptable

As shown from the table above, the overall performance of the system in terms of Portability ( $M = 4.65$ ) based on the International Standard of Software Evaluation or ISO/IEC25010 is highly acceptable by the respondents of the research.

Table 8. Performance of the System based on the International Standard of Software Evaluation or ISO/IEC25010 in terms of Maintainability.

Items	M	Descriptive Interpretation
1. The system is effective and efficient in the event of an update or modification without malfunctioning and will remain in normal state.	4.75	Highly Acceptable
2. The system is efficient to assess and notifies the problem in the event of failure to operate or when undergoing updates and modification.	4.65	Highly Acceptable
Overall Mean	4.7	Highly Acceptable

As shown from the table above, the overall performance of the system in terms of Portability ( $M = 4.7$ ) based on the International Standard of Software Evaluation or ISO/IEC25010 is highly acceptable by the respondents of the research.

Table 9. The Summary of the Performance of IoT Smart Entry System based on the International Standard of Software Evaluation or ISO/IEC25010.

Items	M	Descriptive Interpretation
Functionality	4.85	Highly Acceptable
Performance Efficiency	4.8	Highly Acceptable
Usability	4.57	Highly Acceptable
Accuracy	4.77	Highly Acceptable
Portability	4.65	Highly Acceptable
Maintainability	4.7	Highly Acceptable
Grand Mean	4.72	Highly Acceptable

It can be observed from the table above that the performance of the system in terms of Functionality ( $M = 4.85$ ), Performance Efficiency ( $M = 4.8$ ), Usability ( $M = 4.57$ ), Accuracy ( $M = 4.77$ ), Potability ( $M = 4.65$ ), and Maintainability ( $M = 4.7$ ) are highly acceptable by the respondents and every question in the survey form is based on the International Standard of Software Evaluation or ISO/IEC25010.

In general, the developed system is highly acceptable ( $M = 4.72$ ).



### **5.3 Proposed Improvements**

The proper orientation and training of end-users are crucial in maximizing the use of any developed system. It is essential to provide them with basic knowledge in information technology to ensure that they can handle and fix any malfunction or failure that may occur. Moreover, future researchers are encouraged to upgrade the system by modifying it and utilizing proper equipment, assessments, decision-making, and critical thinking. To ensure better maintainability, it is recommended to apply an uninterruptible power supply to prevent the system from shutting down during electricity interruptions. Additionally, to improve usability, the use of RFID cards instead of RFID tags is suggested to make the system more compatible. These recommendations aim to enhance the system's efficiency and effectiveness, and further research can be conducted to optimize its functionality.

### **5.4 Validation**

The main objective of the study is to develop the IoT Smart Entry System of RFID Attendance with Face Mask Detection and Body Temperature Monitoring for Starlord Delivery Services. This system stands as a tracker of employees' attendance digitally. Also, it serves as a monitor of employees' body temperature to carefully check if a person has a fever and will advise not to enter the working place and to take a rest day. Another is the detection of wearing a face mask for personal protection as until now, we strictly recommend the wearing of face mask in a working station to avoid the spread of the virus.

The current practices of tracking or recording employees' attendance gained a grand mean of 4.69 with an interpretation of "Strongly Agree" or respondents of the study strongly agreed. This implies that the problems encountered of Starlord Delivery Services in tracking attendance are: (1) employees may commit time theft; (2) time consuming of manual marking of attendance; (3) possible incorrect entry of time; and (4) additional cost for materials such as papers & pen and additional workload to finish the task in payroll.

The extent of compliance ISO/IEEE 25010 Software Quality Standard Characteristics based on the evidence from the data gathered prove that the developed system met the highest required Software Quality Standard Characteristics general interpretations which is "Highly Acceptable". This implies that according to the statements; Functional Suitability, Performance Efficiency, Usability, Accuracy, Portability, and Maintainability the perception of the developed system can be materialized by the future end users.

## **6. Conclusion**

The researchers therefore conclude the following: That,

1. The developed system can supervise and record employees' time log-in and the human resource or payroll master can use it as basis in payroll of the employees by showing their daily time record with calculated total hours, overtime hours, and under time hours worked.
2. The developed system can monitor the range of body temperature of the employees through a temperature scanner according to the normal body temperature indicator of 37°C based on clinical methods to assess a person with fever as a symptom of Covid-19 infection which is automatically displayed in the monitor and can be checked and recorded easily. Also, it can detect if the person is wearing face-mask for protection.
3. Based on the responses of the respondents interpreted as "Highly Acceptable" through descriptive surveys in line with ISO/IEC25010, the performance of the developed system is highly effective and recommended to use to a larger group of people.

## **References**

- Ahmad, U. S., Bisu, A., A., Umar, F., A., Balarabe, U., Radio Frequency Identification (Rfid) And Database - Based Attendance Management System, 2021. From: Bayero Journal of Pure & Applied Sciences. Available: <https://web.p.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=19&sid=e6a79ecb-a557-4966-9314-7b5924a6c3e8%40redis>, May 17, 2022.
- Cui, X., Wang, P., Wei, Z., Emergency use of COVID-19 vaccines recommended by the World Health Organization (WHO) as of June 2021. Retrieved from EBSCO Available: <https://web.s.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=15&sid=434d7161-9165-4a2a-b3ec-8a9b5ca6412c%40redis>, March 25, 2022.
- Dey, S. and Amin, B., Best Practices for Improving User Interface Design, 2019. DOI: 10.5121/ijsea.2019.10505. Retrieved September 5, 2019.

- Ding, R., Improving Efficiency and Accuracy for Training and Inference of Hardware-Aware Machine Learning Systems. Carnegie Mellon University Pittsburgh, PA, 2020. Available: <https://www.proquest.com/docview/2377671052/94E36F5C66E541EBPQ/1>, March 18, 2022.
- Fu, X., Design of Facial Recognition System Based on Visual Communication Effect. from: EBSCO, 2021.
- Gabatbat, D. M. C. A., Saint John Academy of Visual and Performing Arts Students and Employees' Attendance Monitoring with Payroll And E-Bulletin Using Rfid. International Journal of Advanced Research in Computer Science, vol. 12, no. 4, pp. 29–33, 2021. Available: <https://doi.org/10.26483/ijarcs.v12i4.6753>.
- Gargaro, D., The pros and cons of facial recognition technology, 2003.
- Koolstra, H., Berreth, A., Development and testing of an Internet-of-Things (IoT) based system for remote monitoring of thermal environments in swine barns, 2021.
- Lin, W., L., Hsieh, C., H., Chen, T., S., Chen, J., Lee, J., L., Chen, W., C., Apply IOT technology to practice a pandemic prevention body temperature measurement system: A case study of response measures for COVID-19, 2021. Available: <https://web.p.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=6&sid=5c8ddc9a-1222-4b0a-98f8-811aa9096a1f%40redis>, April 18, 2022.
- Potential therapeutic opportunities. Available: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7256510/>, March 13, 2022.
- Santana, D., Suthaharan, S., & Mohanty, S., What we learn from learning - Understanding - ProQuest. (n.d.), 2018. Www.proquest.com. Available: <https://www.proquest.com/docview/2153621472/B96CA83937A04173PQ/2>, March 23, 2022.
- Steinberg, J., Kennedy, E., D., Basler, C., Grant, M., P., Jacobs, J., R., Ortbahn, D., Osburn, J., Saydah, S., Tomasi, S., Clayton, J., L., COVID-19 Outbreak Among Employees at a Meat Processing Facility —South Dakota, March–April 2020.
- Sullivan, S. J., Rinaldi, J. E., Hariharan, P., Casamento, J. P., Baek, S., Seay, N., et al., Clinical evaluation of non-contact infrared thermometers. Available: <https://www.nature.com/articles/s41598-021-99300-1>, March 21, 2022.
- Sun, Yongliang, Employee Productivity Is Boosted Psychologically by Keeping Attendance System, CSR, Entrepreneurial Intentions, and Machine Learning Behavior, 2022. Available: Employee Productivity Is Boosted Psychologically by Keeping Attendance Syst...: EBSCOhost, July 1, 2022.
- Walton, P., Artificial Intelligence and the Limitations of Information, vol. 9, no. 12, pp. 332, 2022. Available: <https://doi.org/10.3390/info9120332>, March 23, 2022.
- Wright, T., Exploring the Evolving Concepts of Artificial Intelligence. from PROQUEST: Available: <https://www.proquest.com/docview/2468377736/8AB4F1B933834F46PQ/1>, March 18, 2022.
- Varona, D., Lizama-Mue, Y., & Suárez, J. L., Machine learning's limitations in avoiding automation of bias. AI & SOCIETY, 2020. Available: <https://doi.org/10.1007/s00146-020-00996-y>
- Zhang, Mingyi, Martin, Patrick, Powley, Wendy, Chen, & Jianjun, Workload Management in Database Management Systems: A Taxonomy, 2018.
- Zhang, Wei, Luan, Shang, Tian, Liqi, A Rapid Combined Model for Automatic Generating Web UI Codes. Retrieved July 1, 2022.
- A Rapid Combined Model for Automatic Generating Web UI Codes: EBSCOhost, July 1, 2022.

## Biographies

**Ralph Louise Canlas** is an adaptable student currently pursuing a Bachelor of Science degree in Information Technology, with majors in Network Infrastructure and Cloud Computing, at Angeles University Foundation located in Angeles City, Philippines. Ralph was born in a small town in the Philippines in the Mid-1990s. From a young age, he showed a natural aptitude for technology and was fascinated by computers and the internet.

After completing his high school education with excellent grades in science and mathematics, Ralph enrolled in a top university to study information technology. He quickly became a dedicated student, devoting himself to mastering the complex concepts and cutting-edge technologies that were taught in his courses. He excelled in his studies, consistently achieving top grades and earning the admiration of his professors and peers alike.

Outside of his academic pursuits, Ralph was always exploring new technologies and developing his skills through personal projects and online courses. He participated in hackathons, coding competitions, and other events that allowed him to showcase his talents and connect with other like-minded individuals in the tech community.

As he progressed through his studies, Ralph began to focus more on specific areas of IT that he found particularly interesting, such as cybersecurity, artificial intelligence, and data analytics.

Despite his success, Ralph remains humble and always eager to learn more. He is passionate about using technology to solve real-world problems and improve people's lives, and he hopes to make a significant impact in the field of IT in the years to come.

**Justine Gabriel S. Abria** is a hard-working student currently pursuing a Bachelor of Science in Information Technology, with a specialization in Network Infrastructure and Cloud Computing in Angeles University Foundation. Justine was born in the humble town of San Fernando, Pampanga, Philippines. He came to a small, blessed, professional family, which helped him grow independently. Since then, Justine enthusiasm to learn, earned him certificate and badges in Enterprise Network Security and Automation, Routing and Switching Connecting Network, AWS Academy Cloud Architecting, AWS Cloud Foundation, Azure Fundamentals Cyber Security Essentials, Introduction to Cybersecurity, IT Essentials, build 2020: Innovating the Future and recently he passed the exam in AZ900 and PL900. Those badges and certificates set an inspiration to Justine to explore and learn more with his expertise in order to improve his specialization and personality. Despite the hardship he experiences in his journey as an BSIT student, Justine remained passionate and enthusiastic with his chosen field. He continuously humbled himself and explored the things in the IT field.

**Reginald S. Bruehwiler** is a motivated individual currently pursuing a Bachelor of Science degree in Information Technology, with a specialization in Infrastructure and Cloud Computing, at Angeles University in Angeles City, Philippines. As a passionate and knowledgeable IT enthusiast, he has earned his certification in AZ-900, demonstrating his expertise in cloud computing and infrastructure. Additionally, Reginald holds a Bachelor's degree in Entrepreneurship from Silliman University in Dumaguete City, Philippines, which further enhances his skills in problem-solving, strategic planning, and decision-making. He has shown exceptional leadership qualities in both his academic and professional pursuits, and his dedication to excellence has earned him a reputation for reliability and dependability. Reginald is committed to advancing his knowledge and skills in the ever-evolving field of information technology. With his passion for learning and his drive to succeed, he is poised for a successful career in the IT industry.

**Sharon Wendy T. Mallari** is a working student living independently, currently enrolled at Angeles University Foundation (AUF) pursuing the degree of Bachelor of Science in Information Technology (BSIT), Major in Infrastructure, Cloud Computing, and Cloud Architecture. Started working at the age of 16 to present, Sharon has gained various certifications, badges, and experiences as a Virtual Assistant to a Virtual Representative till she landed a Junior Web Developer position. Ms. Mallari is dedicated to whatever job she's given; she gives her perfectionist side some might say. Sharon also has experience working as a Waitress, a Crew, and as a Customer Service Representative (CSR). She has handled Dropshipping Companies affiliated with VIP Accounts to LBC and J&T Express too. Aspiring Web Developer with basic experience of Frontend and Backend Development through Shopify and WordPress. Eager to acquire more knowledge and skills while also continuously exploring the wonders of the IT Industry.