

A Comparative Study and Analysis of Various Attendance Monitoring Systems and Technologies

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Abstract

This paper briefly discusses the various attendance monitoring technologies from manual to automated monitoring systems. Also, the Authors discussed on the impacts through strengthening the key features in contributing a more timely and efficient performance of employees, students and other external parties. Extended research of evolving attendance systems will be discussed further.

Keyword : Attendance monitoring, biometrics, RFID, DNA, web-based attendance system

1. Introduction

Online work management systems nowadays give us an opportunity to incorporate accurate and efficient techniques in running an organization. The activities of the business, the performance of students in a class, and the behaviour of employees inside the working schedule and other internal and external transactions are taken into account properly with the use of different monitoring technologies.

There are instances where the quality of a product or services of the business are sacrificed. The unequal distribution of quality over quantity is negatively affected. Just like an employee who is reconciling his number of absences but doesn't pay much attention with the quality of his work resulting to poor output. So employee efficiency should always come together with product effectiveness. In short, quality and quantity should come together[1].

In an organizational structure, the behaviour of employees are evaluated based on their working performance and one specific evaluating feature is monitored through their daily attendance. To ensure sufficient service, positive working ethics, and to meet expected productivity and functional standards throughout the organization, members will be held accountable for observing their proper work schedule. If the person is unable to meet this requirements and obligations, he/she must submit to their

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supervisor[2].

Same scenario can be observed in evaluating the performance of the students inside of the class. The student must meet the required attendance percentage and schedule which will help educators in evaluating the weakness and strength of each student in the class. This also secures the integrity of information for the knowledge of parents and other external parties interested and authorized.

Technology as we all know has a great impact on learning and education. The future roles of technology in the advancement of learning made human life easier in ways that the monitoring of attendance can be done in a single click[3]. The topics in this paper are arranged as follows: Section 2 compares the traditional over the automated monitoring system. In Section 3, the basic framework of Attendance Monitoring System will be introduced and followed by the Section 4, which deals with the main characteristics composing the attendance monitoring system. The types of attendance monitoring systems are compared in Section 5. Lastly, future works will be discussed in Section 6 as the concluding part of this dissertation.

2. Manual versus Automated Attendance Monitoring System

Long before, the manual system requires to employ a high-skilled and diligent people who provided stamped cards to employees every time they log in or out of the workplace. Nowadays, there are still few companies that are using this kind of attendance monitoring system.

On the other hand, the automated system, have different types. From using bar code badges, to electronic tags, to using the different kinds of biometrics (e.g., finger, hand, eyes, etc.), to the use of swipe cards with magnet, and also the various kinds of touch screens where one can punch in a password are just few of the many systems that are in use today. These systems work very well in noting the activities of an employee while issuing them a warning in case desired by the management[4].

From the figures above, the automated attendance system reduces the reporting process of the employee compared to giving a smooth swipe of timecard or scanned biometric finger. Although some automated attendance monitoring systems costs are expensive, the level of convenience is also guaranteed in implementing a smarter, faster and leaner systems.

No.		PAY ENDING 7/11	
NAME John Reilly		AMAS401-2	
SUNDAY	AM	OUT	
	NOON	IN	
		OUT	
	PM	IN	
SATURDAY	AM	OUT	
	NOON	IN	
		OUT	
	PM	IN	
FRIDAY	AM	OUT	JUL 10 PM 5:00
	NOON	IN	JUL 10 PM 1:05
		OUT	JUL 10 PM 12:00
	PM	IN	JUL 10 AM 8:00
THURSDAY	AM	OUT	JUL 9 PM 5:44
	NOON	IN	JUL 9 PM 1:35
		OUT	JUL 9 PM 12:30
	PM	IN	JUL 9 AM 8:01
WEDNESDAY	AM	OUT	JUL 8 PM 5:00
	NOON	IN	JUL 8 PM 1:18
		OUT	JUL 8 PM 12:15
	PM	IN	JUL 8 AM 8:15
TUESDAY	AM	OUT	JUL 7 PM 5:05
	NOON	IN	JUL 7 PM 1:00
		OUT	JUL 7 PM 12:01
	PM	IN	JUL 7 AM 7:55
MONDAY	AM	OUT	JUL 6 PM 5:00
	NOON	IN	JUL 6 PM 1:00
		OUT	JUL 6 PM 12:00
	PM	IN	JUL 6 AM 8:00

DEDUCTIONS		HRS.	AMT.
F.O.A.S.			
INC. TAX			
OT			
W			
E			
R			
TOTAL \$			

TOTAL PAY	
TOTAL DEDUCTIONS	
NET PAY \$	

[Fig. 1] Sample Manual Attendance System known as Time Card[5]



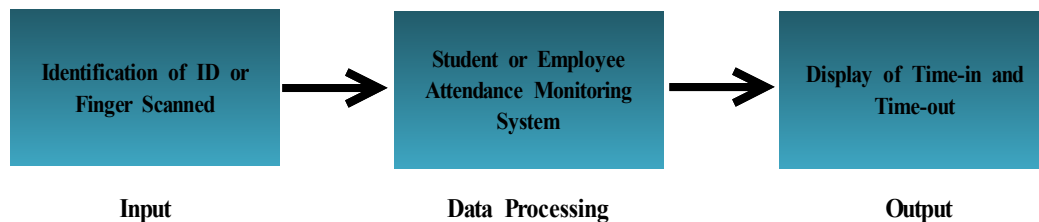
[Fig. 2] Old Time Clock where you insert the Time Card and punch it in logging in[6]



[Fig. 3] Fingerprint Attendance System[7] and automated time card attendance system using ID[8]

3. Basic Structure

Whether it is manual or automated, the basic process of data communication is the same that can be observe in the process of attendance monitoring. In the input process, the manner of punching the timecard, tapping the ID or putting your finger in the recipient machine enables the employee and student to enter their identification data and will be verified. As the attendance monitoring system processes the date received from the input stage, it validates and sends information to other functions of the monitoring system like payrolls and human resource functions. In the output stage, the result of the data processed appears and is called time-in or the time-out of the employee or student. The[Fig. 4] below illustrates this.



[Fig. 4] Basic Attendance Monitoring System Structure

There are also instances where the output stage ends up like a message notification or information update to end users. In the case of students, some High School Universities implements in attendance monitoring system that their parent will be notified through an SMS message regarding their attendance

report. This will positively motivate students to participate and behave accordingly to the required schedule. For schools, the faculty members are the ones who is responsible in the attendance monitoring of the students. While the supervisor or human resource officer takes in-charge of the employees' attendance monitoring in a company. Malpractice and disobedience of schedule or any other conflicts regarding the attendance will be automatically traced by the system.

4. Key Features of Attendance Monitoring

Every monitoring system has its own unique features and characteristics. Here are the main characteristics of a strong attendance monitoring system.

4.1. Security

To secure privacy and confidentiality of data communication, it should have a strong security system. Attendance monitoring system like automated types, are not complicated to use, fast and secure.

4.2. Reliability

To provide reliable information to the whole organization especially to the end users, all information must be correct and free from bias. If a person log-in at 7:55 am of Monday, it should be also the same figures that will appear in his time-in.

4.3. Efficiency

Biometric is a good example of an efficient attendance monitoring system. In this feature, the fingerprint or hand of the person is used in logging in is unique, thus, allowing the biometric scanner to give a proficient level of data output to intended users.

4.4. Accuracy and Timeliness

All data inputted in the attendance monitoring system should be precise and on time. It is very important to have timely information.

5. Types of Attendance Monitoring Systems

There comes a difference in the record keeping depending if the person is either an employee or a student. Attendance monitoring system for students usually records their academic progress, teacher comments and standardized test scores. The system for employees contains the employment history, performance information and references[9].

5.1. Student Attendance Monitoring System

This tracks the students' attendance and performance and mails directly to parents the output of each student's performance.



[Fig. 5] Sample Student Attendance Monitoring System through RFID[9]

With the monitoring system, the information can be easily printed or a soft copy can be sent directly to the parents' personal email accounts or thru an SMS message. In here, the information composed of the student's attendance to class is recorded everyday and all other input data like grades which the system provides in the means of updating the record. Another example is the web-page based systems discussed in Section 5.4.

5.2. Employee Monitoring System

Employee absenteeism is regarded as voluntary or involuntary based on the reasons provided by an employee or supervisors[10]. It is important for the company to train its employees to be committed not just in their daily work but to the organization as a whole.

The most common evaluating factor for employees is based on their attendance.



[Fig. 6] Sample employee attendance monitoring system through fingerprint and hand recognition and password based system[11]

5.3. Biometrics

In the innovating world of technology, biometrics paved the way to a higher level of identification and have been widely ultimately for the purpose of automatic recognition. There are various biometrics utilized for each specific system which will be discussed below.



[Fig. 7] Sample of Biometric Attendance System through Fingerprint Recognition

Biometric system uniquely identifies the human as in the attendance monitoring management, the use of biometrics is considered as a secured approach. It can be categorized into the following types like fingerprint, voice, palm, DNA, Iris, Signature, and facial recognition.

Human fingerprints are known as one of the most developed biometric technologies and have been widely used in forensic laboratories and identification units[12, 13]. Nowadays, it is also used by companies, academic institutions and all extended users in attendance and security systems.

The voice authentication method is another type of biometric security which is opt to eliminate the possibility of fake attendance using other biometric and non-biometric attendance monitoring technologies. It also serves as a password security when you enter a room, one cannot simply fake the sole features of voice. The cost is expensive and usually, suitable to large scales firms[14].



[Fig. 8] Hand and Palm Scanner[15]

Another, the hand recognition process is one of the popular biometric technologies especially in attendance monitoring. Through a robust and other genetic features, the accuracy of hand methodology increases the development and reliability of biometric security[16]. Hand geometry method was also proposed[17] and can be applied in different environments (e.g., attendance, crime investigations, and medical examinations).

DNA (deoxyribonucleic acid) information and profiling, paved the way in contribution of identification and recognition of profiling. The uniqueness of one's DNA shows the physical and behavioural characteristics of the different users which reduces fraud and anomalies especially in organizational

monitoring and management.



[Fig. 9] Fingerprint and Facial Recognition[18]

Other features of identification monitoring systems, the facial biometrics, iris and dental recognition combined are studied as a multifactor authentication system too. In some organizations, the users' facial identification serves as an automatic key in accessing internal environment or simply logging in requiring an advanced sensor camera.

5.4. Web-Based Attendance Monitoring System



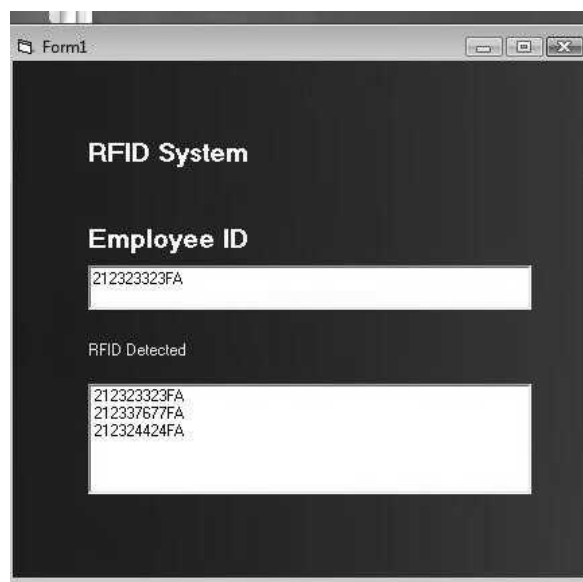
[Fig. 8] Sample Web-page based monitoring system[19]

Considered as one of automated technologies in the innovation of attendance monitoring, this attendance system process efficiently and time-saving. The risks also of losing attendance data are eliminated and the different attendance reposts can be easily generated through efficient output response.

Here, the user simply logs-in his ID information (e.g. name, department, student ID No., etc.) and automatically inputs the time the user logged in. In other cases, if there is an error in logging in, the possibility of invalid date entry was met. In companies, universities and other institutions, CCTVs are installed near the attendance to heighten the security and prevent anomalies inside the organization.

5.5. RFID

RFID is defined as Radio frequency identification learned back during 1985, initially appeared in tracking and access application. Known as a wireless device system, it allows for non-contact reading and effectively exists in manufacturing and other hostile environments where barcode labels could not subsists[20].



[Fig. 10] Sample RFID Monitoring Process showing the employee IDs detected after logged in[21]

RFID-based system of attendance monitoring potentially provide more services to automate educational institution's processes. The integration of other societies within the campus is easily monitored in an

automated manner[22].

6. Conclusion and Future Recommendations

The invention of Attendance Monitoring System greatly affects the performance of the student or employee in managing organizational behaviour and academic performance. The result of this study analysed and compares the various attendance monitoring technologies associating non-automated and automated types. The potential benefits are briefly discussed which is very important in the contribution of advanced monitoring technologies. Furthermore, anomalies and other data risks are eliminated in the implementation of the discussed monitoring systems as exemplified in the biometrics application in attendance monitoring. Further research on the evolving methodologies of electronic attendance system will be discussed in the future.

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