The Performance of Biometric Attendance System (BAS): CTU-Tuburan Campus as case study

Alden Q. Gabuya Jr.[1*], Leo T. Zosa[1], and Joemar T. Miñoza[2]

[1]Industrial Technology Department, Cebu Technological University–Tuburan Campus, Brgy. 8, Poblacion, Tuburan, Cebu, Philippines
[2]College of Arts and Sciences, Cebu Technological University–Tuburan Campus, Brgy. 8, Poblacion, Tuburan, Cebu, Philippines

Abstract- This study aimed to evaluate the performance of the Biometric Attendance System (BAS) of Cebu Technological University-Tuburan Campus during the calendar year 2018 as basis for a proposed system improvement. This study used the quantitative research employing descriptive method that assessed the performance of the Biometric Attendance System as to timeliness, accuracy, graphical user-interface and system maintenance. The study was conducted at Cebu Technological University-Tuburan Campus, Tuburan, Cebu. There were 96 teaching staff and 48 non-teaching personnel who were chosen randomly to evaluate the performance of the Biometric Attendance System. Weighted mean was used to analyze and interpret the data. This study revealed the following findings: the BAS has six (6) features which are touch-screen user interface (TUI), system setup, administrators, finger registration, clock configuration and DTR pint menu. The overall performance of the biometric system was very satisfactory in terms of timeliness, accuracy, and graphical-user interface. Hence, biometric system has always ensured employees' timeliness, provided accurate employee attendance record, and accommodated well the employees in their daily use of the biometric. Thus, it utilized a corrective form of maintenance only for emergency cases or is done after the problem occurred such as system reboot for downtime related issues and database backup. Lastly, "employees forget to log in/out" is found out to be the number one (1) problem in the daily use of biometric system. Formulation of a proposed system improvement on the lapses of the performance of the current biometric attendance system is the output of this study.

Index Terms- Performance, Biometric Attendance System, Timeliness, Graphical User- interface, System Maintenance

*corresponding author: aldenjr.gabuya@ctu.edu.ph

I. INTRODUCTION

In people's lives today, computers are getting more intelligent as they take in more about human thinking process. This procedure has advanced the speed of doing office works and furthermore helped in basic leadership of organizations. Moreover, these personal computers keep on making individuals think more intelligent. They likewise reform workplaces and school methods in smooth and quick task. Truth be told that personal computers are more helpful when they are utilized not simply in an activity. Truth be told that personal computer are more valuable when they are utilized not simply to perform calculations, but likewise to store an expansive amount or tremendous measure of data or date in a drawn-out stretch of time. In other words, they have the capacity to impact human choices, changing the way people work into a superior one and enhance individuals' capacity to convey (Whitney, 2017).

From generation to generation, numerous kinds of frameworks and even advances are being produced and broadly utilized. Using new advancements and frameworks, manual exercises have been changed to work quicker, make errand less demanding and deliver more dependable yields. Nowadays, huge associations or organizations and school exchanges need to actualize attendance monitoring. Monitoring of

attendance is perceived as an essential component in supporting both employees' security and performance (Thakkar, 2015).

In recent years, due to globalization and industrialization of our nation there is a rise of employment opportunities which can be available to every prospect applicant. These employments are present in every establishment that utilizes manpower and human interactions. This innovation is the utilization of science to social event, recording, handling and conveying of business data by methods for electronic media. Most regular apparatus for application is the PC and it includes all the exchange handling framework, administration data framework, different business emotionally supportive network and so forth. The PC is a focal power in the headway of different associations. Some notable examples are hospitals, hotels, department stores, airport, security agencies and specially universities (Ware, 2015).

Validation is the way toward deciding if a person is who he or she claims to be. This procedure can happen in one of two ways. Confirmation asks "Is this the individual who he or she claims?" and comprises of a solitary correlation. Distinguishing proof makes a one-to-N examination and tries to decide whether the individual is one of the N individuals. A few variables, for example, what you know, what you have, or what you are can be utilized for validation, with each of the three alternatives having qualities and shortcomings. For enhanced security, it is prudent to utilize in excess of one factor, if conceivable. Biometric verification is a "what you are" factor and depends on one of the forms of individual qualities. Two varieties of biometric properties are useful for verification. Physical biometrics comprise of DNA, fingerprints, facial acknowledgment, and eye exams (iris, retina). Conduct biometrics comprise voice acknowledgment and written by hand marks (Mustafa Erden, 2017).

The biometric approval process involves a couple of stages: estimation, flag preparing, outline organizing, and fundamental leadership. Estimation incorporates identifying biometric properties and is imperative both for the making of the reference show and for each approval preliminary. For instance, when voice check is used, this stage includes recording one's voice through a receiver. At that point the computerized information is numerically displayed. At the point when the client needs to be confirmed, the gadget thinks about the information to the client model and settles on a choice for the most part in view of a pre-figured edge (ŘíhaZ. , 2002).Biometric validation frameworks are not a hundred percent precise. There are two sorts of error in a run of the mill biometric framework. A false reject (FR) mistake is the dismissal of a permitted personality endeavoring to get to the framework. A false acknowledge (FA) mistake is the acknowledgment of an individual who isn't in actuality who claims to be (Dass, S.C., et. al., 2006). These two kinds of mistakes are conversely relative and when all is said and in done can be controlled by a certainty edge. To build the security of the framework, the edge can be expanded, which diminishes FA mistakes and builds FR blunders. Points of interest of biometric frameworks include (1) Enhanced security, (2) Enhanced client encounter, (3) Can't be overlooked or lost, and (4) Decreased operational expenses. On the other hand, the disservices of biometric frameworks are (1) Environment and use can influence estimations, (2) Frameworks are not 100% exact, (3) Requiring mix as well as extra equipment, and (4) Cannot be reset once traded off (Sahoo et. al.,2012).

Computerized biometric employee clocking system is an automated process that verifies workers identity and captures employee traits with high speed (in one second or less) with high levels of accuracy. Computerized biometric employee clocking systems that are well managed are crucial in the overall performance of any organization. An effective computerized biometric system should address attendance timing, employee identification, and payroll computation. An effectively implemented computerized employee clocking system should lead to more accurate employee attendance records, eliminate the practice where employee clocks in and out for their colleagues 'buddy punching', more authentic identification of workers, and more accurate payroll computation for workers, which leads to happier and productive employees (Shehu & Dika, 2011).

When working time is managed well, employees conscientiously perceive their work. Employees who do not attend to their duties are identified among the workers in the workplace and are encouraged to improve. Improved job satisfaction may be realized through effective computation of overtime, management of extra workload, andrecognition of hard work. The employer can also be able to identify areas of high employee absenteeism in the workplace which can be used to re-organize work.

The history of the time clock dates back to the late 1800s when the first-time clock was invented. The time clocks were used to record the time workers reported to work and left work. The time check mechanically indicated the day and time on the card. This provided the factory owner the actual time worked by the employee. Employers paid for actual hours worked by employees. The system of keeping track of hours labored has always been a problematic task. Among the most famous of these standards on the clock punch in structures are the time card, the punch clock, and time sheets. Each of these picks has their very own disadvantages. During the past several decades, companies have slowly begun integrating software and contemporary clocking terminals to greater precisely tune employee attendance. Through the years, various options have been created for monitoring employee attendance and the time clocks have evolved to give rise to the current computerized biometric employee clocking systems (Mitrefinch, *Advance Systems,* 2016).

In the 20th century, the need to accurately track employee hours has emerged as an essential part of running a business. Laws were put in place to protect employees and make certain they had been precise compensated. Businesses began the usage of a range of strategies of monitoring worker time. While these techniques allowed businesses to report employee time, they also possessed flaws. The foremost negative aspects of these common systems are: (1) potential for human error, (2) employees can commit time theft, (3) manual tracking is time consuming, and (4) inefficient and outdated. While the advantages of upgrading to an automated time tracking solution are: (1) prevent payroll error, (2) prevent time theft, (3) improve efficiency and (4) increase productivity.

Software for commercialization of time clocks appeared for the first time in the 1990s. Prior to commercialization of time clocks, electrical time clocks that were in use were prone to failure, expensive to maintain and repair. The use of clock software has enabled employers to minimize payroll processing costs and expenses. This by extension has made payroll processing much faster and efficient. Computers have continuously become more complex which have also led to evolution more versatile attendance timing systems. The range

of application for current time and attendance software includes absence management, management of vacation, sick days and holidays, automatic tracking of attendance, management of overtime, real-time data and online payroll.

The operational performance of a firm according to Brown, (2008) can be evaluated on prescribed indicators that may include efficiency and effectiveness. Operations transform inputs that produce services or products that translate to value for stakeholders. Business operations should be coordinated well to realize the targets that are set in workplace. In the workplace, business operations involve storage of materials, transportation, processing and inspection of activities. Business operations according to Brown (2008) deal with human resource, location where activities are done, the equipment that are used and the processes that are undertaken. These elements of operations should be combined well to enhance operational performance of an organization. Russel and Taylor, (2011) proposed that every employee should be provided with knowledge and skills that they can utilize to attend to customers promptly for efficiency in operations.

According to Battesse, (2005) the operational performance of an organization can be enhanced through the streamlining of main activities and processes that an organization engages. Organizations are expected to continuously position themselves and be dynamic in the context of the ever-changing market forces. Organizations should strive to attain high levels of operational performance. Organizations should continuously reduce wastages of time and resources while making optimum use of employees and utilizing appropriate technology to manage operations. Firms are said to be effective if they formulate appropriate strategic goals, and efficient if they achieve the goals with minimal resources. Battesse (2005) proposed consequences for increasing operational efficiency, which include lowering costs, enhancing client satisfaction, and staying beforehand of the competition. This helps in imparting employees with invulnerable and constant access to information.

The life span of the biometric is especially engaging in the verification procedure and the way that a biometric can't be changed. Today, one can undoubtedly change secret key, PIN or even keys, yet with the biometrics it is an incredible inverse. In the meantime, as it is difficult to manufacture a biometric include (it is difficult toput a false unique mark or influence the retina to appear as though someone else's) it is very simple to produce once the reference format has been duplicated or stolen, as we can send in photographs of those, we assert we are or examine their marks and utilize them over and over. The primary issue is that once it is stolen, it is stolen forever. A person has recently that numerous fingers, irises and just a single face.

Henceforth, one of the greatest open feelings of dread is the potential abuse of the individual biometric information. Despite the fact that the standard on which the biometric innovation is based is not the slightest bit new, the advancement and the spread of the innovation in the ongoing years has been continuing in an extremely quick pace. While the innovation is extremely engaging from the security outlook, and the most solid and exact type of distinguishing proof and check, there are not kidding contemplations and worries that this innovation raises. No biometric innovation is hundred percent precise and it experiences biometric-particular dangers. It represents a danger to protection, raises worries about its utilization in following and observation and conceivable abuse of the halfway put away data on people. In the same class as the biometric innovation is, we do realize that no framework is foolproof.

Biometrics is considered as a promising arrangement among conventional techniques in view of "what we possess, (for example, a key) or "what we know, (for example, secret key). It in light of "what we are" and "how we carry on". Biometric verification frameworks have numerous applications (Jain et. al., 2004): fringe control, web business, colleges, and so on. The fundamental advantages of this innovation are to supply the most advantageous security and to inspire the validation method for a client. Likewise, it is usually difficult to duplicate the biometric attributes of an individual than the higher section of the other validation techniques, for example, passwords. The fingerprint is the most popular way to biometric authentication. The pattern of the ridges and furrows of the fingers are unique for each individual. Therefore, based on the pattern of the ridges, furrows and minutiae points a person is identified or verified (Hasan et. al., 2013). The advantage of fingerprint biometric system is that it is socially acceptable, easy to collect the fingerprint and even the fingerprint of each finger on the same hand are different from each other. The limitation of the fingerprint is that, the factors like a person's age, occupation or any kind of accident might make it difficult for the sensors to capture the fingerprint (Goudeliset.al., 2008).

While the biometric system is considered to be a secure way of authentication, the impostors also created new ways to bypass the security of the biometric system. The mainproblem with the biometric based authentication is that biometric trails are not secret. Intruders can easily get access to the fingerprints, face image, etc. According to the study of Kamaldeep (2011), there are eight possible attacks against biometric systems. It indicates the different assaults on the one-of-a-kind points on the biometric system for verification, and these are: (1) attack on the sensor, (2) replay attack, (3) overriding the feature extractor, (4) attack with the aid of synthesized function vector, (5) overriding the matcher, (6) assault on the database, (7) assault on the channel between the matcher and database, and (8) overriding closing decision.

The Biometric Attendance Monitoring System of Cebu Technological University-Tuburan Campus is a fingerprint-based mechanized observing framework that will encourage a quicker and simpler checking of the attendance of employees both teaching and non-teaching. This framework will spare time, lessen the measure of work the chairman needs to do and will supplant the stationary material with electronic mechanical assembly.

The increasing population in Cebu Technological University (CTU) -Tuburan Campus is due to higher numbers of enrollee and expanding growth of teaching personnel. In the administrative area, a timely, effective and efficient way is required in recording Daily Time Record (DTR) of every personnel. A smoother process is needed to maximize time management. Avoid crowding a specified area that would cause delay and create additional problems.

The current system is utilizing Biometric Fingerprint Scan in DTR logging. Biometric Fingertip Scan has the current advantages of improved security, electronically recorded, better management compared to traditional time-sheets. Regardless of these advantages with its implementation there are still a number of disadvantages present that didn't get address with the current system. One problem that was

experienced in the Tuburan Campus, the current system causes crowding and delay since it is accessible only in one point and a large number of users is simultaneously using it. Accuracy, timeliness and efficiency are compromised in its operation. Environment and usage can affectmeasurements which may lead to false readings and time delay. The system cannot be reset once compromised and can take time for repair. It requires integration and/or additional hardware which is costly. User factor can also cause errors to the system which decreases its functionality. Lack of real- time tracking of every personnel is observed. All these flaws need to be resolved to have a more effective system accessible to everyone with added benefits and reliability.

In a certain way, one thing that is still in manual process is the recording of attendance of their employees in utilizing logbook in their every day time record or in short it is paper- based. Others may exploit by punching co-workers' card in the Bundy Clock. Thus, it can't generally screen employees who are getting as often as possible absent or late. Furthermore, they need to react to the call of mechanical headway so the school will have the capacity to serve the entire employees with most extreme administrations. Along these lines, the researcher embraces this study to enhance/improve the current Attendance Monitoring System utilizing Biometric of Cebu Technological University- Tuburan Campus due to its apparent significance in order to monitor the attendance of the employees easily, accurately, efficiently and effectively.

The main purpose of this study is to evaluate the performance of Biometric Attendance System of Cebu Technological University-Tuburan Campus during calendar year 2018 as basis for a proposed system improvement.

II.   MATERIALS AND METHODS

The study is quantitative research employing descriptive technique to determine respondents' level of delight to the overall performance of the current Biometric Attendance System. This kind of research work needs extra specification on statistics gathering. The research method normally used has significance in the research methodology due to the data imperative for this completion of this work is all concise and the capacity to discuss it with the survey.

Formulation of a proposed system improvement on the lapses of the performance of the current biometric attendance system is the output of the study.

Environment
This study took place in Cebu Technological University- Tuburan Campus, one of the campuses of the CTU system located at Brgy. 8, Tuburan, Cebu, Philippines. The townnestled in the northern part of Cebu Province. Tuburan is the second-class municipality in the province of Cebu.

Sampling Method
Samples were determined by random sampling in each site using Likert scale survey questionnaire.

System Features
The features of the current biometric system in CTU-Tuburan which utilizes the DTR system Setup version 1.9.1.0 running on a Windows 7

Operating platform that provide the information menus, screens, interactive and administrator and/or user defined setup configuration such as:

A.   Touch-screen User Interface
The Touch Screen Interface or TUI is a special kind of GUI using a touch-pad or a touch-screen display as a combined input and output device. In TUI, the display screen is pressure sensitive where the user interacts with the machine by tapping the screen surface using fingers or stylus. On tapping, the system compares the actions stored in the database and executes appropriate commands.


Figure 1.*Touch-screen User Interface (TUI) used in the study.*

B.   System Setup Menu

The System Setup Menu describes the database setup which is connected to the database host computer defined with its static IP (Internet Protocol) address:
192.168.36.250, where user ID and password are setup. Thus, in this menu Other Configurations like Background Image can also be setup or changed. This feature also sets rules for network setup and the like.

Figure 2.*System Setup Menu*
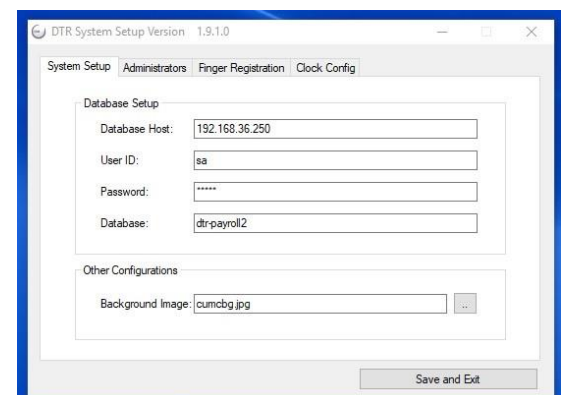
C.   Administrators Menu

A top-level *menu* displays as section in the *administrator's menu* and contains sub-level *menu* items. A sub- level *menu* means the *menu* item is a member of an existing *menu* where another authorized administrator ID (Identification) can be added and can deleted from the database host computer with the permission from the MIS (Management Information System) In-Charge.

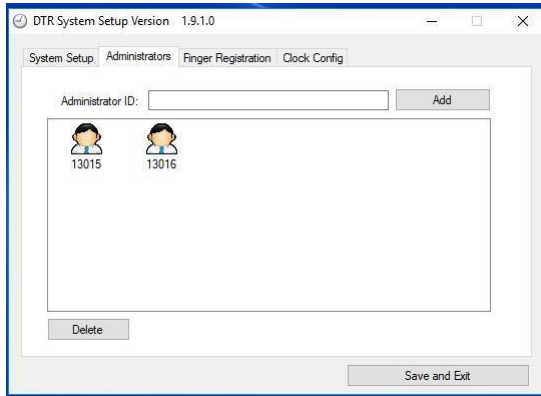attendance. This section also allows the administrator and/or the MIS In-Charge to remove employee from the list and clear fingerprint registration in case of retirement, resignation, reassignment, AWOL and the like. It likewise allows to save data after the registration process. This feature is anchored in the daily time record (DTR) print menu.

Figure 4. *Finger-based Registration Setup*

Figure 4. *Finger-based Registration Setup*

Figure 3. *Administrators Menu*

D. Finger-based Registration Setup

The Finger Registration menu allows the administrator to register each employee through fingerprints as the biometric data which is intrinsically connected to an individual employee and provides a detailed audit trail of employee
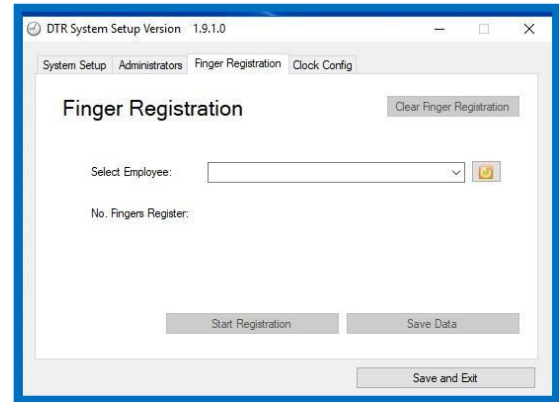
E. Clock Configuration Setup

The purpose of this menu/feature is to help the administrator *configure* themicrocontroller *clocks*, taking into consideration product parameters such as power supply. This section also describes the system clock schemes which are the hour hand, minute hand, second hand, ticks, and digits color. This menu is an added feature to the graphical-user interface (GUI) of the system.
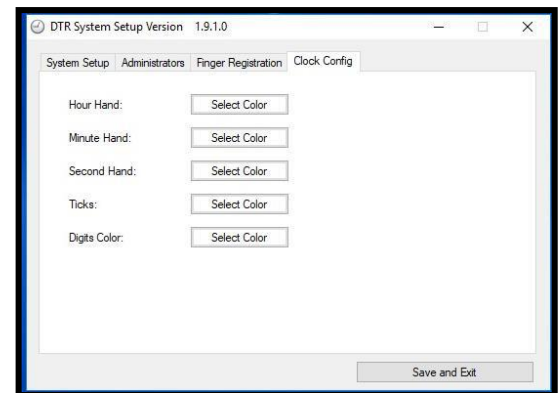

Figure 5. *Clock Configuration Setup*

F. DTR Print Menu

This feature allows the system administrator or an authorized user for the process of printing out of the Daily Time Record (DTR) for each employee. This feature also shows the list of employees by department and by groups or all employees, employee leaves and availment, employee DTR Card, attendance sheet, summary of employees' tardiness and undertime. It also shows the reports on individual employee's tardiness and undertime, name of employee filed leave and monthly reports of absences and undertime which are all connected to the database host PC.
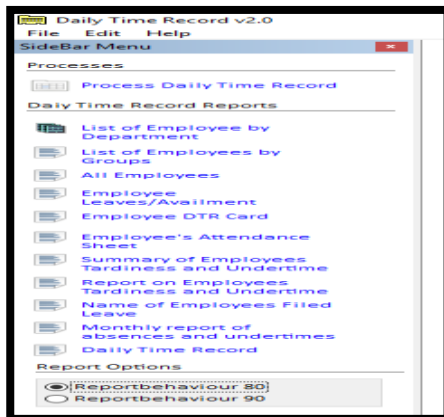

Figure 6. *DTR Print Menu*

System Maintenance

Regular system maintenance is necessary for the proper function of the biometric machine over a period of time. However, there was no log or any record for regular or preventive system maintenance on file. As per statement from the experts, namely the Network Administrator and the MIS-In-Charge, the current Biometric Attendance System in Cebu Technological University–Tuburan Campus only utilized a corrective form of maintenance for emergency cases or is done after the problem occurred such as system reboot for downtime related issues and database backup. Thus, timely maintenance is a practice many users get accustomed to as to preventive maintenance.

III. RESULTS AND DISCUSSION

The result *(See Table 1)* contains the data pertaining to timeliness of the operational performance of the current biometric attendance system. As reflected on the table, the overall weighted mean is 4.25 or verbally described as Strongly Agree.

The data showed that the current biometric attendance system is outstanding in terms of its timeliness as experienced by the respondents in their daily use of the biometric system in logging in and out. The researcher conducted a simulation of at least ten (10) trials as to the timeliness of the biometric machine and the results showed an average of 1.82 seconds just to capture employee data in real-time. In fact, all of the indicators of timeliness were rated SA or strongly agree by the respondents.

This implies that the current biometric system always ensures that employees are attended to their works on time since attendance data can easily be captured and it takes lesser time for recording employee attendance and authenticates employee identity in real-time. With this, it avoids queuing of employees causing them to be late in their respective works.

It presents the data *(See Table 2)* on the accuracy of the current biometric attendance system according to the respondents' responses. The table revealed that accuracy has an overall weighted mean of 4.19 or verbally described as Agree.

The data showed that the performance of the current biometric system as perceived and experienced by the respondents is very satisfactory in terms of its accuracy.

Though, there were only an average of 2 employees per month or 1.39 % of the total population have experienced that the official printed DTR did not show any log as to the actual time rendered. However, this implies still that the current biometric attendance system is mostly effective in capturing employee working hours as it provides a detailed audit trail of employee attendance to ensure data integrity. Moreover, it has an intrinsic connection to an individual employee and provides accurate data for payroll to determine reliably employees' pay. Thus, it enhances employee punctuality and eliminates incidents of wage theft.

Furthermore, the data (See Table 3) on Graphical- User Interface of the current biometric attendance system according to the respondents' responses. The table revealed that graphical-user interface

has an overall weighted mean of 4.06 or verbally described as Agree.

The data showed that the performance of the current biometric is very satisfactory in terms of its graphical-user interface as perceived and experienced by the respondents.

This implies that the current biometric attendance system is generally user friendly because it is easy to use and it requires less force in keying employee ID. Likewise, employee verification is generally fast and its reading characters on the screen of the Biometric Attendance System are readable and performing tasks is straightforward. Ultimately, it is generally user friendly because its organization of information and sequence of screens such as the hand hour, time, date and keypad are clear and the position of messages on screen such as notifications on successful login/out, error messages is clear and consistent.

It revealed that the overall performance of the biometric system is 4.17 or verbally described as Agree *(See Table 4)*. The data showed that the overall performance of the biometric system in Cebu Technological University (CTU) – Tuburan Campus is

very satisfactory in terms of timeliness, accuracy, and graphical-user interface.

This implies that the biometric system has always ensured employees' timeliness, has provided accurate employee attendance record, and has accommodated well the employees in their daily use of the biometric.

IV.   CONCLUSION

Biometric systems are an increasing number of used in our everyday life to control the access of quite a few resources. Several biometric applied sciences exist towards this goal, going from physiological-based features (such as fingerprint) to behavioral-based facets (such as keystroke dynamics). However, a key issue to be considered is the evaluation of such systems. This is generally vital to make sure efficient and effective biometric system that appreciates the privacy of an individual, and to allow a good usability (El-Abed, et.al., 2012).

Based on the findings, it can be concluded that the performance of the current Biometric Attendance System in Cebu Technological University (CTU) –TuburanCampus was very satisfactory with its six (6) features; however, the system still incurs inevitable problems.

ACKNOWLEDGEMENT

REFERENCES

[1] Aquilan, John (2004), "Automation of time attendance   27 System", Technological Institute of the Philippines, Cuabo, Quezon City, March 2004

[2] Armstrong, Elia.(n.d.), Journal Article: "Integrity, Transparency and Accountability in Public Administration: Recent Trends, Regional and International Developments and Emerging Issues"

[3] Battesse, W. T. (2005). Sustainability: a new and complex challenge for crisis managers. International   Journal   of   Sustainable Strategic Management 2(1), 4-16.

[4] Brown, J. (2008). Firm resources and sustainable competitive advantage.   Journal   of Management, 17(1)

[5] Cantoma, Andrea (2004) ,"Personal Computer LibrarySystem for St. James Academy", Technological Institute of the Philippines, Cuabo, Quezon City, March 2004

[6] Chin,   EuTsun,   et.al.,(n.d.),   Journal   Article: AUTOMATED ATTENDANCE CAPTURE AND TRACKING SYSTEM

[7] Columbia   State   Community   College   (2007)   Available   from https://new.columbiastate.edu/home

[8] Dass, S.C., et. al. (2006). Validating a Biometric Authentication System: Sample   Size Requirements.   Publication: IEEE   Transactions   on   Pattern Analysis and Machine   Intelligence.   DOI: 10.1109/TPAMI.2006.255

[9] El-Abed, Mohamad, et.al.,(2012). Evaluation of BiometricSystems, New   Trends   and Developments   in Biometrics.DOI: 10.5772/52084

[10] Floran, Ramon (2005). "The Computer Edge of

the NewEmployment and Opportunities", Philippine Daily Inquirer, Page 14, October 2005Georgios Goudelis, Anastasios Tefas, Ioannis

Pitas. (2008). Emerging Biometric Modalities: A

Survey, Journal on Multimodal User Interfaces, 2, (2008), 217- 235. DOI. Available from http://dx.doi.org/ 10.1007/s12193-009-0020-x

Haitham Hasan, S. Abdul Kareem. (2013).

[11] Fingerprint ImageEnhancement and Recognition Algorithms: A Survey. Neural Computing and Application, 23(6), (2013), 1605-1610. DOI:

Available from http://dx.doi.org /10.1007/s00521- 012-1113-0

Hendrickson, A.R. J Labor Res (2003) 24: 381.

Availablefrom https://doi.org/10.1007/s12122-003-1002-5

[12] Henry, E. B., Echa, E. A. and Alfred, M. A. (2017).

The importance and challenges of biometric machine in school supervision. A case study of Access High School, Calabar. Equatorial Journal of Education and Curriculum Studies, 2 (2): 34- 39.

[13] Jake G. Maggay. (2017). "BIOMETRIC ATTENDANCEMONITORING SYSTEM OF CAGAYAN STATE   UNIVERSITY–   LASAM CAMPUS,   PHILIPPINES". International Journal of Research - Granthaalayah, 5(2), 67-79. https://doi.org/10.5281/zenodo.345444.

[14] Jain, A. K., Ross, A., & Prabhakar, S. (2004). An introduction to biometric recognition. IEEE Transactions on circuits and systems for video technology, 14(1), 4- 20.

[15] JiexunL.,Wang .A. and ChenH (2011). 'Identity matching using personal and social identity features'; 13:101– 113

[16] Joseph Kalunga and Simon Tembo(2016).

Development of Fingerprint Biometrics Verification and Vetting Management System.DOI: 0.5923/j.bioinformatics.20160603.01

[17] Kamaldeep. (2011). A Review of Various Attacks

On Biometrics System And Their Known Solutions, International Journal of Computer Technology and Application, 2(6), (2011), 1980-1992.

[18] Kirmani, M. (2017). Impact of Biometric

Attendance System on Secondary and Higher Secondary Educational Institutions Across J&K. Oriental Journal of Computer Science and Technology,   10(2),   291–297. https://doi.org/10.13005/ojcst/10.02.06

[19] Kumar, A., & Zhang, D. (2010). Improving biometric authentication performance from the user quality. IEEE transactions on instrumentation and measurement, 59(3), 730-735.

[20] Matyáš   V.,   Říha   Z.   (2002)   Biometric Authentication —

https://doi.org/10.1007/978-0-387- 35612-9_17.

[21] Mustafa Erden (2017).Advantages and Disadvantages   of Biometric Authentication   from

http://www.sestek.com/2016/11/advantage   s-disadvantages-biometric-authentication/

[22] Mitrefinch, Advance Systems (2016), "The Disadvantages of Traditional On the Clock Punch   In   Systems." ,   25 May   2016.   Availablefromhttps://advancesystemsinc.c   om/the-disadvantages-of-traditional-on- the-clock-punch-in-systems/

[23] Mendrz, Andrew (2007), Computerized Daily Time Record System". Vision Designer Inc.

[24] MuhtahirO., O., Adeyinka O., A., & Kayode S., A.

(2013).Fingerprint   Biometric Authentication for Enhancing Staff Attendance System. International Journal of Applied Information Systems, 5(3), 19–

[25] https://doi.org/10.5120/ijais12-450867 My Time Force (2006), a software-based time and attendance   system.   Available

fromhttps://www.gotimeforce2.com/ NOVAtime(2007), a group of system developer.

Availablefrom https://www.novatime.com/aboutus.aspx

[26] Ononiwu, G. C., Okorafor, G. N., &Onojo, J. (2012).Attendance system   based   on automatic door   unit   radio   frequency identification   (RFID). International Journal   of

Managment, IT and Engineering, 2(5), 1-24.

[27] Plattner, IlseE.,et. al.(2010). We are the forgotten ones': Occupational stress among university secretaries in Botswana'. DOI: 10.4102/sajhrm.v8i1.213.

[28] Primer, T. (2005), "Automated Computerize Process", in Readers Digest Magazine, Page 45, May 2005.

[29] Riley, Chris, et. al. (2009).Instruction, Feedback and Biometrics: The User Interface for Fingerprint Authentication Systems. Available from http://link.springer.com/10.1007/978-3-642-03658- 3_35. DOI: 10.1007/978-3-642-03658-3_35.

[30] Roberta S. Russell and Bernard W. Taylor (2011). Operations Management, 7th edition, Wiley, 2011,ISBN: 0470646233, 9780470646236, 810 pages

[31] Soyuj Kumar Sahoo, TarunChoubisa& S. R. MahadevaPrasanna (2012). Multimodal Biometric Person Authentication : A Review, IETE Technical Review, 29:1,54-75, DOI: 10.4103/0256-4602.93139

[32] Shehu V. and Dika A. (2011): Using Real Time Computer Vision Algorithms in Automatic Attendance Management Systems. Proceedings of the ITI 2010 32nd Int. Conf. on Information Technology Interfaces, June 21-24, 2010, Cavtat, Croatia.

[33] Swift, J. (2010).Where did time fly: Practical unconventional tips to save and optimize time, CreatSpace Independent Publishing Platform, Amazon USA ISBN 13: 978- 1452855325

[34] Syed Zulkarnain Syed Idrus, Estelle Cherrier, Christophe Rosenberger, Jean-Jacques Schwartzmann (2013). A Review on Authentication Methods. Australian Journal of Basic and Applied Sciences, 7 (5), pp.95-107.

[35] Thakkar, Avanti (2015). Development OfFingerprint Biometric Attendance Management System Using Wireless Connectivity. International Journal on Recent and Innovation Trends in Computing and Communication.DOI: 10.17762/ijritcc2321- 8169.1503157

[36] Ware, Emmanuel Opoku (2015).Computerized Accounting System an Effective Means of Keeping Accounting Records in Ghanaian Banks: a Case Study of the Ga Rural Bank. International Journal of Research in Business Studies and Management Volume 2, Issue 11, November 2015, PP 111-141.

[37] Whitney, Lance (2017). Are Computers Already Smarter Than Humans? Availablefromhttp://time.com/4960778/co mputers-smarter-than-humans/ Yao, Zhigang, et. al. (2016), Journal Article, "A Literature Review of Fingerprint Quality Assessment and Its Evaluation.", page 14

AUTHORS

First Author - Alden Q. Gabuya,Jr.,Computer Engineer, Cebu Technological University- Tuburan Campus, aldenjr.gabuya@ctu.edu.ph

Second Author – Leo T. Zosa, Economics major, Cebu Technological University-Tuburan Campus, leo.zosa@ctu.edu.ph

Third Author – Joemar T. Miñoza ,Language Instructor, Cebu Technological University- Tuburan Campus, joemar.miñoza@ctu.edu.ph

Correspondence Author - Alden Q. Gabuya,Jr.,Computer Engineer, Cebu Technological University-Tuburan Campus, aldenjr.gabuya@ctu.edu.ph

Table 1: Performance of the Current Biometric Attendance System in CTU-Tuburan Campus as to Timeliness

Timeliness	Weighted Mean	Verbal Description
Fingerprints input takes lesser time for recording employee attendance.	4.29	Strongly Agree
Attendance data can easily be captured through computerized biometric employee clocking system.	4.32	Strongly Agree
The biometric attendance system ensures that employees are attended to timely.	4.40	Strongly Agree
The Biometric Attendance System authenticates employee identity in real-time.	4.00	Agree
Overall Weighted Mean	4.25	Strongly Agree

Legend: Strongly Agree (4.21-5.0) Agree (3.41-4.2) Average (2.61-3.4) Disagree (1.81-2.6) Strongly disagree (1.0-1.8)

Table 2: Performance of the Current Biometric Attendance System in CTU-Tuburan Campus as to Accuracy

Accuracy	Weighted Mean	Verbal Description
The biometric attendance system is effective in capturing employee working hours.	4.27	Strongly Agree
The biometric attendance system provides detailed audit trail of employee attendance.	4.21	Strongly Agree
The biometric attendance system ensures data integrity.	4.08	Agree
The biometric attendance system is intrinsically connected to an individual employee	4.25	Strongly Agree
The biometric attendance system is a reliable way to determine employee fair pay.	4.27	Strongly Agree
The biometric attendance system provides accurate data for payroll.	4.16	Agree
The biometric attendance system enhances employee punctuality	4.08	Agree
The biometric attendance system eliminates incidents of wage theft.	4.16	Agree
Overall Weighted Mean	4.19	Agree

Legend: Strongly Agree (4.21-5.0) Agree (3.41-4.2) Average (2.61-3.4) Disagree (1.81-2.6) Strongly disagree (1.0-1.8)

Table 3: Performance of the Current Biometric Attendance System in CTU-Tuburan Campus as to Graphical User Interface

Graphical User Interface	Weighted Mean	Verbal Description
The biometric attendance system is easy to use.	4.13	Agree
The Biometric Attendance System's keypad requires less force in keying employee ID.	3.58	Agree
Employee verification of the biometric attendance system is fast.	4.19	Agree
Reading characters on the screen of the Biometric Attendance System is readable.	4.12	Agree
Organization of information and sequence of screens such as the hand hour, time, date and keypad are clear.	4.11	Agree
Position of messages on screen such as notifications on successful login/out is clear and consistent.	4.10	Agree
Error messages of the Biometric Attendance System are helpful.	4.12	Agree
Performing tasks of the Biometric Attendance System is straightforward.	4.15	Agree
Overall Weighted Mean	4.06	Agree

Legend: Strongly Agree (4.21-5.0) Agree (3.41-4.2) Average (2.61-3.4) Disagree (1.81-2.6) Strongly disagree (1.0-1.8)

Summary of Biometric Performance

Table 4: Summary of Data on the Performance of the Current Biometric Attendance System in CTU-Tuburan Campus

Aspects	Weighted Mean	Verbal Description
Timeliness	4.25	Strongly Agree
Accuracy	4.19	Agree
Graphical-User Interface	4.06	Agree
Overall Weighted Mean	4.17	Agree

Legend: Strongly Agree (4.21-5.0) Agree (3.41-4.2) Average (2.61-3.4) Disagree (1.81-2.6) Strongly disagree (1.0-1.8)

Summary of Corrective System Maintenance

Table 5: Summary of Data on the Corrective System Maintenance of the Current Biometric Attendance System in CTU-Tuburan Campus

Month	Issues/Concerns	Number of Occurrence in a Month	Corrective Action/s
January	Power Interruption	3	System Reboot
February	System freezes/Unresponsive	3	System Reboot
March	Database backup	2	Scheduled System backup/System Reboot
April	System freezes/Unresponsive	1	System Reboot
May	System freezes/Unresponsive	1	System Reboot
June	Power Interruption	2	Scheduled System backup/System Reboot
July	Power Interruption	3	System Reboot
August	System freezes/Unresponsive	4	System Reboot
September	Database backup	1	Scheduled System backup/System Reboot
	System freezes/Unresponsive	2	
October	Power Interruption	1	System Reboot
November	Power Interruption	3	System Reboot
	System freezes/Unresponsive	1	