DEVELOPMENT OF GENERIC AUTOMATED EMPLOYEE DAILY TIME
RECORD MANAGEMENT SYSTEM USING RFID

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- F.G.T.N and P.A.R.A
ABSTRACT

The study developed an automated Employee Daily Time Record Management System Using RFID. The system can track and monitor employee time in and out using RFID technology, provides system management settings such as date and time format, report settings, time zone, display, password and security. It also provides a file management system that stores employees’ information and system transaction logs, and generates printing of attendance reports. The developed system was created using PHP and MySQL interfaced in Notepad++, HTML, and Adobe Photoshop. Testing results showed that the system can be easily be adapted by its intended users. The evaluation was done by 30 respondents composed of IT professionals and students. The evaluation instrument used to determine the acceptability of the system was the ISO 9126 with criteria namely, functionality, reliability, usability, efficiency, maintainability and portability. The overall mean rating was 3.5, which is described as Highly Acceptable.
# Automated Employee Daily Time Record Management System Using RFID

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Chapter 1
THE PROBLEM AND ITS SETTING

Introduction
Small and medium scale companies used manual systems to indicate the everyday time of work of employees which serves as a basis of giving salaries to the employees. On the contrary, this method takes too much time and effort to the accounting clerk to encode all the attendance of employees. In addition, it requires long process such as gathering the data of remittances, daily time records, and individual manual calculations of payroll which may lead to inaccurate results.

According to Fairchild (2012), regardless of the industry, personnel expenditures make up an ever-increasing slice of the "cost pie". By automating the processes for time and attendance, employers can help drive down some of these costs. For example, employees that are allowed to clock-in even slightly early (also known as "clock-creep") could wind
Automated Employee Daily Time Record Management System Using RFID up costing the employer untold sums of money as those extra minutes accrue. For any industry or organization with a large percentage of hourly-wage workers, this is a solution that allows for accurate prediction, and increased success in labor planning and management, often reducing overall labor expenditures by up to 10%. Consequently, Nucleus Research (2008) has performed dozens of interviews with companies that have used solutions from companies such as Kronos, ADP, and Workbrain to replace time and attendance workflows that were either fully manual or poorly automated. All companies benefited from the deployments. Return of investments tended to be particularly high for companies that had migrated from a manual environment. The primary benefits of an automated time and attendance system are improved productivity, reduced payroll error, reduced payroll inflation, lower overtime costs, and the elimination of paper costs.

**Background of the Study**

The automation of recording employees’ daily time entries is essential to the Human Resource office for record keeping and processing of payroll. This transaction minimizes human effort and speeds up the working process therefore saving valuable time. It also aids the department in reducing errors due to hand written entries. It can processes information faster and is more accurate in handling transactions. Since the information about the attendance of employees is directed automatically to the human resources, it does not require employees to submit their daily time record every now and then. It also does not require them to use time cards in order to log their time (Samulde, 2013). By implementing an automated time keeping system for employees copes better to the advancement of technology today. Manual systems that cause technical problems and bring trouble to employees will be eliminated. Delays in the transaction of payroll would be avoided and errors in the computation of payroll would be lessened. Employees will
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be given an opportunity to experience an advanced attendance system and the
introduction of a RFID the system.

Objectives of the Study

The general objective of the study is to develop a generic automated employee daily
time record management system using RFID.

Specifically, it aims to:

1. Design the system with the following features:
   a. Tracks and monitors employee time in and out using RFID technology;
   b. Provides system management settings such as date and time format, report
      settings, time zone, user interface display, password and security settings;
   c. Stores employees’ information and system transaction logs; and,
   d. Generate printing of attendance reports.

2. Create the system using PHP, WAMP, HTML, CSS and MySQL.

3. Test and improve the system’s functionality and usability

4. Determine the acceptability of the developed system according to functionality,
   reliability, usability, efficiency, maintainability, and portability.
Scope and Limitations of the Study

The study covers the system design, creation, testing and evaluation of the developed system entitled Automated Employee DTR Management System Using RFID, a system that can track time keeping and management process. It can record information based on the employee’s work schedule, daily time worked and daily time rendered. It provides a file management system where employees’ information and system transaction records are logged-in. It also covers the management of employees’ time in/out using RFID technology. At the same time, it can also generate printing of attendance information consisting of daily time reports, and number of hours worked. The developed system can only be accessed in a local area network and focuses only on the employees’ information that uses the said system.

It was developed using PHP, HTML, and CSS with the aid of WAMP Server and MySQL as the front-end and back-end applications, respectively.

The whole system was developed in the span of eight months from the analysis phase to the implementation phase based on the system Gantt chart (see Appendix A). The mean was then computed to analyze the result of the evaluation. The evaluation instrument used was based from the ISO 9126 instrument using the criteria of functionality, reliability, usability, efficiency, maintainability, and portability with 30 respondents which consists of professionals and students in computer related courses.

The cost of production for this project estimated on both development and operating cost which consists of labor, hardware, software supplies, maintenance, and miscellaneous cost for a total amount of Php105, 100.00 (see Appendix B).
Chapter 2
CONCEPTUAL FRAMEWORK

This chapter includes the review of related literature, related studies, conceptual model of the study, and the operational definition of terms.

Review of Related Literature
This section includes related literature and concept of the project precisely significant to the researcher’s ideas. These topics greatly influenced the way the study was conducted and done.

Time and Attendance System

According to Messmer (2012), time and attendance systems not only track hours and attendance but also allows to manage employee scheduling and produce invoice and other materials based in part on time allocated job or project. Some programs allow one to identify and analyze labor cost according to employee, branch, department, and specific project. Rouse (2012) stated that time and attendance software is a type of business application designed to track and optimize the hours that employees spend on the job and keep records of wages and salaries paid. This type of software is common in businesses of all sizes. It also provides management of personnel with diverse tools to help maximize cash flow and minimize waste. Smith (2011) also discussed the advantages of having a time and attendance system these advantages are as follows:
1. **Reduce errors.**

Time and Attendance software reduces the risk of human error and ensures an easy, impartial, and orderly approach in addressing specific needs without any confusion. In fact, Time and Attendance software has been shown to have an accuracy rate of more than 99% versus manual systems by eliminating errors in data entry and calculations.

2. **Increase security.**

Time and attendance software together with biometric data collection devices may be used to control employee access to certain areas within a facility and track employee entry. Biometric data collection devices eliminate buddy punching and also help reduce costly liabilities, including theft of equipment or property.

3. **Increase productivity.**

Productivity increases because the process is seamless and makes day-to-day operations more efficient and convenient. Eliminating legacy practices frees up employees’ time, decreases staffing overhead, and provides supervisors with timely labor data to more effectively manage their operations.

4. **Save money.**

Implementing a technology based time and attendance solution with biometric devices will immediately help to reduce your labor costs. Manually collecting, managing, calculating and processing time data to process payroll can take a lot of time, but with an
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automated time and attendance solution, companies are able to increase efficiency and save money.

5. Increase employee satisfaction.

Employees will be happier because time and attendance software guarantees timely and accurate pay. Further, by eliminating manual preparation of time sheets, or mechanical time cards employers are able to improve employer-employee relations by giving employee secure access at their discretion to personal data.

Radio-Frequency Identification (RFID)

According to Violino (2005), Radio frequency identification (RFID) is a generic term that is used to describe a system that transmits the identity (in the form of a unique serial number) of an object or person wirelessly, using radio waves. It is grouped under the broad category of automatic identification technologies.

Weinstein (2005) stated that RFID tags fall into two general categories, active and passive, depending on their source of electrical power. Active RFID tags contain their own power source, usually an on-board battery. They have their own power source, transmit a stronger signal, and readers can access them from further away. The on-board power source makes them larger and more expensive, so active RFID systems typically work best on large items tracked over long distances. Low-power active tags are usually slightly larger than a deck of playing cards. These tags can remain dormant until they come in range of a receiver or can constantly broadcast a signal.

Passive tags, on the other hand, are very inexpensive. They obtain power from the signal of an external reader. Because this kind of tags is inexpensive, they will likely be the basis of most of the growth of RFID implementations.
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According to Hongkong RFID LTD. (2012), the use of an RFID reader on an automated attendance monitoring system has the following benefits:

1. Better planning and management of human resources
2. Minimizes payroll errors and cost of manual system
3. Provide efficiency in payroll processing time
4. Avoid disputes due to errors
5. Stream lines sign in or out process for staff

DNA Tech India (2011) also discussed that using RFID technology versus barcode technology on an attendance system has advantages such as no line of sight requirement, tags can withstand harsh environment, long read range, portable database, multiple tag read/write, and tracking people, items and equipment in real time.

**Networking System**

According to Fituri (2013), a computer network basically consists of an interconnection of electronic devices to facilitate communication and resource sharing among them.

There are many different types of networks depending on their characteristics and functions.

1. Peer-to-peer networks are the type of networks implemented when a limited number of computers are involved and strict security is not required. Direct communication is facilitated between the machines. Client/server networks on the other hands are implemented when a much larger number of computers and resources are
Automated Employee Daily Time Record Management System Using RFID involved. A central computer known as the server acts as the storage location and controls the network access of the other computers on the network.

2. Local Area Network (LAN) consists of wired connections and are suitable for limited size implementations.

3. WLAN (Wireless Local Area Network) on the other hand use wireless transmission technologies, usually WiFi. Though WLAN provide mobility, they suffer from decreased security.

4. WAN (Wide Area Network) extend over large areas. They are usually composed of many LANs connected together.

Moreover, networks include different arrangements and topologies.

1. The bus network is formed by connecting all computers and devices to one long central cable, which is known as the bus.

2. The ring network is formed by connecting all computers to a loop of cable, known as the ring.

3. The star network is what is used for client/server networks.

Networking system, according to Martin and Chapman (1989), provides communication between peers within a geographic area specified. The need to
Automated Employee Daily Time Record Management System Using RFID communication, that is, to send messages, to share data, to access computing resources, to share expensive peripheral devices, has contributed to the development and spread of a network. A network can be classified into a local area network (LAN), or wide area network (WAN). The challenge for a network is to provide facilities that meet users’ communication needs at a reasonable cost. Compatibility is the key issue in keeping costs reasonable. To facilitate compatibility among networks, various organizations and computer and network vendors have developed network architecture that allows a variety of equipment to be connected together in a network.

**Database System**

According to Date (2003), a database is a collection of persistent data that is used by the application systems of a given enterprise. Kumar (2014) stated that a database is a collection of related pieces of data that represents or captures the information about a real-world enterprise or part of an enterprise. He also stated that it is collected and maintained to serve specific data management needs of the enterprise. Silberschatz, Korth, and Sudarshan (2010) also stated that database applications include banking transactions, airlines reservations and schedules, university registrations and grades, customer relations, and almost all applications in the daily life that involves data and information handling.

According to The Linux Information Project (2006), a *database* is a set of data that has a regular structure and that is organized in such a way that a computer can easily find the desired information. Data is a collection of distinct pieces of information, particularly information that has been *formatted* (i.e., organized) in some specific way for use in analysis or making decisions.
A database can generally be looked at as being a collection of *records*, each of which contains one or more *fields* (i.e., pieces of data) about some *entity* (i.e., object), such as a person, organization, city, product, work of art, recipe, chemical, or sequence of DNA. For example, the fields for a database that is about people who work for a specific company might include the name, employee identification number, address, telephone number, date employment started, position and salary for each worker.

Several basic types of database *models* have been developed, including *flat*, *hierarchical*, *network* and *relational*. Such models describe not only the structure of the conforming databases but also the operations that can be performed on them. Typically, a database has a *schema*, which is a description of the model, including the types of entities that are in it and the relationships among them.

Flat databases are the simplest type. They were long the dominant type, and they can still be useful, particularly for very small scale and simple applications. An example is a single table on paper or in a computer file that contains a list of companies with information about each such as name, address, product category, contact name, and so forth. A flat database can also exist in the form of a set of index cards, each containing the information for one of the entities.

The development and subsequent rapid advance of electronic computers in the second half of the twentieth century led to the development of database models that are far more efficient for dealing with large volumes of information than flat databases. The most notable is the relational model, which was proposed by E. F. Codd in 1970. Codd, a researcher at IBM, criticized existing data models for their inability to distinguish
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between the abstract descriptions of data structures and descriptions of the physical
access mechanisms.

A relational database is a way of organizing data such that it appears to the user to be stored in a series of interrelated tables. Interest in this model was initially confined to academia, perhaps because the theoretical basis is not easy to understand, and thus the first commercial products, Oracle and DB2, did not appear until around 1980. Subsequently, relational databases became the dominant type for high performance applications because of their efficiency, ease of use, and ability to perform a variety of useful tasks that had not been originally envisioned.

**Likert Scale**

According to Cherry (2014), a Likert Scale is a type of psychometric scale frequently used in psychology questionnaires. It was developed by and named after organizational psychologist Rensis Likert. On a survey or questionnaire, a typical Likert item usually takes the following format: “Strongly disagree”, “Disagree”, “Neither agree nor disagree”, “Agree”, “Strongly agree”. It is important to note that the individual questions that take this format are known as Likert items, while the Likert scale is the sum of several of these items.

Mcleod (2008) also stated that a Likert-type or frequency scales use fixed choice response formats and are designed to measure attitudes or opinions. These ordinal scales measure levels of agreement/disagreement. A Likert-type scale assumes that the
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strength/intensity of experience is linear, i.e. on a continuum from strongly agree to strongly disagree, and makes the assumption that attitudes can be measured.

Respondents may be offered a choice of five to seven or even nine pre-coded responses with the neutral point being neither agree nor disagree.

In its final form, the Likert Scale is a five (or seven) point scale which is used to allow the individual to express how much they agree or disagree with a particular statement.

**ISO 9126**

ISO 9126 is an international standard for the evaluation of software. The standard is divided into four parts which addresses, respectively, the following subjects: quality model; external metrics; internal metrics; and quality in use metrics.

The ISO 9126-1 software quality model identifies 6 main quality characteristics, namely: functionality, reliability, usability, efficiency, maintainability, portability. These characteristics are broken down into sub-characteristics. The main characteristics of the ISO 9126-1 quality model can be defined as follows:

- **Functionality** - Functionality is the essential purpose of any product or service. For certain items this is relatively easy to define. The main point to note is that functionality is expressed as a totality of essential functions that the software product provides. It is also important to note that the presence or absence of these functions in a software product can be verified as either existing or not.

- **Reliability** - Once a software system is functioning, as specified, and delivered the reliability characteristic defines the capability of the system to maintain its service provision under defined conditions for defined periods of time. One aspect of this
Automated Employee Daily Time Record Management System Using RFID characteristic is \textit{fault tolerance}, that is, the ability of a system to withstand component failure. For example, if the network goes down for 20 seconds then comes back the system should be able to recover and continue functioning.

\textbf{Usability} - Usability only exists with regard to functionality and refers to the ease of use for a given function. The ability to learn how to use a system (learnability) is also a major sub-characteristic of usability.

\textbf{Efficiency} - This characteristic is cornered with the system resources used when providing the required functionality. For example, the usability of a system is influenced by the system’s performance, in that if a system takes 3 hours to respond the system would not be easy to use although the essential issue is a performance or efficiency characteristic.

\textbf{Maintainability} - The ability to identify and fix a fault within a software component is what the maintainability characteristic addresses. Maintainability is impacted by code readability or complexity as well as modularization. Anything that helps with identifying the cause of a fault and then fixing the fault is the concern of maintainability. Also the ability to verify (or test) a system, i.e. is one of the sub-characteristics of maintainability.

\textbf{Portability} - This characteristic refers to how well the software can adopt to changes in its environment or with its requirements. The sub-characteristics of this characteristic include adaptability. Object oriented design and implementation practices can contribute to the extent to which the characteristic is present in a given system.
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The objective of this suite of standards is to provide a framework for the evaluation of software quality. ISO/IEC 9126 does not prescribe specific quality requirements for software, but instead describes a quality model, which can be applied to any software. This ISO standard includes the user's view and introduces the concept of ‘quality in use’.

**PHP**

According to Doyle (2009), PHP is a programming language for building dynamic, interactive websites. As a general rule, PHP programs runs on a web browser and serve web pages to visitors on request. One of the key features of PHP is that it can be embedded within HTML Web pages, making it very easy to create dynamic content quickly.

Suehring, Steve, and Valade (2013) stated that PHP works with the web browser, which is the software that delivers web pages to the world. They also stated that PHP is a scripting language designed specifically for use on the web. It has features that aid the developer in programming the task needed to develop dynamic web applications.

According to Wikipedia (2015), PHP is a server-side scripting language designed for web development but also used as a general-purpose programming language. As of January 2013, PHP was installed on more than 240 million websites and 2.1 million web servers. Originally created by Rasmus Lerdorf in 1994, the reference implementation of PHP (powered by the Zend Engine) is now produced by The PHP Group. While PHP originally stood for *Personal Home Page*, it now stands for *PHP: Hypertext Preprocessor*, which is a recursive backronym.
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PHP code can be simply mixed with HTML code, or it can be used in combination with various templating engines and web frameworks. PHP code is usually processed by a PHP interpreter, which is usually implemented as a web server's native module or a Common Gateway Interface (CGI) executable. After the PHP code is interpreted and executed, the web server sends resulting output to its client, usually in form of a part of the generated web page; for example, PHP code can generate a web page's HTML code, an image, or some other data. PHP has also evolved to include a command-line interface (CLI) capability and can be used in standalone graphical applications.

The canonical PHP interpreter, powered by the Zend Engine, is free software released under the PHP License. PHP has been widely ported and can be deployed on most web servers on almost every operating system and platform, free of charge.

Despite its popularity, no written specification or standard existed for the PHP language until 2014, leaving the canonical PHP interpreter as a de facto standard. Since 2014, there is ongoing work on creating a formal PHP specification.

**WAMP**

According to the TechTerms (2013), WAMP stands for "Windows, Apache, MySQL, and PHP." WAMP is a variation of LAMP for Windows systems and is often installed as a software bundle (Apache, MySQL, and PHP). It is often used for web development and internal testing, but may also be used to serve live websites.

The most important part of the WAMP package is Apache (or "Apache HTTP Server") which is used to run the web server within Windows platform. By running a local Apache web server on a Windows machine, a web developer can test webpages in a web browser without publishing them live on the Internet.
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WAMP also includes MySQL and PHP, which are two of the most common technologies used for creating dynamic websites. MySQL is a high-speed database, while PHP is a scripting language that can be used to access data from the database. By installing these two components locally, a developer can build and test a dynamic website before publishing it to a public web server.

While Apache, MySQL, and PHP are open source components that can be installed individually, they are usually installed together. One popular package is called "Wamp Server," which provides a user-friendly way to install and configure the "AMP" components on Windows.

Tech-faq (2014) also stated that WAMP is a mini web server that runs on almost any Windows operating system. WAMP has Apache, PHP (SMTP ports are disabled), and MySQL (phpMyAdmin and SQLitemanager are installed to manage the user’s databases) pre-installed. WAMP is widely used and relied upon for local development or as a ready-to-deploy server. The ease of installation, configuration and management of WAMP has played a vital role in its worldwide popularity.

WAMP is available for both, 32-bit and 64-bit operating system. There are add-ons available which can easily be plugged into WAMP. These add-ons are for Apache, PHP, and MySQL.

The core functionalities of WAMP are:

1. Effectively manage and administer your Apache server and services.
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2. Take control over your MySQL database and related services.

3. Work in either *Online* or *Offline* mode.

4. Control all the server settings.

5. Keep a watch on the log files.

6. Create aliases and control permissions.

**HTML**

According to Suehring et. al (2013), Hyper Text Markup Language (HTML) is the language of the web. When someone goes to a web page in a web browser such as Internet Explorer, Firefox, or Safari, the browser downloads and displays HTML. It is a program like Microsoft Word is used to view word processor documents because it knows how to read and display them. Likewise, when it comes to the web, the web browser is the program that knows how to read and display documents created with HTML. Word processor documents can be created and read with a single program. On the other hand, HTML documents need different programs for creation and reading; one cannot create HTML documents with a browser. These documents are created using a program called an editor which is a simple Notepad program that comes with Microsoft Windows or as complex as Eclipse or Microsoft Visual Studio.

Margaret Rouse (2005) stated that HTML (Hypertext Markup Language) is the set of markup symbols or codes inserted in a file intended for display on a World Wide Web browser page. The markup tells the Web browser how to display a Web page's
Automated Employee Daily Time Record Management System Using RFID words and images for the user. Each individual markup code is referred to as an element (but many people also refer to it as a tag). Some elements come in pairs that indicate when some display effect is to begin and when it is to end.

HTML is a formal Recommendation by the World Wide Web Consortium (W3C) and is generally adhered to by the major browsers, Microsoft's Internet Explorer and Netscape's Navigator, which also provide some additional non-standard codes. The current version of HTML is HTML 4.0. However, both Internet Explorer and Netscape implement some features differently and provide non-standard extensions. Web developers using the more advanced features of HTML 4 may have to design pages for both browsers and send out the appropriate version to a user. Significant features in HTML 4 are sometimes described in general as dynamic HTML. What is sometimes referred to as HTML 5 is an extensible form of HTML called Extensible Hypertext Markup Language (XHTML).

Cascading Style Sheets (CSS)

According to Nathan (2010), Cascading Style Sheets (CSS) is a style sheet language used to describe the presentation semantics (that is, the look and formatting) of a document written in a markup language. Its most common application is to style web pages written in HTML and XHTML, but the language can also be applied to any kind of XML document, including SVG and XUL. CSS is designed primarily to enable the separation of document content (written in HTML or a similar markup language) from document presentation, including elements such as the layout, colors, and fonts. This separation can improve content accessibility, provide more flexibility and control in the specification of presentation characteristics, enable multiple pages to share formatting,
and reduce complexity and repetition in the structural content (such as by allowing for
tableless web design). CSS can also allow the same markup page to be presented in
different styles for different rendering methods, such as on-screen, in print, by voice
(when read out by a speech-based browser or screen reader) and on Braille-based, tactile
devices. While the author of a document typically links that document to a CSS style
sheet, readers can use a different style sheet, perhaps one on their own computer, to
override the one the author has specified.

MySQL

Based on the the TechTerms magazine (2007), MySQL is an open source relational
database management system. Suehring et. al(2001) mentioned that it is the most
popular database for use in websites, was developed to be fast and small, specifically for
websites. It is particularly popular for use with websites that are written in PHP, and PHP
and MySQL work well together. It is based on the structure query language (SQL),
which is used for adding, removing, and modifying information in the database. Standard
SQL commands, such as add, drop, insert, and update can be used with MySQL. The
language can used for a variety of applications, but is most commonly found on web
servers. A website that uses MySQL may include web pages that access information from
a database. These pages are often referred to as "dynamic", meaning, the content of each
page is generated from a database as the page loads. Websites that uses dynamic web
pages are often referred to as database-driven websites.
**Apache**

From the TechTerms magazine (2011), Apache is the most popular Web server software. It enables a computer to host one or more websites that can be accessed over the Internet using a web browser. The first version of Apache was released in 1995 by the Apache Group. In 1999, the Apache Group became the Apache Software Foundation, a non-profit organization that currently maintains the development of the Apache Web server software. Its popularity in the web hosting market is largely because it is open source and free to use, therefore, web hosting companies can offer Apache-based web hosting solutions at minimal costs. Other server software, such as Windows Server, requires a commercial license.

Apache also supports multiple platforms, including Linux, Windows, and Macintosh operating systems. Since many Linux distributions are also open-source, the Linux/Apache combination has become the most popular web hosting configuration. In addition, Apache can host static websites, as well as dynamic websites that use server-side scripting languages, such as PHP, Python, or Perl. Support for these and other languages is implemented through modules, or installation packages that are added to the standard Apache installation. It also supports other modules, which offers advanced security options, file management tools, and other features. Most Apache installations include a URL rewriting module called "mod_rewrite," which has become a common way for webmasters to create custom URLs.
Automated Employee Daily Time Record Management System Using RFID

While the Apache Web server software is commonly referred to as just "Apache," it is technically called "Apache HTTP Server," since the software serves webpages over the HTTP protocol. When Apache is running, its process name is "httpd," which is short for "HTTP daemon."

Related Studies

The following studies are deemed relevant to the present study:

**Title: Development of GSIS Automated Attendance and Payroll System**

**Author: Karlo M. Samulde: March 2013**

The study is an example of an automated daily and time record and payroll system used for monitoring the attendance and generate payroll for contractual employees of the Government Service Insurance System (GSIS).

The initial situation is that contractual employees’ still uses the old fashioned bundy clock and time card system to log and record their time, which are then passed in table form together with the original time card the following day after the cut-off date for payroll processing.

The current system requires payroll processing to be done by hand. Therefore, time card, wages, payroll computations, and deductions are done manually by the payroll representatives. The main disadvantage with this kind of system is the high room for error.

Based on the study, Samulde has developed an automated attendance and payroll system built on MS Visual Basic 6.0 and MS Access. It utilizes RFID technology to
Automated Employee Daily Time Record Management System Using RFID
record employee’s attendance using RFID ID cards and automatically calculates the
payroll of employees so that there would be no room for errors and makes the payroll
representative’s job a lot easier. The project started with an analysis of the present
situation and proceeded with the implementation of the solution and its testing.

The related literature and studies enabled the researchers to develop the conceptual model
of the study.

**Conceptual Model of the Study**

Figure 1 shows the conceptual model of the study. This indicates the required
hardware and software including the necessary skills and knowledge that helped develop
and establish the system.

**Input**

In the conceptual model, three specific requirements such as knowledge, software, and
hardware are needed. To be able to develop the system, the researchers are required to
have knowledge in Attendance and Payroll Systems, RFID technology, Database
management system, Networking, WAMP, HTML, and CSS. And for the hardware
requirements, a desktop that is connected through Local Area Network with a Windows 7
or XP operating system and a RFID reader is needed.
### INPUT

#### Knowledge Requirements
- Time and Attendance System
- RFID
- Networking
- Database
- Likert Scale
- ISO 9126

#### Software Requirements
- PHP
- WAMP
- HTML
- CSS
- MySQL

#### Hardware Requirements
- Computer
  - Operating system: 32-bit Windows XP, Vista or 7
  - At least 256 MB of RAM
  - At least 2GB of hard disk space
  - Network connectivity
  - RFID Reader

### PROCESS

- System Design
- System Creation
- System Testing and Improvement

### OUTPUT

Automated Employee DTR Management System Using RFID

### EVALUATION

*Figure 1. Conceptual Model of the Study*

**Process**
Automated Employee Daily Time Record Management System Using RFID

The project component consists of system design, system creation, system testing and improvement. The system design includes the general features of the project. The researchers analyzed the appropriate design and considered existing concepts and practices in order to come up with a workable design for the system. The system creation involves data gathering and explanation on how the project was conceptualized until it was completed, where the researchers conducted different procedures to develop or create the system. System testing and improvement in values how the project was encoded, debugged, and checked until all corrections were made.

Output

The required inputs were utilized during the development process. It resulted to the final system called Development of Automated Employee Daily Time Record Management System Using RFID.

Evaluation

Lastly, the Evaluation Process was conducted to assess the quality of the software.

Operational Definition of Terms

The following terms were used in the study:

Administrator refers to the person who manages the registered employees, offices, and groups as well as the time logs of every employee.

User refers to the employee that uses the system. This includes the administrator and employee members.

Offices refer to divisions of some departments in a company.

Groups refer to the divisions on the offices in a company.

In refers to the status that denotes that an employee is currently logged.
Out refers to the status that denotes an employee is currently logged out.

Time logs refer to the records of employee’s log ins and outs.

Daily Time Record (DTR) refers to a sheet that records the number of hours worked by employees during a pay period.

RFID refers to both the reader and the card used for capturing an employee’s time in and out.

Chapter 3

METHODOLOGY

This chapter discusses the project design, project development, operation and testing procedure, and evaluation procedure.

Project Design

The following are the designs of the system:

Context Diagram

The system uses an RFID reader to monitor the daily time in/out of an employee to be stored into a database for processing and generating of reports. The system has an admin page where the admin can add, delete, or update an employee’s information and edit the...
Automated Employee Daily Time Record Management System Using RFID system’s settings.

Figure 2. Context Data Flow Diagram of the Developed System

Figure 2 shows the context diagram of the developed system. There are two external entities that are connected to the system; the employee and the admin. The employee places his RFID ID card on the RFID reader to generate reports using the acquired information. The admin is the one who is in charge of adding employees and keeping the employee’s information up to date.

Figure 3. Top Level Data Flow Diagram of the Developed System
Figure 3 shows the top level dataflow diagram of the developed system. In the diagram, the administrator inputs the employees’ data to the system. In the first process, the administrator manages the information of the employees that is entered to the system. In the second process, the employee places his RFID ID card on the RFID reader which scans and verifies his employee number and check for the employee’s record stored in the system. In the third process, the admin checks all the employees’ time logs and commands the system to generate reports. The fourth process is the printing of reports.
Figure 4 shows the low level DFD of the developed system. Based on the diagram, the first process includes adding of records, update records and view records wherein the admin is the only one who can gain access to the administrative panel. Under the second process is the RFID verification wherein the employee needs to scan their IDs for verification.
Automated Employee Daily Time Record Management System Using RFID

**Network Design**

Figure 5 shows the network design of the system. The setup consists of different devices such as laptops or desktop computer for every department of the organization that are connected to a router which is also connected to the server. The server handles the database for the system and it is operated by the administrator.

![Network Design Diagram](image)

**Figure 5. Network Design**

Figure 6 shows the flowchart for the Employee and figure 7 shows the flowchart for the Administration module. As shown in the flowchart, the employee scans his RFID card on the RFID reader then the system checks if the card number matches the one that is registered on the database. If the card matches an employee it will then automatically save the date and time in/out of the employee for attendance.
Figure 6. System Flowchart for the Employee Module

Figure 7 shows the system flowchart for the Administrator module. The Administrator (admin) is the person in charge of the system that has all the privileges in using the system. If the logged in username and password are correct, the system will be directed to
Automated Employee Daily Time Record Management System Using RFID

the administrator page. He or she can perform the viewing, updating, adding, editing, as well as generating reports.

![System Flowchart for the Administrator Module](image)

*Figure 7. System Flowchart for the Administrator Module*

**Project Development**

Figure 8 shows the project development flowchart of the study. These steps are planned and arranged to obtain the expected output of the study.
1. System Design

The first step in developing the new system was the designing of the system. This is where the proponents started to draw the “TO-BE” process of the system. Of course, this process/system must be aligned with the identified objectives of the study.

2. Program Coding

The next process is the program coding. The coding of the actual system was constructed; application program was written, coded and documented.

3. Testing and Debugging

Testing and debugging was followed in order to check if there were problems and/or errors in the system. If a problem is encountered in this phase, the researchers will immediately fix the problem to avoid further errors in the system.

4. Evaluation

Finally, the last process is the evaluation phase. This involves the actual users who will test and evaluate the system if it passed the requirements. “Fool-proofing” was one of the methods used to ensure that the system is free from any errors and can validate data/information coming in. Should there be additional requirements not covered during the design phase, the programmer will evaluate if it can be accommodated and the necessary revisions will be done if possible. Once the system had passed the testing and evaluation phase, it is now ready for implementation and deployment to the users.
Automated Employee Daily Time Record Management System Using RFID

Is the system working?

Is the system acceptable?

No | Yes

No

Yes

End
Figure 8. The Project Development Flowchart

Operation and Testing Procedure
Automated Employee Daily Time Record Management System Using RFID

The application was subjected to a series of tests and analysis in order to discover any faults or inconsistencies. The debugging and modification of the system are essential to eliminate the errors for it to pass the standards set for the criteria of testing.

**Installing the Application**

1. Installed the WAMP Server.

2. Copied the file attendance to the directory (c:/wamp/www/)

3. Opened 'localhost/phpmyadmin/' in the browser. Created database named 'Payrolltime' and import the payrolltime.sql located at the database folder of Attendancems file.

4. Accessed the system by redirecting the browser to 'localhost/attendancems'

5. Installed the RFID scanner to the computer and utilize the system.

**Testing the Functionality and Usability of the Application**

Table 1 shows the testing procedures for the functionality and usability of each module of the system.

In the Time in/out module, the user logs in as an employee using the RFID cards and reader. In testing the admin module, the user logs in as administrator and test the add, update employees, offices, groups, color indicator for the in/out statuses function as well as the generate attendance reports function.
Automated Employee Daily Time Record Management System Using RFID

Table 1.

*Testing Procedures for the functionality and usability of each Module of the System*

<table>
<thead>
<tr>
<th>Module</th>
<th>Testing Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time In/Out</td>
<td>1. Logged in as employee in the login page.</td>
</tr>
<tr>
<td>Module</td>
<td>2. Chosen IN, OUT, BREAK or LUNCH from the status menu module.</td>
</tr>
<tr>
<td></td>
<td>3. Scanned the RFID card in the RFID reader to complete the process.</td>
</tr>
<tr>
<td>Admin Module</td>
<td>1. Logged in as admin in the login page.</td>
</tr>
<tr>
<td></td>
<td>2. Added employees’ information.</td>
</tr>
<tr>
<td></td>
<td>3. Updated the employee’s information in the User section module.</td>
</tr>
<tr>
<td></td>
<td>4. Added and updated currently registered offices in the Office module.</td>
</tr>
<tr>
<td></td>
<td>5. Updated the color indicator of statuses in the In/Out Status section.</td>
</tr>
<tr>
<td></td>
<td>6. Updated employee time logs, edit system settings, and upgrade database in the</td>
</tr>
<tr>
<td></td>
<td>miscellaneous section.</td>
</tr>
<tr>
<td></td>
<td>7. Generated attendance reports.</td>
</tr>
</tbody>
</table>

*Evaluation Procedure*

In order to determine the acceptability of the system, an evaluation process was conducted. The overall performance of the system was evaluated by 30 respondents consisted of I.T. students and professionals and were chosen according to their relation and involvement to the system. The ISO 9126 evaluation instrument was used with the following criteria: functionality, efficiency, usability, reliability, maintainability, and portability.

The evaluation process was done through the following procedures:

1. The respondents were given questionnaires.
2. The instructions on how to use the system were discussed to the respondents.

3. The respondents / evaluators were requested to operate and test the system.

4. The respondents rated the system based on the evaluation criteria.

5. The ratings were tabulated.

6. The mean of each criteria and the overall mean of the respondents' ratings was computed.

7. The range of the numerical ratings and their corresponding qualitative description was presented.

The mean was used to determine the result of the evaluation that was given by the respondents using the formula below.

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

$\bar{x} =$ mean; $n =$ no. of respondents; $i =$ no. of responses

Based on the formula, the mean was computed by getting the sum of all the responses and dividing it by the number of respondents.

The respondents rated the system using the criteria defined in the ISO 9126 criteria of functionality, reliability, content, and availability (see Appendix C). Table 2 shows the rating scale for the evaluation instrument. A 4-point scale was used to rate the system with 4 as the highest and was described as “Highly Acceptable”, 3 as “Very Acceptable”, 2 as “Acceptable”, and 1 as the lowest or “Not Acceptable”. 
Table 2.

*Rating Scale for the Evaluation Instrument*

<table>
<thead>
<tr>
<th>Numerical Rating</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Highly Acceptable</td>
</tr>
<tr>
<td>3</td>
<td>Very Acceptable</td>
</tr>
<tr>
<td>2</td>
<td>Acceptable</td>
</tr>
<tr>
<td>1</td>
<td>Not Acceptable</td>
</tr>
</tbody>
</table>

Table 3 shows the range of scale values and interpretation. This was used in determining the qualitative description of the mean ratings of the respondents. The ranges are from 1 to 4, 1.0 to 1.50 is “Not Acceptable”, 1.51 to 2.50 is “Acceptable”, 2.51 to 3.50 is “Very Acceptable”, and 3.51 to 4 that corresponds to “Highly Acceptable”.

Table 3.

*Range of Scale Values and its Interpretation*

<table>
<thead>
<tr>
<th>Numerical Rating</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.4 – 4.0</td>
<td>Highly Acceptable</td>
</tr>
<tr>
<td>2.6 – 3.3</td>
<td>Very Acceptable</td>
</tr>
<tr>
<td>1.8 – 2.5</td>
<td>Acceptable</td>
</tr>
<tr>
<td>1.00 – 1.7</td>
<td>Not Acceptable</td>
</tr>
</tbody>
</table>
Chapter 4

RESULTS AND DISCUSSION

This chapter includes the project description, project structure, project capabilities and limitations, and project evaluation.

Project Description

The Automated Employee Daily Time Record Management System using RFID was designed to automate the recording of employees’ daily time entries in order to reduce, if not eliminate errors and redundancies caused by a manual time keeping system. It was designed to record employees’ with additional features and functions such as adding office, groups, editing or deleting time entries if the needed, and editing various system settings like date/time format, report settings, time zone settings, display settings, password and security. It also provides enough tools for recording and monitoring employees’ time logs making the management of employees easier and minimizes error. It has a Time In/Out module where employees can log in or out by scanning the RFID cards on the RFID reader to record their time and check their time logs.

The Admin module is intended for the payroll representatives and system admin. In this module, the admin can add, update or delete employee records, and generate reports.

It was created using Hypertext Markup Language, Cascading Style Sheets, MySQL, PHP and WAMP.
Project Structure

This section contains screenshots and forms used in the application with its descriptions and corresponding functions. The layout of the system is comprised of multiple forms.

Figure 9 shows the Homepage of the developed system. It contains the time in/out module where the employees enters the time in/out transactions.

![Figure 9. Home Page of the Developed System](image-url)
Automated Employee Daily Time Record Management System Using RFID

Figure 10 shows the Admin login page that consists of the username and the password in order to access the admin module of the system.

Figure 10. Admin Login Page

Figure 1 shows the main admin page where all the administrative functions of the system are located.

Figure 11. Main Admin Page
Automated Employee Daily Time Record Management System Using RFID

Figure 12 is the user summary page, this where all registered users are listed. The administrator can edit the employees’ information, change their password, and delete employees.

**Figure 12. User Summary Page**

Figure 13 shows the create user page to register new employees into the system.

**Figure 13. Create User Page**

Figure 14 search user page where the administrator can search for specific employees.
Figure 14. Search User Page

Figure 15 shows the office summary page where all the registered office are listed and can be edited and deleted by the administrator.

Figure 15. Office Summary Page

Figure 16 the administrator can add more offices in the create new office page.
Figure 16. Create New Office Page

Figures 17 and 18 shows the group summary and create new group pages, respectively where the administrator can view existing groups and add new groups.

Figure 17. Group Summary Page
Figure 18. Create New Group Page

Figure 19 shows the status summary page that includes the existing time log statuses and options for color selection, edit and delete.

Figure 19. Status Summary Page
Automated Employee Daily Time Record Management System Using RFID

Figure 20 shows the create new status page that includes the status name, color and options for In or Out status.

![Create New Status Page](image1)

**Figure 20. Create New Status Page**

Figure 21 illustrates the miscellaneous section where the administrator can edit and delete employee time logs if the situation calls for it.

![Add/Edit/Delete Time Page](image2)

**Figure 21. Add/Edit/Delete Time Page**
Automated Employee Daily Time Record Management System Using RFID

Figure 22 shows the edit system settings page where the admin can edit various system settings like date/time format, report settings, time zone setting, display settings, password and security.

![Edit System Settings Page]

Figure 22. Edit System Settings Page

Figure 23 shows the reports of the time logs of the employees for the day. It displays the name of the Employee, Time In/Out Date, Originating IP and Notes.

![Daily Time Report Page]

Figure 23. Daily Time Report Page
Figure 24 shows the total hours worked report page where an employee’s total work hours can be seen for reviewing.

### Project Capabilities and Limitations

The Generic Automated Employee DTR Management System Using RFID has these capabilities:

1. The system can monitor the attendance of all registered employees.

2. The system can manage the attendance of all registered employees

The limitations are as follows:

1. The system does not cover the inventory report of the finance department.

2. The system does not cover the payroll computation of employees.
Project Evaluation

The system was tested for its functionality and usability. Table 4 shows the test results for the different functions that the system provides.
### Test Results for Functionality and Usability

<table>
<thead>
<tr>
<th>Function</th>
<th>Test Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time In/Out Capture</td>
<td>The system functions very well in capturing employees’ time in/out with the use of the RFID cards and reader,</td>
</tr>
<tr>
<td></td>
<td>Additionally it also functions well in capturing time in/out without the use of the RFID card by inputting the employees’ ID number, should</td>
</tr>
<tr>
<td></td>
<td>an event where an employee has lost his RFID card and needs</td>
</tr>
</tbody>
</table>
to sign in or out.

**Administrative Functions and Generating of Reports**

The system produced the expected output in testing the administrative functions such as adding or updating employees, managing time logs, and other system settings as well as the generating of daily time reports, this function aids the administrator in managing employees’ time logs and the system.

The summary of the evaluation for the acceptability of the system is found in Appendix D. The calculated mean rating for each criterion is summarized in Table 5.

Table 5.

*Respondents’ Mean Rating for the Project*

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Mean</th>
<th>Qualitative Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Functionality</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Suitability</td>
<td>3.6</td>
<td>Highly Acceptable</td>
</tr>
<tr>
<td>2. Accurateness</td>
<td>3.3</td>
<td>Very Acceptable</td>
</tr>
<tr>
<td>3. Interoperability</td>
<td>3.3</td>
<td>Very Acceptable</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td><strong>3.4</strong></td>
<td>Very Acceptable</td>
</tr>
<tr>
<td><strong>Reliability</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Maturity</td>
<td>3.3</td>
<td>Very Acceptable</td>
</tr>
<tr>
<td>2. Fault Tolerance</td>
<td>3.4</td>
<td>Very Acceptable</td>
</tr>
</tbody>
</table>
Automated Employee Daily Time Record Management System Using RFID

<table>
<thead>
<tr>
<th>Mean</th>
<th>3.4</th>
<th>Very Acceptable</th>
</tr>
</thead>
</table>

**Usability**
1. Understandability 3.6 Highly Acceptable
2. Learning Process 3.4 Very Acceptable
3. Operability 3.5 Very Acceptable
Mean 3.5 Very Acceptable

**Efficiency**
1. Time behavior 3.2 Very Acceptable
2. Resource behavior 3.3 Very Acceptable
Mean 3.3 Very Acceptable

**Maintainability**
1. Stability 3.3 Very Acceptable
2. Testability 3.6 Highly Acceptable
Mean 3.5 Very Acceptable

**Portability**
1. Installation Process 3.9 Highly Acceptable
2. Adaptability 3.4 Very Acceptable
Mean 3.7 Highly Acceptable

Under the Functionality criterion, suitability and interoperability both got a highly acceptable rating, while the accurateness got a very acceptable rating with a total mean rating of 3.4. This means that the system functions very well.

In the criterion Reliability, maturity and fault tolerance got a very acceptable rating with a mean rating of 3.4.
Automated Employee Daily Time Record Management System Using RFID
The Usability of the system was evaluated by the understandability, learn ability and operability sub-criteria got a rating of very acceptable with a mean of 3.5.

The Efficiency of the system was also conducted. Its time behavior and resource behavior got a rating of very acceptable with a mean of 3.3.

In maintainability criteria of the system, testability and stability was rated as very acceptable with a mean of 3.5.

Lastly, the portability of the system was evaluated and its installation process and adaptability were both highly acceptable and got a rating of 3.7.

Table 6.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Mean</th>
<th>Interpretation</th>
</tr>
</thead>
</table>

Respondents’ Overall Mean Rating of the Project
Table 6 shows the project obtained a mean rating of 3.5 which falls in the range of the scale value of Very Acceptable. This establishes the level of acceptability of the project.
SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

This chapter includes the summary of findings of the study, conclusions, and recommendations of the study.

Summary of Findings

The system is designed to automatically record time logs via RFID card and generate attendance and hours worked reports, and ensure the security and reliability of the information of every employee in the company. It can fully provide a computation of the provided data of every employee and the reports needed by the company can be provided by the system. The security of the system is ensured because only the authorized personnel can gain access and modify all the recorded information. The time computations are provided by the system and the time keeping of the employees are also monitored by the system.

Thirty (30) respondents, which were composed of 10 IT professionals and 20 CS students, evaluated the system using ISO 9126, an evaluation instrument used to determine the software’s functionality, reliability, usability, efficiency, maintainability and portability. All criteria were rated as Highly Acceptable resulting to an overall mean rating of 3.5.

Conclusions
Automated Employee Daily Time Record Management System Using RFID

Based on the evaluation conducted on the study, the following conclusions were derived:

1. The application is designed with the following features:
   a) Tracks and monitor employee time in and out using RFID technology;
   b) Provides system management settings such as date and time format, report settings, time zone, user interface display, password and security settings;
   c) File management system that stores employees’ information and system transaction logs; and
   d) Printing of attendance reports.

2. The system was developed using PHP, HTML, WAMP Server and MySQL for database management.

3. The system was tested in terms of functionality and usability.

4. The system performed very well and was rated “Very Acceptable” by the respondents which proves that the system is a useful tool in tracking employees’ time logs and attendance.

Recommendations
Automated Employee Daily Time Record Management System Using RFID

For further enhancements of the system, the following recommendations were suggested:

1. That the system be implemented in TUP – Manila.

2. That the system be improved of its features by making it a network-based system.

3. That similar researches be made to improve the system.

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Appendix A
Automated Employee Daily Time Record Management System Using RFID

PROJECT GANTT CHART

Research and Data Gathering
Software Elements Analysis
Chapter 1 Writing
Chapter 2 Writing
Chapter 3 Writing
Project Plan and Design
Coding, Debugging and Testing
Evaluation
Chapter 4 Writing
Chapter 5 Writing
Final Defense
Final Report

Appendix B
COST OF PRODUCTION
Automated Employee Daily Time Record Management System Using RFID

### Hardware Cost

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### Software Cost

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### Labor Cost

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### Total Production Cost

Total Production Cost: **Php 105,100.00**

---

Appendix C

SAMPLE EVALUATION SHEET

Evaluation Instrument

Evaluator’s Name (Optional): ___________________________________________

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<th>Employee</th>
<th>Professor</th>
<th>Student</th>
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4 – Highly Acceptable  3 – Very Acceptable  2 – Acceptable  1 – Not Acceptable

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<td>1. Suitability – essential functionality of characteristics and refers to the appropriateness of the functions of the software.</td>
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<td>2. Accurateness - refers to the correctness of the function.</td>
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<td>3. Interoperability – concerns the ability of a software component to interact with other components or systems.</td>
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## RELIABILITY
1. Maturity – concerns about the frequency of failure of the software.
2. Fault Tolerance – ability to withstand from components or environmental failure.

## USABILITY
1. Understandability – ease of which the system can be understood.
2. Learning Process – learning effort of different users.
3. Operability – ability of the software to be easily operated by a given user in a given environment.

## EFFICIENCY
1. Time Behavior – response time for a given throughput.
2. Resource Behavior – characterizes resources used.

## MAINTAINABILITY
1. Stability – sensitivity of a change of a given system that is the negative impact that may be caused by system changes.
2. Testability – characterizes the effort needed to verify a system change.

## PORTABILITY
1. Installation Process – characterizes the effort required to install the software.
2. Adaptability – provides flexible environment.

Comments/Recommendations:

______________________________________________________________________________
______________________________________________________________________________

### Appendix D

**SUMMARY OF EVALUATION RESULT**

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## Automated Employee Daily Time Record Management System Using RFID

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### Mean per Criterion

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### Overall Mean

3.5

### Overall Descriptive Rating

“Very Acceptable”