Analysis and Web based Automation Student Attendance Model using Radio Frequency Identification (RFID) at Private Vocational High School in Jakarta

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Analysis and Web based Automation Student Attendance Model using Radio Frequency Identification (RFID) at Private Vocational High School in Jakarta

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Abstract: The Objective of this research is to build a web-based attendance system using Radio FrequencyIdentification (RFID). Student identification cards fitted with RFID chips will be utilized to replace the manual attendance system at a private vocational high school. The benefits of this system are many and include the following: (1) A reduction in the need to print paper time-sheets along with the resultant time and cost this process requires. (2)Negating the need for collection and collation of time-sheets along with the time and and costs this incurs, as well as the costs for any subsequent storage of such sheets (3) Reduce human errors in filling out of time-sheets as as well as errors which may occur during collation or, in communication associated from any absenteeism. (4) To provide valuable data and information resource which can be quickly and easily accessed by staff. (5) To provide a real-time information resource to parents about the presence, or not, of their children in school. (6) To minimize fraud and to additionally train students to be honest in recording their presence in class. (7) To provide important real-time information to any relevant authority on the exact numbers and identities of the students in the school in the event of any emergency situation. The Development method used in this study is the Waterfall Software Development Life Cycle system and also uses three stages of Analysis which consists of the stages of analyzing system weaknesses, analyzing system requirements, and analyzing information needs. The Result of this study showed that the system could store 50 cards data of attendance and operate 8 hours non-stop with a distance between card and reader of 3 cm, with the limitation of delay time for about 15 minutes.

1. INTRODUCTION

Attendance systems using RFID technology has been widely used in many companies for employee attendance purposes, there is various software that can be used to access attendance machines which can manage attendance transactions according to company needs. However, the use of RFID technology has not been fully utilized in the world of Education, such as supporting the attendance system needs in the classroom. As we know the student attendance system in class still uses manual presence system, which has many disadvantages. Such as the; the manual presence system is not practical in the process of recording attendance because it must be done manually, and there is a possibility of errors in the recording process caused by human error.

Presence data stored in the computer admin cannot be updated immediately, because it has to wait for an officer to record and update the attendance data on the admin computer. An integrated presence system is obviously preferential in order to minimize these errors. Therefore, to overcome the above problems, in this paper the author designed a software system that aims to build an automation model for student attendance systems at one of the vocational schools using the web and Radio Frequency Identification (RFID) integrated with the database, this model involves several parties, namely teachers, students, and administrative staff, who are tasked with inputting study schedule data. Teachers and students have RFID cards that are recognized by attendance devices to be used when studying in class. So it is expected that the system built can support the

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increase in the effectiveness of learning in the classroom, such as (1) A reduction in the need to print paper time-sheets along with the resultant time and cost this process requires. (2)Negating the need for collection and collation of time-sheets along with the time and and costs this incurs, as well as the costs for any subsequent storage of such sheets (3) Reduce human errors in filling out of time-sheets as as well as errors which may occur during collation or, in communication associated from any absenteeism. (4) To provide valuable data and information resource which can be quickly and easily accessed by staff. (5) To provide a real-time information resource to parents about the presence, or not, of their children in school. (6) To minimize fraud and to additionally train students to be honest in recording their presence in class. (7) To provide important real-time information to any relevant authority on the exact numbers and identities of the students in the school in the event of any emergency situation.

In this study there are few journals that used as reference sources, there are in the research of RFID-based Attendance Systems published in Journal Technic compyer the results of these studies are (1) the system can only store student attendance data as many as 45 more ID tags system error will occur. (2) if the timer is pressed then after 30 minutes the student does not can do attendance to limit students who arrive late cannot do absent (1), The other Journal which used as reference is Attendance System for college students used Radio Frequency Identification(RFID) at Electrical Engineering, universitas Riau and the outcome of the research are attendance of the Universitas Riau Electrical Engineering students which are integrated with RFID, consists of 8 from which have been made using Visual Basic Express 2010 and to maintain the database they Created a database using Mysql

2. METHODOLOGY

a. Unified Modelling Language (UML)

UML is a language that has become a standard in the industry for visualizing, specifying, designing, and documenting software systems (Booch, G., et al. 2007). UML offers a standard for designing a system model. Like other languages, UML also has a notation. UML notation is a set of special forms to describe various software diagrams. Each form has a specific meaning and UML explains how these forms are defined.

a. Building a model for a software system is very dependent on the construction or ease of repairing it. A good model is very important to produce good communication between team members and to ensure the perfect system architecture is built.

b. If you want to build a model from a complex system, it is impossible for us to understand it as a whole. With the increasing complexity of the system, visualization and modeling are very important. UML is created to respond to those needs.

c. Looking at the historical factors and the drivers of UML formation, a conclusion can be drawn regarding the purpose of the establishment of UML, namely as follows:

a) Describe the conceptual software model of a textual programming language so that it can be understood by people who are non-programmers.

b) Build an appropriate, unambiguous, and complete model that can assist in the stages of analysis, design, and implementation.

c) Can model several types of programming languages, and help re-map the model to another programming language.

d) Assist in software design documentation.

b. Radio Frequency Identification (RFID)

Identification with radio frequency is technology to identify a person or object by using radio frequency transmission, especially 125kHz, 13.56Mhz, or 800-900Mhz. RFID uses radio wave communication to identify an object or person uniquely. There are several meanings of RFID, according to (Maryono. 2005), namely:

a. RFID (Radio Frequency Identification) is an identification method using a tool called RFID label or transponder (tag) to store and retrieve data remotely

b. Label or transponder (tag) is an object that can be installed or inserted in a product, animal, or even human being to identify using radio waves. The RFID label consists of a silicon microchip and antenna.

c. RFID System Components

RFID tags can be in the form of stickers, paper, cards, or plastic of various sizes. In each of these tags, there is a chip that can store certain amounts of information. RFID tags function as transponders (transmitter and responder) that contain data using frequency. RFID tags consist of three types, namely:

a) Active Tag has an on-board power supply like a battery. When the tag wants to transmit data to the interrogator, the pliers take power from the battery to transmit the data. Therefore, active tags can communicate with interrogators who have little power and can transmit information in a range farther up to several kilometers.

b) Semi Passive Tag has an integrated battery and therefore does not require energy from the reader field to drive the chip. The distance is limited because the tag does not have an integrated transmitter, and still needs to use the reader field for communication back to the transmitter.

c) Passive Tag does not have an on-board power supply. This tag gets the power to transmit data from signals sent from the interrogator. Therefore, the size is smaller and cheaper than the active tag. However, the range of passive tags is closer than active tags only 4-5 meter.

In addition to tags, the following components are necessary:

a. RFID Reader Terminal, consisting of an RFID-reader and antenna that will affect the optimal identification distance. The RFID terminal will read or change information stored in the tag via radiofrequency. RFID terminals are connected directly to the Computer Host system.

b. Host Computers, computer systems that regulate the flow of information from items detected within the RFID system and manage communication between tags and readers. Hosts can be all-computer computers or connected to LAN / Internet networks for communication with servers.

d. Requirement Analysis Methodology

To identify the problem, we must do the analysis at performance, information, economy, controlling, efficiency, and service. This guide known as PIECES analysis (performance, Information, Economic, Control, Efficiency, Service) (Alfatta, 2007)

a. Performance
Performance is system capabilities about how they solve their task with quickly so the target can be reached immediately. Performance is measured by the amount of production (throughput) and time used to adjust the transfer of work (response Time)

b. Information
Information is essential because, with this information, the management (marketing) and users can take the next step. If the information system capability is excellent, the user will get accurate, timely and relevant information as expected.

c. Economy
Utilization of costs used from information utilization. An increase in economic needs affects cost control and increased benefits. At present many companies and management are starting to implement paperless systems (minimizing paper use) in the context of savings. Therefore, judging from the excessive use of paper materials and the cost of advertising in print media for publication media, this system is considered to be less economical.

d. Control
This analysis used to compare the systems analyzed based on the timeliness, ease of access, and accuracy of the data being processed.

e. Efficiency
Efficiency relates to how the source can be used optimally. Operations in a company are said to be efficient or not usually based on duties and responsibilities in carrying out activities.

f. Service
Services Improvement to show the various categories. The selected project is a better service improvement for management (marketing), users, and other parts that are a symbol of the quality of an information system.

e. Rational Unified Process RUP

RUP (Rational Unified Process) is a software development approach that is repeated (iterative), focusing on architecture (architecture-centric), more directed based on case use (use case driven) (Rosa and Shalahuddin 2011). The 4 working stages of the RUP are as follows:

a. Inception Phase
This stage is more about how to modeling the required business processes (business modeling) and to define the system requirements that will be created (requirements)

b. Elaboration Phase
This Stage can detect whether the desired architecture system can be made or not. Detect the risks that might occur from the architecture created. This stage is more about system

analysis and design and system implementation that focuses on system prototypes.

c. Construction Phase

This phase is focused on developing components and system features. This stage is more on the implementation and testing of systems that focus on the implementation of software in the program code.

d. Transition Phase

This stage is more of a system deployment or installation so that it can be understood by the user. Activities at this stage include the user training, maintenance and testing of the system whether it meets user expectations.
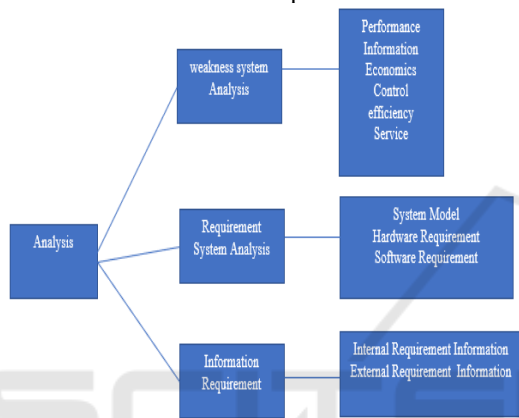
Figure 1. Design of Needs Analysis

Then summarized as a rationale, as well as linked to the methodology that will be carried out, so that it will get a development solution according to needs.

3. RESULT AND DISCUSSION

3.1. Weakness Analysis

To identify, analyze, and solve problems, the authors propose using the PIECES framework. And the stages in the PIECES framework are as follows:

a) Performance

The process of recording attendance in the classroom is done quite a time and effort so that this system can reduce the effectiveness of classroom learning activities.

b) Information
   1) The attendance system of this manual school cannot provide an overview of student attendance because it must wait for the teacher to recapitulate it first

   2) Schools cannot provide parents with real-time information about the presence of their children at school

c) Economics

Printing of attendance sheets is quite a lot, per teacher, per subject

d) Control
   1) Manual attendance cannot record student exclusion per subject.
   2) Parents cannot check the presence of their children in school in real time.
   3) Possible errors at the time of attendance and attendance recapitulation by the teacher.

e) Efficiency

The process of recording attendance in the classroom is done quite a time and effort so that this system can reduce the effectiveness of classroom learning activities

f) Service

The attendance system for manual students cannot provide parents with real-time information about the presence of their children at school
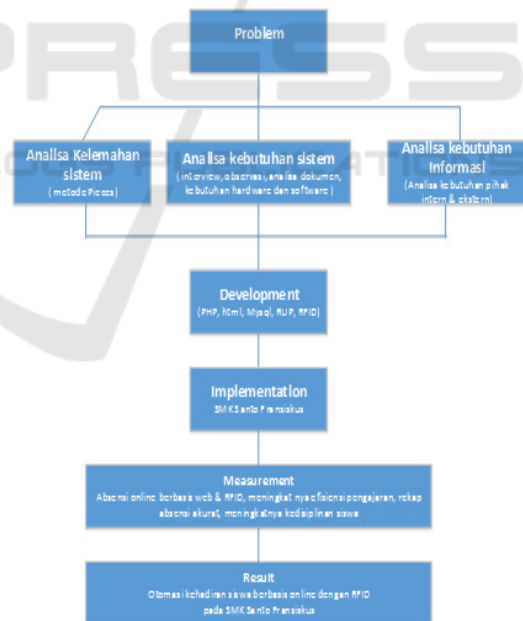

Figure 2: Framework of thought

3.2. System Requirement Analysis

1) System Model

To analyze the needs of the author using use case modeling. The following is a picture of the proposed system use case diagram:
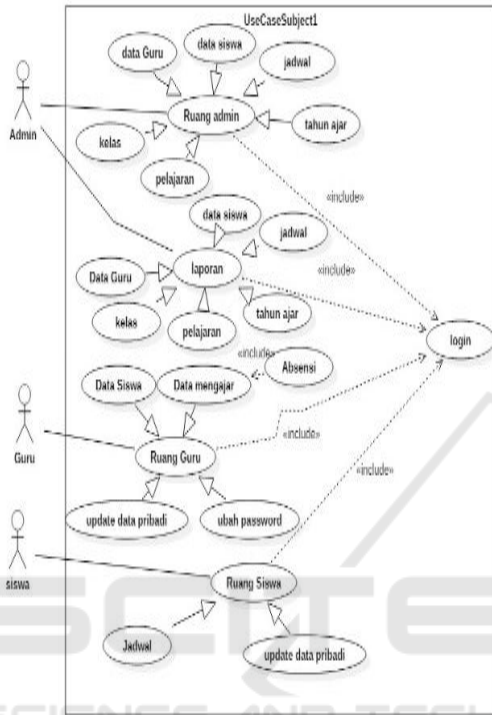

Figure 3. Use case Requirement Analysis diagram

2) Logic Design

The system design is logically illustrated by the use of the activity Diagram and database design using the logical Record structure.

  a. Attendance students Activity Transaction Attendance Activity Diagram

  On activity, This diagram describes the interaction of users with the system when students will do attendance in class
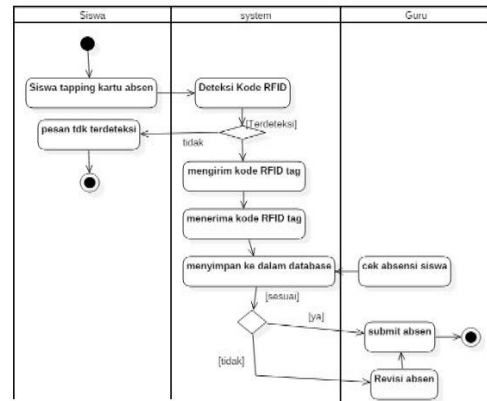
Figure 4. Activity RFID student attendance diagram

  b. Use Case Diagram

1) Administration Use Case Diagram
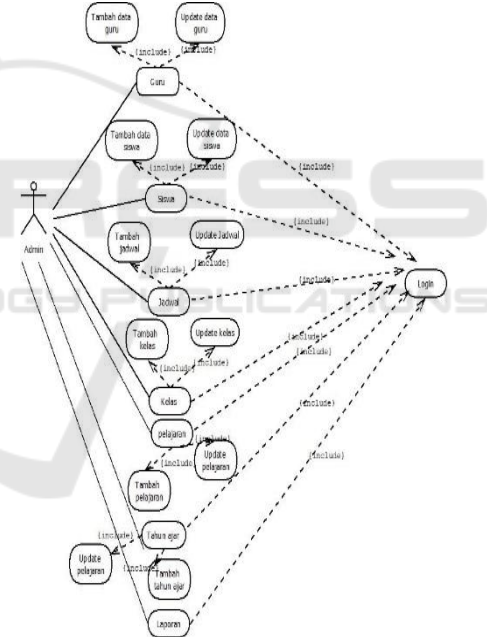
Figure 5. Administration Use case diagram
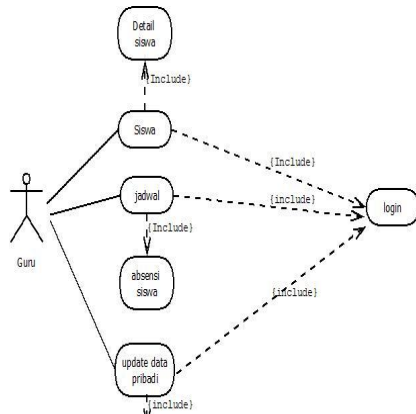
2) Teacher Use case diagram

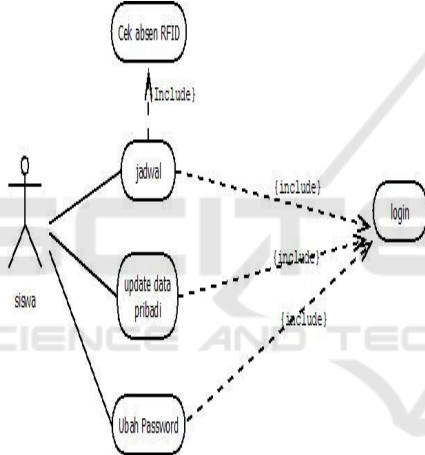Figure 6. Teacher's Use case diagram

3) Student's Use Case Diagram

Figure 7. Student's Use case diagram

c. RFID database Design

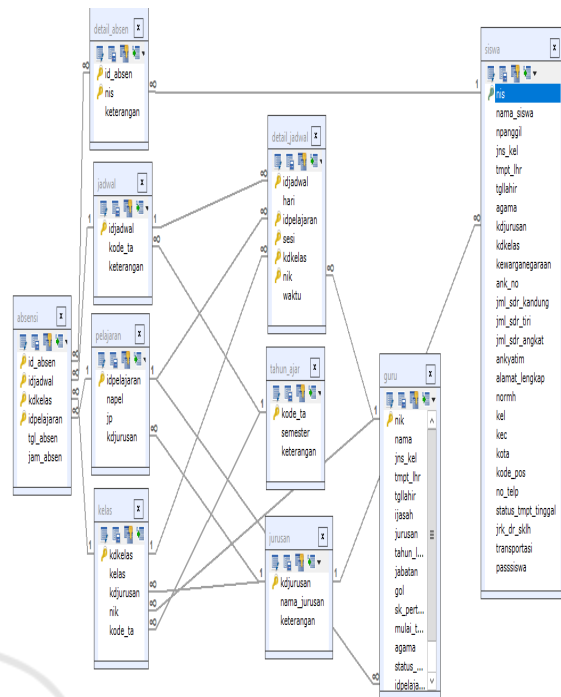In the picture below that describes the database design for making RFID-based attendance

Figure 8. Design of RFID student absentee database

d. Hardware Requirements
   The hardware specifications used are:
   a. Processor: Core I3
   b. Monitor: 17 "
   c. Mouse: Optic
   d. RAM: 2GB
   e. HD: 250 GB
   f. Keyboard: Standard
   g. Printers: Deskjet and Laserjet
   h. RFID: tag and reader

e. Software requirements
Software
   1) Operating System
      The operating system used in this study is a Windows-based operating system, with the specifications of Windows 7 Ultimate 32 bits.
   2) Application software
      The application forming program used in this study is PHP with the Code Igniter framework.
   3) Browser
      The browser used is Mozilla Firefox Version 35.0.1
   4) Database
      The database used in this study is SQLYog.

3.3 Information Requirement Analysis

1. Internal Requirements Analysis
   a. Attedance Form
   b. Lesson Data
   c. Students Data
2. External Requirements Analysis
   a. Overall attendance recap
   b. Recap attendance per student in real time
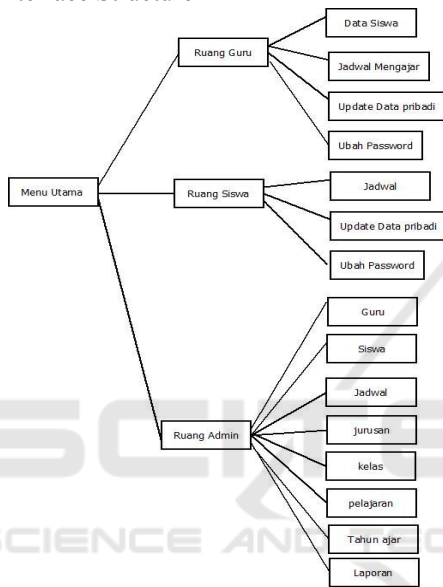
3.4. Interface Design

a. Interface Structure

Figure 9. Interface Structure

b. Interface Design

Interface design in this system design consists of Front End and Back end interface design

1) BackEnd Interface Design
   The following is one of the Back End screen displays that appear after the admin logs in
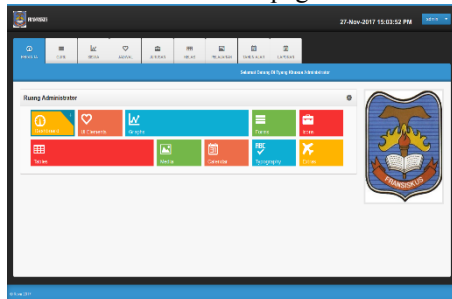   a) Administrator room Main page

Figure 10: Administrator room Main page

b) Teacher Data Administrator Room Page
   This page contains teacher data, and this form has facilities to add, edit and delete teacher data
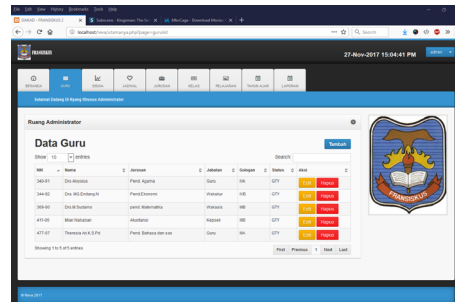

Figure 11: Interface of Teacher Data Administrator Room Page

2) Frontend Interface Design
   a) Teacher's Room Main Page
      The teacher's room page contains links to access student data, teaching schedules, personal data and change passwords

Figure 12: The Teacher's Room Main Page Interface

b) Student Attendance Page
   This page contains student attendance data in the class taught by the teacher, select the attendance option then click the save button to save attendance data
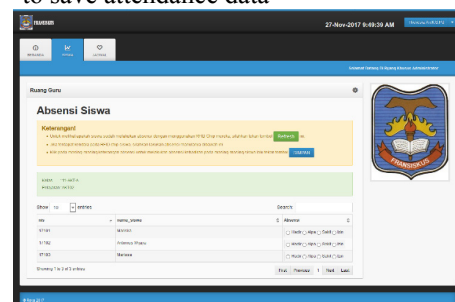

Figure 13: Student Attendance Page Interface

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4. CONCLUSIONS

The conclusions and suggestions obtained from the results of this research are:

a) Designing an online attendance system is expected to simplify the process of recording attendance for students who are now still using manual methods, so that data will be stored properly and reports can be made quickly and accurately.

b) It is hoped that in the future, development of this system can be carried out, for example by adding facilities for student attendance information aimed at the parents of students through the SMS broadcast facility, so that parents can monitor their children's attendance at school.

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