

Analysis and Design of Employee Attendance Application System Using RFID E-KTP Technology with ICONIX Process Method

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Abstract— Attendance is an essential reference for the quality of human resources, including those who will carry out an activity, such as employees and supervisors. In carrying out these attendance activities, some still use it manually, such as recording in a detailed book, and its storage is still classified as conventional. Therefore, an employee attendance system that can record and manage data easily can be done quickly, efficiently, and accurately. This paper aims to analyze and design an employee RFID attendance information system using the ICONIX Process method. This RFID system is made using an RFID E-KTP supported by a database, where the RFID E-KTP is very easy to use. The results of this study are the analysis and design of an information system for implementing an employee attendance system based on RFID technology. The scope of information includes records of arrival times and return times. The results of the analysis and research design can be implemented properly in accordance with the proposed business process and can be a recommendation for various business actors to record employee attendance activities using RFID on the E-KTP.

Keywords— Analysis and Design System, RFID E-KTP, ICONIX Process, Attendance.

I. INTRODUCTION

The rapid development of technology in this era of globalization can provide many valuable impacts in various fields or aspects [1]. The existence of technology can also help complete a job very efficiently, briefly, and quickly. In addition, the development of technology must also be followed by the development of human resources so that humans can fully use them in supporting their activities. However, at this time, there are still some human resources who do not use or utilize technology to help an organization or the business process itself. Such as using a book written in detail, such as using employee attendance records manually, and the storage is also still classified as conventional. Therefore, it takes a lot of time and a lot of paper; in addition to that, it also requires a lot of space to store the data, and employee attendance data often have data [2]. There is a requirement for an employee absenteeism information system that is needed to facilitate employee attendance in detail [2].

The study object of research is the retail store *UD Sukodadi Fruit Products* is a shop that provides daily necessities and household needs that the community needs. Concerning the research study's purpose, there are issues with the employee attendance system, including the recording and recording of attendance, which is still considered to be a manual process. This ultimately makes the attendance activity ineffective, irrelevant, and can take a long time. The study object of research requires an attendance information system for employees to perform attendance quickly, accurately, and efficiently. Namely, an attendance information system that utilizes RFID technology from E-KTP. Where the E-KTP owned by each employee can be appropriately used without

additional costs. So we need an information system regarding employee attendance to help monitor and recap in detail.

Based on the literature study, previous research discusses the RFID technology attendance system. It aims to design a prototype attendance system using RFID technology connected to a database to improve company performance and make it more efficient, faster, and more accurate [2]. The result of this study is a prototype that uses an RFID attendance system that functions as employee attendance storage, with a maximum reading distance of 2 cm. The second literature study discusses the Design of an Attendance System for Employees With IoT-Based RFID Using the ESP8266 MCU Node to help the Tourism Office for a This research has produced websites that allow employees to record their attendance.

These records will be automatically saved to the website's database using MySQL, powered by the PHP programming language. These websites do not use specific cards that can be read by RFID, which can read tags from a distance of 3–4 centimeters. While the previous literature study discusses an attendance system using RFID and IoT-based ESP32 Cam to help improve the problematic attendance system and assist teachers in recapitulating student attendance reports [4]. The results of this study are to create a system using ESP8266, an RFID tag that reads student data, and an ESP32 Cam, which has a student attendance validation function and utilizes a website interface and WhatsApp application aims to provide information to parents about student attendance. The ICONIX process method is used in this study with reference to the results of previous studies [5][6].

The existence of an information system regarding employee attendance utilizes RFID technology from E-KTP, where attendance activities can be integrated and recorded directly

by the database system that has been created. Useful to find out the results of the recap of reports made by the system. Using RFID can help address difficulties in this employee attendance information system and decrease attendance fraud such as absenteeism, so it can indirectly benefit admins, supervisors, and employees regarding attendance system outcomes promptly, precisely, and in detail.

II. LITERATURE REVIEW

A. Business Process

A business process is a set of activities that take one or many inputs and create an output that is useful to customers [7]. A business process is considered successful if it has the following characteristics: clearly defined goals, inputs, and outputs; effective use of resources; multiple activities carried out in stages; the ability to affect more than one person within the organization; and the capacity to generate value for customers [8].

B. Attendance

Attendance is a form of data collection in the presence or presence of a person or employee in an agency or company [9]. Besides that, attendance is part of reporting performance results and, at the same time, being present in carrying out their work. Absence is a recurring pattern of absenteeism from tasks or obligations that must undertake. In the past, a person or employee's absence violated an implicit contract between supervisor and employee [10]. There are also several types of absenteeism that are differentiated based on how they are used and the level of usefulness. In general, the types of absenteeism are divided into two [11].

1) *Attendance manually*: Inputting attendance or arrival using a pen through a signature and paper.

2) *Non-manual attendance*: The way to enter attendance or arrival using a device or a computerized system such as using a card with a barcode (barcode) and taking fingerprints (fingerprint).

Attendance is the most important thing in supporting activity in work or lectures. Before starting to do something or afterward, each person or employee is asked to fill in attendance or presence as proof that they have been present in an activity.

C. Radio Frequency Identification (RFID)

Radio Frequency Identification or RFID is an object identification method that uses radio waves. This identification process is carried out by an RFID reader and an RFID tap [12]. An RFID tag is attached to an object or object to be identified. RFID is used to describe a system that can transmit an object's identity data wirelessly using radio waves. RFID is included in Automatic Identification (AutoID) technology. The identification system is becoming very popular in various industries such as services, purchasing, manufacturing, etc. Radio Frequency Identification (RFID) is a technology that combines the functions of electromagnetic

or electrostatic coupling in the radio frequency portion of the electromagnetic spectrum to identify an object. RFID is used in various fields, including companies, supermarkets, attendance, and hospitals, and is even used to identify the control of the use of subsidized fuel [10]. RFID uses a system that identifies a radio wave [13]. Therefore, there are two devices to do in this research [13]. The tools in question are RFID Tags and RFID Readers. Where so that the two tools can function properly and correctly.

D. ICONIX Process

The ICONIX Process is a minimalist, streamlined approach to using case-driven Unified Modeling Language (UML) that uses a core subset of UML diagrams and techniques to provide thorough coverage of object-oriented analysis and design. Its main activity is robustness analysis, a method for bridging the gap between research and innovation. Robustness analysis reduces the ambiguity in use case descriptions by ensuring that they are written in the context of an accompanying domain model. This process makes the use cases much easier to design, test and estimate.

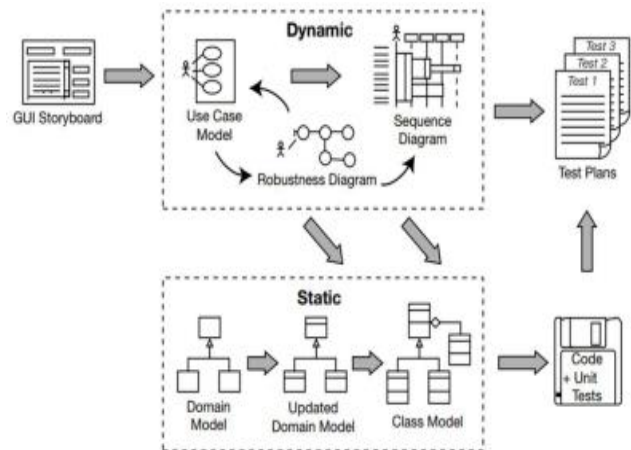


Figure 1. ICONIX Process

Figure 1 shows the process sequence of using the ICONIX method, which consists of several stages. Such as producing output used in work for the next stage. The ICONIX Process has 6 stages and their explanations [14].

- Requirements gathering are collecting all the functional requirements needed in the manufacture of software.
- Preliminary design is an early stage in estimating dimensions based on architectural and structural drawings.
- A preliminary design review is a technical assessment that establishes an Allocated Baseline of a system to ensure a system is operationally effective.
- Detailed design is a planning product made by planning consultants for civil building works such as buildings, and ponds.
- Critical design review is a multi-disciplinary technical review to ensure that the system can proceed to

fabrication, demonstration, testing, and performance requirements stated in terms of cost, schedule, and risk.

- Implementation is an application or implementation of something.

The following is Table I of descriptions of each stage and its output regarding the ICONIX Process method. Table I shows the stages or phases of using the ICONIX process method. Many iterations also occur when doing domain models, use case analysis, and so on [6]. This workflow determines the activities that must be carried out by workers, such as requirements determination, modeling, analysis, design, implementation, testing, and deployment. The ICONIX process was chosen as the methodology for developing the content management system application that was developed because the ICONIX process could meet all requirements. The choice of the method using ICONIX Processes is inseparable from some of its main features [15].

TABLE I
ICONIX Process Method

Phase	Artifacts	UML
Requirement	Functional Requirement	Yes
	Domain Modeling	Yes
	Behavioral Requirement	Yes
	Requirement Review	No
Analysis of Preliminary Design	Robustness Analysis	Yes
Milestone 2: Preliminary Design Review	Domain Model	Yes
Detailed Design	Sequence Diagram	Yes
	Class Diagram	Yes
Milestone 3: Critical	Consistency Analysis	No
Design Review	Correctness	No

III. RESEARCH METHODOLOGY

The research methodology that will be used to support the observation and research process is as follows,

A. Data Collection

Data collection at the analysis stage of this research uses interview and observation methods. In the interview activities, we provide several questions addressed by certain parties to obtain direct information about the situation and conditions at that time. In addition, there is also an observation method where data collection is carried out by observing the

requirements of the surrounding environment when implementing this information system.

B. Literature Study

Collect various literature sources from various existing references to support this research, such as journals, the internet, and e-books.

C. Requirement Analysis

In conducting a needs analysis, a business process analysis is carried out regarding activities before and after using an information system. This analysis uses the Business Process Model and Notation (BPMN) technique because it can summarize a business process activity. It simultaneously determines several functional requirements supporting this process, such as creating a modeling domain and identifying business process activities.

D. System Design

The design of this system uses a process that follows the needs and the literature review described. Then several steps are taken to (1) design the system, namely analysis/preliminary design, which produces robustness diagrams and milestones; (2) preliminary design review, which results in updating the domain model; and (3) detailed design, which produces sequence diagrams and class diagrams. [16].

IV. RESULT DAN DISCUSSION

The method used for analysis and design in this study is based on UML objects based on the ICONIX Process method

A. Business Process Analysis

This business process analysis is carried out using BPMN (Business Process Modeling Notation) modeling. Business Process Modeling Notation (BPMN) is a modeling standard that describes a business process activity [17]. Where, it serves as an explanation or description of a current and proposed business process [8]. Therefore, to describe the entire business process that currently wants to be designed, several proposals regarding this design as the process of taking attendance, the proposed attendance data storage, and the suggestions regarding access rights to users.



Figure 2. Current Attendance Business Process

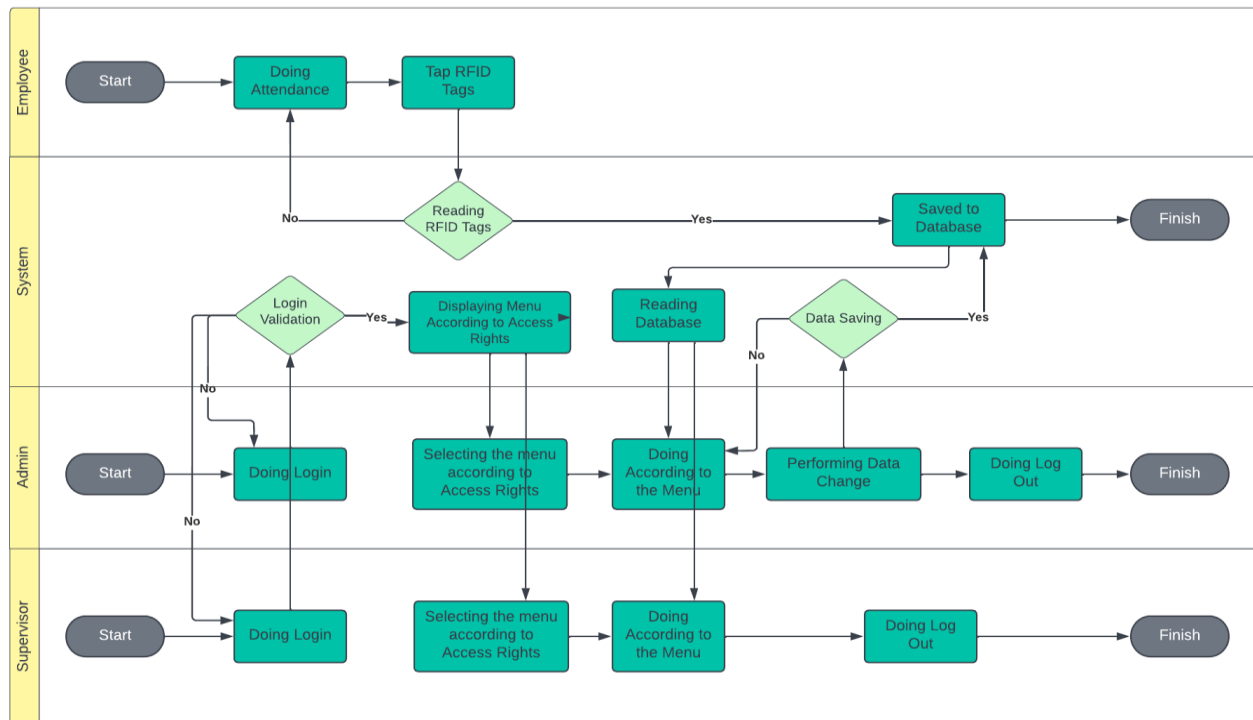


Figure 3. Proposed Attendance Business Process

The business process modeling in this research object is shown in the flow in Figures 2 and 3. Figures 2 and 3 show that the state of the process as a whole still has not implemented Information Systems at all. In its implementation, it is still using conventional process models.

B. Requirement

This process is a stage to analyze several needs that will support the design of an employee attendance information system. Usually consists of Functional Requirements, Domain Modeling, Behavioral Requirements/Story Board Interfaces, and Use Case Modeling [18].

1) Functional Requirement

At this stage, identifying the problems and users using an information system is carried out. Therefore, we obtained three actors from the identification process: Employees, Supervisors, and Admin. The following are the results of identifying and analyzing functional and non-functional requirements. The following are the results of an analysis of applicable requirements

- The system can manage attendance data such as adding, editing and deleting.
- The system can create and manage the results of attendance reports for employee attendance or absenteeism.
- The system can store and back up employee data using cloud storage.

In addition, there are also the results of the analysis of non-functional requirements needed by the system to get the expected output, as follows:

- Availability, this attendance application system can provide convenience in doing attendance by employees and can be used to recap the results of attendance by supervisors and owners.
- Usability, this attendance application system will have an interface design that is easy to use by admins and supervisors, as well as for employees to simplify attendance easily, namely by tapping the E-KTP card to the RFID reader integrated by the database.
- Security, this attendance application system can only be accessed by superusers such as admins and supervisors because each has a username and password to access the system. However, employees do not have access to enter the system but are only used for attendance.
- Portability access to the attendance application system can only be accessed on the local network, and the attendance file will be integrated with storage in the cloud.
- Supportability has been explained in the analysis above for the needs related to software, hardware, and users in this attendance application system.

2) Domain Modeling

At this stage, the identification of several terms in the functional requirements used to support the contents of the domain model is carried out, as shown in Figure 4.

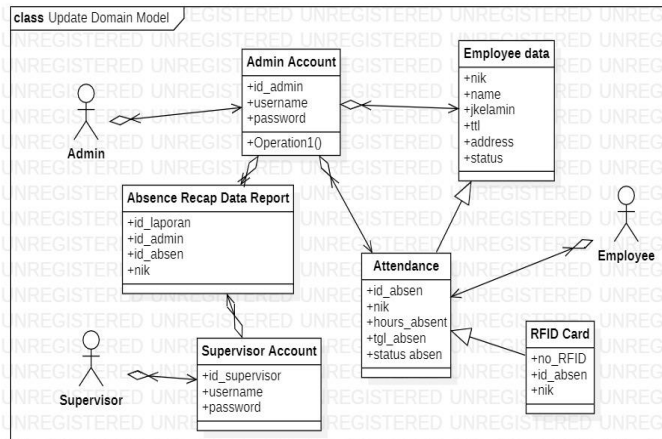


Figure 4. Update the Domain Modeling of Employee Attendance Applications

Figure 4 is a domain model with three actors: Supervisors, Admins, and Employees. And also, the domain model has several tables: admin accounts, supervisor accounts, reports on absent recap data, employee data, attendance, and RFID cards. The table supports the process of running the system and storing existing data. There are also several attributes to support the process of running the system and storing existing data. The domain model has five tables: attendance reports, employees, admins, supervisors, attendance, and RFID. Where each table also has several attributes in it as an entity class.

3) Behavioral Requirement

The next step is the development of a GUI Storyboard or the design of several displays on a system. And will attach a use case diagram to support the depiction of a feature and a fungus in this information system. Figure 5 is a storyboard design regarding the login page display form, where the structure consists of brief information such as textboxes, login buttons, and some current information.

Figure 5. Display Menu Login

Figure 6 illustrates a storyboard design for the main page display form, also known as the main dashboard, which pertains to the page displayed after signing in. The page includes information about the store taken from the case study

and various buttons on the left side of the page that expands into dropdown menus. The menu on the left, specifically the main menu, employee data, employee attendance data, the attendance recap report, and the log-out option.

Figure 6. Main Menu Display

Figure 7 is a storyboard design that is still the same on the main page. However, this design will only display the results of a dropdown or expand from several menus on the left. For example, if the Employee Data menu is expanded, several more sub-menus will appear, such as Employee Data and Add Employee Data. Likewise, the other menus can be seen in Figure 7.

Figure 7. Display "Expand" Menu

Figure 8. Employee Data Addition Display

Figure 8 is a storyboard design regarding the form for adding employee data. As in the picture, there is some information to fill out on the record for adding employees. In the form, there are several textboxes, radio buttons, and submit buttons.

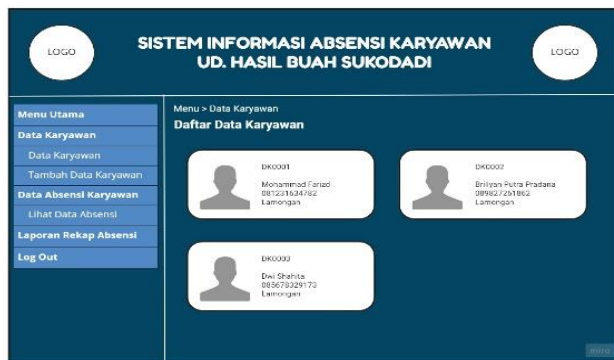


Figure 9. Employee Data Menu Display

Figure 9 shows a storyboard design regarding the form to see some of the existing employee data. In the form later, employee data can be seen if you double-click on display. Besides that, the employee data also presents some important information about personal data from the employee data.



Figure 10. Attendance Data Menu Display

Figure 10 is a storyboard design regarding the display form of attendance data. The attendance data will display a table object with column information such as Employee Name, Incoming Attendance, Exit Attendance, and Number of Working Hours. In addition, there is also a textbox object to find information or the names of existing employees.

After seeing some of these pictures, a display design such as a login form, dashboard form, or main menu, several expanded dropdown menus, employee data addition forms, and other form displays. Where, the display is made to be customized based on the identification of functional requirements and features.

Figure 11 is a use case diagram generated from the system. That is, there are seven use cases. The actors themselves consist of Admin, Supervisor, and Employees; some have

different access rights. Like actors, employees can only do attendance. Meanwhile, the admin actor can log in to the system, manage attendance results, manage employee data, and manage attendance report recaps. In addition, actor supervisors can only view employee data and simultaneously check attendance recap reports.

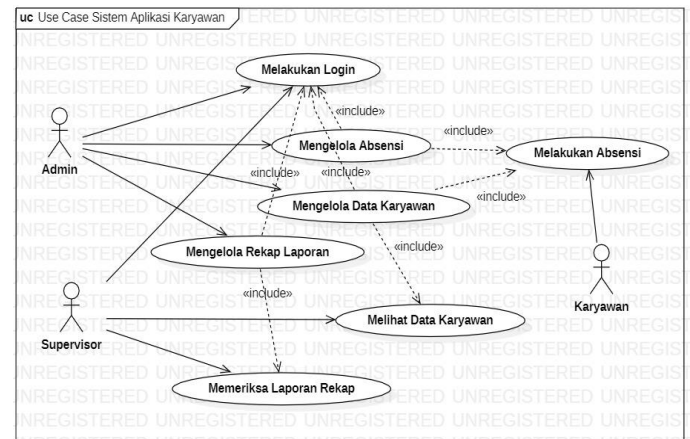


Figure 11. Use Case Diagram

C. Analysis/Preliminary Design

The analysis or preliminary design stage is a process stage to bridge a need that has been analyzed and is used as a liaison with system design [18].

1) Robustness Analysis

At this stage, research is carried out using the Robustness Diagram to connect the analysis with the design of the existing system. The diagram is some descriptions of objects from the use cases that have been made.

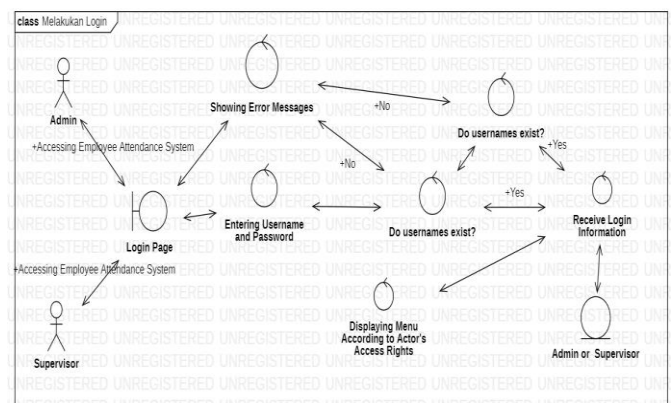


Figure 12. Robustness Diagram Login

In Figure 12, login above, starting with the actor admin and supervisor. Where the actor will access the admin on the employee attendance application system, it will display the login page, and the actor must enter the existing username and

password. After that, the system will verify whether the username and password are in the database or not; otherwise, it will display an error message regarding the username and password and will then be returned to the main login page.

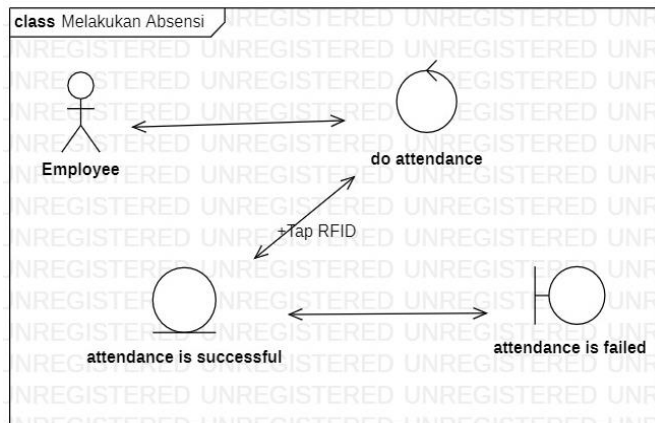


Figure 13. Robustness Diagram for Attendance

In Figure 13 attendance, three actors can do attendance, namely Employees, Admins, and Supervisors. The actor can perform attendance by tapping the RFID. If the attendance is successful, the attendance data is stored directly in the database. If the RFID tap fails, it must do a re-tap.

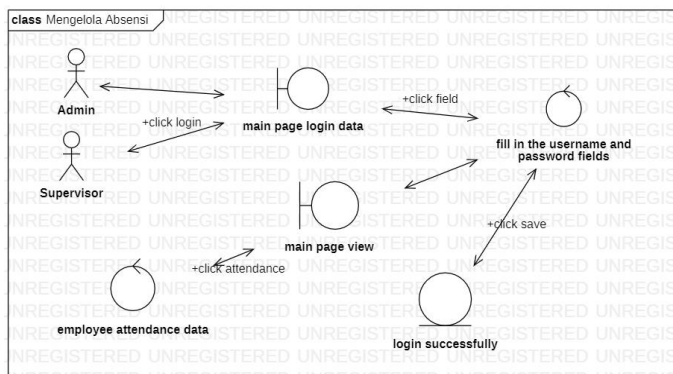


Figure 14. Robustness Diagram Managing Attendance Data

Figure 14 describes the managing attendance data admin and supervisor click login. The main login data page will appear; after that, the admin and supervisor fill in the username and password created or provided. The supervisor and admin click the save button, then the login will be successful, after logging in The main web page will appear. On the main web page, there is a menu of employee attendance data. In this menu, admins and supervisors can manage attendance.

In Figure 15, managing employee data, there are two actors: admin and supervisor. The actor can log in using the username and password that has been prepared, and then on the main web page, there is a menu option for managing

attendance data. A page for managing attendance data will appear when you click on the menu.

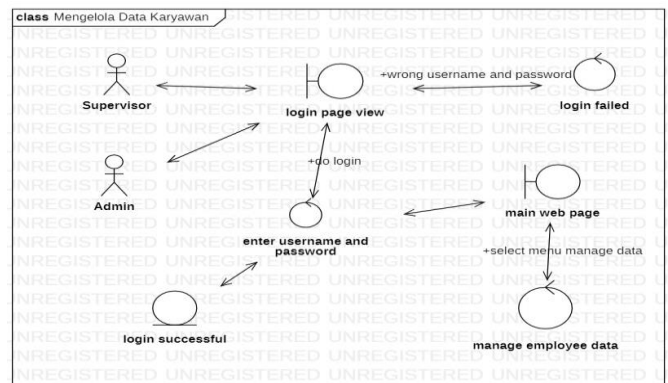


Figure 15. Robustness Diagram Managing Employee Data

In Figure 16, seeing this employee data, there are two actors: admin and supervisor. The actor can log in using the username and password that has been prepared, and then on the main web page, there is a menu option to view employee data. When you click on the menu, a page will appear with information on some employee data.

In Figure 17, managing the data recap of this report, there are two actors, the admin, and the supervisor. The actor can log in using the username and password that has been prepared, and then on the main web page, there is a menu option for managing report recaps. Furthermore, there is an activity to verify whether the report has been changed or not. If something is to be changed, the actor will modify the information, and the system will confirm the change. If the confirmation is "yes," it will save the report changes; if not, Changes in the report will immediately direct the system to the next stage. At this last stage, the Back system will offer to download the report or directly print the information.

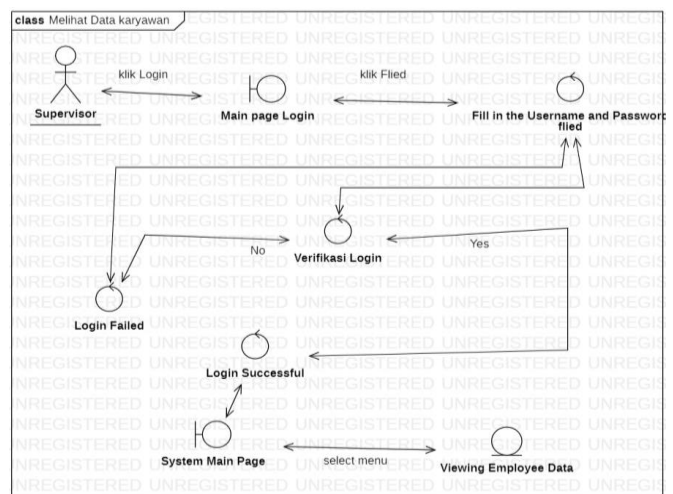


Figure 16. Robustness Diagram Viewing Employee Data

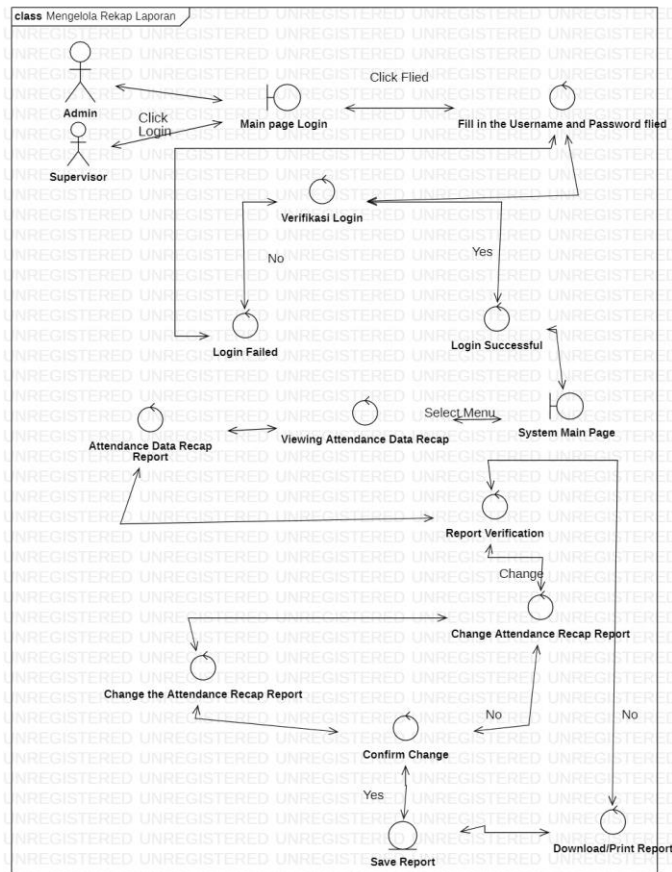


Figure 17. Robustness Diagram Managing Report Recap

D. Detailed Design

This process is used to explain in detail the information system that will work according to the existing object. This stage usually consists of a sequence and class diagram [18].

1) Sequence Diagram

Sequence diagrams are made according to the number of use cases, and this design has seven pieces. So the sequence diagram follows the robustness diagram, which previously followed the use case scenario. sequence diagram Login shown in Figure 18.

The sequence diagram in Figure 19 contains three objects, including the admin and supervisor actors, the system, and the database. The two actors have different access rights for each user. After entering their username and password for the first time, the actor will then click the login button to complete the process. The system object will then check if the user has successfully logged into the database object. The login and password that have been entered will be validated by the system based on the database. If the login fails, the database will give a failed login response, and the system will notify the actor that the username and password are incorrect. If the login is successful, the system will display the main page on the system to the actor.

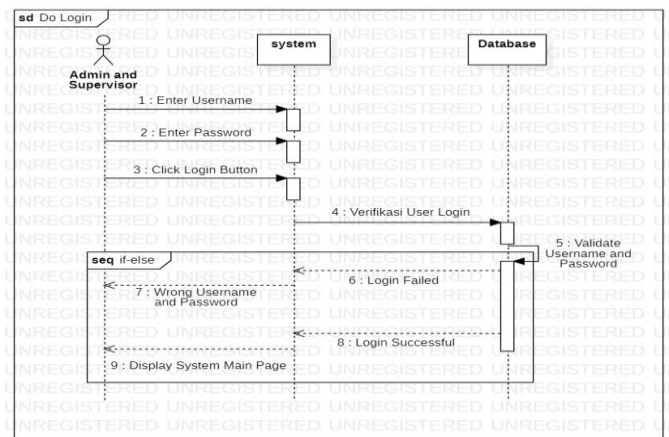


Figure 18. Sequence Diagram Login

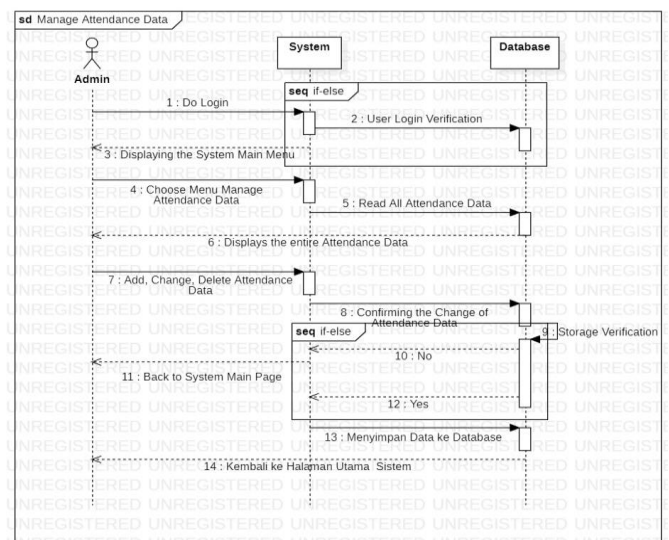


Figure 19. Sequence Diagram Managing Attendance Data

In the sequence of managing attendance data, Figure 20 contains several objects, where the objects consist of the admin actor, the system, and the database. Before processing attendance data, the actor is required to log in first. If the login is successful, it will display the main attendance menu. Next, the actor will select the menu to process attendance data, and the system will send a message to read all the attendance data in the database. Then from the database, it will display the entire attendance data to the actor object. The actor can add, change, and delete attendance data directly. After that, the system will confirm the changes to the database; if not saved, it will immediately return to the main system page. If the data is saved, the system will send a message to the database to save it, and from the database, it will go straight back to the main page on the system.

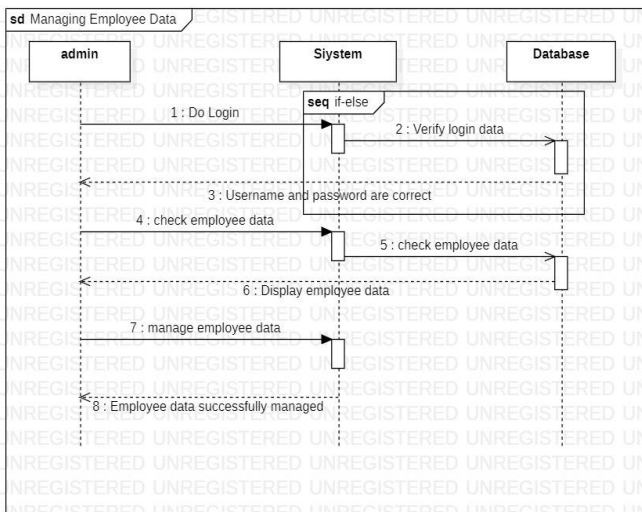


Figure 20. Sequence Diagram Managing Employee Data

The diagram in Figure 21 is almost the same as the diagram of seeing employees. This is where there are 3 Lifelines, namely Admin, System, and Database. The admin logs into the system, then the system verifies the login data to the Admin Database. If the username and password are correct, the database will display a successful login to the admin. After that, the admin can check employee data into the system. Then the system will check the employee data in the Employee database. If the employee database is correct, the employee database will display employee data to the admin. Then the admin manages employee data in the system. If successful, the system will display employee data successfully managed to the admin.

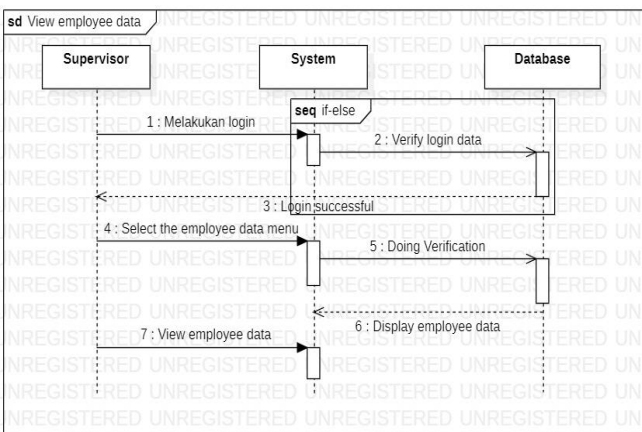


Figure 21. Sequence Diagram Viewing Employee Data

In the diagram in Figure 22, the Supervisor Actor logs into the system. After logging in, the system verifies the login data to the database. Here the database checks whether the username and password entered are correct. If appropriate, the database will display a successful login to the supervisor. If the login is successful, the supervisor can continue by

selecting the employee data menu. After selecting the employee data menu, the system will verify the employee database. Then the employee database will display employee data to the system so that supervisors can view employee data in the system.

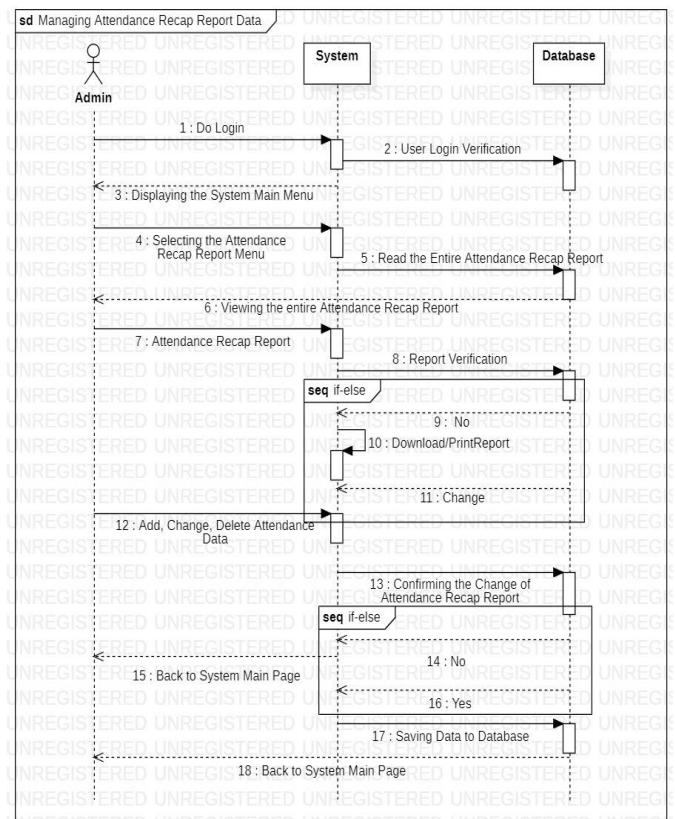


Figure 22. Sequence Diagram Managing Attendance Recap

In the sequence diagram of Figure 23, the Admin or Supervisor logs in and then fills in the username and password then the system verifies the login if the login is successful and then enters the main system page then from the admin/supervisor object selects the menu to view the attendance data recap, the system will automatically enter the report the attendance data recap and the database will read the entire attendance recap report and display it on the admin/supervisor object and then switch to the system object for the attendance recap report and then verify on the database object to verify the report whether anything has been changed or not, otherwise it will automatically return to the system to download/print the report and if you select 'Download' then the next process the admin/supervisor object performs the activity of adding, changing, or deleting attendance data then the system object will send it to the database object to confirm the change of the attendance recap report then the database object confirms If the confirmation is 'yes' then the report changes will be saved to the database and if 'no' it will immediately return to the main system page. At this last stage,

the Back system will offer to download the report or directly print the report.

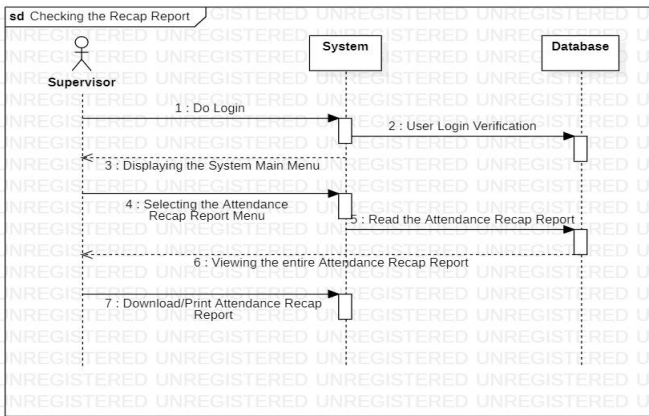


Figure 23. Sequence Diagram Checking Attendance Recap Report

In Figure 23, the admin/supervisor object logs in and automatically enters the system object, verifies the user login, and leads to the database object. The system object will display the main system menu on the admin/supervisor object, and the admin/supervisor object will select the attendance recap report menu. The database will read the attendance recap report, and the database object will immediately display the entire attendance recap report to the admin/supervisor object. At this last stage, the system will offer to download the report or directly print the information.

The following are some diagrams regarding sequence diagrams, from the several images of the sequence diagram, in which there are also several objects and actors, such as Admin, Supervisor, Employee, System, and Database.

1) Class Diagram

The class diagram was created because of developments regarding the domain model and several other diagrams that had previously been made. The following is an image of the class diagram that has been created.

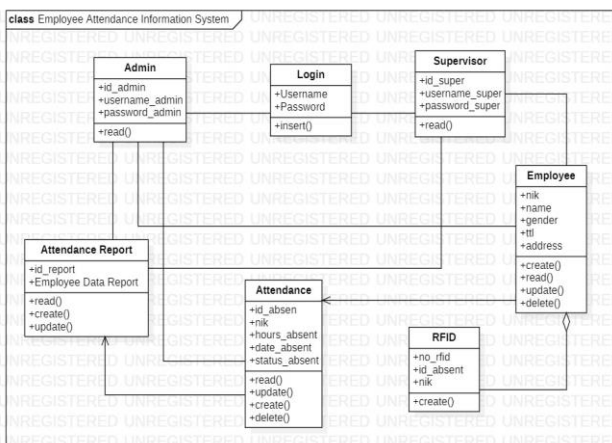


Figure 34. Class Diagram

In Figure 24, this is a Class Diagram created based on the definition of the use case diagram, where each function is contained in each class that is made to meet the needs of the processes contained in the Use Case. In the class diagram, the Employee Attendance Information System has several classes: Admin, Supervisor, Employee, Login, Attendance, Attendance Report, and RFID. The class itself serves to accommodate the contents of the program to be run, it contains attributes, data types, and operations to run a program. In this class diagram, each employee has several attributes. The supervisor and admin classes have attributes *id_admin*, *username_admin*, and *password_admin*. The login class contains the *username* and *password* attributes. The employee class has the attributes of *nik*, *name*, *gender*, *ttl*, and *address*. RFID class has attributes of *no_rfid*, *id_absen*, and *nik*. The class attendance attribute of *id_absen*, *nik*, *jam_absen*, *tgl_absen*, and *status_absen*. The class attendance report attribute of *id_report* and *report_data_employee*.

So in making this class diagram, there are several stages regarding the system process that have occurred previously following the identification of needs.

V. CONCLUSION

The ICONIX Process method is a methodology that requires a short time, which is usually used to build the design or development of an Information System and software. In ICONIX itself, there are several processes in it. However, the implementation stage has not yet been carried out in this observation or research. The findings can be gleaned concerning the investigation and planning of an information system utilizing RFID technology from E-KTP. The RFID system is very helpful in managing attendance; besides that, the system can be integrated and recorded directly using a database that can help to find out the results of the report recap that the system will carry out.

It can help and make it easier for admins, supervisors, and employees regarding the employee attendance system on the study object of research store with results quickly and accurately. Integrating the system with the database can make it easier to read attendance with the results of the recap of reports produced by the system. An RFID system that can accommodate large amounts of data is assisted by a database which can be profitable in terms of operations and time efficiency. Effective use of RFID is beneficial for business process activities. Where these business processes depend on human resources, the use of RFID in managing attendance is very effective in terms of its flexible use and reach.

The future research is about the improvement and maximization of the RFID-based attendance information system concerning the results of the analysis and design of this research for use in the new system. Need to do learning or training on the user. After the system can be implemented and implemented properly, it is possible to develop a new system so that its deficiencies can be corrected or added to keep it in line with increasingly sophisticated technological developments. The program can be redeveloped to get maximum results in its use.

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