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Analysis and Design of Employee Attendance System Using QR Code with Webcam
(Case Study: PT. Adhicon Perkasa)

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Abstract – *Employee attendance is a process of recording employee attendance that is commonly used in companies, where previously all attendance recording was done manually and on a paper basis, so it took time to recapitulate, and allowed human error to occur. The use of technology in recording attendance, such as fingerprint attendance, web-based attendance, Quick Response Code attendance and others, is expected to help in managing attendance data. The aim of this research is to design a Web and Android-based Quick Response Attendance Code Application that can simplify the process of recording employee attendance and recapitulating daily attendance so that the results obtained are more accurate, then the stored data is used to count employees. need for food money per day. The research method is divided into problem identification, an interview approach is carried out with related parties by taking case studies at PT. Adhicon Perkasa. Solution development is carried out by conducting analysis and system design using uses diagrams and other diagrams. The result of this research is the Quick Response Attendance Code Application which can make the attendance process more accurate, minimize human error, and make it easier to recapitulate attendance for calculating daily meal allowances. It was concluded that with this application it is hoped that employee performance can improve because there is no longer a need to make attendance reports manually and the calculation of meal allowances will become more accurate.*

Keywords: Attendance; recapitulation, QR Code; Employee Data

I. INTRODUCTION

Efficiency and accuracy in employee data management are important things for companies. Attendance recording systems with manual attendance or fingerprint machines often face various obstacles, including long queues, data manipulation, and inaccurate recording. Therefore, an innovative solution is needed to overcome these problems while increasing the effectiveness of human resource management.

PT. Adhicon Perkasa is a sub-contractor operating in the general contracting sector. Employees, in this case field officers, record their attendance using fingerprints. An error that often occurs when using this method is if the fingerprint pattern does not match the initial pattern during registration, This is because the fingerprints on workers' hands change due to the impact of work, such as thickening or contact with building materials.

Because of this, the system will give an order to repeat the position of the employee's finger until the fingerprint pattern is read by the system. This error makes the finger printing machine ineffective, and caused a queue in front of the recording machine.

For storing and retrieving employee data, PT. Adhicon Perkasa still uses manual methods. It's like creating columns in Excel manually and giving each category a subtitle, so

it can disrupt employee work time if they have to create reports manually. Likewise, storing and retrieving employee attendance data for calculating weekly meal allowances is still done manually.

Therefore, the use of QR Code (Quick Response Code) technology integrated with a webcam offers great potential for a revolution in employee attendance systems. Presence is the presence or absence of an object or person, which is involved in an organization, and requires notification of the number of attendance or absences within the scope of the organization (A. Husain et al, 2017),, in addition, attendance can also be used as an application of discipline in a company or institution (O.H Lengkong et al, 2016).

QR Code is a two-dimensional matrix that can store large amounts of information with high reading speed (Dennis, 2021). Meanwhile, webcams that are generally installed on computer devices can function as efficient and economical QR Code scanners. With QR Code, document authenticity information is made simpler without typing validation code information on the document.

The design of an employee attendance data processing application using QR Code with a webcam aims to optimize the attendance recording process, improve data accuracy, and simplify the management of attendance information. This system is expected to provide several benefits, including:

1. Accelerate the attendance process and reduce queues
2. Increase the accuracy of attendance recording
3. Reduce the possibility of manipulation of attendance data
4. Facilitate real-time monitoring of employee attendance
5. Integrate attendance data with other HR management systems
6. Reduce operational costs related to manual attendance recording
7. Increase efficiency in reporting and analyzing attendance data

The implementation of this application is expected to provide an effective and efficient solution in managing employee attendance data, while supporting increased productivity and transparency in the company's human resource management. With an efficient and reliable attendance system, companies can optimize employee attendance management, increase productivity, and reduce the potential for human error (Cahyono, 2023).

II. METHODS

2.1 Researh Flow

The waterfall model, sometimes called the linear sequential model was used in this study as the reseach flow. This method was chosen because of the requirements for a problem are well understood. Illustration of prototyping approach can be seen in Figure 1.

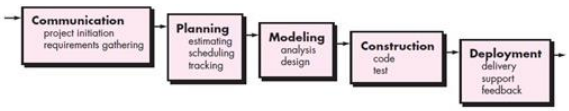

Figure 1. The Waterfall Model (Pressman, 2020)

1. Communication (Project Initiation & Requirements Gathering). Communication with the company is very important to understand and achieve the desired goals, before starting technical work. Observations and interviews were carried out related to the current process. The result of this communication is the initialization of the project, such as analyzing the problems encountered and collecting the necessary data, as well as helping to define the required software features and functions. Additional data collection can also be taken from journals, articles and the internet, as support.
2. Planning (Estimating, Scheduling, Tracking). The planning stage explains the estimated technical tasks that will be carried out, the risks that may occur, the resources needed to create the system, the work products that will be produced, the work schedule that will be implemented, and tracing the system work process. to ensure all work is carried out properly and completed according to the deadline.
3. Modelling (Analysis & Design). At this stage do the designing of data structures, software architecture, interface displays, and program algorithms. The goal is to better understand the big picture of what will be

done. Use several diagram aids such as flowcharts and use case diagrams.

4. Construction (Code & Test). The Construction stage is the process of translating the design form into a code or form/language that can be read by the machine. After the coding is complete, testing is carried out on the system and the code that has been created. The goal is to find errors that may occur so that they can be fixed later.
5. Deployment (Delivery, Support, Feedback). The Deployment stage is the stage of implementing software to customers, periodic software maintenance, software repair, software evaluation, and software development based on the feedback provided so that the system can continue to run and develop according to its function.

The Waterfall method was chosen because the project is small to medium scale with clear and stable needs. This method has a structured development approach, thereby helping the development team to stay focused on each phase of development. Carrying out in-depth and systematic testing at every stage and easy documentation. Resource management is simpler and control over time and budget is more predictable

2.2 Current Conditions

The current employee data processing system still uses fingerprints, which are no showing data, which means that employee data that has arrived cannot be displayed. Employees cannot see the arrival time. While in general, companies already use tapping machines with cards as a medium for processing employee data. So employees do not need to worry about errors when recording data.

A common error in using the fingerprint system is that the fingerprint pattern cannot be read, because it does not match the initial registration, so the system will give an order to repeat the employee's finger position, until the fingerprint pattern is successfully read by the system.

This error often occurs because employees in the field do construction work, so it is very possible for fingers to be damaged or dirty. This causes the fingerprint machine to be ineffective for data recording. The company returns to using the manual method, namely with an excel table that is given a sub-title for each category.

This disrupts employee work time because they have to make reports manually, while this data is used to calculate weekly meal money.

After conducting interviews with related parties and observing the ongoing process, the current process is as shown in Figure 1.

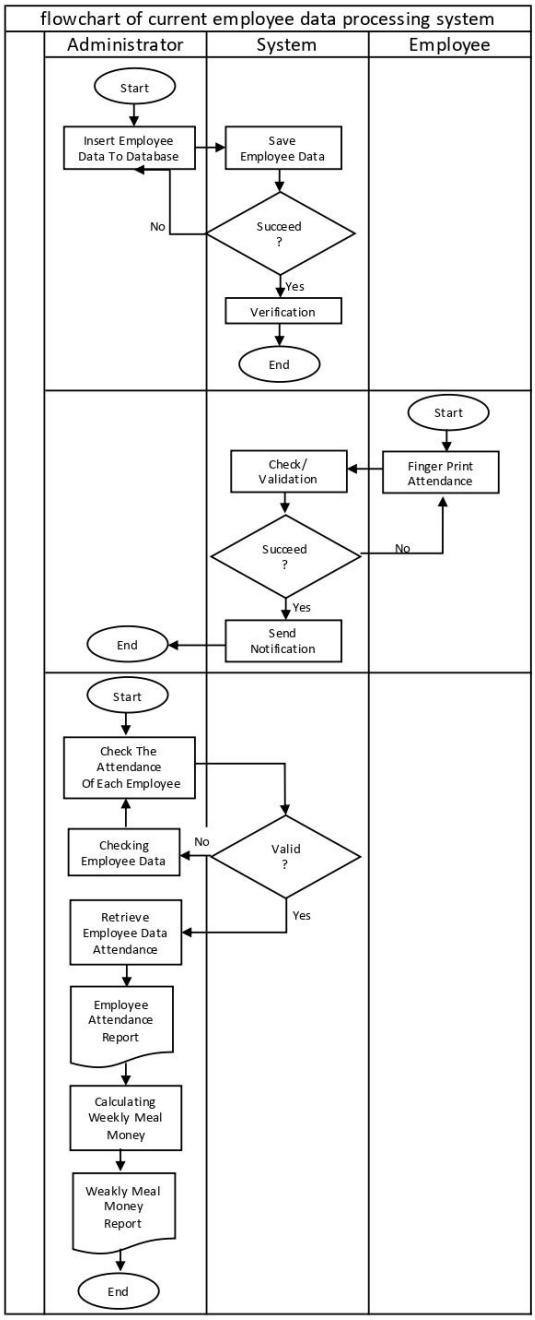

Figure 1. Current System Flowchart

2.3 Problem Identification

Based on the background that has been stated above, several problems can be identified as follows:

1. Employee attendance recording technology using fingerprints is less efficient, especially when recording return hours, due to work risks in the construction sector.
2. Because it often fails, data recording is re-used using Excel
3. Each employee makes their own attendance report, resulting in the use of different data formats.
4. The withdrawal of employee data reports is not integrated, so it takes more time to get the final report
5. Calculation of weekly meal money is inefficient, due to data that is in different formats and is not integrated

2.4 Proposed solution

The company needs an effective and accurate employee data processing system, so that it can help the company in managing data and creating employee reports systematically.

An application that helps record employee attendance, and calculate meal money based on employee attendance.

The application to be built is a desktop-based application, with the main features including:

1. Enter Code or Scan Barcode
   This feature is used for employees to record employee attendance every day by scanning the Qr Code or entering the Qr Code listed on the employee card.
2. Employee Attendance List
   After the employee has successfully entered the Qr Code in the input box, the employee's name will be displayed in this feature.
3. Retrieval of Attendance Recap Data
   This feature is used to transfer recorded employee data into excel format, which is then saved.
4. Admin Features
   Special features used by Admin for:
   a. Employee Data
      This feature is used to view employee data that has been registered. Contains detailed data for each employee. There is an "Add Employee" feature that is used to register new employees to get a Qr Code
   b. Attendance Data Recap
      This feature displays employee data that has been registered in the attendance list, and directly displays the amount of employee meal money per day. This feature is equipped with a function to move data from the application to Excel.
   c. Settings
      This feature is used to control all application settings according to admin needs. Including updating work hours, meal money amounts, admin passwords, and being able to test database connections in the software.

2.5 Design

2.5.1 Use Case Diagram

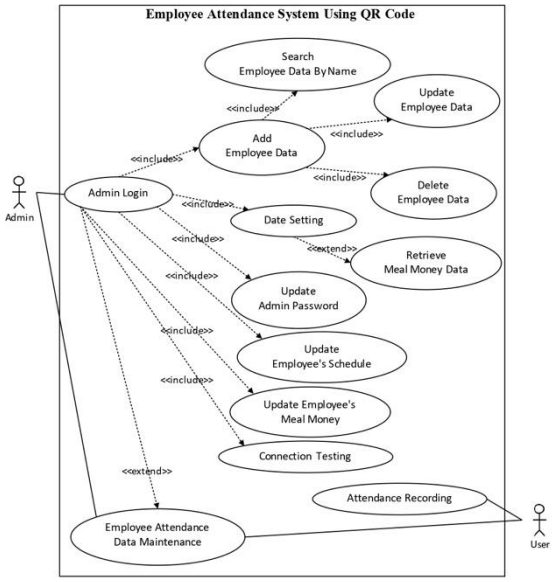

Figure 2. Use Case Diagram

III. RESULTS AND DISCUSSION

3.1 User Interface

The following display is the main page used by employees to record attendance by using a QR code scan or input code. On this page, the attendance of employees who have attended will also be displayed.

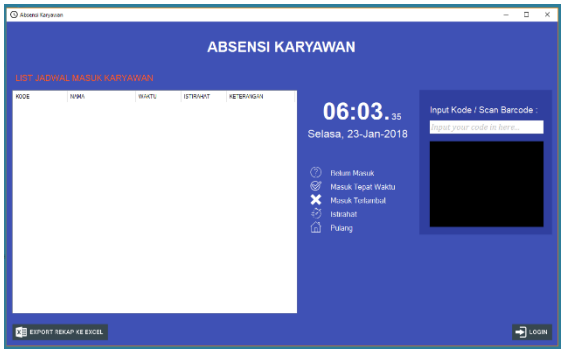

Figure 3. Main Home

Figure 4 is a display when an employee is taking attendance or recording attendance.

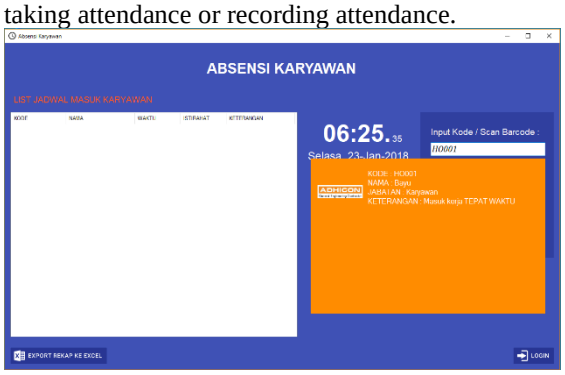

Figure 4. Notifications when employees are recording attendance

Figure 5 is a data recap page that will display the number of employee attendance and display the amount of food allowance per day for each employee.

Admin can pull data on employee meal allowances and add up employee meal allowances per day into excel form.

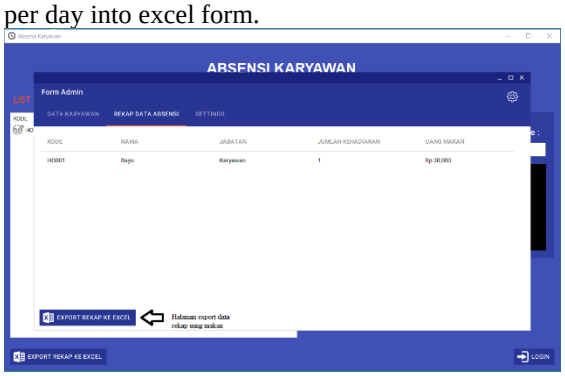

Figure 5. Data Recap Page

3.2 Testing Using Blackbox Method

Table 1. Testing For User (Employee)

No	Test Case	Result	Note
1.	*Scan Qr Code*	✓	Employees who do not have an ID card cannot do attendance except through the admin. Enter username & password
2.	*Input Code*	✓	If the QR Code cannot be read, the user can enter the code manually.
3.	Employee Attendance List	✓	After the user checks in, they will be added to the list.
4.	Export Employee Attendance Data	✓	Admin or user can take daily attendance data

Table 2. Testing For Admin

No	Test Case	Result	Note
1.	*Login Admin*	✓	Press the login button to enter the admin and enter your username and password.
2.	*Employee Data Page*	✓	Display employee data
3.	*Attendance Data Recap Page*	✓	Display the number of employee attendance and the amount of meal money that can be withdrawn based on date.
4.	*Page Settings*	✓	Can set employee attendance schedule, daily meal allowance, connect to database and change admin password.
5.	*Employee Data Input*	✓	*Admin must know the employee data that he wants to input into the application.*
6.	*Generate QR Code*	✓	*QR Code has been created*
7.	*Saving Employee data*	✓	Save employee data to database
8.	Export Date Settings for Meal Money Recap Data	✓	Select the desired data export date.
9.	*Export Data Recap of Meal Money*	✓	*Select the desired Export data summary of meal money*
10.	*Export Employee Attendance Data*	✓	Admin or user Recap of attendance per day The edge of the web is given a note for user input
11.	Set Working Hours Schedule	✓	Enter desired working hours schedule
12.	Set Daily Meal Money Addition	✓	Enter the amount of food money per day
13.	Connection Test	✓	Connecting to database
14.	Change Password	✓	Change password if admin wants

3.3 User Interface Evaluation

UI evaluation uses 8 golden rules based on Ben Schneiderman's theory. There are 8 principles that can help a developer or designer to design a more interactive interface. These principles are also known as the 8 golden rules which consist of:

a. Strive For Consistency
b. Seek Universal Usability
c. Offer Informative Feedback
d. Design Dialogs to Yield Closure
e. Prevent Errors
f. Permit Easy Reversal of Actions
g. Keep Users in Control
h. Reduce Short-term Memory Load

3.4 User Experience Evaluation

The evaluation used is 5 measurable human factors, here are the results of the interviews conducted:

1. Time to Learn
   The application is easy to learn even though there are still obstacles in the admin section, because the employee data processing system is different from the previous data processing system that used fingerprints.
2. Performance Speed
   The application performance is considered quite good and meets user's desires.
3. Level of Errors Made by Users
   The application can be used well and displays final results that are in accordance with user needs.
4. User memory
   Users can easily remember each feature they want to use. Able to remember the functions of each available feature.
5. Subjective satisfaction
   Application users are quite satisfied, and especially the admin feels helped in terms of calculating the number of employee attendance and the amount of meal money based on employee attendance each day.

IV. CONCLUSION

Based on the data obtained after going through the stages of analysis, design, development, testing and evaluation, it can be concluded that Employee attendance System Using QR Code With Webcam has the potential to significantly improve in recording employee attendance data faster and more accurately.

The results of this research have shown the advantages of using QR codes in increasing the efficiency of data recording. The impact of implementing this system that the application provides a good user interface and user experience to users and will help minimize human error, and also ease of data retrieval helps users (admins) in calculating meal money, organizing data, and creating employee attendance reports.

The system that can be improved is primarily the need for a security system to prevent employee cards from being transferred to other employees. Employee attendance System can be completed with clocking out, to ensure employees work the specified number of hours.

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