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The Implementation of Employee Management System on SMC Technology Sdn. Bhd.

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Abstract: The employee management system is a platform that stores and manages all work-related as well as critical personal information of human resources in a secure environment. The aim of this study is to design, develop and test the web-based employee management system. This project employs a waterfall development method, and the system is built with Visual Studio Code and the phpMyAdmin as database. Employees and administrator are the two types of user in this system, and there are around five functional modules available, including employee information, attendance, leave, payroll, and performance. After the system is implemented, the user acceptance test and test plan are carried out, and the actual results also show that the test of each module is successful. In general, the system performs as a platform for improving employer-employee relationships, and also improve the performance of the company's employee management.

Keywords: Employee management, web-based, waterfall

1. Introduction

An employee management system is a platform that stores and manages all work-related as well as critical personal information of human resources in a secure environment. This project aims to develop an employee management system that will allow the company to more conveniently and methodically handle all employee-related matters.

According to an interview with Ms. Gan Bing Bing, an office clerk of recycling company SMC Technology Sdn. Bhd., that specializes in plastic recycling and reprocessing to export, there is no a formalized and systematic management system between the employer and the employees. All employee-related matters are primarily managed manually through paperwork.

As a result, there were some clear problems with the unsystematic employee management. The use of a punch card method to track employee attendance is the most significant problem. In addition, the company's payroll method requires manually calculating and paying each employee. Furthermore, unsystematic employee management also makes it difficult for employers to correctly assess an employee's performance. Based on the problem statement, several objectives were identified. The objectives of this project are: 1. To design an employee management system using structured approach.

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2. To develop an employee management system using web-based approach. 3. To test the developed system.

The system, on the other hand, had two types of user: employees and administrator. The administrator will be in charged by the head of human resources, and the employees will be all of the company's employees. In addition, the system comprised five modules: employee information, attendance, leave, payroll, and performance.

2. Related Work

This section discusses about the related work for the study which are employee management system and web application.

2.1 Employee Management System

Employee management is built on ideas and procedures developed to increase worker motivation, productivity, and performance [1]. Clearly, an employee management system, which also known as human resource management system (HRMS), is a tool that integrates ideas and procedures with the goal of assisting employees in performing at their best and achieving company's goals. It is a comprehensive process that encompasses practically all aspects of human resources, including new hire recruitment, payroll management, performance management, and more [2].

2.2 Web Application

Web applications are currently one of the fastest-growing segments of the software industry. Web apps not only introduce new types of applications, but they also introduce a completely new method of delivering software to end users [3]. A web application allows information processing functions to be started from a browser and run on a web server, application server, and database server. A web application is more than just a series of web pages with navigational links that specifically built to run in a web-based environment [4]. On the other hand, web usability refers to a web application that can be used by a specific group of users, with specific training and support, to complete a specific set of activities in a specific set of circumstances, with the interaction being measured by a set of usability criteria [4].

2.3 Study of the Existing System

For the proposed system's benchmark, three systems were chosen for comparison: Workday [5], PeopleSoft [6], and PeopleBookHR [7]. Table 1 shows what are the similarities and the differences of them with the proposed system.

Workday offers a number different features, one of which is workforce management and planning. There is feature-rich dashboard provided to assist business leaders better manage their staff. Aside from that, there is a reporting and analytics feature. Workday has an effective reporting dashboard that shows customers how well all of the HR services are performing. Furthermore, recruitment and talent management are another feature available. Workday's recruiting module functions as an applicant tracking system (ATS), assisting the hiring process from beginning to end.

As a well-known HR solution, PeopleSoft also equipped with workforce management, which through a range of useful capabilities such as anticipating workload demand and labor, capturing working time and absences, establishing and recognizing work schedules, and guaranteeing compliance with rules, regulations, and laws. It's labour regulations and monitoring management help businesses control expenses by delivering real-time analysis of essential labour data, such as overtime and unreasonable absences. It also has a talent management tool that helps to manage the entire talent cycle, including recruiting, planning, and learning.

Lastly, attendance, leaves, document management, payroll, performance management, roster management, resource allocation, and more can all be automated with PeopleBookHR. The system can be customized to meet company specific objectives while remaining cost-effective.

Table 1: Comparison between the existing system and the proposed system

No.	Features	Workday	PeopleSoft	PeopleBookHR	Proposed System
1.	Mobile platform	✓	✓	✓	✕
2.	Web platform	✓	✓	✓	✓
3.	Advertising banner pop-up	✕	✕	✕	✕
4.	Free to use	✕	✕	✕	✓
5.	Paid to use	✓	✓	✓	✕
6.	Employee information module	✓	✓	✓	✓
7.	Attendance & Leave	✓	✓	✓	✓
8.	Payroll	✓	✓	✓	✓
9.	Performance	✓	✓	✓	✓
10.	Talent training	✓	✓	✓	✕
11.	Recruitment	✓	✓	✓	✕
12.	Reporting	✓	✓	✓	✓

Legend: ✓ = Yes ✕ = No

3. Methodology/Framework

The Waterfall model is used in developing this system. It is the most basic SDLC approach for software development. Because it depicts the software development process in a linear sequential flow, it's also known as a linear-sequence life cycle model. This implies that each phase must be finished before moving on to the next, and the phases must not overlap [8].

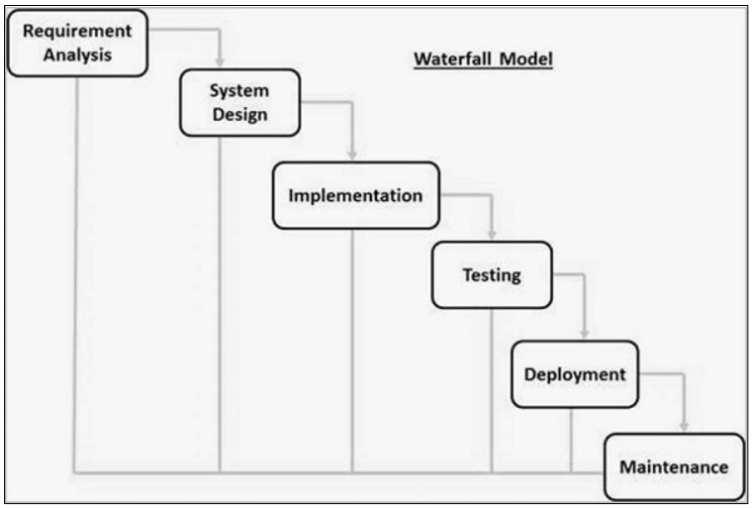

Figure 1: Waterfall model [8]

Requirement analysis, design, development, testing, and maintenance are the main five stages of the Waterfall model as shown in Figure 1. Waterfall development has the advantage of allowing for departmentalization and control. A timetable may be created with deadlines for each step of development, and a product can be guided through the various phases of the development process one by one. From idea to design, execution, testing, installation, and troubleshooting, development leads to operation and maintenance. Each stage of development must always be completed in a precise sequence [8].

3.1 Requirement Analysis Phase

The process of identifying the expectations of users for a product that is to be produced or updated is known as requirements analysis. The complete proposed system's functional and non-functional requirements are identified and presented in Table 2 and Table 3 respectively.

Table 2: Functional requirements

No.	Function Modules	Functionalities
1.	Registration	• Only the administrator is allowed to register account with valid username and password for employees.
2.	Login	• Administrator and employees are able to login to the system with the registered account.
3.	Logout	• Administrator and employees are able to logout from the system after using it.
4.	Account Update	• Administrator is able to update account's profile. • Employees are only allowed to update their account's password.
5.	Employee Information	• Administrator is able to manage employees' information with CRUD operation. • Employees are allowed to view their personal information.
6.	Attendance	• Administrator is able to view employees' attendance details and generate the report. • Employees are allowed to sign in and sign out for their attendance. • Employees are allowed to view their personal attendance records.
7.	Leave	• Administrator is able to manage the leave application from employees and view all the leave application records. • Employees are allowed to apply for the leave and view their personal leave application whether is approved or not.
8.	Payroll	• Administrator is able to calculate employees' salary automatically with the clearly details salary list.
9.	Performance	• Administrator is able to rate the employees' monthly performance. • Employees are allowed to view their personal monthly performance.

Table 3: Non-functional requirements

No.	Requirement	Description
1.	Operational	• The system is available only on web-based platform.
2.	Performance	• The system should be respond less than three seconds.
3.	Security	• The system can only be accessed using the valid credentials that had been registered by administrator.

3.2 Design Phase

The system's required features and modules were determined during the design phase. The design has covered the design of system architecture with numerous associated diagrams such as Flowchart, Data Flow Diagram (DFD), and Entity Relationship Diagram (ERD), which contains all of the proposed system's function modules, during this phase.

3.2.1 Flowchart

A flow chart is a depiction of a process in graphical or symbolic form. Each process step is represented by a specific symbol and includes a brief explanation of the stage. The flow chart symbols are connected by arrows that indicate the direction of the process flow. Figure 2 in Appendix A depicts the proposed system's flowchart, which includes the general flow of each process.

3.2.2 Data Flow Diagram (DFD)

Figure 2 shows the proposed system's DFD level 0 also called as context diagram, which illustrates the users' interaction with the system as well as the overall system process flow. There are two categories of user shown in the diagram: employees and administrator. After registering for an account and logging in, employees and administrators may access the system and the function modules inside it. The more detailed of level 1 DFD of the system will be shown in Appendix.

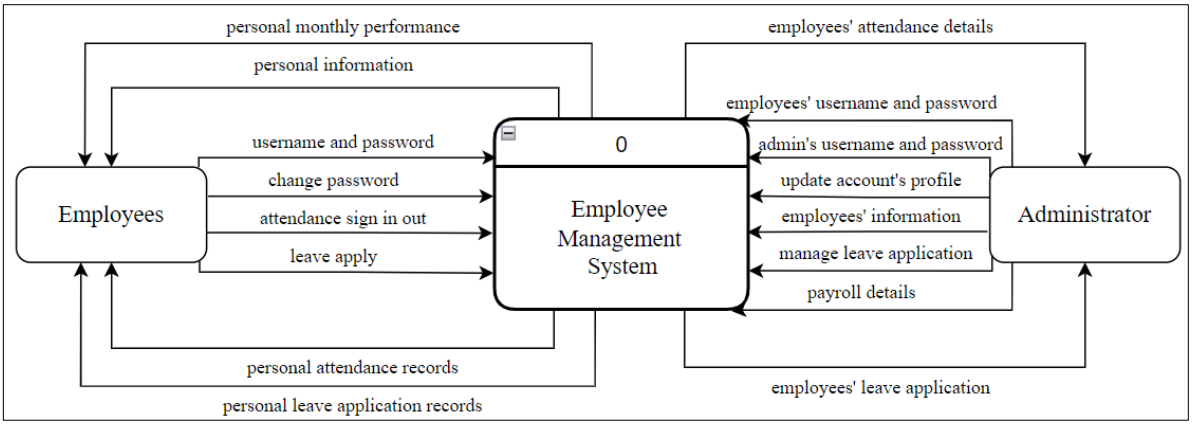

Figure 2: Level 0 DFD of the proposed system

3.2.3 Entity Relationship Diagram (ERD)

Entity Relationship Diagram (ERD) is a type of structural diagram for use in database design. An ERD contains different symbols and connectors that visualize two important information: The major entities within the system scope, and the inter-relationships among these entities. Figure 4 in Appendix C shows the ERD of the proposed system.

3.3 Implementation Phase

In this phase, the proposed system will be built using all of the data from the previous phase. Visual Studio Code, which uses the PHP programming language, will be used to construct the proposed system. At the same time, phpMyAdmin performs as the database for the system.

3.4 Testing Phase

All codes are developed and implemented during the testing process. Alpha and Beta testing are the two forms of testing phase will be conducted. Alpha testing is a type of software testing performed to identify bugs before releasing the product to real users or to the public. While the Beta testing is performed by real users of the software application in a real environment [9].

3.5 Maintenance Phase

Following the completion of the implementation phase, the system will be given time to provide client assistance. These services may include everything from technical assistance to maintenance to ensure that the system is always up and running and that users are satisfied. Table 4 summarizes the workflow process of the proposed system.

Table 4: Workflow for the development of the proposed system

Phases	Activity	Outcomes
Requirement analysis	1. Identify system/project scope. 2. User requirement. 3. System development requirement. 4. System requirement. 5. Project timeline.	1. Project proposal. 2. Problem identification and data collection. 3. Software & hardware requirements for developer. 4. Software & hardware requirements for user. 5. Gantt chart.
Design	1. Design database. 2. Design interface.	1. Wireframes of user interface. 2. Database specification.
Implementation	1. Develop the system modules and connect with the database.	1. Proposed system.
Testing	1. Alpha & Beta testing.	1. Errors found and fixed.
Maintenance	1. Operate and maintain proposed system in a production environment.	1. System is always up and running and users are satisfied.

4. Results and Discussion

The back-end user side of the Employee Management System is built with PHP, while the front-end system is designed with HTML, CSS, and JavaScript. The system is also connected to phpMyAdmin, which serves as the system's database for data storage.

4.1 System Implementation

Figure 3 depicts the system's registration interface; it's worth noting that the Employee Management System's registration module is only accessible by the administrator. As a result, employees can only access the system when an account has been created for them by the administrator.

Figure 3: Registration interface for administrator

Figures 4 and 5 depict the system's administrator and employee login interfaces, respectively. By logging in using their registered username and password, the administrator and employees can access to the system.

Figure 4: Login interface for administrator

Figure 5: Login interface for employees

The administrator will be taken to the system's dashboard after logging in, as illustrated in Figure 6. It clearly displays the total number of employees, the monthly on-time percentage, as well as the number of on-time and late employees for the day.

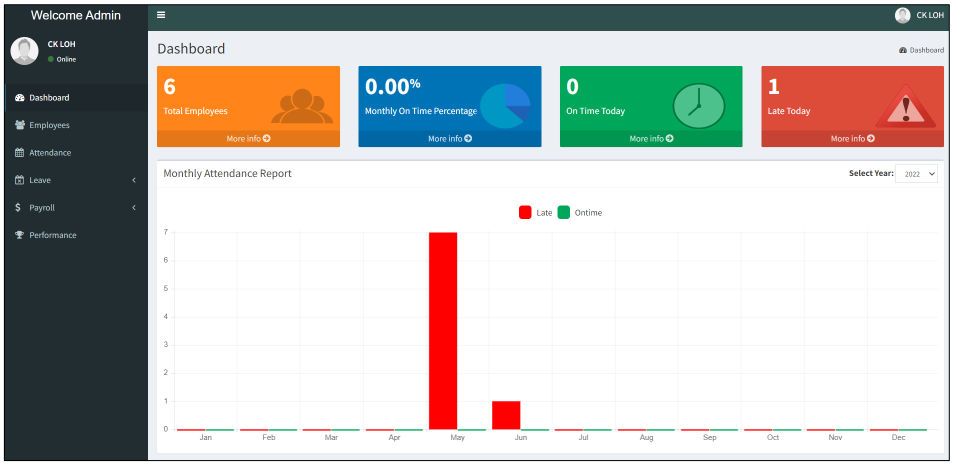

Figure 6: Dashboard interface for administrator

As shown in Figure 7, the administrator is able to update the account's profile, which includes the account username, password, admin's name, and photo. Employees, on the other hand, can only reset their account password using the module shown in Figure 8. Users must enter their current password to save any changes made in order to update their account successfully. Otherwise, the account will be updated failed.

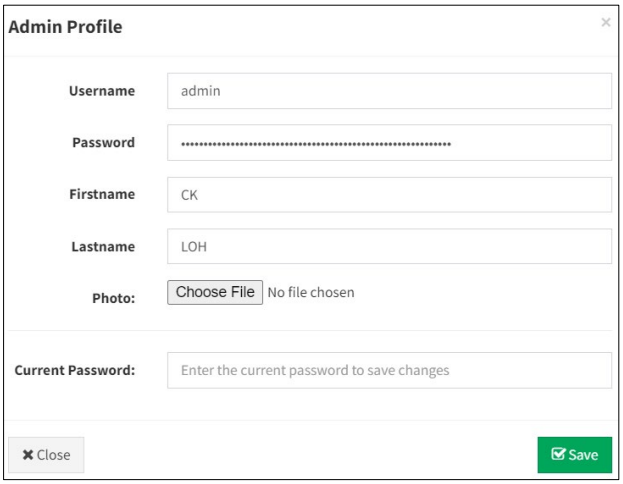

Figure 7: Interface of account update for administrator

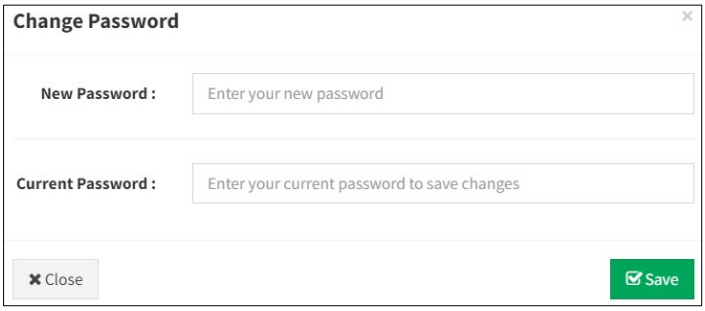

Figure 8: Interface of account update for employees

The interface of the employee information module is shown in Figure 9. Using the tool buttons provided "New, View, Edit, and Delete," the administrator will be able to perform CRUD operations for creating, reading, updating, and deleting an employee. After the administrator has created an employee, the employee can then view his personal information, and only allowed to update the address and contact information as illustrated in Figure 10.

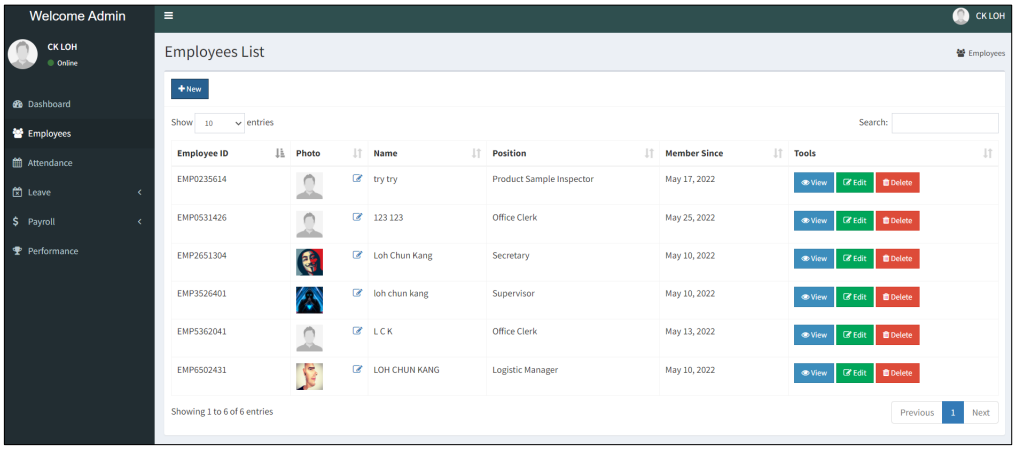

Figure 9: Interface of employee information module for administrator

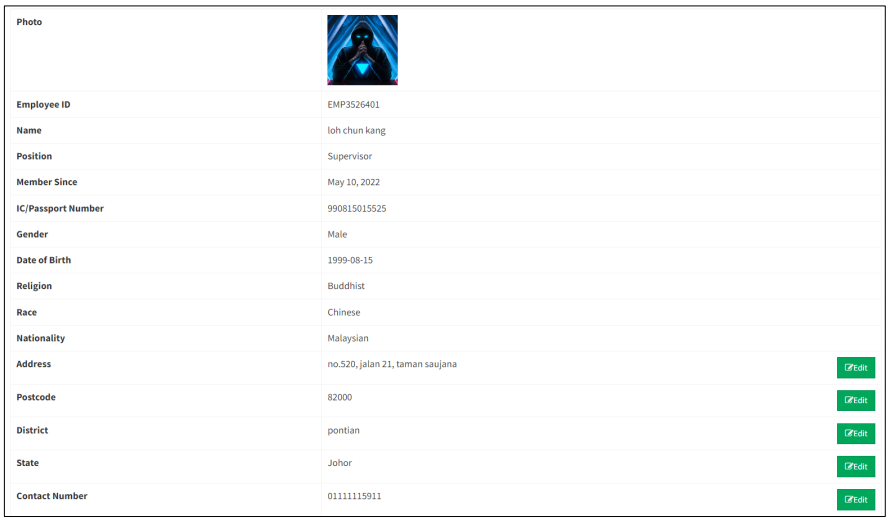

Figure 10: Interface of employee information module for employees

Figure 11 shows interface of attendance module for administrator, the employees' attendance details including employee ID, name, date, time in, time out, and duration of working hours will be displayed in this module, and even printed out in PDF format. On the other hand, employees are also able to sign in and out for their attendance rate using the module as seen in Figure 12.

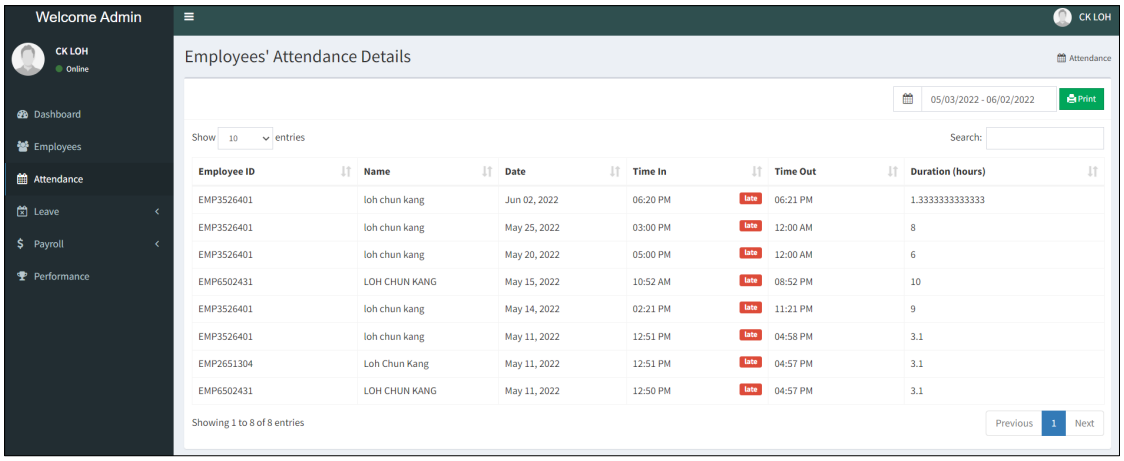

Figure 11: Interface of attendance module for administrator

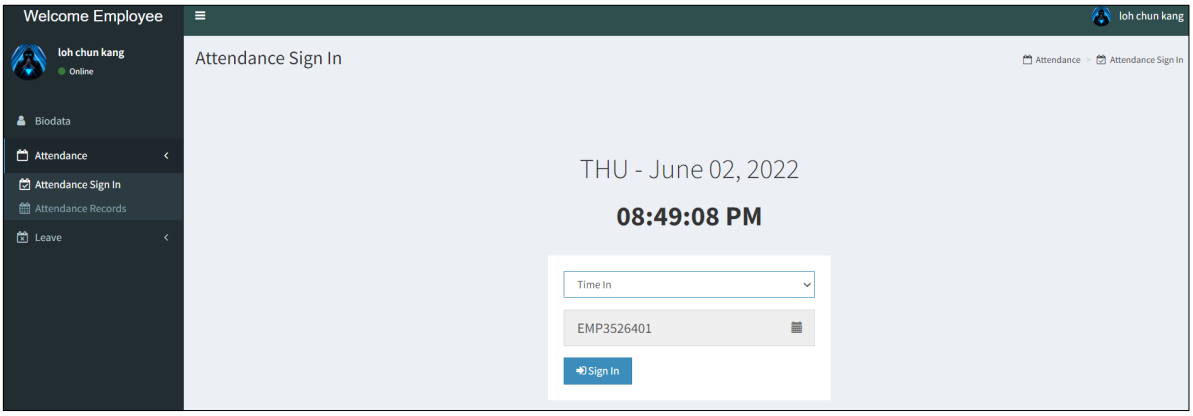

Figure 12: Interface of attendance module for employees

In Figure 13, the leave module is for administrator to manage whether is want to approve or reject the leave application from employees. While as shown in Figure 14, employees are allowed to

apply leave through the module, and the available leave duration will also be displayed here according to each employee's position.

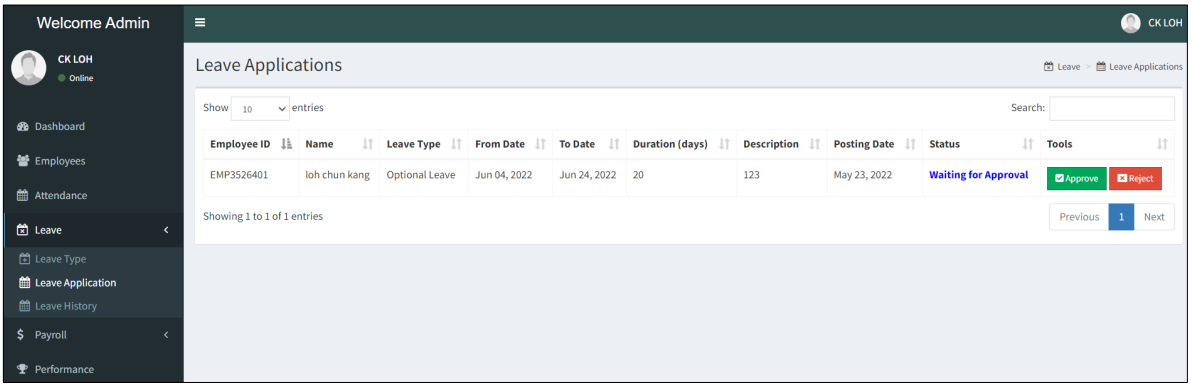

Figure 13: Interface of leave module for administrator

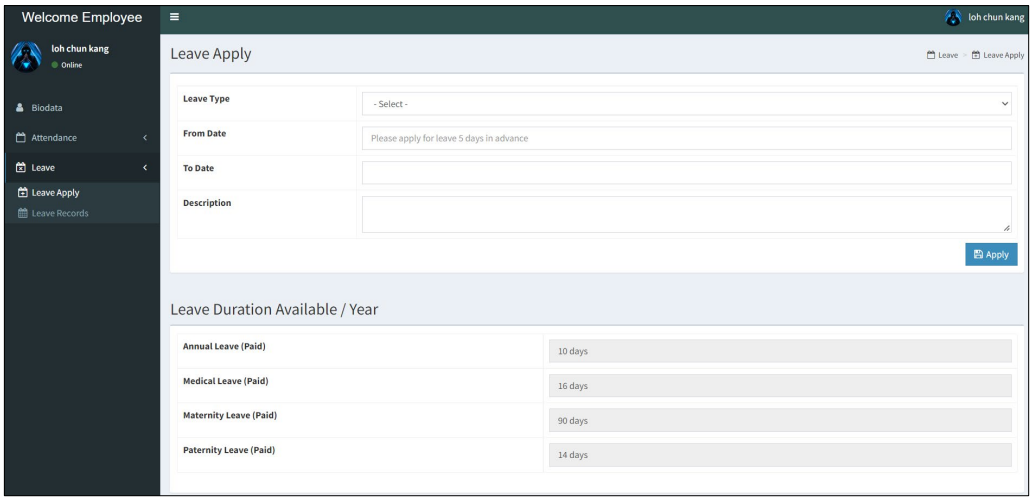

Figure 14: Interface of leave module for employees

Figure 15 indicated the payroll module that only administrator have access to it. The module contains every employee's payroll details, and the administrator also is able to print out the payroll.

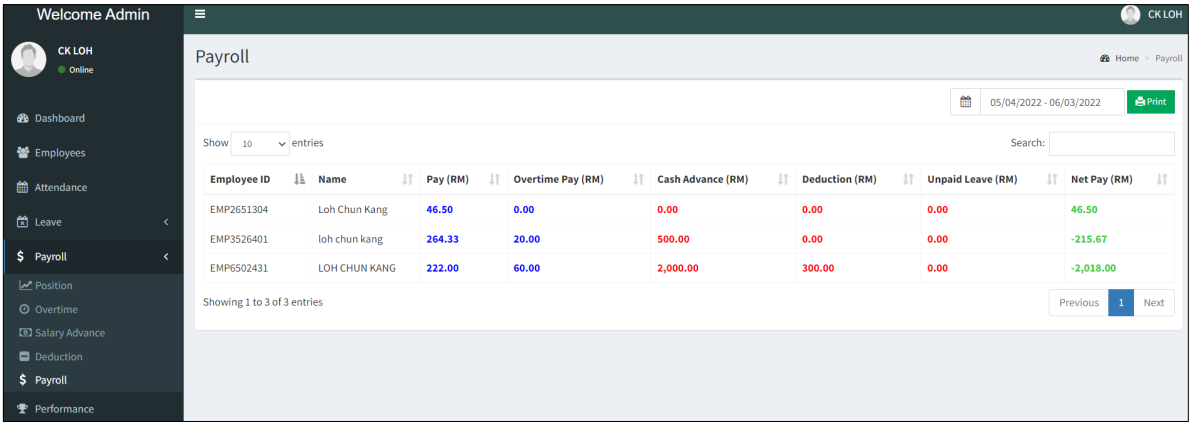

Figure 15: Interface of payroll module for administrator

The administrator's interface for the performance module is shown in Figure 16. The administrator can use the module to rate employees' monthly performance on a scale of 1 to 5. Once an employee has been rated by an administrator, the employee can view it on their personal information page, as shown in Figure 17.

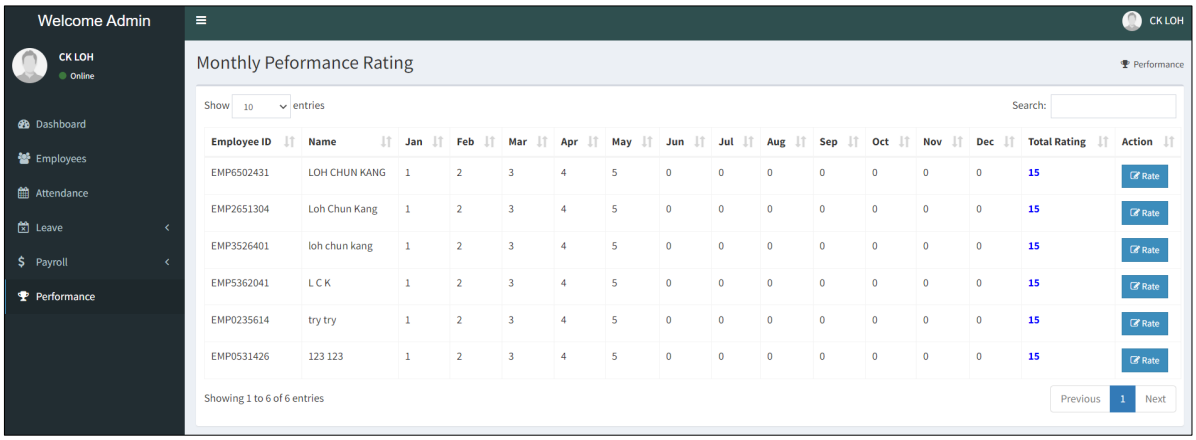

Figure 16: Interface of performance module for administrator

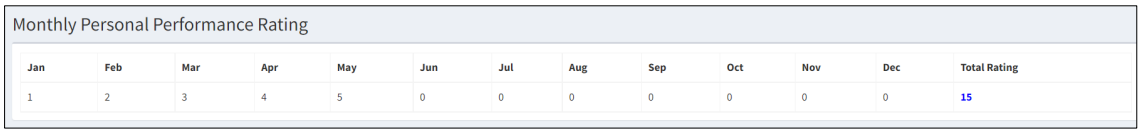

Figure 17: Interface of performance module for employees

4.2 System Testing

After the system is completely developed and implemented, the testing phase then will be conducted using the test plan and the user acceptance test, to ensure that the system had fulfilled all the functional and non-functional requirements.

4.2.1 Test Plan

The test plan is primarily divided into functional and non-functional sections, which are used to evaluate the system's functionality and security. Table 5.1 – Table 5.3 shows the results of functional test plan for the proposed system, whereas Table 5.4 illustrates the results of non-functional test plan for the proposed system.

Table 5: Functional test plan

No.	Functions	Test Cases	Expected Results	Actual Results
1.	Registration	Empty data input	Display alert message if the input fields empty.	Pass
		Input data pattern	Display alert message if the input data do not match the pattern requested.	Pass
		Password and confirm password	Display alert message if the passwords do not match.	Pass
		Unique employee ID	Display alert message if the employee ID already existed in database.	Pass
		Complete registration	Display success message and account registered successfully.	Pass
2.	Login	Empty data input	Display alert message if the input fields empty.	Pass
		Input data pattern	Display alert message if the input data do not match the pattern requested.	Pass

Table 5: (cont)

No.	Functions	Test Cases	Expected Results	Actual Results
2.	Login	Login with invalid credentials	Login failed with alert message	Pass
		Login with valid credentials	Login successfully and redirected to home page according user's role.	Pass
3.	Account Update	Administrator	Update account profile.	Pass
		Employees	Update account password.	Pass
4.	Dashboard	Total employees	Display the total of the employees exist in database.	Pass
		Monthly on time percentage	Display the employees monthly on time percentage.	Pass
		On time today	Display the number of employees on time.	Pass
		Late today	Display the number of employees late.	Pass
		Chart	Display the numbers of employees on time and late in chart form.	Pass
5.	Employee Information	Administrator	Perform CRUD operations for employees information.	Pass
		Employees	View personal information and update address, contact information.	Pass
6.	Attendance	Administrator	View and print the employees' attendance details.	Pass
		Employees	Sign in and out for attendance rate, and view personal attendance details.	Pass
7.	Leave	Administrator	Perform CRUD operations for leave types.	Pass
			Approve or reject employees' leave application.	Pass
			View all leave history.	Pass
		Employees	Apply for leave.	Pass
			View personal leave application details.	Pass
8.	Payroll	Administrator	Perform CRUD operations for positions.	Pass
			Update employees' overtime rate.	Pass
			Perform CRUD operations for salary advance.	Pass
			Perform CRUD operations for deduction.	Pass
			View and print employees' payroll details	Pass
9.	Performance	Administrator	Rate employees' monthly performance.	Pass
		Employees	View personal monthly performance	Pass

Table 6: Non-functional test plan

No.	Test Cases	Actual Results
1.	Ensure the login error message does not directly indicate which part of the authentication data is incorrect. For example, "incorrect password" should not be shown as an error message.	Pass
2.	Enforce the password length. For example, a minimum of six characters in creating a password.	Pass
3.	Passwords should be obscured in the textbox.	Pass

4.2.2 User Acceptance Test

The user acceptance test was conducted afterward as a short survey using Google Form. In this survey, 15 users were chosen to take part in the test. Five of these users would be in charge of administrator testing, while the others would be tested as employees. The test was divided into two parts: the user interface and the system's features, both of which were rated on a scale of 1 to 5. While 1 denotes very unsatisfactory, 5 denotes very satisfactory.

The results of the evaluation on the system's user interface are shown in Table 7, while the results of the evaluation on the system's features are shown in Table 8. There is no one rated the interface design, as well as the system's features, as unsatisfactory or very unsatisfactory in either of the results. Figures 18 and 19 show the results of the evaluations in chart form at the same time.

Table 7: Result of system's user interface evaluation

No.	Features	Ranking					Total
		1	2	3	4	5	
1	Easy to use and understand	0	0	2	5	8	15
2	Navigation	0	0	0	9	6	15
3	Layout of the content	0	0	0	5	10	15
4	Interface design (e.g. background, colour)	0	0	0	11	4	15
5	Text (e.g. font family, font size)	0	0	4	5	6	15

Table 8: Result of system's features evaluation

No.	Features	Ranking					Total
		1	2	3	4	5	
1	Registration function	0	0	4	5	6	15
2	Login function	0	0	3	6	6	15
3	Employee information function	0	0	1	5	9	15
4	Attendance function	0	0	0	8	7	15
5.	Leave function	0	0	0	6	9	15
6.	Payroll function	0	0	2	6	7	15
7.	Performance function	0	0	1	9	5	15

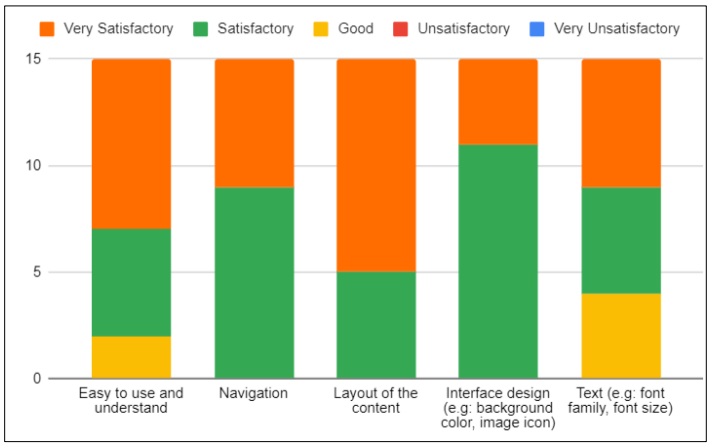

Figure 18: Result of system's user interface evaluation

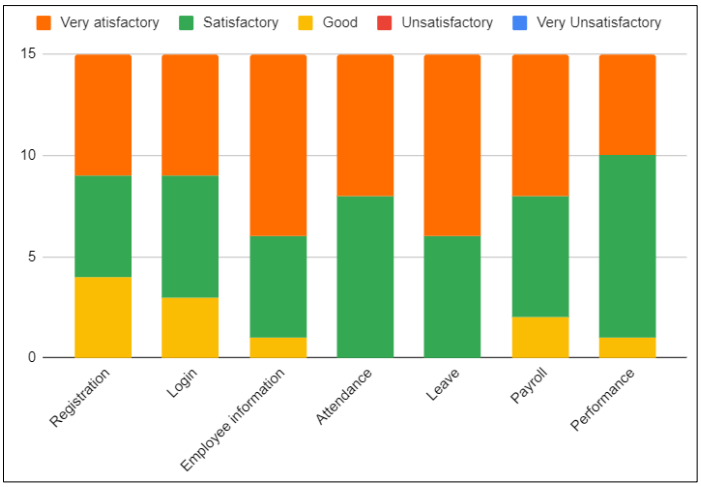

Figure 19: Result of system's feature evaluation

6. Conclusion

Despite the fact that the system's initial objectives and intended functionality were successfully implemented and developed, it still has some limitations. One of the system's limitations is the absence of notification capability for leave applications module. Furthermore, because the project scope is restricted to company SMC Technology, the system may not cover the entire spectrum of employee or human resource management such as lack of the training and recruiting functionality. Moreover, the payroll module is only for administrator to calculate employee salary more conveniently, but it does not support any payment function due to the restricted project scope.

Therefore, the enhancements that can be made for the system in the future first is implement the notification functionality for the leave module to improve the overall performance of employee management. Besides, the scope of the project may also perhaps be broadened in the future. As a result, the proposed system could potentially cover a wider range of employee management such as implement the training and recruiting functionality. Once the project scope is expanded, it is also possible to further enhance the system's payroll module to make it more advance which allows payment of wages can be completed online through bank credentials to follow the goal of a cashless society.

Acknowledgement

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Appendix A

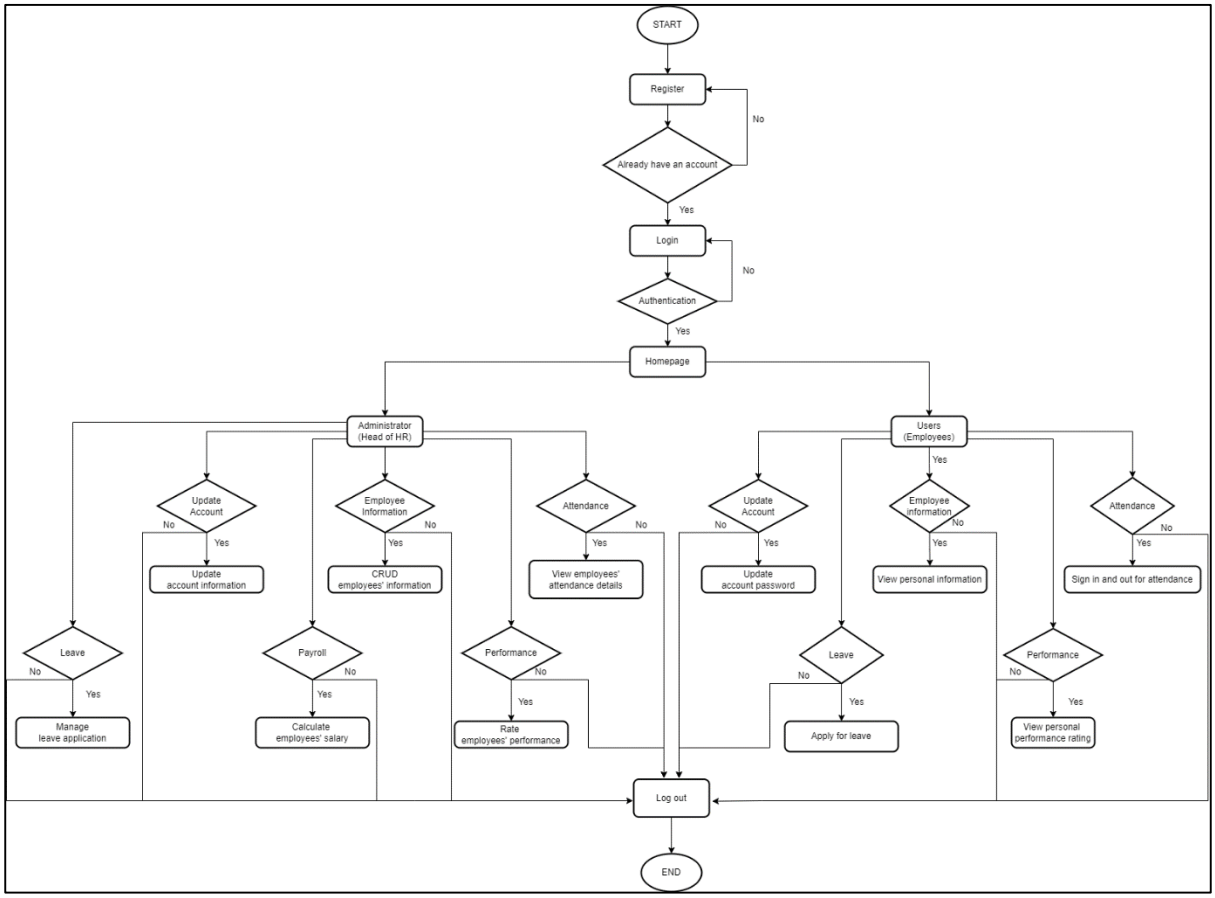

Figure 20: Flowchart

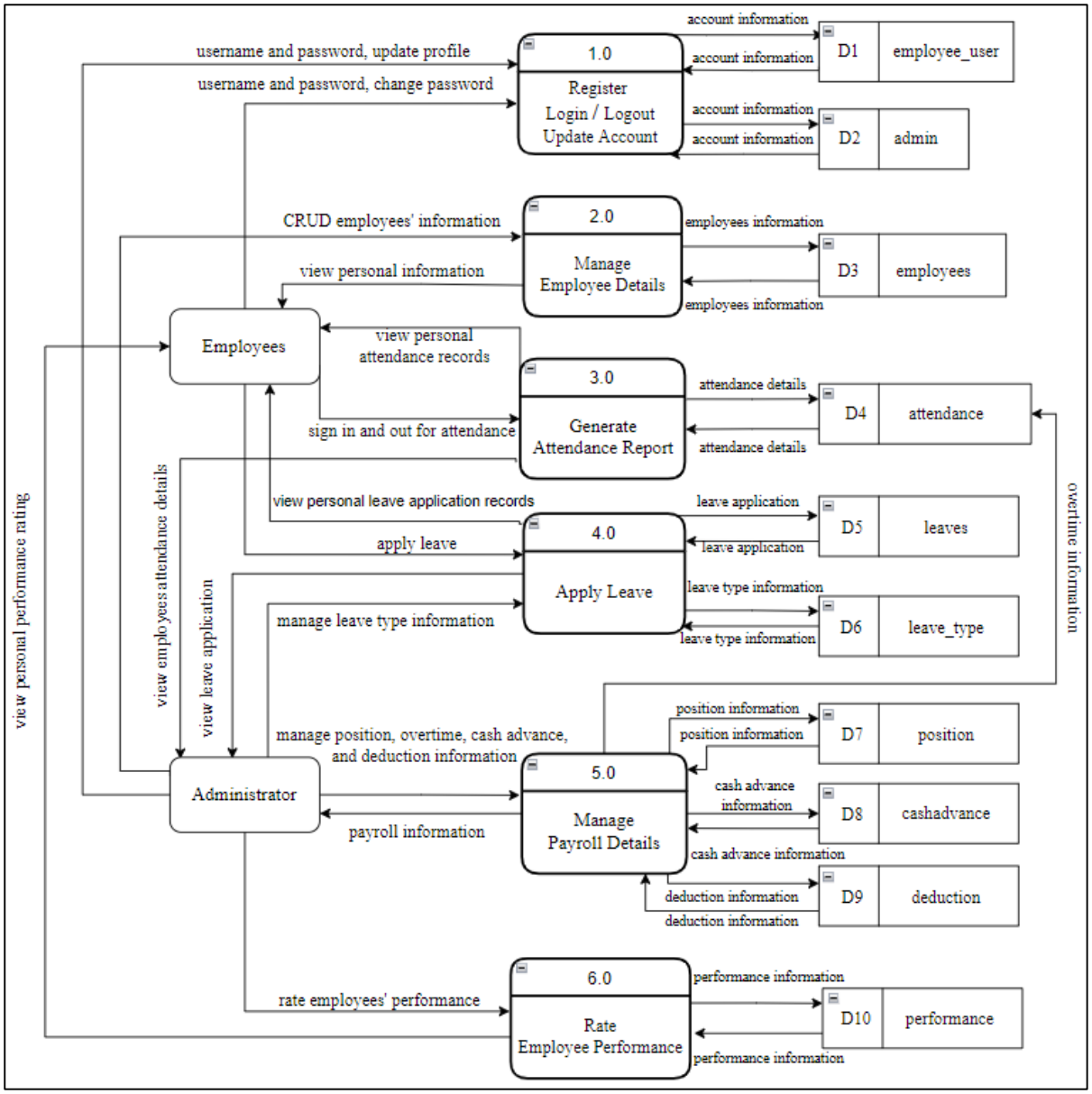

Figure 21: DFD – Level 1

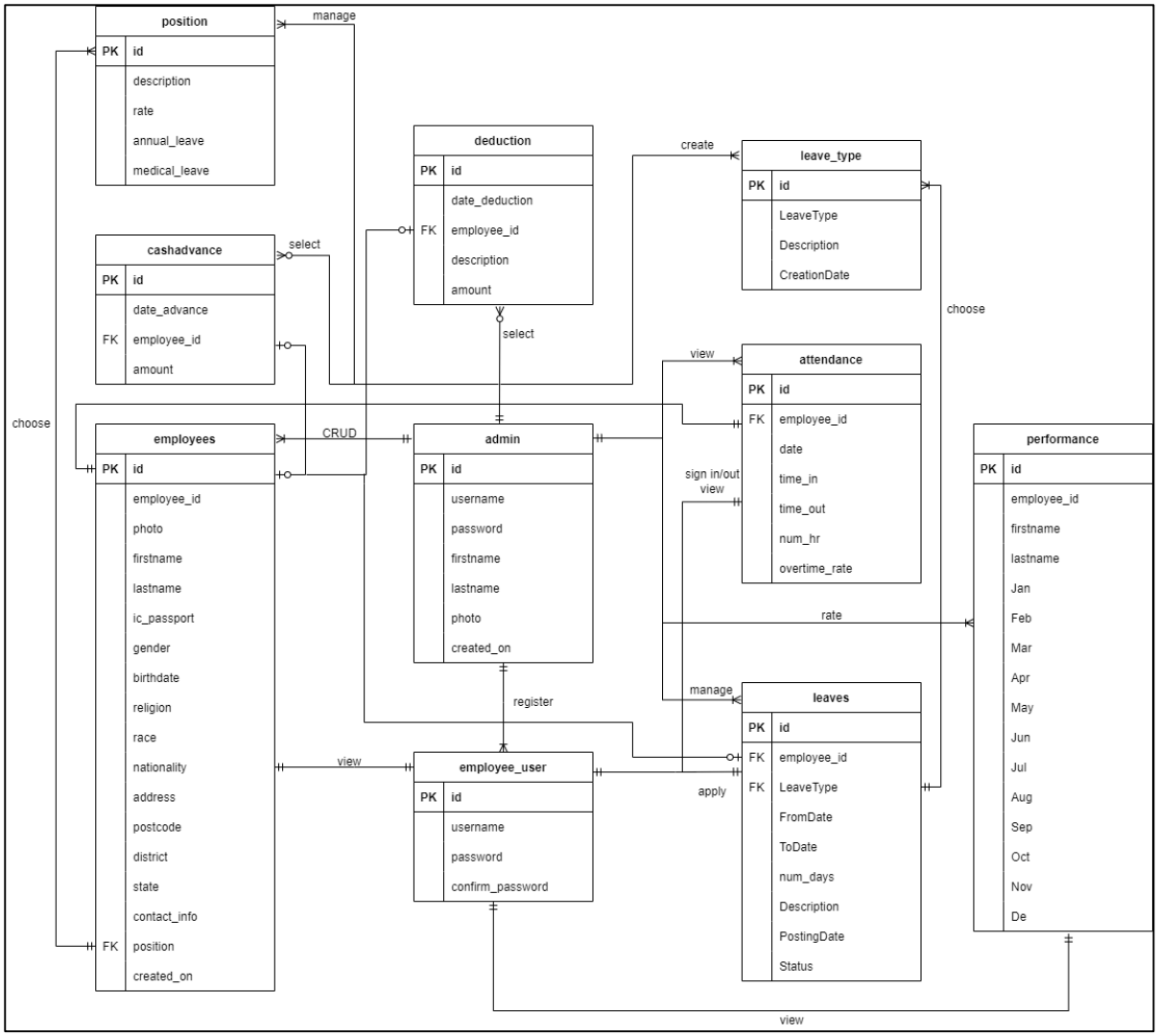

Figure 22: ERD

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