Large Scale Contractor Management Dashboard

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Abstract—**Advancements in digital technology have considerably boosted productivity and economic growth over time. Numerous businesses and organizations use a variety of software to organize their work efficiently. This system's main objective is to convert from a manual to an automated method for more effective management. An Employee Management System is one of the systems that contribute significantly to the management of a business. However, this article highlights the deployment of an automated system to replace the paper-based approach that general contractor companies have been using for decades. Laravel is one of the most popular framework technologies for system development among developers. Laravel enables developers to concentrate on the design architecture and functionality of an online application, making it easier for other developers to manage their tasks. Furthermore, role-based access control (RBAC) in Contractor Management System (CMS) has increased the system's security by granting users access depending on their jobs. On-site users will be able to access the system with the tip of their fingers. This development aims to simplify the organization's staff management and will elaborate further on the technologies employed in the proposed system.**

Keywords—**Management system, role-based access control, automated method, framework technologies**

I. INTRODUCTION

The advancement of technologies has constantly been essential to the people on the usage of various types of software systems or mobile applications [1]. Globally, many countries like The United States and China are fighting over developing new technologies to be in the market. Also, in Malaysia, many companies offer the latest software system technologies and mobile applications to their users [2]. However, some small organizations and businesses nowadays are still using a paper-based system to store documents and manage their business. This has made the company less efficient and requires more staff to handle the documents and manage the company itself.

In most construction companies, there have been several problems faced for decades. Some of the problems are that there are no attendance records for an employee who works outside the office, the complicated process of claim requests, and leave management. Furthermore, the management faced several difficulties where some claim request evidence is missing and the ink on the thermal paper will face when exposed to direct light.

The proposed system will be described in section II and the technologies used in developing the proposed system will be explained in section III. Section IV elaborates the proposed system methodologies. Section V explains the user requirement and design of the proposed system. Section VI presents the system testing methods used to evaluate the proposed system functionality and section VII provides discussion on the contribution of the proposed system. Lastly, Section VIII provides a conclusion to the paper.

II. PROBLEM BACKGROUND

Current problems faced by the organization include no attendance records for an employee who works outside the office, the complicated process of claim requests, and leave management [3]. Previously, most construction companies were still using paper-based for employees to apply for leave when sometimes the manager accidentally lost it before submitting it to the Human Resource (HR) department. This will cause difficulties for many departments and might cause a conflict among their staff.

III. PROPOSED SYSTEM

In this study, the proposed CMS focuses on the employee management domain. The major components in CMS are attendance records, claim requests, and leave management. It is proposed to develop a system for solving the problems faced by

a client to ease the management of the organization. This system will be beneficial to several departments in the organization such as Human Resource, Finance, and employees to increase the efficiency of their communications.

Based on the technologies that are suitable for the requirements proposed by the client, Laravel is the best framework technologies for the role-based access control (RBAC) system where it provides various libraries and proper arrangement of the folder with its functionality [4-6]. The are 4 main goals of the proposed system, Contractor Management System (CMS):

1) To study the current problems and issues of the employee management system of general construction companies.
2) To design a system, CMS as a solution for problems and issues identified in first goal.
3) To develop CMS as a web-based system on process design suggested in goal 2.
4) To test and evaluate the developed application against requirements and design specifications.

IV. METHODOLOGY

For the proposed system, the methodology implemented in CMS is Agile-Waterfall Hybrid methodology.

A. Agile-Waterfall Hybrid Methodology

Software Development Life Cycle (SDLC) [7] is a process that allows developers to produce the product or software with the maximum quality at the lowest cost that meets the requirements of the client [8]. This methodology was widely implemented by the developer as it can fulfill the requirements proposed by the client.

Waterfall methodology involves several stages of development including requirement gathering, system design, system implementation, system testing, and deployment [9]. However, in hybrid methodology, Agile method stages are embedded during the system implementation where the stages will be carried out in 6 stages including feedback, scrum, build, deploy and test. It will repeat until the client is satisfied with the system's functionality. Figure 1 depicts the phases of the Agile-Waterfall Hybrid methodology.
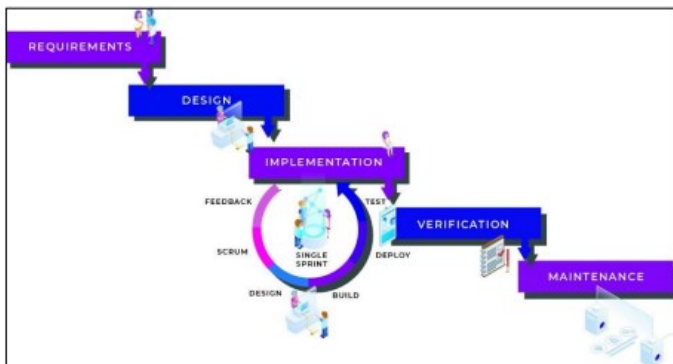

Fig. 1.   Agile-Waterfall Hybrid methodology phases

B. Requirement Phase

After identifying the problems encountered, the results will be analyzed and included in the document requirements such as objectives, scope, and goals.

C. Design Phase

This phase involves an agile model to perform the system design process which includes architectural design, technology determination, database design, and user interface design. In this phase, several documents will be prepared based on user requirements. Among them are the system requirements specification document (SRS) and software design document (SDD) using Enterprise Architecture (EA) as the main design software tool.

D. Development Phase

This Development Phase uses Visual Studio Code as an editor for programming code using the PHP programming language. This development phase should refer to the design sketch planned in the system requirements specification document (SRS) so that the modules are developed according to the objectives and needs of the user.

E. Testing Phase

The testing phase is a phase that involves all parties including users to ensure that each module function is tested as a whole to identify problems or errors and can be fixed quickly and retested until the user is satisfied with the system. Testing the functionality of this module uses black box testing. In addition, acceptance testing and usability testing of the system are also tested and evaluated by users before they adopt the system as a whole.

V. USER REQUIREMENT AND DESIGN

Requirements analysis involves requirements analysis, project design, database design, and system interface design. The Integrated Modeling Language (UML) is used to provide a clearer picture of the proposed CMS system.

A. Use Case Diagram

The Use Case diagrams represent the behavior of the system and visualize the requirements of the system [10]. Figure 2 depicts the use case diagrams for CMS. Based on the use case diagram, there are three main actors for the system, which are employees, the HR department, and Finance.
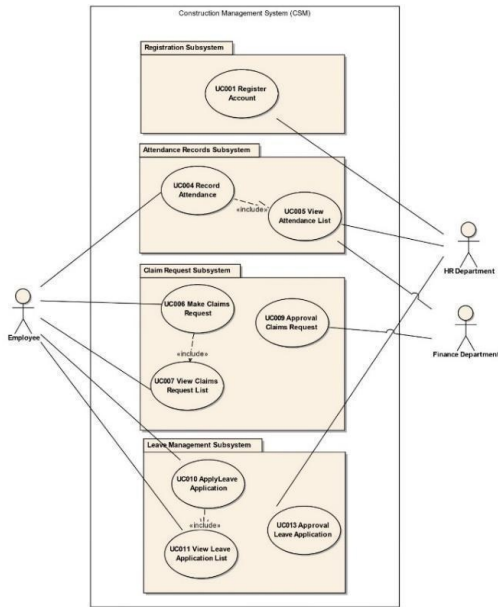
Fig. 2.   Use Case Diagram of CMS

B. System Architecture

As the system is proposed using role-based access, Laravel is a suitable framework that provides many features for the developers. Laravel is a Model-Controller-View (MVC) [11] based architecture where it separates the presentation layers and business logic. MVC was chosen as it allows for fast development of the application and is easier in debussing the project due to its multiple levels of well-written code. Figure 3 depicts the architecture of MVC that was applied in the development of CMS.
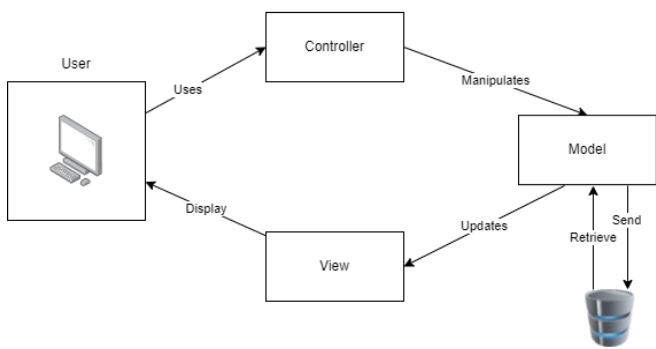

Fig. 3.   MVC Architecture

C. System Interface Design

User Interface is crucial for the system development as the features of the system will allow the user to interact with it [10]. Fig. 4 depicts the login page for employees, management, and finance. The user will need to enter the username and password and click on the Sign In button to log into the system. If successful, the system will redirect the user into their dashboard

based on their role in the system. If the system failed to authorize the user, the system will display an error message. Fig. 5 depicts the dashboard page for employees, management, and finance. The user will be able to see the news that displays on the dashboard.

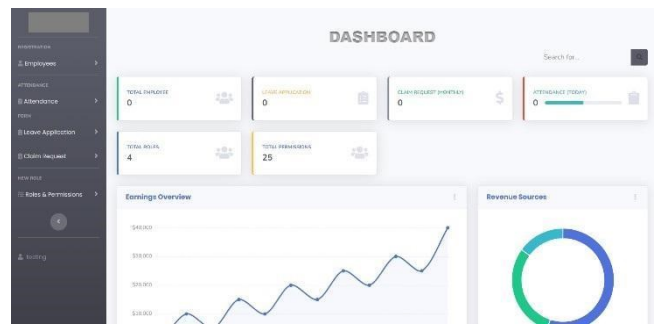Fig. 4.   CMS Login Page

Fig. 5.   CMS Dashboard Page

Fig. 6 depicts the Claim Request List Page, where the employee can view the claim request that they have made and the status of the request. For the finance department, they can make approval whether the user can Approve or Reject the request. Fig. 7 shows the Claim Request Form where the employee can make the request claim and upload the file of the claim evidence. Fig. 8 depicts the Update Form of the claim request that can be made by the employee. However, both management and finance roles will not be authorized to do this action and will not be displayed on their page.
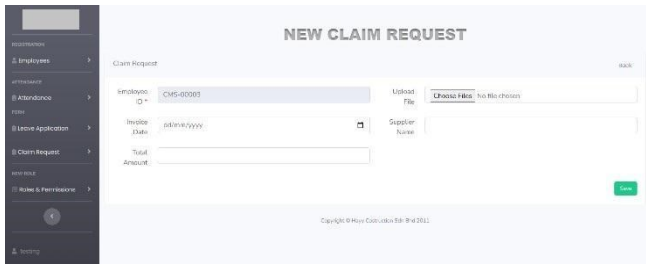

Fig. 6.   Claim Request List Page
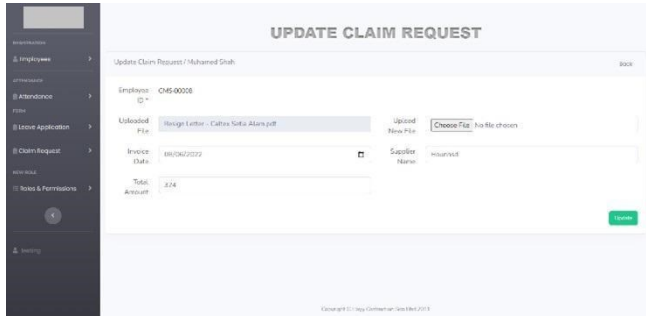
Fig. 7.　Claim Request Form Page

Fig. 8.　Update Claim Request Page

VI.　SYSTEM TESTING

After the development of CMS, testing was carried out to ensure the functionality of the system. The Black-Box Testing method was chosen as it is to test the functionality of the software without knowing the internal code structure, implementation details, and internal routes.

The tester will test the valid input to process the actions and the invalid input to verify whether the system can detect any errors. Table I to IV shows the conducted test cases to ensure the functionality of the system.

TABLE I.　MAKE A CLAIM REQUEST TEST CASE

Test Case CMS-01-1/011: Make a Claim Request					
Author					
Summary: To verify the user can make a claim request.					
Preconditions: 1.　The user is logged in as an employee. 2.　The system displays the user dashboard.					
#	Step Actions	Input Data	Expected Result	Actual Result	Pass / Fail
1	The employee clicks on 'Make New Claim' under the 'Claim Request' menu in the sidebar.		The system navigation employee to the Claim Request Form page.		
2		Upload file Date Supplier Name Total Amount			

TABLE II.　VIEW CLAIM REQUEST LIST FOR EMPLOYEE TEST CASE

3	The employee clicks the 'Save' button		The employee clicks the 'Save' button. The system displays the successful message.		
Execution type:		Manual			
Estimated exec. duration (min):					
Priority:		High			

Test Case CMS-01-1/012: View Claim Request List for Employee					
Author					
Summary: To verify the user is able to view their claim request list.					
Preconditions: 1.　The user is logged in as an employee. 2.　The system displays the user dashboard.					
#	Step Actions	Input Data	Expected Result	Actual Result	Pass / Fail
1	The employee clicks on 'Claim Request List' under 'Claim Request' menu at the sidebar.		The system navigation employee to the Claim Request List page.		
2			The system will display the table list of all the employee claim request records.		
Execution type:		Manual			
Estimated exec. duration (min):					
Priority:		Medium			

TABLE III.　VIEW CLAIM REQUEST LIST FOR FINANCE TEST CASE

Test Case CMS-01-1/013: View Claim Request List for Finance					
Author					
Summary: To verify the user is able to view their claim request list.					
Preconditions: 1.　The user is logged in as a finance. 2.　The system displays the user dashboard.					
#	Step Actions	Input Data	Expected Result	Actual Result	Pass / Fail
1	The finance clicks on 'Claim Request List' under 'Claim Request' menu at the navigation bar.		The system navigation finance to the Claim Request List page.		
2			The system will display the table list of all the employee claim request records.		
Execution type:		Manual			
Estimated exec. duration (min):					
Priority:		Medium			

TABLE IV. CLAIM REQUEST APPROVAL TEST CASE

Test Case CMS-01-1/014: View Claim Request Approval					
Author					
Summary: To verify the user is able to view their claim request list for approval.					
Preconditions: 1. The user is logged in as a finance. 2. The system displays the user dashboard.					
#	Step Actions	Input Data	Expected Result	Actual Result	Pass / Fail
1	The finance clicks on 'Claim Request List' under 'Claim Request' menu at the navigation bar.		The system navigation finance to the Claim Request List page.		
2	The finance clicks on the approval button.		The system will display the approval option, which is "Approved" or "Rejected"		
3	The finance clicks on the 'Approved' button in the status column to approve the employee claim request.		The status will display 'Approved' based on the id with the green color of the text.		
Execution type:		Manual			
Estimated exec. duration (min):					
Priority:		Medium			

VII. DISCUSSION

The primary objective of this development is to improvise staff management within the general contractor companies by introducing an innovative system. The proposed system is specifically designed to tackle the challenges faced by the client, and its core purpose is to simplify and optimize various aspects of organizational operations [12].

By streamlining processes and facilitating more efficient communication channels, this system aims to significantly boost the overall efficiency of the organization. It is expected to bring notable benefits to departments such as human resource, finance, and employees. This development represents a crucial step towards achieving enhanced productivity and operational excellence within the organization in general contractor companies.

VIII. CONCLUSION

In overall, the development of CMS has been successfully developed to fulfill the requirement and objectives that have been identified during the proposal of CMS. The system has been developed using the Laravel framework which is MVC-PHP-based technology. Other programming languages were used such as JavaScript. The system has been made available online to ensure the functionality of the system during its deployment in production.

CONFLICTS OF INTEREST

The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper.

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