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Agile-Based Payroll Application Development to Improve Efficiency and Accuracy of Payroll in Cargo Companies

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ABSTRACT
This research aims to address the efficiency and accuracy of the payroll process in a cargo company through the development of an Agile-based application. The problems identified include payroll processes that are still manual, prone to errors and need more flexibility in adapting the system to rapid changes in the logistics industry. The research methods used are user needs analysis, Agile-based planning, application development with design and prototyping, and functional, performance, and security testing. The expected result is implementing a payroll application that is efficient, accurate, and responsive to changes to increase productivity, reduce payroll errors, and increase employee satisfaction in cargo companies. The contribution of this research is to provide practical solutions for cargo companies in optimizing payroll management by utilizing Agile-based technology and providing a framework that can be used as a foundation for developing similar applications in the logistics industry.

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INTRODUCTION

Payroll management is a crucial aspect of a cargo company's operations. An efficient and accurate payroll is critical to maintaining business continuity and employee satisfaction. Traditional payroll processes often involve various physical documents, manual calculations, and processes that tend to be slow and prone to errors. Critical challenges in cargo company payroll include the complexity of various salary structures for different positions and job levels, frequent changes in tax regulations, and the need to integrate data from various departments such as human resources, finance, and operations(Aliev et al., 2020; da Silva et al., 2015; Niankara & Islam, 2023; Tang & Feng, 2021).

Agile methodology has proven effective in the development of responsive and adaptive software(Al-Saqqa et al., 2020; Dingsoeyr et al., 2019; Dingsøyr et al., 2012; Santos et al., n.d.; Serrador & Pinto, 2015; Shrivastava & Rathod, 2014). The key characteristics of Agile, such as short iterations, intensive team collaboration, and focus on customer needs, are well suited to address the challenges in payroll application development that require flexibility and scalability. In the context of cargo companies, the speed of change in the logistics industry demands a payroll system that can adapt quickly to changes in organizational structure and payroll policies.

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Several case studies have highlighted the successful implementation of Agile in payroll application development. Challenges faced in the implementation process should also be noted, such as expanding the IT team's Agile-related competencies and more intensive coordination between the departments involved(Alami et al., 2022, 2023; Almeida et al., 2022; Estrada-Esponda et al., 2024; Hasan et al., 2013; Michalides et al., 2023; Mishra & Alzoubi, 2023; Paasivaara et al., 2018; Tøndel et al., 2022). Cargo companies often face unique challenges related to payroll management, such as complex payroll systems for contract and permanent employees, complex data integration from various information systems, and compliance with changing tax regulations. Manual payroll processes tend to be time-consuming and increase the risk of errors, negatively impacting employee productivity and trust in the company.

Agile in payroll application development can provide various benefits, including improved process efficiency, reduced payroll errors, increased employee satisfaction, and flexibility in adapting the system to internal and external company changes. Factors supporting successful Agile implementation include top-level management commitment, availability of sufficient resources, practical training for the development team, and adoption of a collaborative work culture(Abusaeed et al., 2023; Altuwaijri & Ferrario, 2022; Leong et al., 2023; Sarhadi et al., 2022; Senabre Hidalgo, n.d.; Udvaros et al., 2023; Wiechmann et al., 2022). However, challenges such as change resistance, difficulty adapting internal processes to Agile methodologies, and managing stakeholder expectations must also be carefully addressed. Previous research shows that the development of Agile-based payroll applications has significant implications in improving the efficiency and accuracy of cargo company payroll. The successful implementation of Agile will provide sustainable benefits for cargo companies, such as increased productivity, reduced operational costs, and increased employee satisfaction. Therefore, this research is very relevant to the context of improving the payroll system of cargo companies(Behutiye et al., 2022; Dingsøyr & Lassenius, 2016; Hinderks et al., 2022a, 2022b; Mero et al., 2022; Persson et al., 2022a, 2022b).

This research aims to develop an Agile-based payroll application that improves the efficiency and accuracy of payroll processes in cargo companies. By adopting the Agile methodology, this study aims to design an application responsive to changes, speed up the payroll process, reduce error risks, and enhance employee satisfaction. The research's contribution is providing a practical solution for cargo companies to enhance their payroll management. It offers a better understanding of Agile implementation in the logistics industry, serving as a reference for future development of similar applications.

METHODS

The first stage was requirements definition, where an in-depth analysis of user needs and system requirements was conducted. The second stage is planning, which involves drafting an Agile project plan and forming a project team. The third stage is development, where the design and prototyping of the application are done before the implementation of the main features of the payroll application. The last stage is testing, which involves functional, performance, and security testing to ensure the quality and reliability of the application be-

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fore it is widely implemented. This entire process aims to improve the efficiency and accuracy of the payroll process in the context of a cargo company by applying Agile methodology for responsive and adaptive application development as shown in Figure 1.

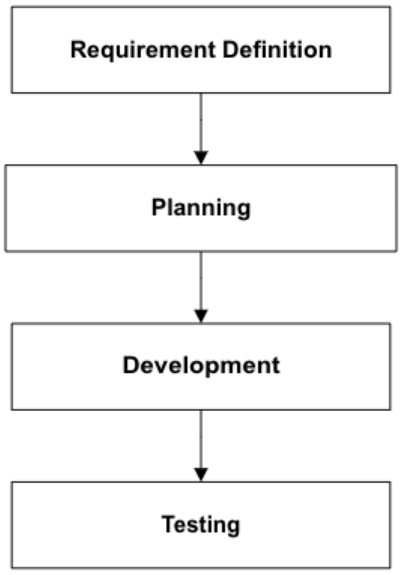

Figure 1. Research Stages

Definition of need

At this stage, the main activity was to conduct an in-depth analysis of user needs and expected system requirements. This was done through interviews with internal stakeholders, such as HR, finance, and operations teams, to understand the current payroll process and potential desired improvements in detail. In addition, competitor analysis and best practices were also conducted to identify relevant features in the cargo industry. The results of this stage will serve as the basis for developing the right application development plan according to the needs.

Planning

In the planning stage, the first step is to develop an Agile project plan that includes the formation of a product backlog and determining sprints for iterative development. The project team is also formed by covering essential roles such as scrum master, product owner, and development team members. The team was also given training on Agile methodologies to ensure a comprehensive understanding of the Agile practices applied during the application development.

Development

Once the plan is drawn up, the development phase begins with the design and prototyping of the application. This step involves creating a user interface that conforms to the requirements and design best practices. Prototypes were made to get initial feedback from users and improve the design based on the feedback. Next, key features such as automatic salary calculation, employee data management, and payroll reporting were implemented according to the product backlog that had been compiled.

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Testing

The last stage in application development is the testing stage. Functional testing ensures all payroll application features run correctly according to predetermined needs. In addition, performance testing is also carried out to ensure that the application can handle high user loads without experiencing a decrease in performance. Security testing is also a focus to ensure payroll data is well protected from potential security attacks. The results of these tests will serve as a reference for making improvements or enhancements before the application is widely implemented in the cargo company.

RESULTS AND DISCUSSION

Definition of need

User Needs Analysis was conducted by conducting in-depth interviews with internal stakeholders such as HR, finance, and operations teams. The aim was to thoroughly understand the specific payroll needs and the expected system requirements to support an efficient and accurate payroll process in the cargo company. In addition, a workshop session was conducted to get further input from the teams involved in the payroll process to understand the needs and challenges better. Next, a Competitor and Best Practices Analysis was conducted to investigate payroll applications used by competitors in the cargo industry. This aims to identify relevant features and best practices that can be adopted in developing a practical and innovative payroll application. Thus, this stage provides a deep understanding of user needs and system requirements and draws inspiration from industry best practices to ensure the successful development of an Agile-based payroll application.

Table 1. Results of Needs Definition

Data Source	Results
Interviews with internal stakeholders	- Understand the specific payroll needs of HR, finance and operations teams. - Obtain the expected system requirements to support the payroll process. - Recognize the challenges and barriers faced in the payroll process.
Workshop session with relevant teams	- Obtain further input from the team involved in the payroll process. - Discuss ideas for improvements and innovations that can be applied in application development.
Analysis of competitor payroll applications	- Identify relevant features present in competitor payroll applications. - Investigate best practices in the cargo industry regarding payroll management. - Gain insight into the latest trends and developments in application development.

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Table 1 provides an overview of the data sources used in the Requirements Definition stage, as well as the results obtained from each data source. By using various methods such as interviews, work-shop sessions, and competitor analysis, this research managed to gain a comprehensive understanding of the user needs and system requirements needed for the development of an Agile-based payroll application in a cargo company.

Planning

The formation of a project team consisting of developers, scrum masters, and product owners who were given Agile training also showed readiness to manage the development process efficiently and responsively to user needs. The analysis of this stage highlights the importance of careful planning and the formation of a competent team in ensuring the smoothness and success of an Agile-based payroll application development project.

Table 2 The Planning Phase

Stages	Results
Agile Project Plan Prepara-tion	- Development of a detailed product backlog with a list of features to be developed in the Agile-based payroll application, including descriptions, time estimates, and feature prioritization. - The establishment of sprints for iterative development with a predefined schedule, ensuring that each sprint has clear objectives and features pri-oritized by user needs and project goals.
Project Team Formation	- An application development team was formed with members that in-cluded developers to develop the application code, a scrum master to manage the overall development process, and a product owner as a user representative responsible for identifying user needs and determining the direction of application development. - Team members are provided with intensive Agile training to understand Agile methodologies, best practices in application development, and the collaborative and adaptive ways of working required in an Agile devel-opment environment.

In application development, as shown in Table 2, planning steps are essential to en-sure project success. A detailed product backlog provides a strong foundation by clearly listing all required features, including descriptions, time estimates, and feature priorities, which are essential for maintaining consistency with the project's needs and goals. Estab-lishing sprints for iterative development demonstrates a systematic and focused approach, allowing the team to work efficiently and adaptively. In addition, creating teams with clear-ly defined roles reflects an excellent organizational structure in application development, with a developer, scrum master, and product owner each responsible for a specific devel-opment aspect. The Agile training provided to the team is crucial to ensure a good under-standing of the methodology and best practices and enhance collaborative and adaptive capabilities in the development process, providing a solid foundation for responsive apps that meet user needs.

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Development

The user interface (UI/UX) design for the payroll application took into account user needs and best design practices, as shown in Figure 3. A good interface design will ensure a better and more efficient user experience when using the application. In addition, a prototype of the app was created to get initial feedback from users. This feedback is valuable as it can be used to improve and refine the app's design before its full implementation. Next, the implementation phase of the payroll features was carried out by developing the main features of the Agile-based application. These features include automatic salary calculation, employee data management, and payroll reporting. The development of these features should consider the previously identified user needs and ensure the continuity of integration with the company's internal systems, such as the employee database and financial system. Good integration will improve the efficiency and accuracy of the payroll process in the cargo company. Thus, this Development phase focuses on responsive and functional design and implementation of relevant payroll features integrated with the company's internal systems to improve the overall efficiency and accuracy of the payroll process.

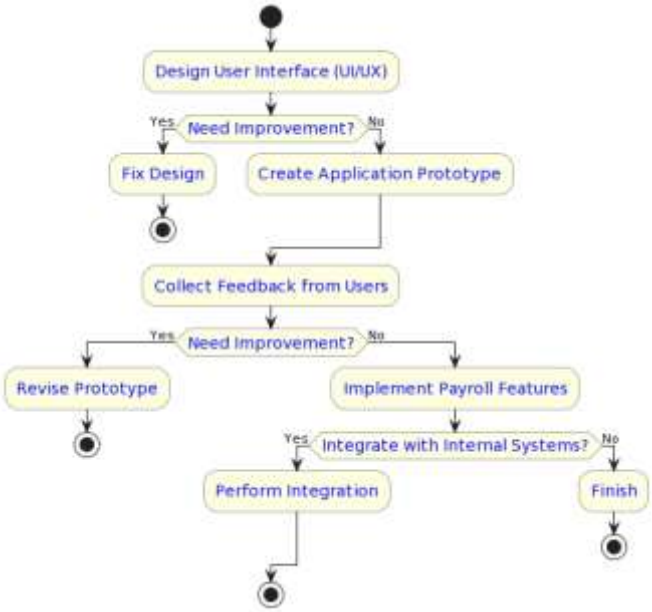

Figure 3 Development

The data model shown in Figure 3 has a more complex structure for an Agile-based payroll application. First, the Employee entity includes essential information such as EmployeeID (unique identifier), first and last name, date of birth, gender, a position he/she occupies (PositionID as a foreign key), a department he/she works for (DepartmentID as a foreign key), address, and phone number. Then, the Position entity has attributes PositionID (unique identification), position title, and DepartmentID as foreign keys that link it to the corresponding department. Meanwhile, the department entity has attributes such as DepartmentID (unique identifier) and department name. Finally, the Salary entity contains essential data such as SalaryID (unique identifier), EmployeeID as a foreign key that links it to

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the employee receiving the payroll, information on the month and year of payroll, base salary, allowan

In the context of relationships between entities, each employee is associated with the position he or she occupies and the department he or she works for. Each position "Belongs to" a particular department. In addition, employee payroll data is stored in the Salary entity, which is directly linked to the employee who receives it. With this complex data model, the payroll system can manage employee information, positions, departments, and payroll data in a structured and efficient manner, using the principles of Agile-based application development.

Testing

Functional testing ensures that all features in the payroll application run correctly according to the predefined requirements. The development team will conduct a series of tests to identify whether the features function correctly and according to the predefined specifications. In addition, the team will identify and fix any bugs or functional issues found during testing so that the application can run smoothly and according to user expectations. Next, performance testing ensures the payroll application can handle high user loads without experiencing significant performance degradation. Performance testing is essential to ensure that the application can respond quickly and efficiently to users, even in high user load situations. In addition, security testing is also conducted to ensure that the payroll data stored in the application is well protected and not vulnerable to security attacks such as hacking or data theft. This is very important to maintain users' trust in the security of their sensitive data. By conducting thorough functional, performance, and security testing, the developed payroll application is hoped to meet high-quality standards and provide a good and safe user experience.

CONCLUSION

Based on this research, the application of Agile methodology provided several significant benefits in improving the efficiency and accuracy of the payroll process. Steps including user needs analysis, project planning with the formation of an Agile-trained team, app development with a focus on responsive design and system integration, and thorough testing to ensure feature correctness, performance, and security, have resulted in a payroll app that is responsive, reliable, and secure to use. The overall research confirms that Agile methodologies can improve user experience and ensure the security of sensitive data, which is an essential foundation for cargo companies in managing payroll processes effectively and efficiently.

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