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Designing an information system for recapitulating goods received transactions

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Abstract: This research aims to design and implement an information system to recapitulate goods receipt and delivery transactions. Previously, this process used Microsoft Excel, which required manual data copying, took a long time, and required daily, weekly, and monthly printing and reporting. In addition, the application used was not stored in a database and was not integrated with the network, making data processing inefficient. In order to overcome this problem, the research developed a database programming-based information system with the waterfall method for the design stage. System modelling is done with the Unified Modeling Language (UML). This research produces a needs analysis, system design using UML, and nine tables supporting the system. Testing is done with black box testing and direct trials by users involved in data management, showing satisfactory results. Implementing the system using PHP programming and MySQL database resulted in a web-based application that accelerates the recapitulation process, stores data in the database, and is integrated with the network. This application is proven to speed up data processing. The application needs to be improved with more complex technology and compatible with various smartphones for further development. In addition, the app needs a dashboard feature to display the number of daily monthly deliveries, as well as the income of each officer. Increasing the number of human resources capable of maintaining the system is also important to ensure its sustainability and efficiency.

Keywords: Decent work and economic grouwth; Information systems; Unified modeling language; Goods delivery

1. Introduction

The need for information technology is increasing in the current era of globalization. Many companies use information technology as a means to run business processes to improve service quality (Muskhir et al., 2024; Prasetya, Fortuna, Jalinus, et al., 2024; Prasetya, Fortuna, Samala, et al., 2024). The advantage of using a computerized system to process data is speed and accuracy (Tulbure et al., 2022). Processing data and information quickly, precisely, and efficiently is crucial for every company or agency to increase productivity, save time, and reduce costs (Haleem et al., 2022; Soori et al., 2023). In the world of work, technology can help store data that has been inputted, making work more accessible (Rahim et al., 2024).

Companies engaged in air cargo shipping services need an application for managing the recapitulation of goods receipt and delivery transactions (Ahmad et al., 2023). The recapitulation process that still uses the Microsoft Excel application takes longer and requires daily, weekly, monthly, and annual printing and reporting. Although Microsoft Excel helps manage transaction recapitulation, the system is still semi-computerized (Handayani et al., 2023). Data has not been stored in the database or integrated with the network, so superiors cannot easily access the recapitulation of goods receipt and delivery transactions (Esenogho et al., 2022). Additionally, employees still have to send files every

week and month via email or WhatsApp to superiors as reports, which further slows down the data processing process.

This research aims to design and implement a more efficient information system for recapitulating goods receipt and delivery transactions. This system is based on database programming and uses the waterfall method in the design stages. System modelling is done with the Unified Modeling Language (UML). This research starts with needs analysis, system design using UML modelling, and nine tables that support system development. System testing involves black box testing and direct testing by users who manage goods recapitulation data, which shows satisfactory results.

Implementing the system using PHP programming and MySQL database resulted in a web-based application that accelerates recapitulating goods delivery, stores data in a database, and is integrated with the network (Quido Conferti Kainde, 2022). This application is proven to speed up data processing and facilitate access for superiors.

2. Methods

Application development is done with a waterfall approach (Prasetya et al., 2023). This is because the waterfall model has stages that are arranged linearly, allowing for complete identification and documentation, so the workings of this model are easy to understand (Lin, 2019). The Unified Modeling Language (UML) is used for design modelling, which is one of the language standards widely used in the industry to define requirements, perform analysis and design, and describe architecture in object-oriented programming.

UML is an image-based language used to visualize, specify, build, and document object-based software development systems (Chen et al., 2022; Gosala et al., 2021; Jang et al., 2024). UML facilitates object-based software development systems' visualization, specification, development, and documentation (Abdelnabi et al., 2021). Although not a programming language, the models generated by UML can be mapped directly to various object-oriented programming languages, such as Java, thus supporting the software development process (Torre et al., 2023). In software creation, the artefacts produced can be models, descriptions, or software of software systems and modelling of business and other non-software systems (Ahmad et al., 2023).

3. Results and discussion

The analysis stage aims to detail the need to update or create an information system for recapitulating receipt transactions and freight forwarding companies. Data is collected through documentation and interviews, including an interview with one of the people from the freight forwarding company, which provides company information and petty cash data. The flow of the goods delivery recapitulation system in the company was also analyzed (Mbakop et al., 2021).

The data processing process involves analyzing primary and secondary data, identifying problems in the existing system, and designing a new system (Yaqoob et al., 2022). The system design is tailored to user needs, and testing is done to ensure the system functions properly. System implementation involves PHP programming and MySQL database, using the CodeIgniter framework for ease of maintenance (Niarman et al., 2023). System analysis describes the components of an information system to identify problems, opportunities, and needs. The application developed is a website with a PHP scripting server, MySQL database, and the CodeIgniter framework to facilitate development and maintenance.

The main problem is that the recapitulation process is still manual using Microsoft Excel, time-consuming and not integrated with the database or network (Wirastuti et al., 2023). The new system was designed to address these issues, storing data in a database and integrating it with the network, speeding up the data processing. Moreover, the new system is also designed to improve data accuracy by reducing human errors often occurring in manual processes. The system enables daily, weekly, and monthly reporting automation, providing real-time access for management to monitor shipping and receiving activities. Users can easily view delivery statistics, revenue per officer, and other operational trends with additional features such as interactive dashboards. More complex technology also allows the system to function across multiple platforms, including smartphones, making accessing and managing data on the go easy. In order to ensure the system runs smoothly, human resources training is conducted to maintain and develop the system according to the company's future needs.

Functional requirements analysis included the ability for admins to manage data, including items, profiles, transactions, and users, as well as record data changes (Teisserenc & Sepasgozar, 2021). System officers can also manage and search data as needed. Non-functional requirements include usability, security, and flexibility. The system is designed with an easy-to-use interface, login/logout security features, and good data organization to facilitate data search and management, ensuring the system meets the needs of freight forwarding companies. In addition, the system must handle large volumes of data without compromising performance and support integration with other devices and applications that the company may use. The system should also be able to generate customized reports according to management needs, providing valuable insights for strategic decision-making (Niu et al., 2021). System implementation includes backup and recovery mechanisms to maintain data integrity and availability (Gokulakrishnan & Gnanasekar, 2020). Thus, the company can improve operational efficiency, reduce data processing time, and provide better customer service while supporting future business growth.

The design of the information system for recapitulating receipt transactions at a freight forwarding company is described as follows. The system is designed with a web-based architecture for easy accessibility from various locations and devices. The user interface (UI) is designed to be intuitive and user-friendly, allowing admins and officers to manage and process transaction data presented in Figure 1 easily.

Figure 1.
Use case diagram of item recapitulation

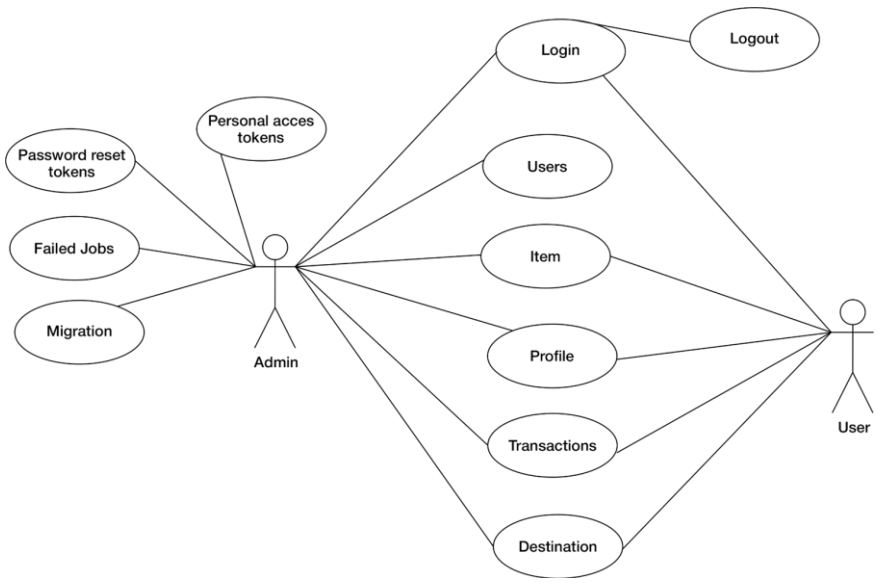


Figure 2 presents the results of the innovative description of the proposed use case diagram for the information system for recapitulating goods receipt and delivery transactions at the freight forwarding

company. This use case diagram details the interaction between the user and the system, illustrating the various functions that can be performed by the user in the new system. Admins will be able to manage goods, user profiles, and transaction data and record any changes that occur. Officers will be able to access and manipulate data per their operational needs, while the system is designed with a focus on ease of use, security, and flexibility. It also includes automated workflows for reporting and notifications, as well as integration with external devices and applications, ensuring that the system meets current needs and is ready for future developments. The following further information is presented in Table 1.

Figure 2. Item activity diagram

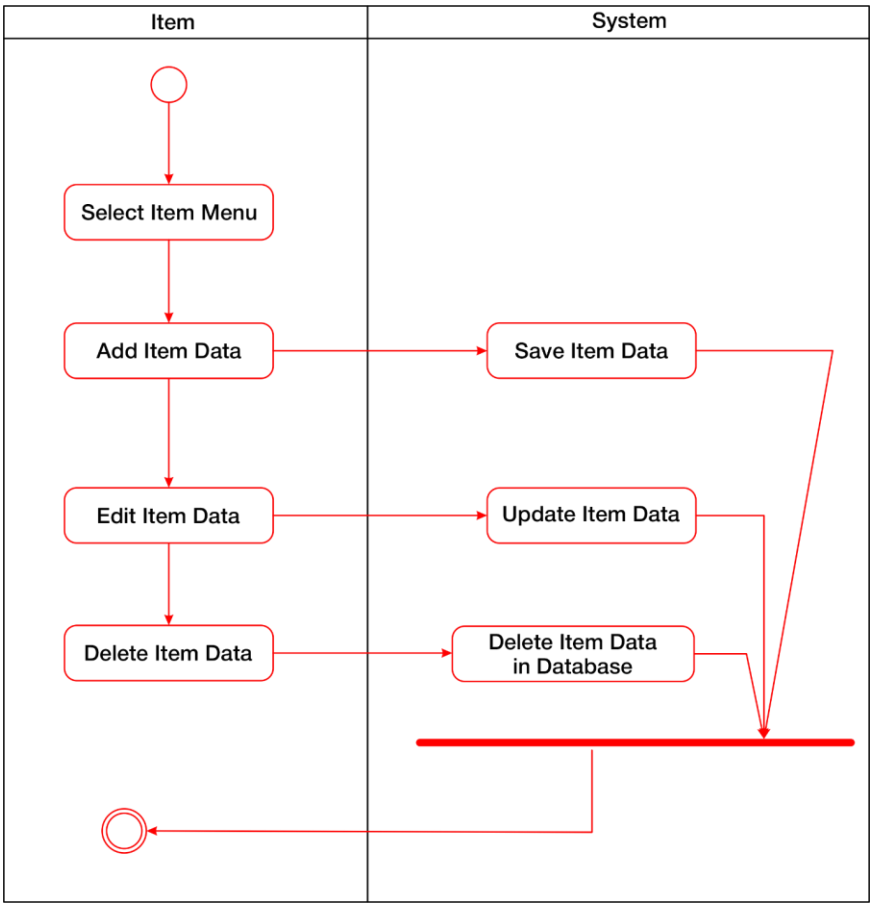


Table 1. User use case diagram of goods recapitulation

User	Description
Admin	The admin user can manage overview and unique data, and the admin can display data on goods, profiles, transactions, destinations, users, failed jobs, and migrations. Password reset tokens, personal access tokens. Admin users can record data whenever they make changes, add, delete and search data.
User/Assistant	Officers in the system display data on goods, profiles, transactions, and goals to make changes, add, delete and search data.

Table 2 presents an innovative description of the use case diagram proposed in the design of the information system for the recapitulation of goods receipt and delivery transactions at the freight forwarding company. This use case diagram depicts the interaction between the user and the system in detail, highlighting the various functions and processes that will be automated to improve the efficiency and accuracy of the company's operations.

Table 2. Use case diagram of goods recapitulation

Use case	Description
Transaction	The process of entering, editing, or deleting transaction data by the admin
Support	The process of entering, editing, or deleting support data by the admin
Destination	The process of entering, editing, or deleting destination data by the admin
Goods	The process of entering, editing, or deleting goods data by the admin
Users	The process of entering, editing, or deleting user data by the admin

Figure 3 presents an innovative activity diagram depicting the system's flow of admin user activities. This diagram shows how the admin can easily add, change, delete and search data, ensuring efficient and structured data management in the system.

Figure 3. Sequence diagram of item recapitulation

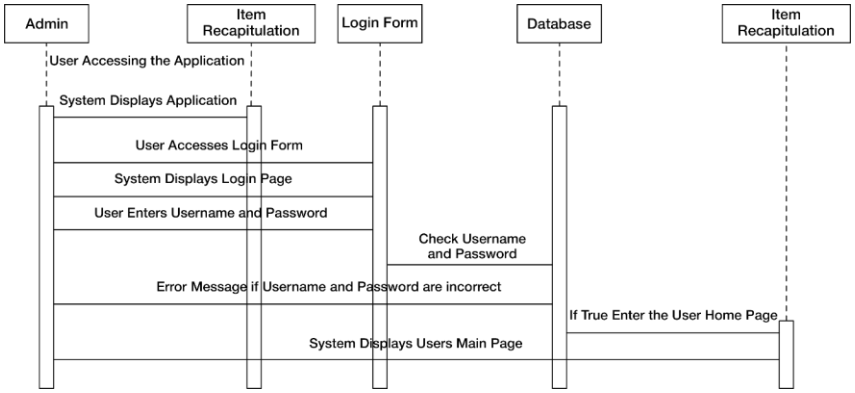


Figure 4. Class diagram of item recapitulation

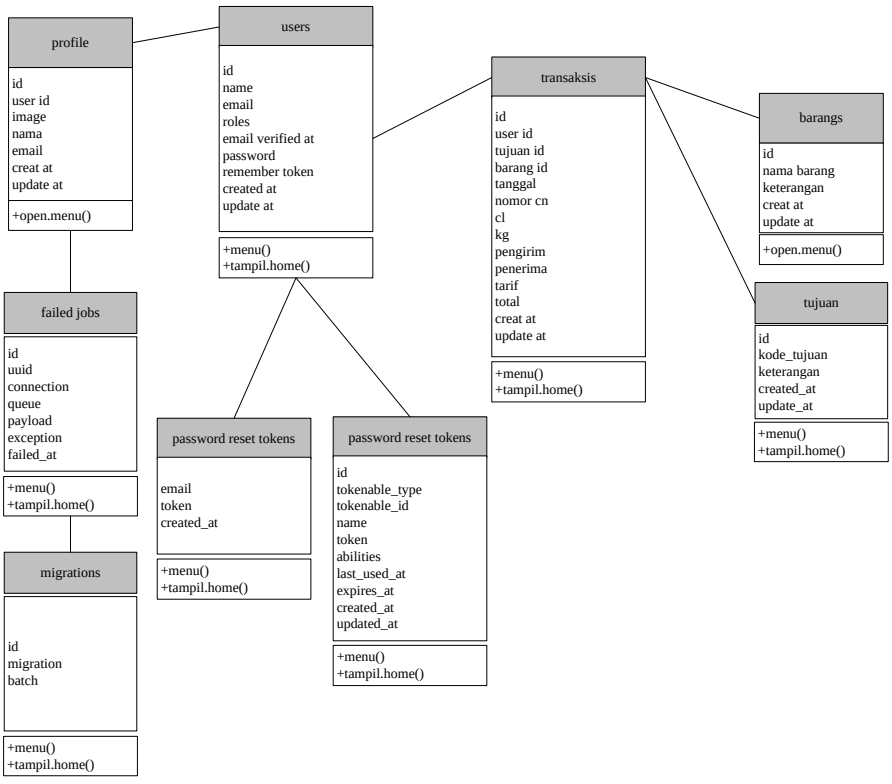
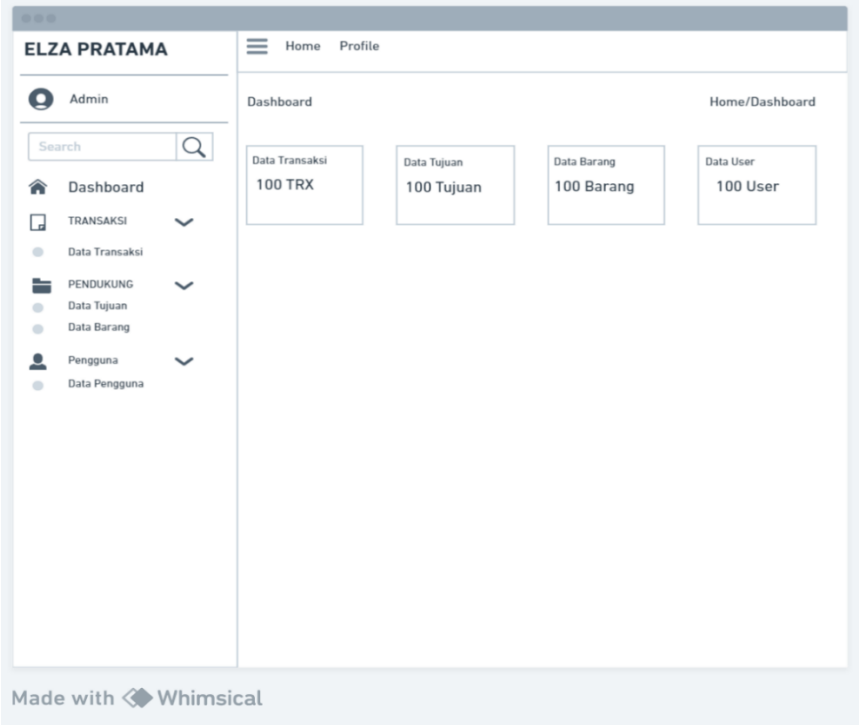


Table 3. SIM database recapitulation of goods shipment

No	Table name	Description
1	Items	Goods receipt data
2	Profile	Company profile data
3	Transactions	Goods receipt transaction data
4	Destination	Goods delivery destination data
5	Users	System user data
6	Failed jobs	Save error data in the system
7	Migrations	Save system migration data
8	Password reset tokens	Save password reset data
9	Personal access tokens	Save system user access data

Writing Program Code involves creating a system or application using software and hardware based on the analysis and design that has been done, resulting in a functional system. Writing program code (coding) is converting analysis and design results into a complete system. This system is implemented with PHP programming and MySQL database, while Adobe Dreamweaver and Notepad++ are used as development tools to run the information system for recapitulating goods receipt and delivery transactions at the freight forwarding company.

Figure 5. Design the admin dashboard page



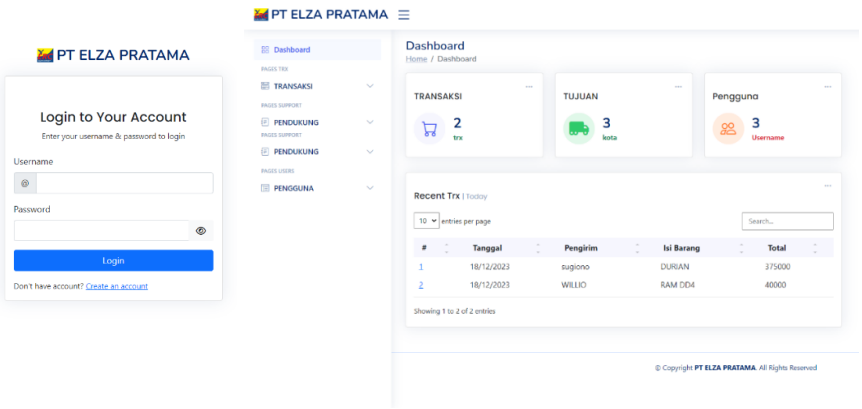
Testing is done on each part of the program code, mainly through the black box testing method. This test ensures that the developed system is following the predetermined functional specifications. Black box testing tests various functions in the information system for recapitulating goods receipt and delivery transactions, ensuring that all elements operate as expected and meet user needs.

The results of testing the software with company leaders, using several sample test cases, concluded that this software can function correctly. However, this test is not fully comprehensive because it only covers one aspect of the test. The results of this test are expected to represent other functions in the general service administration information system and the information system for recapitulating goods delivery receipt transactions at the freight forwarding company.

Table 4. Testing the item recapitulation SIM page

Testing activity	Expected realization	Results
Main page	Login menu	Success
Dashboard	Display dashboard data	Success
Transaction	Display transaction data	Success
Add transaction	Display add transaction form	Success
Edit transaction	Display edit transaction data	Success
Delete transaction	Display the delete transaction command	Success
Search transaction	Display search transaction data	Success
Destination	Display destination data	Success
Add destination	Display add destination form	Success
Edit destination	Display edit destination data	Success
Delete destination	Display delete destination command	Success
Search Destination	Display search destination data	Success
Goods	Display goods data	Success
Add goods	Display add goods form	Success
Edit goods	Display edit goods data	Success
Delete goods	Display delete goods command	Success
Search goods	Display search goods data	Success
Users	Display user data	Success
Add users	Display add users form	Success
Edit users	Display edit users' data	Success
Delete users	Display delete users command	Success
Search users	Display search users' data	Success
Profile	Display system user profile data	Success
Logout	Exit the system	Success

Figure 6. Implementation of the login page and dashboard page



Implementing the service administration information system at the freight forwarding company requires two user interfaces: one for admins and one for officers. For the admin login, the diagram below illustrates that the credentials must match the username and password stored in the database. Upon successful authentication, the user is redirected to the admin's main page. If the credentials are incorrect, the user remains on the login page and receives an error notification. Similarly, the system's officer login process follows the same protocol, ensuring only authenticated users can access system features. This comprehensive approach ensures secure access for both admins and officers, maintaining the integrity and functionality of the system for managing the recapitulation of goods delivery receipt transactions.

The implemented dashboard provides a sophisticated informative and visual display, exposing essential data such as total transactions, number of delivery destinations, total system users, and a summary of goods delivery transactions. This is integrated into the information system to recapitulate goods receipt and delivery transactions at the freight forwarding company, making it easy to monitor and analyze data efficiently and effectively.

4. Conclusion

This study successfully designed and implemented an information system for recapitulating goods receipt and delivery transactions for an air cargo expedition company that is more efficient and automated than using Microsoft Excel. Using a waterfall development approach, UML modelling, and the implementation of web-based technology using PHP and MySQL, the new system speeds up data processing, reduces human error, and improves real-time data accessibility for management. The implementation has improved the company's operational efficiency by enabling automated reporting and easy access to data through interactive dashboards.

5. Limitations and future work

This research's limitations and future work are fundamental in improving and optimizing the application of information technology in the recapitulation of goods delivery transactions. One of the limitations of this research is the waterfall development model, which is less flexible to changing needs during the development process. Although this method facilitates documentation and has a clear structure, it does not support rapid revision or iteration after the initial phase is completed, so it can be less effective if there are significant changes in user needs during development.

Furthermore, this study only tested the system using black box testing and did not involve comprehensive security testing, especially considering the sensitive data processed in the transaction recapitulation system. Data security is an important aspect that must be considered, given the risk of data breaches that can affect user trust and company integrity.

For future work, implementing a more agile development methodology is highly recommended, which can adapt to changing user needs more dynamically. An agile methodology will support continuous evaluation of the effectiveness of the system and its integration into daily operations. More in-depth security testing must also be conducted to ensure that all data transacted through this system is safe from unauthorized access. Further research could involve the development of additional features, such as predictive analytics and integration with AI technology to predict freight trends, which could give companies a tremendous competitive advantage.

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Declarations

Author contribution

Afrina: Conceptualization, methodology, Validation, data curation and writing - original draft. Didin Setyawan: Investigation, resources, writing - review & editing. Radiyatul Ulia: Writing - original draft, software, formal analysis, investigation and data curation.

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Conflict of interest

No conflicts of interest in this research

Ethical clearance

There are no human subjects in this manuscript and informed consent is not applicable. The research company has agreed to carry out the research and is willing if the results of this research are published.

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