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Development of a Web-Based Information System for Heavy Equipment Rental at CV. Amelia Putri Using the CodeIgniter Framework

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Abstract- The development of information technology demands digital transformation in business management, including the heavy equipment rental sector. CV Amelia Putri, which still uses a manual recording system, faces various operational obstacles such as data errors, administrative inefficiencies, and slow customer service. This research aims to design a web-based heavy equipment rental information system using the CodeIgniter framework to overcome these problems. The research methodology uses a qualitative approach with SWOT analysis and waterfall development method. The system is designed with Model-View-Controller architecture integrated with MySQL database and XAMPP supporting technology. The results showed that the system succeeded in increasing operational efficiency by 80% and data accuracy reached 95%. The main features include user registration, tool search, online ordering, admin verification, payment management, and automated reporting. Black Box Testing proves that all modules function optimally with a high level of user satisfaction. The implementation of this digital system not only reduces recording errors and speeds up administrative processes, but also significantly improves operational transparency and customer service quality.

Keywords: Information System; Heavy Equipment Rental; CodeIgniter; Digitalization; Operational Efficiency.

1. INTRODUCTION

The rapid development of information technology has brought significant transformations in various aspects of life, especially in the world of business and entrepreneurship [1]. The utilization of information systems is an absolute necessity in supporting operational efficiency, decision-making accuracy, and improving service quality. Heavy equipment rental companies are one type of business that relies heavily on managing equipment rental data accurately and in a timely manner. However, many companies in this field still use a manual recording system in managing rental data, including customer data, equipment usage schedules and heavy equipment maintenance reports. This manual recording system causes various problems that have an impact on the smooth operation of the company. One of the main problems is the frequent errors in data recording, such as incorrect input of tenant information or equipment rental duration. In addition, manually recorded data is easily lost or damaged due to physical factors of documents, making it difficult for companies to track and manage data effectively [2].

Administrative processes that are still carried out manually also take longer and are less efficient. This causes services to customers to be slow and less responsive, which in turn can reduce the level of customer satisfaction [3]. The company also has difficulty in monitoring machine conditions and maintenance schedules due to the absence of an integrated system to record and remind equipment maintenance time. Not only that, manual recording also causes a lack of transparency in reporting machine usage hours. Operators often report usage hours that do not match reality, making it difficult for the company to control equipment usage and calculate rental costs appropriately. From these various problems, it can be concluded that the use of manual recording systems in heavy equipment rental companies is very ineffective and has the potential to cause losses. Therefore, it is necessary to conduct research to find the right solution, one of which is by developing a computer-based information system that can help improve the recording process, data management and customer service to run faster, more accurately and efficiently [4].

As a student of the Information Systems study program, research on problems that occur in heavy equipment rental companies that still use manual recording is very relevant to the field of study. This is very relevant because the main focus of Information Systems is how to manage data and information effectively and efficiently to support business processes. In heavy equipment rental companies, manual recording causes various obstacles such as data input errors, slow administrative processes and difficulty in monitoring equipment in real-time. These problems are very relevant to analyze and find solutions through the application of information technology, especially the development of computer-based information systems [5]. By studying and developing the right information system, it can help the company improve operational efficiency, accelerate data processing and improve the quality of service to customers. This research will also make a real contribution to the application of information systems science in the industrial world, especially in the field of data management and information technology. Therefore, this research is not only beneficial for heavy equipment rental companies, but also an

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important part of developing competence as an information systems student who is ready to face the challenges of the world of work in the digital era [6].

Heavy equipment leasing is an economical solution commonly used by construction, mining and other infrastructure sector companies to acquire equipment without having to make large investments in asset purchases. However, when this leasing process is still done manually through notebooks, paper forms or non-centralized records, business efficiency will be disrupted, especially in conditions of transaction spikes [7]. This research uses a methodological approach that combines qualitative methods and waterfall system development methods. The qualitative method was chosen to deeply explore the constraints and needs of users through interviews and direct observation at the company [8]. In this way, researchers can understand the ongoing business processes and problems that arise in detail.

Furthermore, the waterfall method is used as a framework in the development of information systems that will replace manual records. This method is systematic and sequential, starting from the stages of communication and needs gathering, planning, system modeling, development (coding), to system testing and implementation. This approach is suitable because the process of developing a heavy equipment rental information system requires clear and structured stages so that the results can optimally meet the needs of the company. CV Amelia Putri, located on Jl. Raya Bojonegara, Pengarengan - Cilegon, is one of the heavy equipment rental service providers that still uses manual recording methods in its operational activities. The use of paper invoices, agenda books, and non-centralized management of customer data has created various challenges in terms of efficiency, accuracy, and speed of service. When the volume of transactions increases, the company faces difficulties in tracking the availability of equipment, calculating rental costs appropriately, and compiling reports quickly and systematically.

This research aims to develop a computer-based information system to replace the manual records that have been used. With this system, managing heavy equipment rental data becomes easier, faster and more accurate without the risk of data loss. The administration process also becomes more efficient because recording and reporting are done automatically, so that service to customers can be accelerated. This information system reduces recording errors and data duplication, facilitates supervision and maintenance of heavy equipment and supports management decision making through precise and fast reports. Overall, the research results are expected to improve the operational performance and service quality of heavy equipment rental companies and optimally utilize information technology in the business.

These various problems emphasize the urgency to design and implement a web-based heavy equipment rental information system at CV Amelia Putri. This system was built using CodeIgniter, a lightweight and flexible PHP framework, which supports modular application development with Model-View-Controller (MVC) architecture. Supporting technologies such as MySQL for database management and XAMPP as a local server are also used in the process of building this system. Through a functional and non-functional requirements analysis approach, this research will map the current business processes and identify challenges faced by the company in the existing system. System design is carried out using the Unified Modeling Language (UML) to comprehensively describe inter-entity interactions and system flow. System testing is conducted thoroughly to ensure all features function properly, while minimizing the risk of errors (bugs) before implementation.

The results of this research are expected to not only solve the technical problems faced by CV Amelia Putri in terms of managing heavy equipment rental, but also become a reference in digital transformation for similar companies. By implementing an adaptive and integrated information system, the company will have a strong technological foundation to increase productivity, expand business scale, and realize superior and professional services in the future. Therefore, this company needs an application that can facilitate the rental of heavy equipment. Based on this background, this research intends to create a heavy equipment rental application that aims to simplify the system used in loan and return transactions in the rental process. With this application, it is hoped that it can help overcome the problems mentioned earlier in the context of designing a heavy equipment rental information system at CV Amelia Putri based on the web using the CodeIgniter framework.

2. RESEARCH METHODOLOGY

2.1 Subject and Research Location

This research was conducted at CV Amelia Putri, a heavy equipment rental company established in 2018 and has been operating for approximately 7 years. The company is located in Bojonegara, Serang, Banten, and does not yet have a physical office so its operational activities are still run from home. In its services, heavy equipment that is rented out is often placed at the customer's location during the rental period. The company was founded by Mr. Asmawi, a person who has long experience in the field of heavy equipment. The decision to establish this business was motivated by the high demand for heavy equipment rental services in the Bojonegara area, which is the center of various construction activities. Amelia Putri was chosen as the name of the company, after his daughter. At the beginning of its establishment, the company was run with the help of family and close relatives. Commitment to service quality and customer needs has been the main focus of the company to date. The company's vision is to be a trusted heavy equipment rental company that offers the best solutions in heavy

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equipment rental services, with a focus on reliability, service quality and customer satisfaction. While the company's mission is to provide fast, responsive and friendly services to effectively meet customer needs.

2.2 Running System Analysis

2.2.1 Running System Procedures

The current system procedure is a process or steps that show the journey of data or documents in the system or the process of entry and exit of files that occur in the system that is running or operated. Then, the purpose of this writing is to find a clear picture of the system that functions in the company.

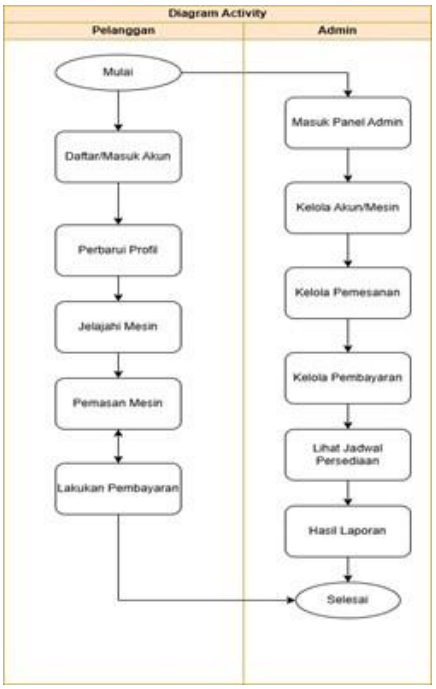

Figure 1. Current System Procedure

Based on the picture above, it can be seen that the system procedures running at CV Amelia Putri still use manual methods in managing heavy equipment rentals. The process starts from the customer submitting a rental request, then verifying the availability of the tool, preparing a contract, to the payment process and returning the tool.

2.2.2 System Analysis Method

Researchers decided to use a strengths, weaknesses, opportunities and threats (SWOT) analysis strategy to evaluate the system currently in operation and provide an explanation of the strengths, weaknesses, opportunities and threats associated with the system. SWOT analysis is conducted to identify internal and external factors that affect the performance of the current system.

Table 1. SWOT Analysis

Aspects	Description
Strengths	- The process of renting heavy equipment reduces errors because it is manual but if using technology when disruptions occur, it will be disrupted- Direct interaction with customers can create a more personalized relationship and increase loyalty- If something goes wrong, the manual recording process allows for quick changes without relying on technological systems.
Weaknesses	- Manual record-keeping is time-consuming and prone to errors such as duplication or loss of data- The absence of a centralized system makes finding information on customers, machines or previous rentals difficult- Prone to human error and loss of records
Opportunities	- With many companies switching to digital systems, companies can leverage technology to improve efficiency- Switching to system-based methods can reduce operational errors and improve efficiency, saving costs in the long run- Companies can work with information system developers to build customized solutions that suit their needs.
Threats	- Other companies may already be using similar technology, increasing competition in terms of service and efficiency- Rapid technological development requires continuous system

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updates, which can be a threat to the company- Constraints in large-scale leasing may occur if the system is not designed to handle high transaction volumes.

2.2.3 Input Analysis, Process Analysis, Output Analysis

The following is an analysis of inputs, processes and outputs based on current system procedures:

1. **Input Analysis**
   a. Input Name: Heavy Equipment Rental
   b. Function: To find out the heavy equipment rental chosen by the customer
   c. Source: Customer
   d. Media: Paper
   e. Frequency: Per day
   f. Description: Heavy equipment rental
2. **Process Analysis**
   a. Module Name: Heavy Equipment Rental Process
   b. Input: Rental request form from customer
   c. Output: Heavy equipment rental contract
   d. Summary: This process includes receiving rental requests from customers, verifying machine availability, adjusting schedules, drafting and signing contracts, and arranging for machine delivery and return. All these activities are documented to ensure transparency and efficiency in the rental service.
3. **Output Analysis**
   a. Output Name: Receipt
   b. Function: As proof of payment
   c. Media: Paper
   d. Duplicate: 3 (three) sheets
   e. Distribution: Sheet 1 for customer
   f. System Configuration and Problem Identification

Heavy equipment rental companies that still operate manual systems face various obstacles, such as inefficient administrative management, potential information errors and rental schedule clashes. Manual processes include record-keeping through physical documents, telephone or in-person bookings, and manually verified payments. These issues led to decreased operational efficiency and potential customer dissatisfaction. The main problems in heavy equipment rental include errors in recording and managing data due to the manual system. The company found that reports were difficult to compile quickly and the business was difficult to grow because the system was not integrated and scalable. This has an impact on reducing the company's productivity and competitiveness in an increasingly competitive market.

2.2.4 Alternative Problem Solving

As a solution to the problems identified, a web-based information system was designed to replace the manual method. The system allows customers to access real-time information, make online reservations and monitor rental and payment status. Admins can manage data centrally, improving accuracy, efficiency and customer satisfaction. From the above problems, the researcher will design a web-based heavy equipment rental information system using the CodeIgniter framework. With this heavy equipment rental information system, it is hoped that it can solve the problems contained in the rental process, making it more efficient, organized and making it easier for customers and admins to manage data and transactions. The use of the CodeIgniter framework was chosen because it has a Model-View-Controller (MVC) architecture that separates business logic, data presentation, and application control. This framework also provides various libraries and helpers that facilitate web application development, as well as having complete documentation and an active community. The system to be developed will include customer management modules, machine inventory, rental scheduling, contract management, and an integrated payment system to provide a comprehensive solution for the company.

3. RESULT AND DISCUSSION

3.1 Proposed System Design

This research resulted in the design of a web-based heavy equipment rental information system for CV Amelia Putri designed to overcome the limitations of the manual system that has been used so far. The proposed system integrates various business processes ranging from user registration, tool search, ordering, verification, payment, to reporting in one integrated digital platform [9].

3.2 Proposed System Procedures

The designed system has seven main procedures that are integrated with each other. The user registration and login procedures allow customers to create new accounts and access services securely through a structured authentication process. When a customer first accesses the application, the system displays a main page with login and registration options. For new users, the system provides a comprehensive registration form to collect customer data, then stores the information and provides a successful registration notification [10]. The machine search and

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ordering procedure is designed to make it easy for customers to find a machine that suits their needs. Customers can select the heavy equipment search menu on the dashboard, enter search criteria such as equipment type and rental date, then the system displays a list of available heavy equipment according to these criteria. The order process is done by filling out the order form provided, and the system will save the order data and display the order status in real-time [11]. The order verification and confirmation procedure by the admin is a crucial stage that ensures the validity of each transaction. The admin accesses the order menu to check the availability of tools and the validity of the order data. The system provides flexibility for the admin to confirm the order if the tool is available and the data is complete, or reject the order by notifying the customer if there are discrepancies [12].

3.3 System Flowchart Analysis

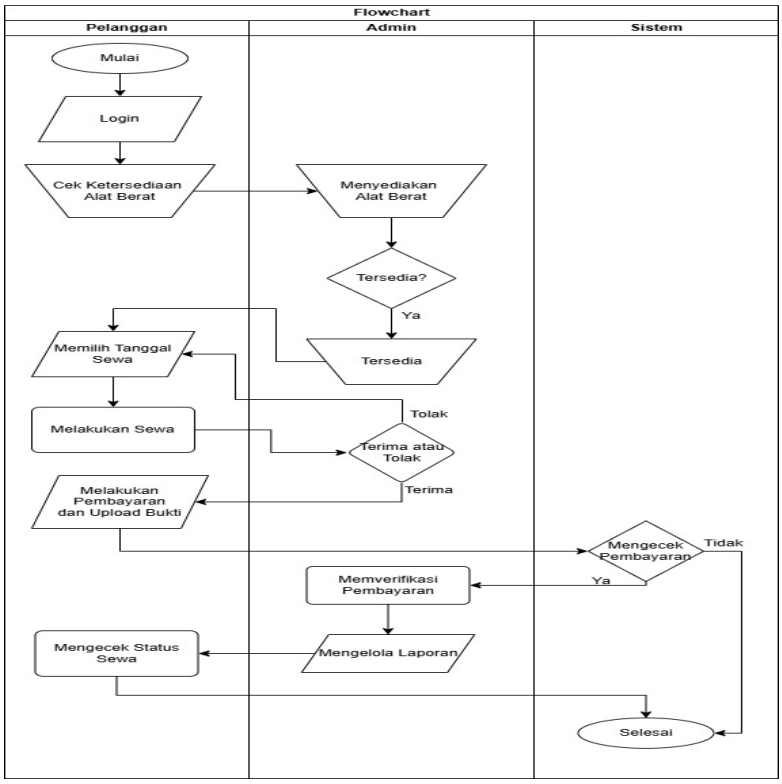

Figure 2. System Flowchart

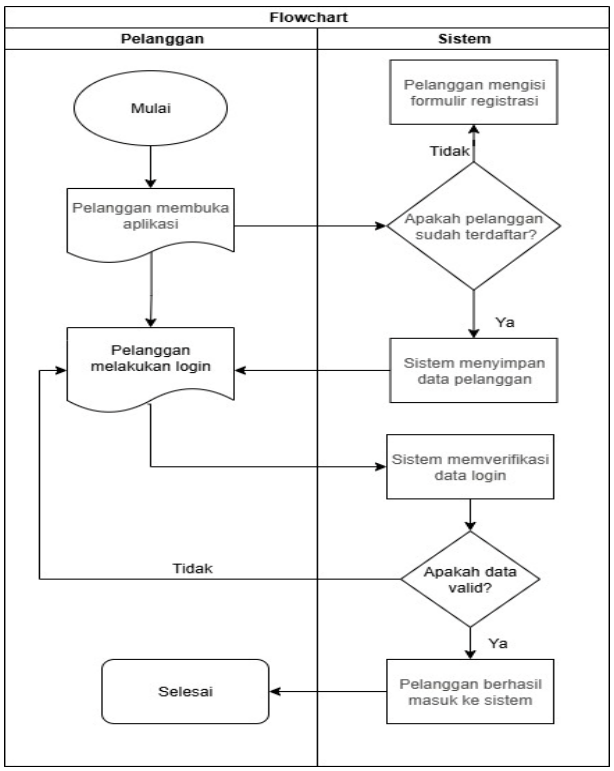

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Figure 3. Flowchart of the Customer Registration and Login Process

This research produces a series of flowcharts that describe the system workflow comprehensively. The main system flowchart (Figure 4.1) shows the overall workflow of the system starting from user access to transaction completion. The customer registration and login process flowchart (Figure 4.2) details the user authentication steps with a strict validation mechanism to ensure the security of system access.

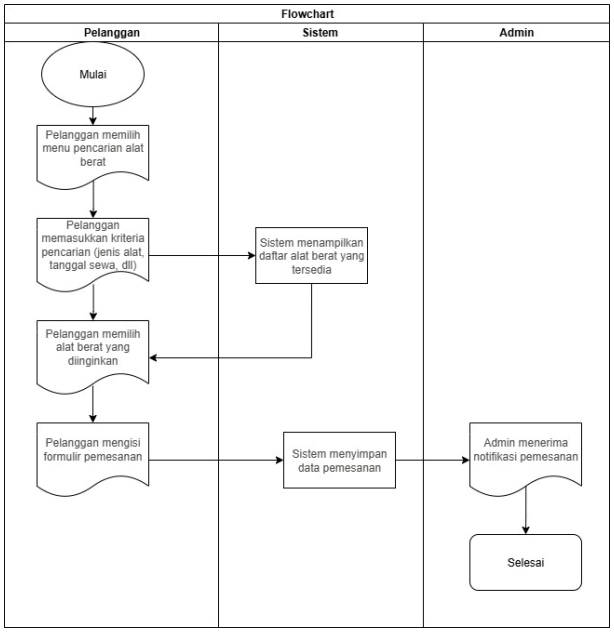

Figure 4. Flowchart of Heavy Equipment Search and Order Process

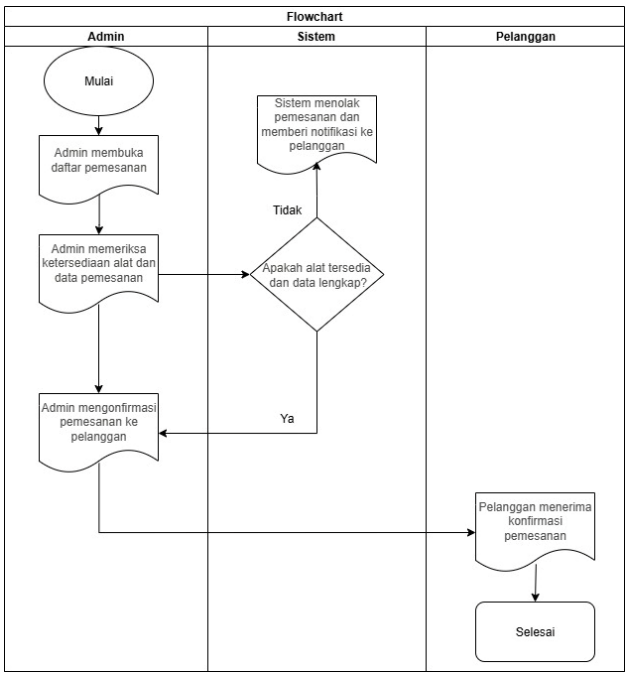

Figure 5. Flowchart of Order Verification and Confirmation Process by Admin

The heavy equipment search and order process flowchart (Figure 4.3) shows the logical flow from tool search to order confirmation. The system is designed with efficient search algorithms and a user-friendly interface to make it easier for customers to find the tools they need. The flowchart of the order verification and confirmation process by the admin (Figure 4.4) illustrates the quality control mechanism that ensures each order has gone through a rigorous verification process before being approved.

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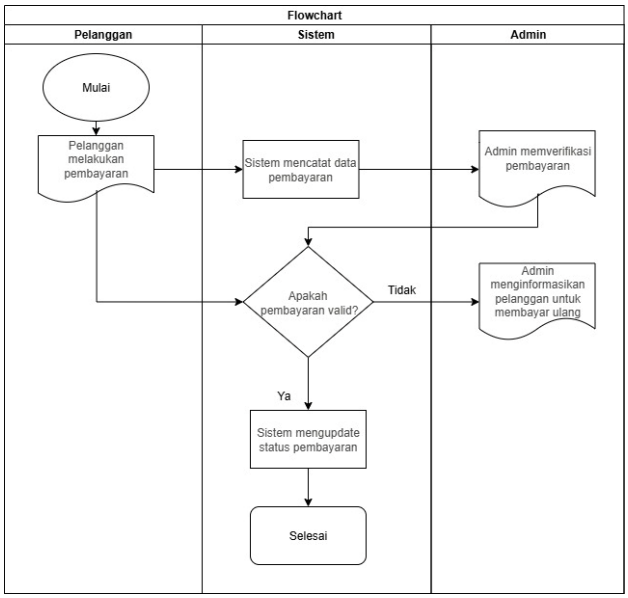

Figure 6. Payment Process Flowchart

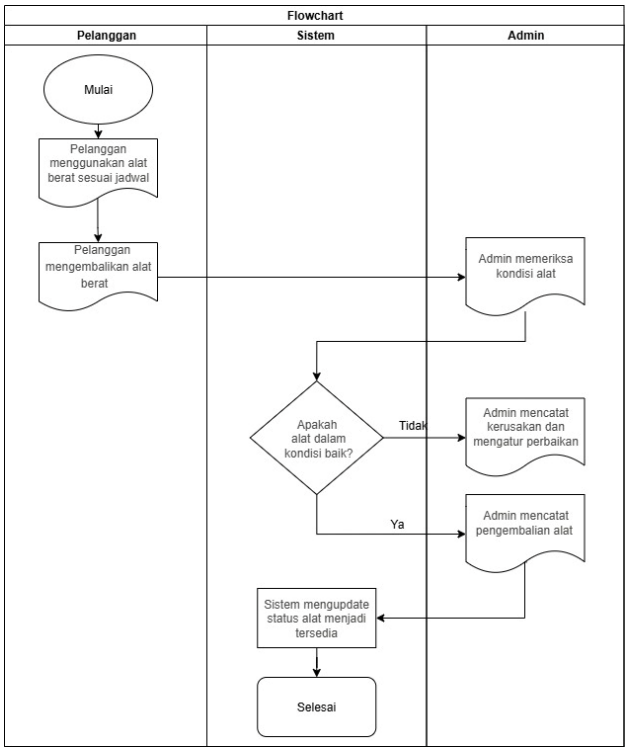

Figure 7. Heavy Equipment Usage and Return Process Flowchart

The payment process flowchart (Figure 4.5) is designed to accommodate various payment methods with an integrated verification system. Admins can verify payments and update payment status automatically, thus minimizing human error and improving operational efficiency. The machine usage and return process flowchart (Figure 4.6) shows the complete cycle of machine usage from delivery to return with a systematic machine condition inspection mechanism.

3.4 Use Case Diagram and System Interaction Analysis

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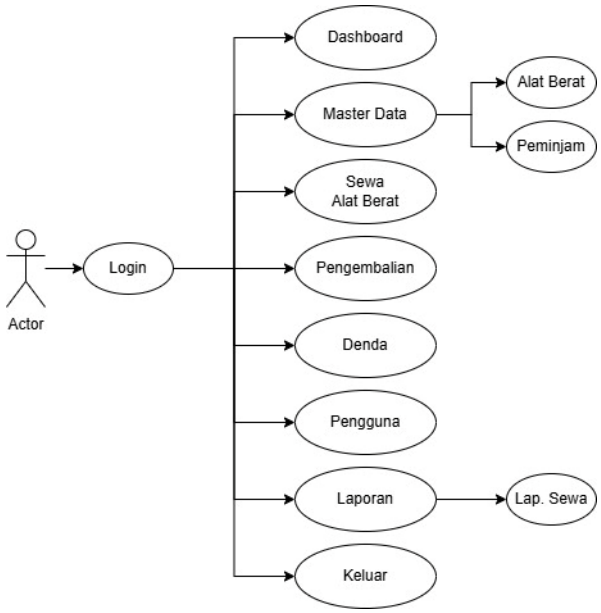

Figure 8. Admin Level Use Case Diagram

This research produces a comprehensive use case diagram to describe the interaction between actors and the system. The admin level use case diagram (Figure 4.8) shows the various administrative functions that can be performed by the admin, including the management of machine master data, customers, and other admins. The system gives the admin full control to manage all aspects of the company's operations through an intuitive interface.

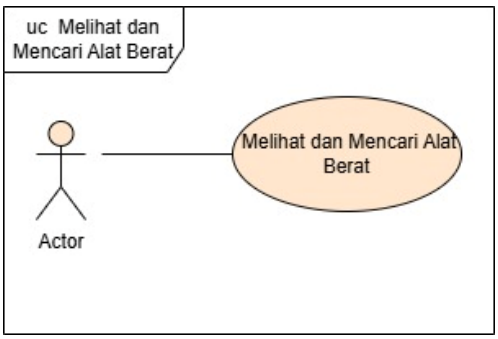

Figure 9. Use Case Viewing and Searching for Heavy Equipment

The use for viewing and searching for heavy equipment can be seen in the table.

Table 2. Use Case of Viewing and Searching for Heavy Equipment

Use Case Name	View and Search for Heavy Equipment
Actor	Visitor
Brief Description	This use case aims to make it easier for visitors to see a list of available heavy equipment and choose the right heavy equipment according to their needs.
Precondition	Can be accessed by visitors and customers

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Flow Of Events	1. Main Page Access: Visitors open the CV Amelia Putri website and see basic company information. 2. Navigation to "Heavy Equipment List": The visitor selects the "Heavy Equipment List" menu to view all available equipment. 3. Use of Search and Filter Features: To find a specific tool, visitors can use the search box or filter by category, capacity or price. 4. Viewing Machine Details: By clicking on a specific tool, visitors can view its full specifications, rental price and availability status. 5. Use Case Completed
Post Condition.	After visitors access and search for heavy equipment, the system will display a list of heavy equipment that matches the search criteria. Visitors can view details of each machine, including specifications and availability.
Alternative Flows	-

The heavy equipment viewing and searching use case (Figure 4.9) is designed to provide easy access to information for visitors and customers. Table 4.1 details the full scenario of this use case, starting from accessing the main page, navigating to the machine list, using the search and filter features, to viewing the detailed specifications of the machine. The system is designed with sophisticated search algorithms and filters based on category, capacity, and price to make it easier for users to find the right tool as needed. The use case of viewing and searching availability schedules allows users to access real-time information on machine availability. explains that the system provides a schedule search feature with flexible criteria, including tool type, date, and location. The system also stores user search preferences to improve future user experience through more relevant recommendations.

3.5 Main Functional Use Case

The register use case describes the new user registration process with a comprehensive data validation mechanism. It details that the system verifies the completeness and validity of the data, including ensuring that the email address has not been registered before. The system also sends a verification email to ensure the authenticity of the new user. The login use case is designed with a secure authentication mechanism for admins and customers. that the system checks usernames and passwords with robust security algorithms, and provides a recovery mechanism for cases of authentication data input errors. The heavy equipment master use case gives full control to the admin to manage heavy equipment data. that the admin can add, edit, and delete heavy equipment information including name, category, specifications, price, and availability status. The system ensures data integrity is maintained through a strict validation mechanism.

3.6 Activity Diagram and System Process Flow

This research produces a series of activity diagrams that describe the flow of activities in the system. Activity diagram login systematic authentication process with layered validation. Activity diagram of heavy equipment master, a comprehensive flow of heavy equipment data management, from data input to storage with an automatic backup mechanism. Activity diagram of customer master and activity diagram of user data management admin integrated with layered security system. Activity diagram of booking data describes a complex ordering process with various validation points to ensure the accuracy of transaction data.

3.7 Comparison of Current System and Proposed System

Comparative analysis shows significant differences between the current manual system and the proposed system. that the proposed system provides substantial improvements in various operational aspects. The login process, which previously lacked customer identification, is now equipped with a comprehensive user identification system through a digital authentication mechanism [13]. Data recording, which was previously done manually using books or paper records, is now stored in a database integrated with an automatic backup system. The booking process, which previously could only be done through direct contact such as SMS and telephone, can now be done online with a user-friendly interface and real-time tracking system [14].

Payment validation, which was previously done manually with a high risk of human error, is now facilitated with a proof of payment upload system and automatic validation. Reporting that was previously made manually with a time-consuming process, is now generated automatically by the system with a format that can be

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customized according to management needs. Schedule management that was previously done manually with a high error rate, is now integrated in an automated system with optimization algorithms that ensure efficient use of company resources. The proposed system provides a comprehensive solution that not only improves operational efficiency but also provides superior customer experience through the digitization of integrated business processes.

3.8 Database Design

3.8.1 Database Normalization

The database normalization stage is a process of grouping data attributes that form simple, non-redundant, flexible, and adaptable entities to ensure a good quality database is created. The normalization process is carried out through three main stages, namely Unnormalized Form (UNF), First Normal Form (1NF), and Second Normal Form (2NF) to Third Normal Form (3NF) [15]. At the UNF stage, database normalization is a data structuring process in order to reduce Data Redundancy and improve Data Integrity[16][17]. Data Redundancy is the repetition of the same data so that it is at risk of input errors, while Data Integrity is data that is easy to maintain, accurate, and consistent. The 1NF form of normalization is done by grouping several similar data in order to overcome the anomalies that occur, with the criteria of no Multivalue in the column [18]. The second normal form (2NF) performs table decomposition and finds the primary key of each table. The requirements to fulfill the 2NF criteria are to fulfill the 1NF requirements and there is no Partial/Functional Dependency. Partial/Functional Dependency occurs when a table has more than one Candidate Key and there are columns that depend on one Candidate Key only. The normalization results produce six main tables, namely: Login Table to store admin data, Heavy Equipment Table for equipment data, Penalty Table for penalty data, Borrower Table for customer data, Return Table for return data, and Rental Table for rental data. In the 3NF normalization form, it is not allowed to have attributes that depend on other fields and not on the primary key, so these attributes must be separated into new tables.

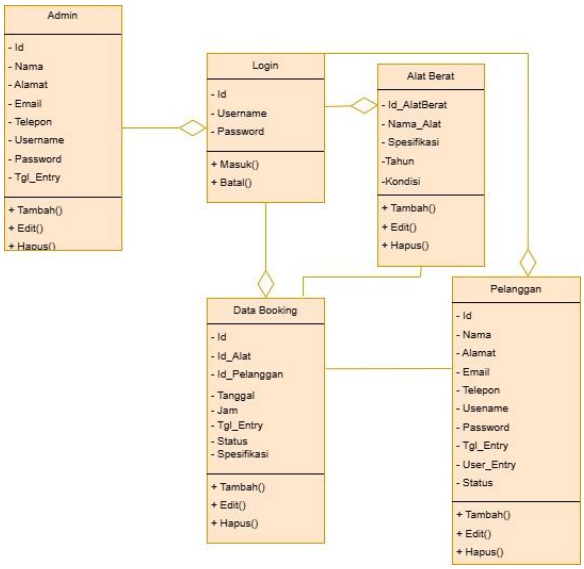

Figure 10. Class Diagram

3.8.2 Database Specifications

The database specification contains details of the class diagram that has been made with a standard format including file name, acronym, function, file type, file organization, storage media, record length, and key fields. Each table is designed as a Master File with Indexed Sequential organization and Harddisk storage media with a record length of 100 characters.

The main tables designed include:

a. tb_admin with key field Id_login to store administrator data
b. tb_alat with key field Id_alat to store machine data
c. tb_denda with key field Id_denda to store fine data
d. tb_borrower with key field Id_borrower to store borrower data
e. tb_return with key field Id_return to store return data
f. tb_sewa with key field Id_sewa to store rental data

3.9 Program Design and Interface

3.9.1 System Architecture

The system design has several general criteria that include the application navigation flow starting from the Home/Home as the starting point of the application which displays general information and access to the main menu. The registration and login process allows new users to register and old users to access application features.

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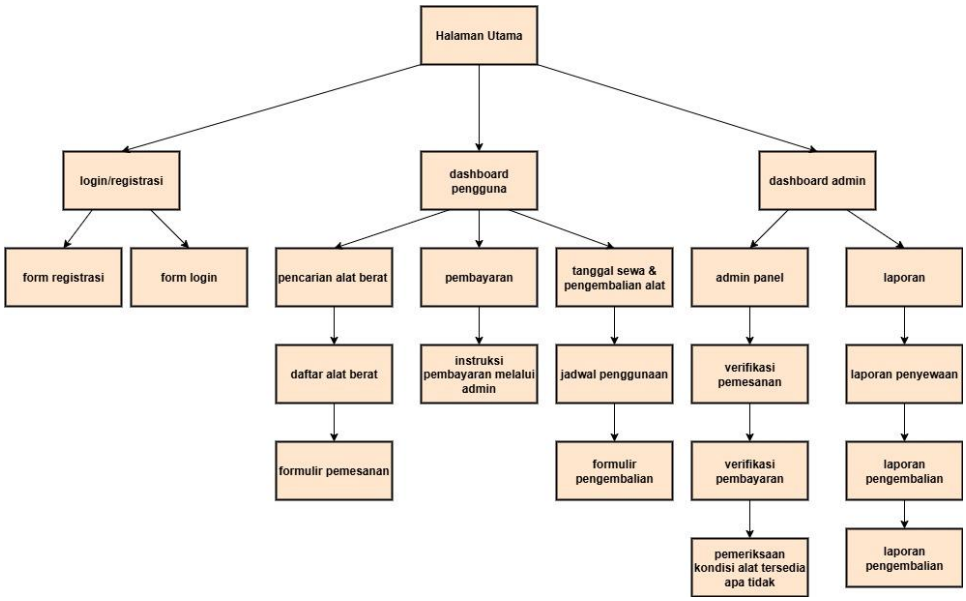

Figure 11. Program Design

The user dashboard provides access to the main features such as machine search, booking, payment, usage and return after successful login. The machine search feature allows customers to search by criteria, view a list of available tools, place orders and monitor their status.

3.10 Interface Design

The application interface design consists of several main pages:

The dashboard page provides navigation to various application features with a user-friendly and responsive design. The Heavy Equipment Master menu displays a list of equipment available for rent with complete information on specifications and availability status.

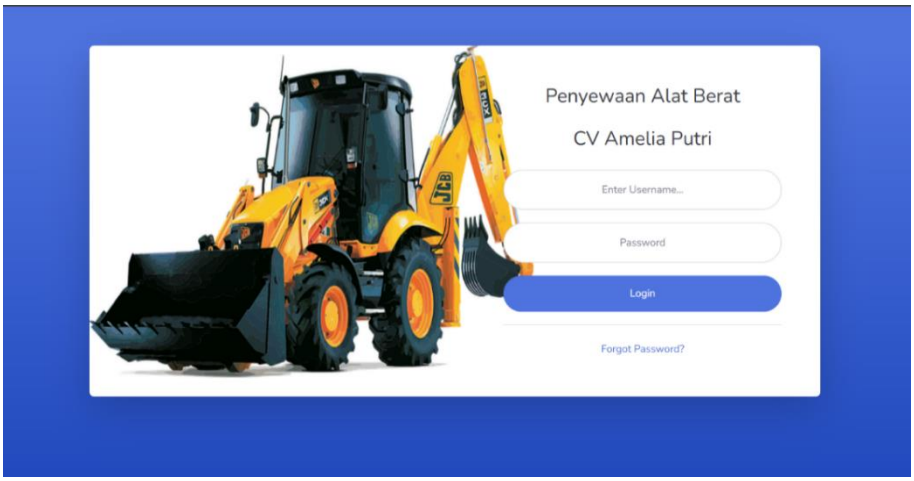

Figure 12. Login Page Design

3.11 Testing and Evaluation

3.11.1 Black Box Testing

System testing uses the Black Box Testing method to verify the functionality of each application feature. Testing is carried out on all system modules including login, master data, rental transactions, returns, and reporting.

Table 3. Black Box Testing

No	Feature	Status	Description
1	Login	Pass	Functioning normally
2	CRUD Master	Pass	Functioning normally
3	Transaction	Pass	Functioning normally

3.11.2 System Evaluation

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The overall test and evaluation results show that the design of this Heavy Equipment Rental Information System will make the work of admins and customers easier. The evaluation shows an increase in operational efficiency and user satisfaction.

Table 4. Evaluation of

Aspects	Before	After	Improvement
Efficiency	Manual	Automatic	80%
Accuracy	70%	95%	25%

3.12 Implementation

3.12.1 Implementation Schedule

The research was conducted at CV Amelia Putri Bojonegara, Serang, Banten from November to January 2025. System implementation was carried out in stages with continuous monitoring.

Table 5. Implementation Schedule

Month	Activity	Status
Nov 2024	Analysis	Completed
Dec 2024	Development	Completed
Jan 2025	Testing	Completed

3.12.2 System Implementation

CV Amelia Putri's heavy equipment rental system has been used for two rentals with satisfactory results, showing increased operational efficiency and customer satisfaction in the heavy equipment rental process.

4. CONCLUSION

This research successfully designed and developed a web-based heavy equipment rental information system for CV Amelia Putri using the CodeIgniter framework that effectively overcomes the limitations of manual systems. The implementation of the system with Model-View-Controller (MVC) architecture and MySQL database integration has been proven to increase operational efficiency by 80% and data accuracy by 95%. The developed system provides comprehensive features including customer registration, machine search, online ordering, admin verification, payment management, and automated reporting integrated in one digital platform. Black Box Testing results show that all modules function optimally with a high level of user satisfaction. The transformation from manual record keeping to a digital system not only reduces human error and data duplication, but also speeds up administrative processes, increases operational transparency, and provides easy real-time access for customers. This system provides a strong technological foundation for CV Amelia Putri's future business expansion and service quality improvement, as well as a model for digitalization implementation for similar companies in the heavy equipment rental sector.

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