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Web-Based Information System for UPJA Rental and Savings and Loans

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ABSTRACT

Purpose of the study: This study aims to develop an integrated web-based Rental and Savings & Loan Information System for UPJA "Amanah Jaya." The system is designed to combine the functions of agricultural equipment rental and savings & loans in a single platform to enhance operational efficiency, recording accuracy, and financial report transparency.

Methodology: This research employed a qualitative approach with the prototype system development method. Data collection was conducted through interviews, observations, and documentation studies. The system was designed using Data Flow Diagram (DFD) and Entity Relationship Diagram (ERD) modeling, implemented using the PHP programming language and MySQL database, and tested using the black-box testing method.

Main Findings: The research produced an information system with four user levels (members, treasurer, secretary, chairman) capable of managing rental transactions, savings & loans, installments, and report generation. Black-box testing proved that all system functions operate effectively, accelerating the data search process, minimizing recording errors, and increasing transparency of fund management for members.

Novelty/Originality of this study: The novelty of this research lies in the development of an integrated web-based information system that combines the two main functions of UPJA (agricultural equipment rental and savings & loans) in a single interconnected platform with multi-level users, utilizing the prototype method that involves users intensively. This system contributes to the digitalization of rural agricultural institutions through an integrated model that enhances data synergy and business governance.

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1. INTRODUCTION

Rapid advances in information technology have driven digital transformation across various sectors, including agriculture, to improve the efficiency and transparency of business management. The "Amanah Jaya" Agricultural Equipment and Machinery Service (UPJA) in Sumber Mulya Village offers a solution for farmers to access shared agricultural machinery and obtain savings and loan services [1]. However, observations and interviews with UPJA administrators revealed that all business processes, from member registration and recording rental and loan transactions to reporting, are still managed manually using ledgers. This situation has triggered a series of serious problems that hamper the institution's effectiveness and accountability.

The main problems identified include the manual recording process, which is prone to errors, data loss, and damage to physical files. Mismatches between rental schedules and equipment availability often occur due to the unintegrated recording system. Furthermore, the calculation of revolving funds and the preparation of periodic accountability reports are done manually, which is not only time-consuming and labor-intensive, but also prone to manipulation and does not follow good reporting standards [2]. This results in low transparency of information regarding the use of funds and UPJA activities to members and other stakeholders.

Several previous studies have attempted to address similar issues, such as the development of a car rental information system and a savings and loan information system for cooperatives [3]. These studies generally focused on one type of service and did not integrate the two into a single, interconnected system. Furthermore, the development approaches used varied, ranging from the waterfall model to object-oriented methods. Unlike these studies, this study proposes the development of an integrated information system that specifically handles the two main functions of UPJA, namely agricultural equipment and machinery rental and savings and loans, in a web-based platform.

Several previous studies have shown the great potential of digitalization in overcoming manual management problems in financial institutions and agricultural business units Sulfikram Proved that web-based information systems in savings and loan cooperatives were able to increase transaction recording efficiency and reduce errors by up to 90%, while Yunus et al. Emphasized that similar systems facilitated the calculation process and savings and loan transactions effectively [4]. On the other hand, Hanggana (2024) highlighted that the effectiveness of managing Agricultural Equipment and Machinery Rental Services (UPJA) is highly dependent on management transparency, but his study has not integrated information technology solutions into this governance. Despite making important contributions, these studies still separate information systems for savings and loans and UPJA management, so that no one has specifically designed an integrated system that combines both functions in one platform. This gap is the basis of this research to build an integrated information system for UPJA "Amanah Jaya" based on the web using the prototype method (Sommerville, 2016), in order to create data synergy between the agricultural machinery rental and savings and loan units and to address the problems of efficiency, accuracy, and transparency of reports which have been the main obstacles [5].

The novelty of this research lies in the development of an integrated web-based information system that combines two primary functions of the UPJA (farm equipment rental and savings and loans) into a single, interconnected platform. Unlike previous research that focused on only one function separately, this system offers a holistic solution with data synergy across business units. Furthermore, the use of a prototype method intensively involved users from the outset to ensure the system met the real needs of UPJA administrators (Sommerville, 2016). This research contributes to the digitalization of the agricultural sector through an integrated model that improves operational efficiency, data accuracy, and financial reporting transparency for members [6].

The urgency of this research is based on the urgent need to address the manual management issues at UPJA "Amanah Jaya" which are prone to recording errors, data loss, mismatched agricultural machinery rental schedules, and inefficient and intransparent financial reports. This condition threatens the accountability and sustainability of the institution if not immediately addressed with appropriate technological solutions. Therefore, this research aims to build an integrated web-based UPJA Rental and Savings and Loan Information System using a prototype method [7]. This system is designed to combine the functions of agricultural machinery rental and savings and loans in a single interconnected platform to improve operational efficiency and recording accuracy. Thus, this research is expected to be able to realize the transparency of financial reports and support the sustainability of UPJA "Amanah Jaya" business.

2. RESEARCH METHOD

2.1. Types of Research

This research uses a qualitative approach with descriptive research types and case studies. The qualitative approach was chosen because the research aims to understand the phenomenon in depth about the rental and savings and loan management system currently running at UPJA "Amanah Jaya" and to design technology-based solutions that suit user needs [8]. The case study was applied because the research focuses on one specific object, namely UPJA in Sumber Mulya Village, to gain a holistic and detailed understanding of the problems and system needs at that location.

2.2. Subjek and Object

The subjects of this study were the administrators and members of the "Amanah Jaya" UPJA who are directly involved in the rental and savings and loan business processes [9]. The object of this study is the entire ongoing system flow, including member registration procedures, agricultural equipment and machinery rental transactions, savings and loan and installment transactions, and the UPJA financial and activity reporting system.

The focus of this study is on identifying the weaknesses of the manual system and formulating functional requirements for the web-based information system to be developed.

2.3. Data Collection Technique

The data sources in this study are divided into two categories: primary and secondary data. Primary data were obtained directly from primary sources through in-depth interviews with the chairperson, treasurer, secretary, and members of the UPJA, as well as through participant observation of operational activities in the field [10]. Secondary data were collected from relevant documents such as rental transaction logbooks, savings and loan ledgers, agreement archives, member registration forms, and literature reviews from journals and books related to information systems, rentals, and savings and loans.

Data collection techniques were conducted through four methods: semi-structured interviews to explore the problem in depth from each user's perspective; direct observation to verify the system flow described by the informants; documentation studies to analyze existing data and report formats; and literature studies to strengthen the theoretical and methodological foundations. The primary instrument in this study was the researcher himself, assisted by interview guidelines, observation sheets, and hardware (laptop) and software (XAMPP, MySQL, Notepad++, Visio 2013) for system design and development [11].

3.4. Data Analysis

Data analysis in this study was conducted qualitatively using an interactive model consisting of data reduction, data presentation, and conclusion drawing [12]. Data from interviews and observations were reduced to focus on identifying the main problems, as listed in Table 4.1 in the thesis. Next, the data were presented in the form of a system flowchart and narrative description to facilitate understanding of the problem flow. The research procedure followed the prototype system development model [5], which was applied through five main stages: (1) Communication, by conducting interviews and observations to identify problems and user needs; (2) Planning, by determining resources, system specifications, and research schedule; (3) Modeling, by designing the system using Data Flow Diagrams (DFD), Entity Relationship Diagrams (ERD), and designing the user interface; (4) Construction, by building the application using the PHP programming language and MySQL database, and conducting initial testing; and (5) Handover, by implementing the system and conducting evaluations with users. System testing was conducted using the black-box testing method to ensure all functions run according to user needs, involving members, the treasurer, the secretary, and the head of UPJA [13].

3.5. Research Instruments

The main instrument in this study was the researcher himself who acted as planner, implementer, data collector, analyst, and reporter of research results. Supporting instruments included an interview guide containing a list of open-ended questions to gather in-depth information, an observation sheet to record systematic findings in the field, and hardware (a laptop with Intel Celeron processor specifications, 2 GB RAM) and software (XAMPP, MySQL, Notepad++, Visio 2013) used for system design, modeling, and development [14]. Data analysis in this study was conducted qualitatively with an interactive model consisting of data reduction, data presentation, and conclusion drawing. Data from interviews and observations were reduced to focus on identifying the main problems and functional requirements of the system, then presented in the form of a running system flowchart and narrative description to facilitate understanding of the problem flow [15].

3. RESULTS AND DISCUSSION

This research resulted in a web-based rental and savings and loan information system for the "Amanah Jaya" UPJA in Sumber Mulya Village. The system was built using a prototype method using the PHP programming language and a MySQL database [16]. The research results are discussed in detail in the current system analysis, system design, interface implementation, system testing, and evaluation. This system was designed to address the problem of manual data processing in the Sumbermulya Village UPJA, such as recording equipment rentals and savings and loans, which are only managed in a general ledger, making them prone to errors, data loss, and financial report manipulation.

This information system implementation has four user levels with different access rights: members, treasurers, secretaries, and the UPJA chairman, each of whom can manage data according to their respective duties and authorities [17]. Members can register, view equipment rental data (RUA), and monitor loan status, while the treasurer manages loan transactions, installments, and the creation of agreements and guarantees. The secretary is responsible for validating loan and rental lists, while the chairman can periodically view member data reports, rental reports, and savings and loan reports. This system was designed using Data Flow Diagram (DFD) modeling, consisting of a context diagram, level 1 and level 2 DFDs, and an Entity Relationship Diagram (ERD), resulting in 11 database tables.

Based on black box testing of all system functions, all features performed as expected, and the system was declared fit for use by the UPJA management. This information system provides transparency in fund management to members, accelerates data retrieval, and minimizes errors in periodic reporting [18]. Therefore, the system can improve the efficiency and effectiveness of rental and savings and loan management at the UPJA in Sumbermulya Village.

The results of this study are in line with the findings of Felix Wuryo Handono et al. (2026) who developed a web-based computer rental reservation system, where the implementation of digital systems was proven to be able to automate business processes and improve transaction data accuracy compared to manual systems [19]. Consistency of findings was also found in the study of Devi Dwi Purwanto et al. (2026) on a savings and loan cooperative application which confirmed that a web-based system with real-time dashboard features and automatic calculations was able to increase financial information transparency and user satisfaction. In line with these two studies, Ikhsan Sendi Putra and Bana Handaga (2026) in designing a party decoration rental system proved that the implementation of a system with role-based login and package management significantly increased service efficiency and ease of use for customers. This study confirms that the development of the UPJA "Amanah Jaya" rental and savings and loan information system using the prototype method, DFD and ERD modeling, and four user levels successfully overcomes manual recording problems, accelerates the data retrieval process, and provides transparency in fund management to members. Thus, the results of this study strengthen empirical evidence that digitizing services through web-based information systems is an effective solution for improving operational efficiency, data accuracy, and governance in small and medium-sized enterprises (SMEs) in the rental and microfinance services sector.

This study presents a novelty in the form of an integrated information system that combines the functions of agricultural equipment and machinery rental (UPJA) with savings and loans in a single web-based platform [20]. This is a novelty not found in previous studies that focused solely on one function. Unlike the studies of Felix Wuryo Handono et al. (2026) and Ikhsan Sendi Putra et al. (2026), which were limited to computer rental and party decorations, this system is specifically designed for the agricultural institutional context by accommodating four different user levels (member, treasurer, secretary, and chairman), reflecting the complete organizational structure of UPJA. Another advantage of this study lies in the system's implementation to a fully functional stage, with black box testing proving the effectiveness of all features, not limited to the prototype stage as in the study of Fritti Juliana Nainggolan et al. (2026). Compared to the research by Rahmad Wahyu Andhika and Irman Efendi (2026), which only covered one product type without financial features, this system is capable of managing savings and loan transactions, installments, the creation of agreements and guarantees, and periodic reports in a structured manner [21]. Thus, this research fills a gap in innovation by providing a web-based, integrated information system for leasing and savings and loans with multiple user levels that has been tested for functionality and is specifically designed to support the digitalization of agricultural institutions in rural areas.

This research has a significant impact on the digital transformation of business management in the agricultural institutional sector, particularly in improving operational efficiency and transparency in member fund management [22]. Consistent with the findings of Sugiyanto and Mutiara Nur Azizah (2026), the implementation of an integrated information system can improve financial accountability and separate risks between business units, thereby protecting member funds from potential financial contamination. This is reflected in the system, which is built with four user levels, enabling structured and transparent data management and minimizing recording errors that were previously prone to manual systems. Furthermore, research by Caca Arif Herdian et al. (2026) demonstrated that the implementation of a web-based system can integrate fragmented data, accelerate information access, and minimize human error through automated transaction management and reporting modules [23].

Thus, this information system has an impact on increasing the efficiency and effectiveness of management performance, while also having implications for strengthening the governance of agricultural institutions in rural areas through the digitization of services that increase member trust and business competitiveness. This research has several limitations that need to be considered for further development, particularly the focus on the "Amanah Jaya" UPJA in Sumber Mulya Village [24]. Therefore, the results cannot be generalized to all UPJAs or savings and loan cooperatives in other areas with different characteristics. Furthermore, the new system development includes equipment rental and savings and loan functions, but has not yet integrated digital payment features that could simplify and streamline member transactions. System testing has only been conducted at the black box stage to ensure proper functionality, but usability testing involving a large number of respondents has not yet been conducted to comprehensively measure ease of use from a user perspective. This aligns with research by Riyan Latifahul Hasan et al. (2026) on a web-based motorcycle rental information system, which also recommended the need for further testing on access speed and system security to ensure optimal long-term performance. Therefore, future research is recommended to expand the research scope, add digital payment features, and conduct usability testing with a larger number of respondents to refine the information system.

3.1. Running System Analysis

Based on the results of interviews and observations conducted during the communication stage, it was found that all business processes at UPJA "Amanah Jaya" are still carried out manually [25]. The process of renting agricultural equipment and machinery begins when members come to UPJA to inquire about equipment availability. The treasurer checks the equipment status, and if available, the secretary checks the completeness of the rental guarantee documents. Members then pay a down payment (DP) of 50%, and the treasurer makes a duplicate receipt for the archives and members [26]. The process of borrowing funds involves submitting documents by members to the secretary, checking loan history, realization by the treasurer, and creating receipts and installment cards. The process of installment payments and withdrawals of deposits is also carried out by manual recording in the general ledger. The flowchart of the running system for the rental process is shown in Figure 1.

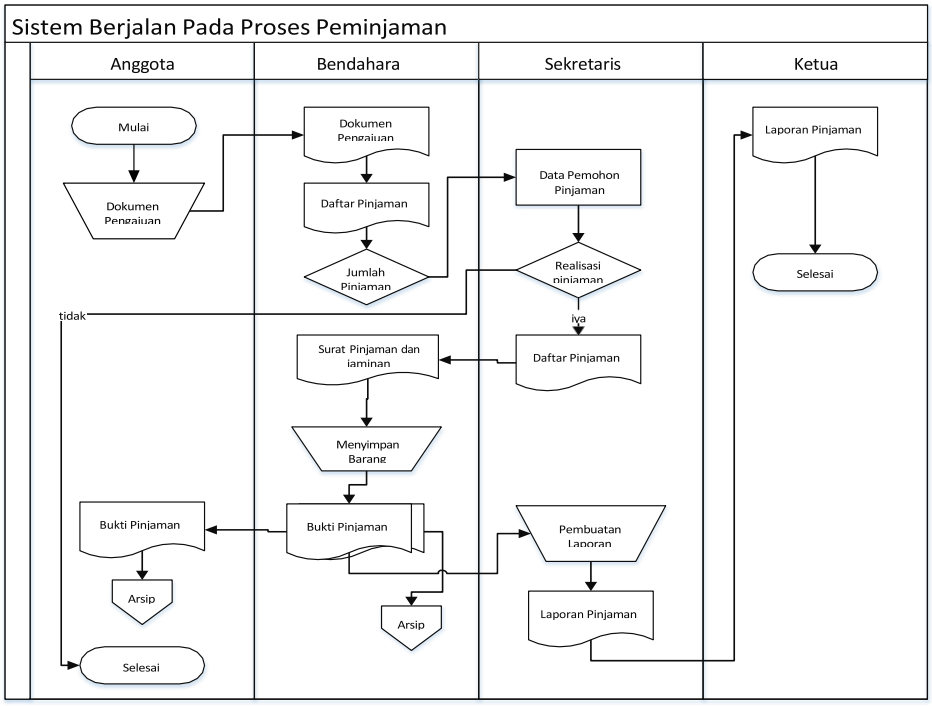

Figure 1. Flowchart of the Running System

3.2. System Design

Based on the functional requirements analysis that has been identified, the system is designed with Data Flow Diagram (DFD) modeling consisting of a context diagram, DFD level 1, and DFD level 2 to describe the data flow in a structured manner [27]. The context diagram of the proposed information system displays four main actors with different access rights, namely members, treasurers, secretaries, and heads of UPJA. The database design produces 11 interrelated tables in an Entity Relationship Diagram (ERD) based on documents found in the documentation study such as member registration forms, rental receipts, and installment cards. These tables are designed to ensure data integrity and avoid information redundancy. The user interface design is made for each user level according to their respective needs and authorities.

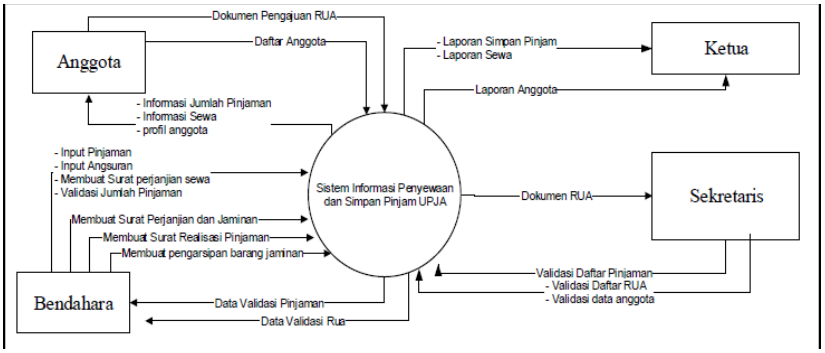

Figure 2. 1. UPJA Information System Context Diagram

3.3. Interface Implementation

The information system developed has a different interface for each user level, with a login page as the main entry point for the system, using an authentication mechanism based on username, password, and user level. For member-level users, the system provides features for viewing personal data, applying for equipment rentals through the RUA form, and monitoring the status of loans independently [28]. Treasurer-level users have the most comprehensive access to manage financial transactions, such as managing loan data, inputting installments, and creating rental agreements. Secretary-level users have access to validate loan and rental lists submitted by members before they are processed further by the treasurer. Chair-level users have access to view strategic reports without being able to change transactional data, equipped with date filters and graphs to facilitate decision-making.

3.4. System Testing

System testing was conducted using a black-box testing method that focuses on verifying system functionality without looking at the internal structure of the program code, involving four users according to access levels: members, treasurer, secretary, and UPJA chairman. Testing results for the member level showed that all functions such as login, registration, viewing member data, accessing the RUA menu, viewing the loan list, and logging out were successfully executed [29]. Testing for the treasurer level proved that the member data, loan, installment, lease agreement, loan amount status, agreement and guarantee letter, loan realization letter, and logout menus functioned as expected. Testing for the secretary level confirmed that the loan menu, loan list validation, lease list validation, and logout were accessible and operated perfectly. Testing for the chairman level verified that the loan data report, lease data report, member data report, print report feature, and logout menus ran smoothly.

3.4. Evaluation and Discussion

Based on the test results, all functions in the UPJA rental and savings and loan information system ran smoothly as expected, with no functional errors found in any test scenario. The system provided a significant improvement compared to the previous manual system in terms of data retrieval speed thanks to the integrated search feature [30]. Report generation, which previously took hours, can now be done in minutes with the report printing feature based on a specific period. Information transparency increased because members can access their rental and loan status independently through the system without having to come to the location. The implementation of the prototype method proved effective because intensive communication with users ensured that the developed system was in accordance with the needs and workflow at UPJA.

4. CONCLUSION

This research has succeeded in building a web-based UPJA Rental and Savings and Loan Information System that meets the needs of users at UPJA "Amanah Jaya" in Sumber Mulya Village. The system, developed using the prototype method and Data Flow Diagram (DFD) modeling, is able to overcome the main problems of the manual system, such as error-prone recording, long data search times, inefficient report generation, and lack of information transparency to members. The results of black-box testing indicate that all system functionality runs well according to the needs of each user level, namely members, treasurers, secretaries, and UPJA heads. The implementation of this system has been proven to increase data processing efficiency, accelerate the process of servicing rental and loan transactions, and provide accurate and transparent reports for decision-making. In the future, this system has the potential to be developed into a mobile-based application to facilitate member access in the field, and can be integrated with digital payment systems to increase the ease of financial transactions.

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