

# Design of a Web-Based Savings and Loan Information System for Lolong Village-Owned Enterprise

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## ABSTRACT

This study focuses on designing and implementing a web-based savings and loan information system for the Village-Owned Enterprise (BUMDes) in Lolong Village, Nagawutung Subdistrict, Lembata Regency, East Nusa Tenggara. The system addresses inefficiencies in manual financial management, previously reliant on notebooks and spreadsheet software, by utilizing PHP and MySQL to streamline the handling of member data, savings, loans, and installment records. A modified Waterfall methodology guides the development process, employing a structured sequence of stages to ensure alignment with operational needs. Unified Modeling Language (UML) diagrams, including Use Case and Activity Diagrams, map user interactions and process workflows, facilitating a clear design framework. Data collection, conducted between April and May 2023, involved observing operational challenges and gathering requirements to create an intuitive interface accessible through web browsers. The system enables administrators to process transactions rapidly and accurately, while members can view their savings and loan details via personal accounts, fostering greater transparency in village financial operations. Compared to earlier manual methods, the system minimizes errors and reduces risks of mismanagement, offering a reliable tool for rural financial administration. Challenges such as managing credit risks and ensuring user adoption highlight the need for additional features, such as enhanced security measures like two-factor authentication and comprehensive user training programs. The resulting system provides a scalable solution for improving financial management in rural settings, with opportunities for future enhancements to support long-term sustainability and broader community participation in economic activities.

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## 1. Introduction

Village-Owned Enterprises (BUMDes) play a central role in advancing rural economic development in Indonesia by fostering financial independence and empowering communities to manage local resources. Established under the framework of Law No. 6 of 2014 concerning Villages, BUMDes serve as legal entities mandated to generate income, provide services, and strengthen economic resilience at the village level. Among the various business models operated by BUMDes, savings and loan programs remain one of the most impactful because they directly address community needs for accessible financial services. These programs offer villagers easier access to credit and encourage the habit of saving, both of which contribute to local economic stability and long-term welfare improvement.

Despite their importance, many BUMDes continue to rely on manual systems for managing financial transactions. Recordkeeping is often conducted using notebooks or spreadsheets, methods that are highly vulnerable to errors, duplication, delays in

reporting, and even data loss. Such practices also lack transparency, as members have limited ability to independently verify their savings or loan balances. Moreover, the absence of real-time monitoring reduces managerial control and increases the risk of fraud and mismanagement. These challenges highlight the urgent need for a more structured, secure, and transparent system to manage village-level financial activities.

The urgency of digital transformation in rural financial administration is increasingly emphasized in national policies promoting “Smart Villages” and digital inclusion. Web-based information systems have been widely recognized as effective tools to enhance accuracy, efficiency, and accountability in financial operations. Previous studies support this claim: Chofifah (2023) developed a web-based system for BUMDes in Air Panas Village that streamlined member data and loan records; Anggreni (2021) designed a similar system in Kerambitan Village, improving the organization of savings and loan activities; and Samsudin et al. (2019) demonstrated that web-based systems significantly improve data accessibility in cooperatives. These examples show that digital solutions are capable of resolving inefficiencies inherent in manual processes.

Nevertheless, research on BUMDes financial digitalization remains limited, especially in remote rural areas with modest infrastructure and varying levels of digital literacy. While previous studies have primarily highlighted efficiency gains, other critical aspects such as system security, member adoption, and long-term sustainability have received less attention. Sarosa et al. (2021), for example, showed the adaptability of mobile-based savings and loan applications but also stressed the challenges of ensuring widespread community use. Similarly, Asmi and Hutrianto (2022) applied a prototype method to accelerate development, yet issues of system integration and user readiness persisted. This gap indicates a need for studies that not only design technical systems but also adapt them to local contexts.

Responding to these challenges, this study focuses on the design and development of a web-based savings and loan information system for BUMDes Lolong, located in Nagawutung Subdistrict, Lembata Regency, East Nusa Tenggara. The system was developed using PHP and MySQL with a modified Waterfall methodology, ensuring a structured and sequential approach to software development. By incorporating features such as role-based access, data entry forms, and financial reporting tools, the system aims to enhance the efficiency and transparency of BUMDes operations. More importantly, it provides villagers with direct access to their savings and loan information, thereby strengthening accountability and community trust. This study contributes to the discourse on rural digitalization by presenting a scalable model of financial management tailored to the needs of village-owned enterprises in remote settings.

## 2. Methodology

The study was conducted at BUMDes Lolong, located in Lolong Village, Nagawutung Subdistrict, Lembata Regency, East Nusa Tenggara Province. Field data collection occurred from April to May 2023 through direct observation of employee activities and information gathering to analyze challenges in savings and loan management. The research adopted a modified Waterfall methodology, which provides a sequential and structured approach to system development, as described by Wahid (2020), who notes its effectiveness in supporting systematic analysis to meet user requirements. Pricillia (2021) compares the Waterfall method with alternatives such as Prototype and RAD, highlighting its suitability for projects with clear requirements, such as savings and loan data management. System development incorporated a Relational Database Management System (RDBMS), as outlined by Setyawati, Wijoyo, and Soeharmoko (2020), to ensure efficient and organized data storage. Subhan (2012) stresses the importance of system design analysis to minimize errors in information

technology development. Li and Chen (2009) explain the use of data flow diagrams to map data processes, applied in the study to design savings and loan transaction workflows. Hafizh and Novita (2021) demonstrate that web-based systems, such as those developed for managing tutoring data, can be adapted for administrative needs like those of BUMDes. A similar approach by Lestari, Tabrani, and Ayumida (2018) for population administration in Pucung Village, Karawang, underscores the relevance of web technology for operational efficiency. Rivaldi (2018) developed a web-based digital library system, reinforcing the argument that web technology enhances data accessibility and management.

In the context of savings and loans, Ulya (2016) analyzed the transition from conventional to sharia-based systems in PNPM-Mandiri, providing a foundation for shifting from manual to digital systems. Nurhanafi (2013) designed a user-friendly savings and loan system for a cooperative in Ngadirojo, emphasizing intuitive system design. Agustine and Prajawati (2023) address the role of savings and loan programs in economic empowerment, aligning with the objectives of BUMDes Lolong. Jaurino *et al.* (2023) discuss loan accounting practices, supporting system design for financial transparency. Kurniati and Mawarni (2021) employed object-oriented design to streamline funding proposal selection, adapted in the study for designing the system interface. Novita and Pujiyono (2023) emphasize strategies to strengthen savings and loan cooperatives, relevant for enhancing BUMDes operations. Putra *et al.* (2023) developed a web-based system for a cooperative in Medan Helvetia, reinforcing the technological approach of the study. Rahman and Alfaizi (2014) highlight the importance of software knowledge in system development, underpinning the selection of PHP and MySQL for the project. These approaches collectively support the design of an efficient and accessible savings and loan information system for BUMDes Lolong.

### 3. Results

The study at BUMDes Lolong produced a web-based savings and loan information system that facilitates the management of member data, savings, loans, and installments. Developed using PHP and MySQL, the system enables access via web browsers, enhancing operational efficiency. The system design is documented through UML diagrams, including a Use Case Diagram for user interactions and Activity Diagrams for process workflows. The application’s implementation yields a user interface supporting login, data entry, and reporting functions. The system allows BUMDes administrators to process transactions more swiftly and accurately than manual methods, such as notebooks or Microsoft Excel spreadsheets. Members can access their savings and loan information through individual accounts, improving transparency and usability.

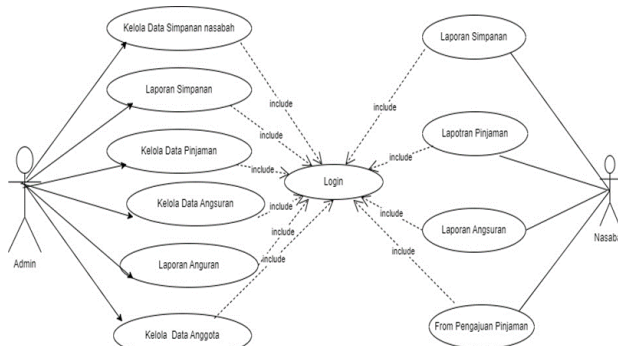


Figure 1. Use Case Diagram

The Use Case Diagram illustrates the interaction between two main actors, administrators and members, with the savings and loan information system. Administrators are responsible for managing key operations such as member registration, savings records, loan applications, and report generation. Members, on the other hand, access the system to view their personal savings and loan information. This diagram provides a clear overview of user roles and the functional boundaries of the system, ensuring that responsibilities and system features are well defined.

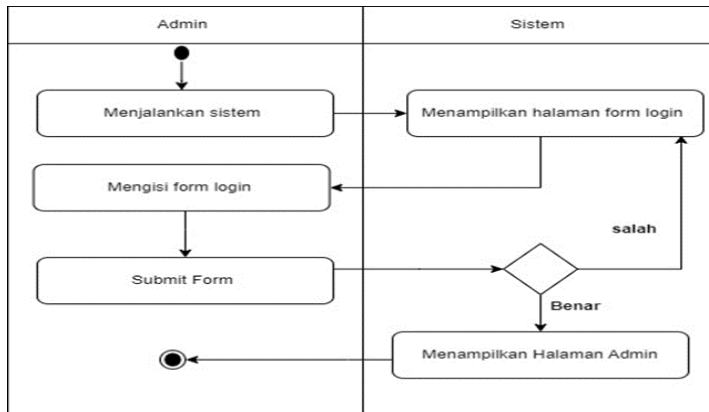


Figure 2. Activity Diagram: Admin Login

This diagram illustrates the process by which administrators access the system. It begins with entering login credentials, followed by system verification, and ends with granting access to the administrator dashboard. This workflow ensures that only authorized users can manage sensitive financial data.

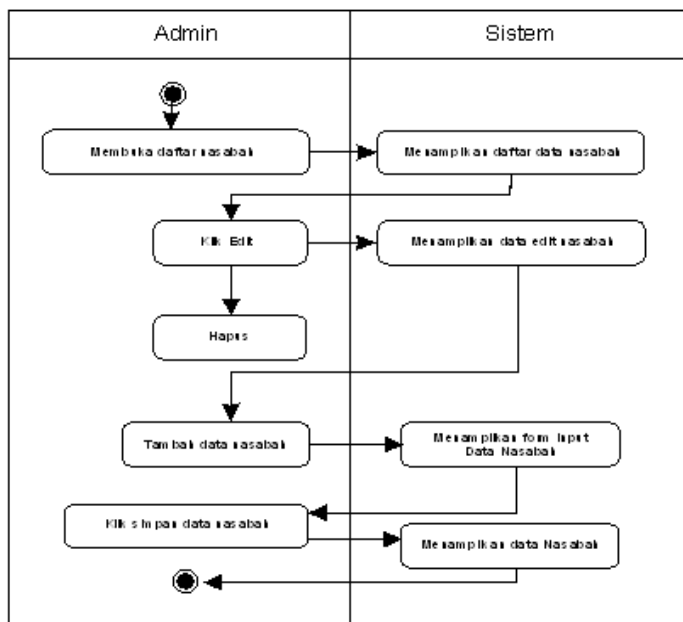


Figure 3. Activity Diagram: Member Data Management

The member data management process includes registering new members and

updating existing member information. This diagram demonstrates how administrators handle personal details systematically, ensuring accuracy and consistency in the database.

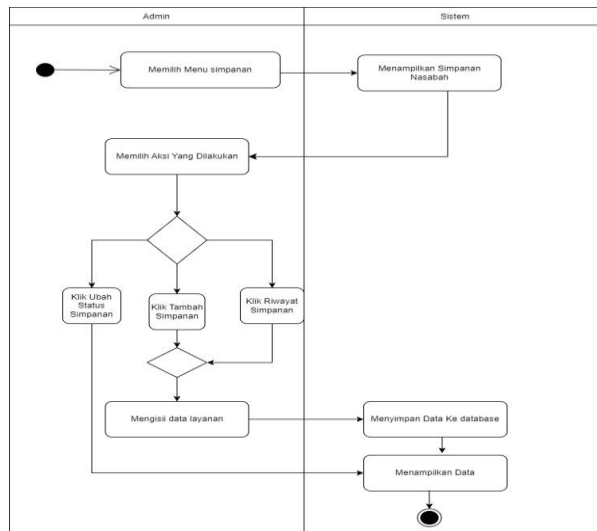


Figure 4. Activity Diagram: Savings Data

This diagram explains the process of managing member savings, covering both principal and mandatory deposits. It shows how administrators record contributions and update records, which are then used for reporting and monitoring purposes.

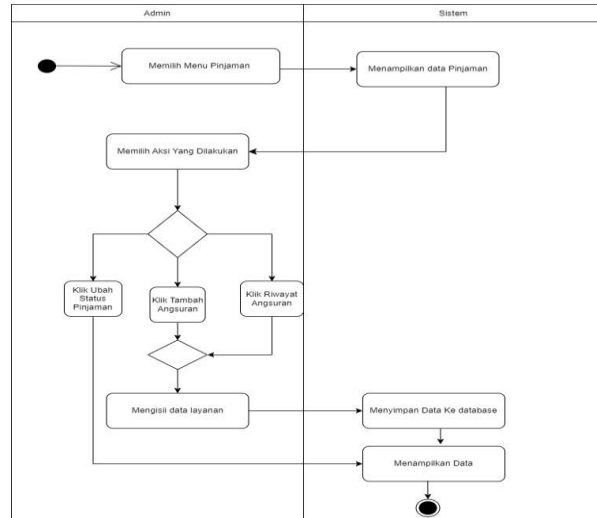


Figure 5. Activity Diagram: Loan Data

The loan data management workflow begins with administrators receiving loan applications, recording the requested amount and repayment terms, and updating the loan status in the system. This ensures transparency and traceability in loan processing.

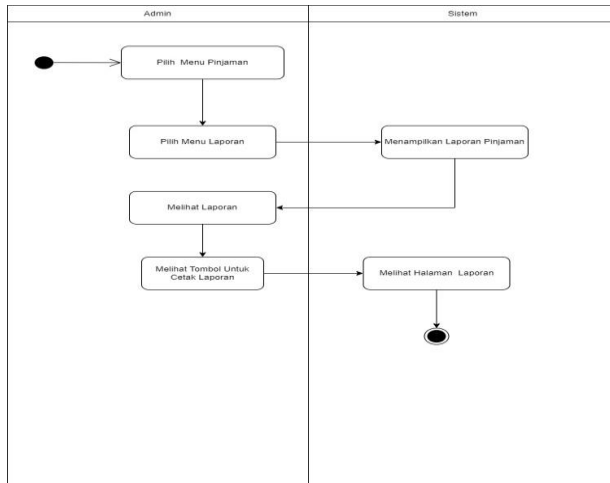


Figure 6. Activity Diagram: Loan Installment Report

This diagram outlines the process of generating installment reports for financial monitoring. It enables administrators to produce accurate records of repayment progress, which supports accountability and helps minimize risks of mismanagement.

Application Implementation :



Figure 7. Home Interface

The home interface serves as the main navigation page of the system. It provides administrators and members with easy access to core features such as savings, loans, member management, and reports. The design emphasizes usability, ensuring that both user groups can quickly find and operate the available functions.

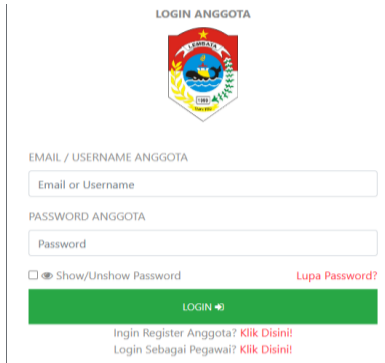


Figure 8. Login Interface

This interface enables secure access to the system. Administrators and members are required to enter their usernames and passwords, with access levels determined by their role. The login mechanism ensures that sensitive financial data is protected and only available to authorized users.

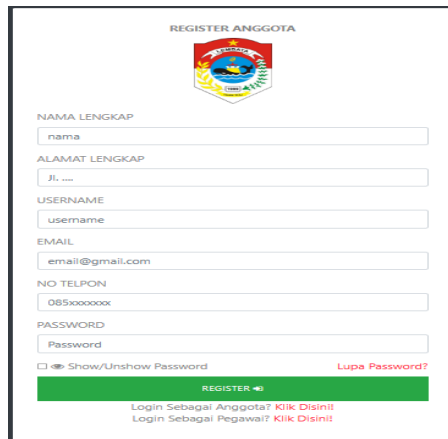


Figure 9. Member Data Entry

The member data entry form allows administrators to record and update member information systematically. Key details include personal identification, address, and other relevant attributes, which are stored in the database for accurate and structured member management.

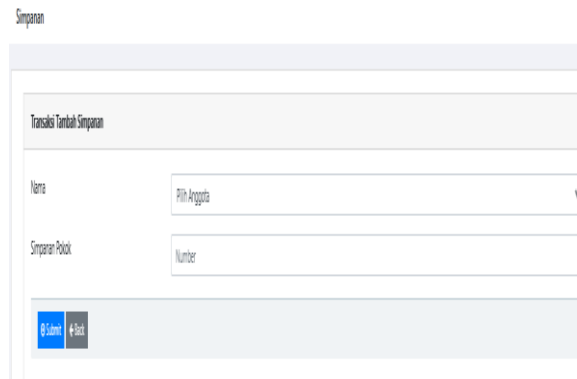


Figure 10. Principal Savings Data Entry

This form facilitates the recording of members' principal savings, which are mandatory deposits required to participate in the program. The system ensures that each transaction is documented digitally, reducing errors and enhancing transparency in savings management.

Figure 11. Loan Application Data Entry

This form is used by members to apply for loans by entering the requested amount and repayment duration. Administrators then review and validate the application before recording it into the system, ensuring that each request is processed systematically and transparently.

No	Nama	Jumlah Simpanan Pokok	Jumlah Simpanan Wajib	Status Simpanan	Aksi
1	novi palang	100000	3425000	Sudah Ditarik	Ubat Status Simpanan   Setor Simpanan Wajib   Bayar Simpanan
2	mara biborang	50000	500000	Belum Ditarik	Ubat Status Simpanan   Setor Simpanan Wajib   Bayar Simpanan
3	Herman Bean	1000000	250000	Menunggu Penarikan	Ubat Status Simpanan   Setor Simpanan Wajib   Bayar Simpanan
4	pace	100000	0	Belum Ditarik	Ubat Status Simpanan   Setor Simpanan Wajib   Bayar Simpanan
5	Margi	150000	0	Belum Ditarik	Ubat Status Simpanan   Setor Simpanan Wajib   Bayar Simpanan
6	justina kromen	1000000	1200000	Belum Ditarik	Ubat Status Simpanan   Setor Simpanan Wajib   Bayar Simpanan
7	petrus bukan	500000	1000000	Belum Ditarik	Ubat Status Simpanan   Setor Simpanan Wajib   Bayar Simpanan

Figure 12. Savings Data Output

The savings data output presents a detailed report of member contributions, including both principal and mandatory savings. This feature supports accurate monitoring of member deposits and provides transparency for both administrators and members.

Nama Anggota	Status pinjaman	Tanggal Peminjaman	Tanggal Pelunasan	Total Pinjaman	Aksi
Mariji	Sudah Lunas	07-05-2023	29-05-2023	400000	Bayar Angsuran
maria bibilog	Belum Lunas	29-04-2023		600000	Batal Status Pinjaman, Tambah Angsuran, Bayar Angsuran
Natalia Benge Bibilog	Belum Lunas	30-05-2023		1000000	Batal Status Pinjaman, Tambah Angsuran, Bayar Angsuran
novi palang	Sudah Lunas	29-04-2023	29-04-2023	500000	Bayar Angsuran
pace	Belum Lunas	07-05-2023		500000	Batal Status Pinjaman, Tambah Angsuran, Bayar Angsuran
petrus tukan	Belum Lunas	30-05-2023		500000	Batal Status Pinjaman, Tambah Angsuran, Bayar Angsuran
justina kronen	Belum Lunas	16-05-2023		500000	Batal Status Pinjaman, Tambah Angsuran, Bayar Angsuran

Figure 13. Loan Data Output

This report displays information about active member loans, including loan amounts, repayment terms, and current statuses. It helps administrators track outstanding obligations and manage loan portfolios more effectively.

No	Nama Pegawai	Tanggal Angsuran	Jumlah Angsuran	Aksi
1	veronika	2023-05-29	525000	Cetak

Figure 14. Installment History Output

The installment history output provides a chronological record of loan repayments made by members. This feature ensures accountability, reduces the risk of misreporting, and enables both administrators and members to clearly monitor repayment progress.

#### 4. Discussion

The web-based savings and loan system for BUMDes Lolong effectively addresses the limitations of manual methods, such as inaccuracies in record-keeping and risks of fraud, previously reliant on notebooks or Microsoft Excel spreadsheets. The Waterfall methodology, as described by Erawati (2019) and Wahid (2020), ensures a structured development process from requirements analysis to implementation, aligning with BUMDes operational needs. The database design, utilizing a Relational Database Management System (RDBMS) (Setyawati *et al.*, 2020), supports organized data storage, as visualized in UML diagrams like Use Case and Activity Diagrams for core processes. Chofifah (2023) and Anggreni (2021) affirm that web-based systems enhance savings and loan management efficiency, consistent with findings showing accelerated data processing and reporting. Samsudin *et al.* (2019) highlight the accessibility benefits of web systems, evident in the member login feature for independent access to savings and loan reports. However, challenges such as credit risk, as noted by Jaurino *et al.* (2023), suggest the need for risk management features to ensure financial sustainability. Novita and Pujiyono (2023) recommend user training to strengthen system adoption, relevant for ensuring optimal use by village

communities. The web-based approach, as developed by Putra *et al.* (2023) for a cooperative in Medan Helvetia, supports findings that web technology enhances transparency. Future development could incorporate additional security measures, such as two-factor authentication, and financial analytics, as implied by Kurniati and Mawarni (2021) in their object-oriented application design.

## 5. Conclusion and Recommendations

The study successfully developed a web-based savings and loan information system for BUMDes Lolong, enabling more efficient and accurate management of member data, savings, loans, and installments compared to manual methods using notebooks or Microsoft Excel. Built with PHP and MySQL, and supported by UML diagrams such as Use Case and Activity Diagrams, the system allows administrators to process transactions swiftly and systematically. The user interface enables members to access savings and loan information through individual accounts, enhancing financial transparency in village operations. The Waterfall methodology ensures a systematic development approach, aligning with BUMDes operational requirements. The system reduces inaccuracies and fraud risks, though further enhancements, such as additional security features and user training, are necessary to maximize adoption and sustainability among the village community.

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