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Web-Based Information System for Managing Savings and Loans at the Mera Ndi Ate Cooperative

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Abstract: A web-based cooperative information system — accessible at any time via the internet — allows administrators and members to retrieve real-time financial data, automate transaction recording, generate periodic reports, and monitor loan and deposit statuses with measurable accuracy. At the Mera Ndi Ate Cooperative, however, member registration and financial data management are still conducted manually through ledger entries, producing recurring problems: duplicate records, transcription errors, vulnerability to physical data loss, slow reporting cycles, and underutilized computing infrastructure. A web-based system was therefore developed to support daily operations, accelerate service delivery, reduce recording errors, and improve financial transparency. The study adopted a descriptive qualitative approach and applied the Waterfall model as the system development methodology. The resulting Mera Ndi Ate Cooperative Information System covers the full operational cycle — from member registration to financial reporting — and is supported by a real-time dashboard connected to a centralized database that tracks deposits, loans, and installment payments. The system measurably improves data accuracy, access speed, and operational accountability, while also strengthening the cooperative's capacity for long-term financial governance.

Keywords: Cooperative; Information System; Waterfall; Website.

1. Introduction

The case for web-based cooperative management systems is, at this point, well established in the literature. Systems accessible via the internet remove the geographic and temporal constraints of paper-based administration, enabling administrators and members to retrieve transaction data in real time, automate recurring financial entries, and produce reports without the delays inherent in manual bookkeeping (Adi Priana *et al.*, 2024; Permatasari & Wijayanto, 2024). What this means in practice is that an administrator no longer needs to be physically present at the cooperative's office to verify a member's savings balance, nor does a member need to wait until the end of the month to learn whether their loan installment was correctly recorded. The system becomes, in effect, a shared source of truth — one that is updated continuously rather than reconciled periodically. Beyond convenience, this architecture reduces the structural vulnerability of cooperatives that depend on a single ledger or a single officer's memory. Reni Setiawati (2024) observed that web-based deployment specifically accelerates the recording of recurring deposits and loan transactions, supporting more responsive administrative services as part of broader cooperative digitalization efforts. The

automation of these processes is not merely a technical upgrade; it is a shift in how financial accountability is distributed across the organization.

Indonesian cooperatives are under considerable pressure to modernize. The sector has been moving toward application-based financial management, online savings products, and digital loan services — changes expected to improve efficiency and competitiveness in an increasingly networked economy (Deddy Supriatna *et al.*, 2022; Priyo Utomo *et al.*, 2022). The Indonesian government and cooperative associations have repeatedly emphasized digitalization as a strategic priority, and the rationale is straightforward: cooperatives that cannot produce timely, accurate financial data are cooperatives that cannot be trusted, and cooperatives that cannot be trusted lose members. Yet a substantial portion of cooperatives, particularly at the community level, still operate on manual ledgers. The consequences are predictable: human error accumulates over months of handwritten entries, reporting is delayed because reconciliation takes time that staff do not have, and data retrieval becomes a problem rather than a routine task (Luh *et al.*, 2023; Muku *et al.*, 2024; Rahman Ismail & Sidik, 2025). The gap between what digital tools can offer and what many cooperatives actually use remains wide — and the welfare costs of that gap fall directly on members who receive incorrect statements, wait longer for loan approvals, or lose access to their savings history when a ledger is damaged or misplaced.

The Mera Ndi Ate Cooperative operates in the savings and loan sector with the explicit goal of improving member welfare, offering relatively low-interest loans for daily needs and small business capital alongside short-term savings products — year-end savings, school savings, and holiday savings — that members may withdraw within a year. These products serve small and medium-sized community members who have limited access to formal banking services, making the cooperative's administrative accuracy a matter of genuine financial consequence for its members. Managing these products accurately at scale, however, requires more than a ledger. Member registration, transaction recording, and financial reporting at this cooperative are still handled manually, producing data duplication, transcription errors, physical damage risks, slow reporting cycles, and a persistent failure to use available computing infrastructure effectively. Officers spend significant time cross-checking entries, correcting errors, and reconstructing transaction histories that a properly designed database would retrieve in seconds. Financial reports that should take minutes to generate instead take days, and the margin for error in manual arithmetic is never zero. A web-based information system was therefore developed to address these specific operational gaps: to support daily administration, increase transparency, accelerate service delivery, reduce recording errors, and produce financial reports that administrators can actually rely on — not as a generic modernization exercise, but as a direct response to the documented failures of the cooperative's current manual processes.

2. Related Work

Several prior studies inform the design decisions made in this research. Vidianto and Hendrawan (2024) developed a cooperative application integrated with a web-based accounting system, with the primary aim of designing, building, and evaluating an accounting-integrated platform. Armiati *et al.* (2024) focused on structured information system design intended as a foundation for implementation-phase development. Kustian (2020) approached cooperative system design through the PIECES method, producing a Java-based desktop application centered on new member registration. Ihsanil Huda *et al.* (2024) designed an internal control system capable of monitoring member data, simplifying savings and loan applications, and generating financial reports automatically. Priono and Latifah (2024) applied the Waterfall method to design a web-based savings and loan information system for KSP CU SANYOS MITRA SEJATI, with the stated aim of improving administrative efficiency and member trust.

2.1 State-of-the-Art Research

This study departs from prior work in several specific ways. First, in terms of financial logic specialization — where earlier studies tend to address member registration or internal control in general terms, this study applies a precisely defined interest calculation scheme, specifically a 2% flat or 0.2% declining balance rate, directly integrated into the loan processing module. Second, tenor tracking automation: the system automatically updates outstanding debt and monitors the installment sequence — recording, for instance, that a member is on their third of six scheduled payments — within a single deposit transaction workflow, a level of automation absent from the desktop-based and design-stage studies reviewed above. Third, real-time dashboard integration: rather than stopping at design documents or static reports, this study produces a live dashboard that displays cash balance summaries and member statistics as a decision-support tool for administrators. Fourth, cultural interface design: the cooperative's visual identity and its founding motto — *"When you are in trouble, I will help you; when I am in trouble, you will help me"* — are embedded in the system interface, an aspect rarely addressed in purely technical studies yet consequential for institutional adoption.

2.2 Comparison with Previous Studies

Table 1 summarizes the positioning of this study relative to prior research.

Table 1. Comparison of Previous Research with Current Research

Features / Methodology	(Vidianto & Hendrawan, 2024)	(Armiati *et al.*, 2024)	(Kustian, 2020)	(Ihsanil Huda *et al.*, 2024)	(Priono & Latifah, 2024)	Current Research (Mera Ndi Ate Cooperative)
Development Method	Iterative SDLC	Porter & BPMN Analysis	PIECES & UML	Prototype	Waterfall	Structured Waterfall
Technology	Laravel (Modern PHP)	Structured (DFD & ERD)	Java Desktop	Visual Basic .Net	PHP & MySQL	PHP & MySQL (Web-Based)
Main Focus	Accounting Integration	Buying and Selling Business Process (Kopma)	New Member Registration	Internal Control	Digitization of Manual Records	Savings, Loans & Installments
Special Characteristics	Real-time Financial Monitoring	Detailed BPMN & DFD Modeling	Focus on smooth registration	Emphasis on digital archives	Migration from MS Excel to Web-Based System	2% Interest (0.2% Decreasing) & Cultural Motto
Transaction Calculation	Integrated Accounting	Inventory & Sales	Savings and Loan Transactions	Cost & installment estimates	Standard Savings and Loan Management	Automated Remaining Debt & Tenor
Report Output	Financial Reports	Sales & Inventory Trends	Member & Loan Reports	Automatic Financial Reports	Master Data & Transaction Reports	Ending Balance Report (Cash) & Print

2.3 Positioning of This Research

This research is positioned as a comprehensive operational information system for medium-scale cooperatives. Most prior studies either stopped at the DFD/ERD design stage or produced desktop applications limited to local access. By contrast, this research occupies a specific niche across three dimensions. First, it bridges member identity management with dynamic financial transaction processing — combining administrative and transactional functions that prior studies tend to treat separately. Second, it selects a web-based platform (PHP/MySQL) with particular emphasis on installment ledger automation, a function frequently identified as the weakest point in manual cooperative management. Third, by focusing exclusively on the Mera Ndi Ate Cooperative, the system is not a generic template but a purpose-built tool aligned with the cooperative's internal regulations on interest rates and loan tenors — ensuring compliance rather than approximation.

2.4 Review of Technologies, Frameworks, and Algorithms

The system was built on a combination of open-source, web-based technologies selected for reliability and maintainability. PHP (Hypertext Preprocessor) serves as the primary server-side programming language; its flexibility in handling complex business logic — including dynamic loan interest calculations — made it the appropriate choice for this application (Sinlae *et al.*, 2024). MySQL manages the relational database, maintaining data integrity across the Members, Deposits, Loans, and Installments tables through primary key and foreign key constraints (Wahyudi *et al.*, 2022). Bootstrap 5 (HTML/CSS/JS) provides the interface framework, ensuring that the system renders correctly on both desktop computers and tablet devices (Rousselet *et al.*, 2023). XAMPP/Apache served as the local development environment for running PHP scripts and managing the MySQL database during development and initial deployment (Albert Yakobus Chandra & Putry Wahyu Setyaningsih, 2025).

The Waterfall methodology was applied in a structured sequence to ensure software quality at each stage. Requirements analysis identified the cooperative's specific business rules, including deposit categories (Basic, Mandatory, Voluntary) and loan terms. System design produced the data architecture in ERD form and the process flow in DFD form. Implementation converted those designs into executable PHP code. Black Box Testing verified that each feature — login, transaction input, and report printing — functioned correctly and

without logical errors. The maintenance stage was planned to accommodate future changes in member data or reporting requirements. Three specific algorithmic procedures govern the system's financial logic. The declining balance interest calculation applies the formula: Interest = Remaining Principal × Interest Rate (2%), ensuring that members' interest expenses decrease proportionally as their outstanding balance falls. The automatic balance validation procedure executes a defined sequence on each installment deposit: retrieve the current loan balance from the database, subtract the new payment amount, update the installment sequence counter (e.g., from installment 1 to installment 2), and write the revised balance back to the Loans table. The report recapitulation algorithm aggregates all "In" and "Out" columns across transaction tables within a specified date range, then calculates the difference to produce the Ending Cash Balance figure displayed on the dashboard in real time.

3. Methodology

This study adopted a descriptive qualitative approach (Saebani, 2024) and employed the Waterfall model as the system development method. The full sequence of research stages is illustrated in Figure 1.

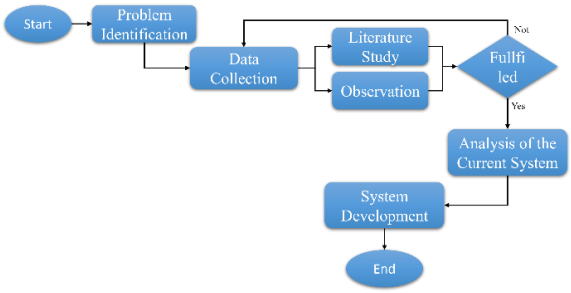

Figure 1. Research Flowchart

The flowchart traces the following sequence. Research began with problem identification, in which the primary operational issues at the Mera Ndi Ate Cooperative were defined and documented (Niam *et al.*, 2024; Saebani, 2024). Data collection followed through two channels: literature study — reading relevant theories, journals, and references — and direct field observation conducted at the cooperative's office (Niam *et al.*, 2024). A verification stage then confirmed that the collected data and research requirements were complete and sufficient to proceed. System analysis was subsequently conducted to document the current state of the cooperative's administrative processes, followed by system development to address the identified problems. Completion marks the final stage, indicating that both the research and development processes had been concluded.

3.1 System Development Method

The Waterfall model was selected as the development method for the Mera Ndi Ate Cooperative web-based information system. Waterfall is a sequential software development model in which each stage — analysis, design, implementation, testing, and maintenance — must be completed before the next begins (Mokhtar & Khayyat, 2022). Its structured, stage-by-stage progression makes it well suited to projects with clearly defined and stable requirements, such as cooperative information systems, school administration systems, and internal organizational applications (Rumetna *et al.*, 2022). The model's predictability is precisely what makes it appropriate here: the cooperative's business rules are fixed, the scope is bounded, and the risk of mid-project requirement changes is low. The Waterfall model stages are illustrated in Figure 2.

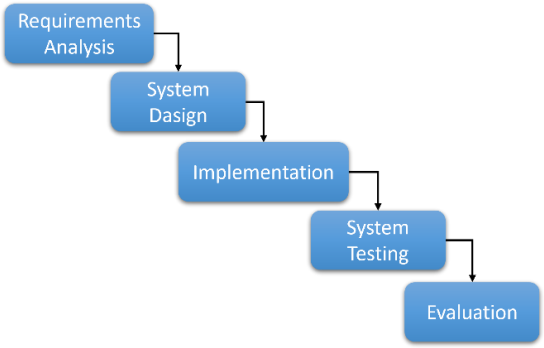

Figure 2. Waterfall Model Stages Diagram (Rumetna *et al.*, 2022)

The development process proceeded through five stages. Requirements Analysis, the first stage, involved identifying and defining user requirements and system specifications — including the cooperative's deposit categories, loan terms, and reporting needs. System Design followed, covering the system architecture, database structure, process flow, and interface layout, all derived directly from the requirements analysis outputs (Mokhtar & Khayyat, 2022; Rumetna *et al.*, 2022). In the Implementation stage, the approved design was translated into executable PHP code, producing a functioning web-based application. System Testing was then conducted to verify that all features operated correctly and to identify and resolve any errors before deployment (Rumetna *et al.*, 2022). The final stage, Evaluation, assessed the overall quality and performance of the system — including user satisfaction and alignment with the original functional objectives — and provided the basis for any further refinement and development (Mokhtar & Khayyat, 2022; Rumetna *et al.*, 2022).

4. Result and Discussion

4.1 Results

4.1.1 Overview of System Implementation

The implementation phase involved translating the procedural design, business logic, and database schema into web-based program code. The system was built on a client-server architecture using PHP for server-side processing, MySQL for database management, and Bootstrap 5 as the interface framework. All of the cooperative's financial operations — from member registration through to automated cash balance reporting — were digitized within this architecture.

4.1.2 Data Flow Diagram (DFD) Implementation

A Data Flow Diagram depicts the movement of data between external entities and internal system processes (Brazhuk, 2023; Leicht *et al.*, 2023). The DFD for the Mera Ndi Ate Cooperative Information System was developed at two levels to provide a structured logical overview. The context diagram represents the system at its highest level of abstraction, showing system boundaries and the relationship with the single external entity: the Administrator. Incoming data flows from the administrator include member master data, savings transactions, loan entries, and installment records. Outgoing data flows return balance summaries via the dashboard and print-ready financial reports covering all incoming and outgoing transactions. The Level 0 DFD is shown in Figure 3.

Figure 3. DFD Level 0 (Context Diagram)

DFD Level 1 decomposes the system into five discrete processes. Process 1.0 (Member Management) collects member identity data — ID number, NIK, and full name — from the administrator and stores it in the Member data store, which serves as the reference table for all subsequent transaction processes. Process 2.0 (Deposit Transactions) records incoming funds in the Deposit table, categorized by savings type. Process 3.0 (Loan Management) handles credit processing: the system retrieves member data, applies the 2% interest rate under the 0.2% declining balance scheme, and automatically updates the remaining debt while monitoring the installment payment sequence. Process 4.0 (Installment/Deposit Transaction) records monthly installment payments, automatically updates the installment sequence counter, and decrements the outstanding balance in the Loan table. Process 5.0 (Report) pulls transaction histories from all data stores — Members, Deposits, Loans, and Installments — aggregates incoming and outgoing totals, and produces the Ending Cash Balance report for the administrator. The Level 1 DFD is shown in Figure 4.

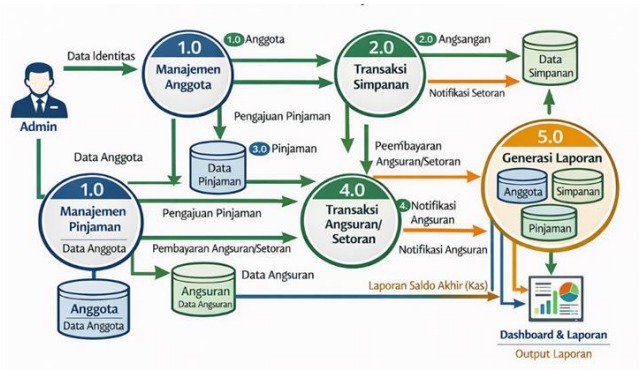

Figure 4. DFD Level 1

This process is the first step in data processing within the system, managing member identities from initial input through to confirmed registration. The administrator inputs raw identity data — ID number, national identity number, and full name — and the system validates the entries to prevent duplication of identification numbers. Valid records are written to the Member data store, and confirmation of successful registration is returned to the administrator.

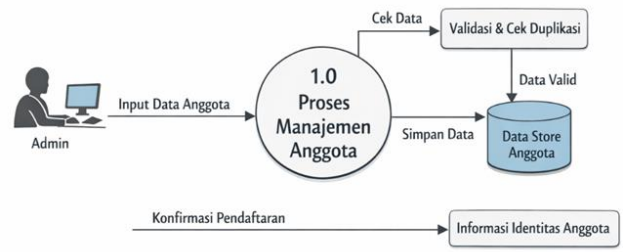

Figure 5. DFD Level 1 Process 1.0 Member Management

This process handles all incoming money activities in the form of savings from members. The administrator enters the payment amount, date, and savings category. The system verifies the member's ID against the Member data store to confirm relational integrity, records the transaction in the Savings data store, and automatically updates and displays the member's accumulated balance.

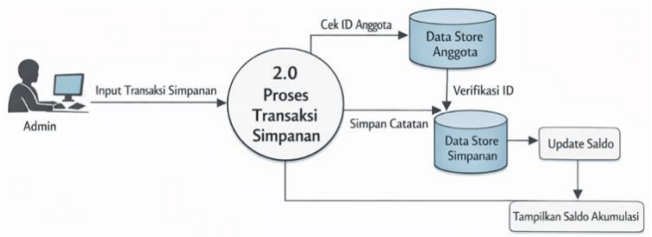

Figure 6. DFD Level 1 Process 2.0 Deposit Transactions

This process manages credit granting with specific interest calculation logic. The administrator enters the loan application amount and repayment tenor. The system retrieves the member's profile, calculates interest at 2% under the 0.2% declining balance scheme, and determines the monthly installment amount. All member obligation details are stored in the Loan data store with an initial status of "Active."

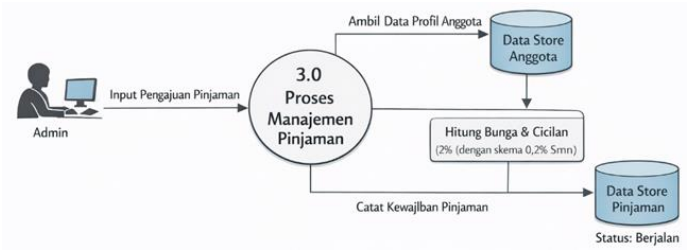

Figure 7. DFD Level 1 Process 3.0 Loan Management

This process records monthly installments and monitors members' outstanding debts. The administrator enters the installment deposit data, and the system validates the loan reference number and automatically advances the installment sequence — from installment 1 to installment 2, and so on. Proof of deposit is stored in the Installment data store, while the remaining debt in the Loan data store is decremented accordingly.

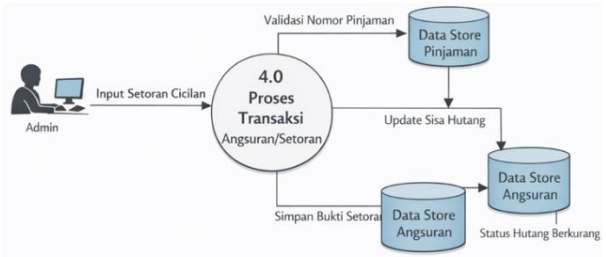

Figure 8. DFD Level 1 Process 4.0 Deposit/Installment Transactions

This final process serves as an information provider to support administrative decision-making. The system pulls all transaction histories from the Members, Deposits, Loans, and Installments data stores, aggregates total incoming and outgoing funds to calculate the Closing Cash Balance, and produces a formatted, print-ready periodic financial report for the administrator.

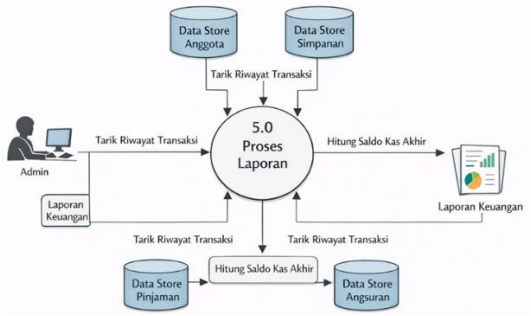

Figure 9. DFD Level 1 Process 5.0 Report

The database comprises five primary tables: Members, Deposits, Loans, Installments, and Users. The Members table — storing ID number, NIK, name, address, and contact information — sits at the center of the relational structure. One member may have multiple deposit and loan records; both the Deposits and Loans tables reference the Members table through a member_id foreign key. The Loans table stores loan type, amount, tenor, interest rate, status, and loan date. The Installments table references the Loans table through an id_loan foreign key, reflecting the one-to-many relationship between a single loan and its scheduled payments. The Users table stands apart from the financial tables, managing administrator and officer account credentials independently.

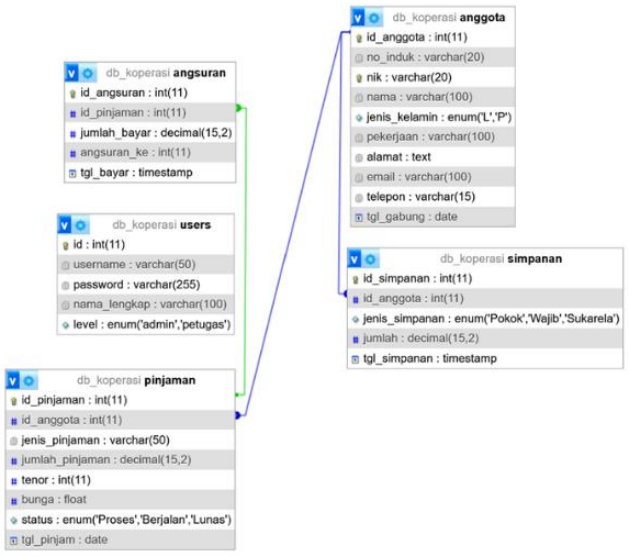

Figure 10. Table Relationship

4.1.3 System Interface Implementation

The login page functions as the system's primary access control point, requiring valid administrator credentials before any cooperative data becomes accessible.

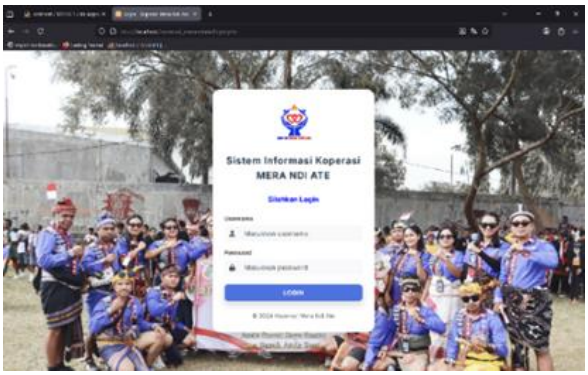

Figure 10. Login Page Display

After a successful login, the administrator lands on the Dashboard — a concise summary of the cooperative's current financial position, displaying total deposits, total outstanding loans, and net cash balance in a single view.

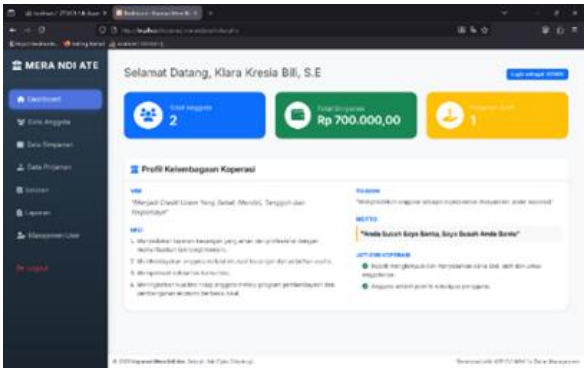

Figure 11. Dashboard Page Display

The Member Data page serves as the central registry for all cooperative members, allowing administrators to monitor member profiles, contact details, and individual financial summaries from a single interface.

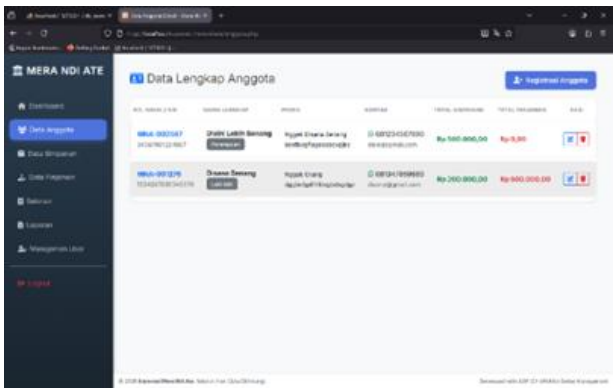

Figure 12. Member Data Page Display

The Savings Data page records and displays every incoming deposit transaction in detail, organized by savings type and date of entry.

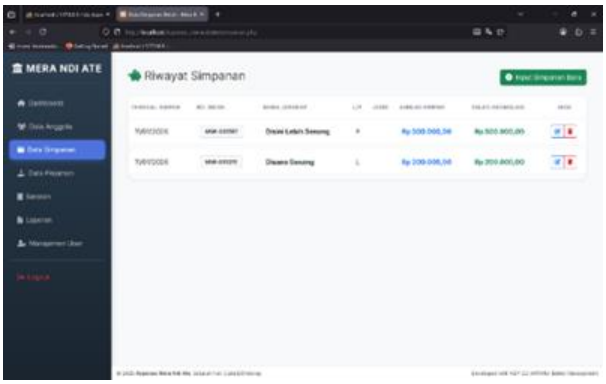

Figure 13. Saving Data Page Display

The Loan Data page manages and monitors all credit activities provided by the cooperative, presenting loan status, outstanding balances, and repayment progress in a transparent and measurable format.

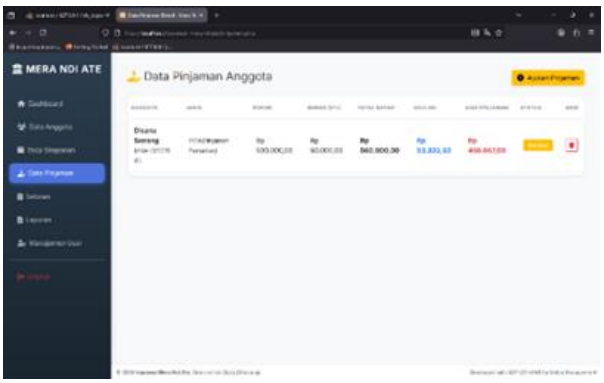

Figure 14. Loan Data Page Display

This module records and tracks periodic installment payments made by members, including the current installment sequence number and the member's remaining debt balance.

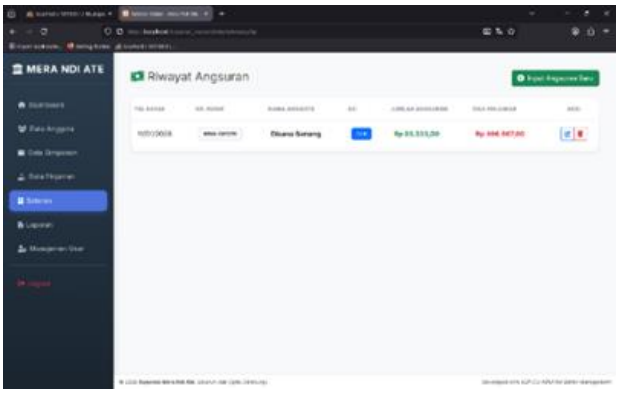

Figure 15. Deposit Page Display

The Report page presents a summary of all financial activity within a specified period, calculated from aggregated transaction data across all modules and formatted for administrative review.

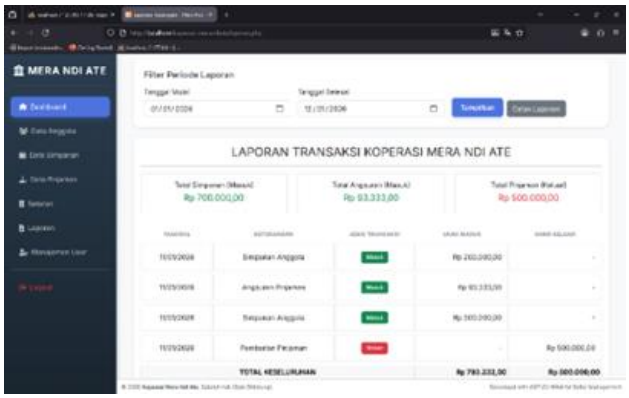

Figure 16. Report Page Display

The User Management page controls system access by managing administrator and officer accounts with defined access rights, maintaining both data security and a clear division of operational responsibilities within the cooperative.

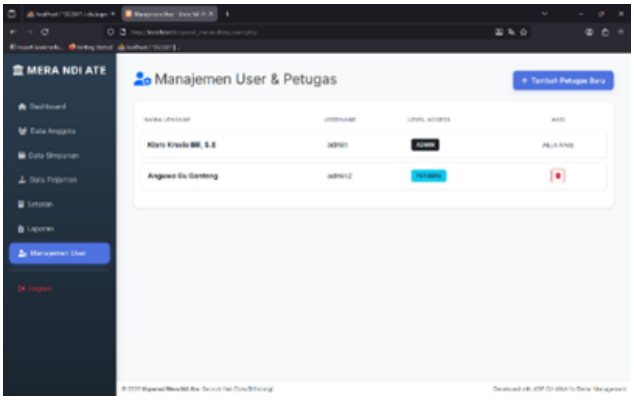

Figure 17. User Management Page Display

4.2 Discussion

The Mera Ndi Ate Cooperative Information System was built around one central concern: financial data must be accurate, and its accuracy must be verifiable without manual recalculation. The system addresses this by consolidating transaction variables — SIAWA Savings, SIBUSIWA, SIBUHAR, and others — into a single dashboard view. Through database-level subqueries, total deposits and total loan obligations per member are calculated dynamically, without repeated manual input. This design choice directly reduces the risk of accumulation errors that characterize manual bookkeeping over extended periods. The 0.2% monthly declining balance interest logic in the Loan module deserves specific attention. The system does not merely store a fixed interest figure; it recalculates interest against the current outstanding principal at each installment cycle. A JavaScript-based simulation calculator on the client side allows officers and members to review installment breakdowns, total interest, and total payment obligations before a transaction is approved — a transparency measure that shifts the information asymmetry often disadvantaging cooperative members in manual systems. The automation continues in the Installment module, where the system tracks the current installment number, updates the sequence on each payment, and automatically changes the loan status to "Paid" when the final installment is recorded. The "Remaining Loan" and "Next Month's Payment Prediction" displays extend this further, giving members a forward-looking financial projection rather than just a historical record.

Reporting presented a distinct set of challenges. The Print Report feature was optimized using CSS Media Query @print rules to resolve a common problem in web-based financial systems: navigation elements, sidebars, and interface components bleeding into printed output. Non-printable elements are suppressed, and a professional letterhead format — including the cooperative's logo — is applied automatically. The generated reports include a cumulative Net Cash Balance figure, calculated as total inflows (deposits and installment payments) minus total outflows (loan disbursements). That single figure is a direct indicator of the cooperative's operational health, and its placement on the main Dashboard means administrators do not need to run a separate report to check it. The decision to embed organizational identity into the system interface — displaying the Vision, Mission, and Motto of the Mera Ndi Ate Cooperative on the Dashboard — may appear incidental from a purely technical standpoint. It is not. The motto, *"When you are in trouble, I will help you; when I am in trouble, you will help me,"* is a statement of the cooperative's operating principle, and placing it within the system that administrators use daily is a deliberate reminder of the institutional values that distinguish a cooperative from a commercial lender. Technically, the system meets the standards expected of

intermediate-level financial management applications: modular code structure, relational database integrity, and a clear path for future feature additions such as Excel export or expanded accounting modules. The shift from paper ledgers to this system is not simply a change in recording medium — it is a change in how the cooperative's work is organized, verified, and remembered.

5. Conclusion and Recommendations

Building the Mera Ndi Ate Cooperative Information System was a deliberate response to a specific institutional failure: manual administration was producing errors, delays, and data loss that the cooperative's members could not afford. The Waterfall method provided the structured development sequence needed to ensure that each feature — member registration, deposit recording, loan processing, installment tracking, and financial reporting — met the cooperative's functional requirements before the next module was built. Data accuracy and retrieval speed were the primary operational problems, and the centralized database addresses both directly. The Dashboard now gives administrators a real-time view of the cooperative's financial position, reducing the manual calculation burden that previously delayed periodic reporting and introduced arithmetic errors that were difficult to trace after the fact.

The financial logic embedded in the system reflects the cooperative's actual regulations rather than generic defaults. The 0.2% monthly declining balance interest rate in the Loan module, and the automatic balance validation in the Installment module, are direct implementations of how the Mera Ndi Ate Cooperative operates. The inter-table relationships ensure that the Loan Data page and financial reports update immediately when an installment transaction is recorded, so the data administrators see is current rather than a snapshot from the last manual reconciliation. This transparency serves both sides of the administrative relationship: officers can monitor obligations accurately, and members have access to reliable data about their own financial standing. Print reports optimized with custom CSS ensure that physical documents meet the formatting standards expected of financial institutions, with clear organizational letterheads applied automatically. The success of Black Box Testing across all tested scenarios confirms that the application is technically ready for daily operational use.

The system has also strengthened the cooperative's institutional identity in ways that extend beyond technical function. Incorporating the motto *"When you are in trouble, I will help you; when I am in trouble, you will help me"* into the interface is a small design decision with a non-trivial institutional effect — it keeps the cooperative's founding values visible within the tool that administrators use every day. Role-based user management, separating administrator and officer access permissions, protects member financial data from unauthorized access while maintaining a clear division of operational responsibilities. Taken together, these features position the Mera Ndi Ate Cooperative Information System as a purpose-built solution that addresses the cooperative's specific operational gaps. Digitalization here has not simply moved records from paper to screen — it has produced a more organized, accountable, and data-driven work culture, one better equipped to serve members and keep pace with the broader trajectory of financial technology in the Indonesian cooperative sector.

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