E LOAN EVOLUTION: TRANSFORMING DJEMC CO-OP LENDING WITH INTEGRATED SMS ALERT AND QR-CODE ACCESS

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The Researchers

ABSTRACT

E LOAN EVOLUTION: TRANSFORMING DJEMC CO-OP LENDING WITH INTEGRATED SMS ALERT AND QR-CODE ACCESS

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The study titled "E-Loan Evolution: Transforming DJEMC Co-op Lending with Integrated SMS Alert and QR-Code Access" aimed to develop a comprehensive loan administration system tailored to the operational needs of DJEMC Co-op. This system was designed to streamline loan application, approval, and repayment processes, integrating modern technologies such as SMS alerts and QR code-based access for enhanced security and user convenience. The project was guided by the general objective of improving financial management and operational efficiency within the co-op while fostering transparency, accountability, and ease of access for both staff and members.

The system's development was based on the Rapid Application Development (RAD) methodology, ensuring iterative feedback and adaptability. Evaluation of the system was conducted using the ISO/IEC 25010 framework, assessing key categories such as functionality, usability, security, and efficiency. The results of the evaluation indicated a highly successful implementation, with an impressive overall score of 4.74, reflecting the system's effectiveness in meeting its objectives. Specific features like automated loan interest calculations, role-based access control, and real-time application status updates were highlighted for their efficiency and ease of use. However, the study also identified areas for further optimization, particularly in reporting and system scalability to meet future growth.

The study concluded that the system significantly improved the loan management process at DJEMC Co-op by automating manual tasks, ensuring data security, and

providing staff with better financial management tools. Moving forward, it is recommended that the system be expanded to include broader financial management features such as savings accounts, automated dividend distribution, and financial forecasting to further enhance the co-op's operational capabilities and long-term sustainability. The research demonstrates that technological integration can not only improve administrative efficiency but also empower staff and members with a modern, secure, and user-friendly platform for managing financial transactions.

Keyword: E-Loan, Co-op, Lending, Loan Management, SMS Alert, QR- Code,

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Definition of Terms

DJEMC CO-OP Loan Administration System	The comprehensive online platform developed specifically for managing Cooperative Education (CO-OP) loans at Don Jose Ecleo Memorial College (DJEMC). This system facilitates the application, approval, disbursement, and repayment processes of loans, aiming to streamline financial operations and enhance transparency.
E-Loan	An electronic loan provided through an online platform, enabling borrowers to apply for, receive, and repay loans via digital means. E-loans streamline the traditional loan process by leveraging technology to enhance efficiency, accessibility, and user convenience.
Loan Interest	The cost incurred by a borrower for using the lender's money, typically expressed as a percentage of the principal amount over a specified period. It represents the compensation

	that the lender receives for the risk and opportunity cost of lending money.
Interest	Is the cost of borrowing money or the reward for saving or investing money. It is usually expressed as a percentage of the principal amount (the original sum of money borrowed or invested) and is calculated over a specific period.
Interest Rate	**I**s the percentage charged or paid on the principal amount of money borrowed, lent, or deposited over a specific period. It represents the cost of borrowing money or the reward for saving or investing funds.
Non-Performing Loans (NPLs)	Loans in which the borrower is not making the agreed-upon interest payments or principal repayments for a specified period, typically 90 days or more. These loans are considered to be in default or close to default, posing a risk to the lender as they may not be fully recoverable.
QR-Code Login	A login method that utilizes Quick Response (QR) codes for secure

	authentication into the DJEMC CO-OP Loan Administration System, enhancing user convenience and system security.
Salary Deduction	Is an amount subtracted from an employee's gross pay before they receive their net pay. These deductions can be mandatory or voluntary and are applied for various purposes.
SMS Alerts	Short Message Service notifications sent to users' mobile devices to provide timely updates on loan application status, repayment reminders, and other financial notifications.
Streamlined	Refers to the process of simplifying or improving a system or procedure to make it more efficient, effective, and straightforward by removing unnecessary steps or complexities.
Yearly Dividends	Payments made annually to shareholders or members of a cooperative, representing a portion of the organization's profits. These payments

are distributed based on the number of shares owned or the amount of participation in the cooperative and serve as a reward for the members' investment or involvement.

CHAPTER I

INTRODUCTION

This study focuses on the development and implementation of the "E Loan Evolution: Transforming DJEMC Co-op Lending with Integrated SMS Alert and QR-Code Access" within the context of Don Jose Ecleo Memorial College (DJEMC). With the rising significance of Cooperative Education (CO-OP) programs in facilitating professional growth among staff members, the need for a streamlined loan administration system becomes imperative. Through a meticulous analysis of existing financial processes and consultation with stakeholders, this study delves into the design and deployment of a comprehensive system tailored to the unique requirements of DJEMC.

In a study by Priscilla et al. (2023), the authors addressed the critical importance of effective loan approval systems in the context of banking institutions. Their work underscored the significance of accurately assessing loan applicants to minimize the risk of default and optimize profitability. Drawing parallels to the challenges faced by educational institutions in managing Cooperative Education (CO-OP) loans for staff members, the study emphasized the need for robust loan administration systems to streamline processes and mitigate financial risks. Priscilla et al. (2023) highlighted the utilization

of machine learning prediction models and data preprocessing techniques to enhance the accuracy and efficiency of loan approval decisions. By leveraging these methodologies, the authors demonstrated the potential for improving financial management practices within institutions, ultimately benefiting both stakeholders and the institution itself. This study provides valuable insights and methodologies that can inform the development and implementation of the " E Loan Evolution: Transforming DJEMC Co-op Lending with Integrated SMS Alert and QR-Code Access", aligning with the objectives of enhancing staff financial management and empowering them with greater control over their financial affairs.

At DJEMC, the absence of a streamlined and efficient system for administering CO-OP loans has led to numerous operational inefficiencies and administrative bottlenecks. Manual processes for loan application, approval, disbursement, and repayment not only consume valuable time and resources but also increase the likelihood of errors and discrepancies in financial records. Furthermore, the lack of visibility and transparency in the loan management process can erode staff trust and confidence in the institution's financial systems. Without a dedicated system in place to address these challenges, DJEMC staff members may experience frustration and dissatisfaction with the CO-

OP loan process, hindering their ability to fully leverage the benefits of participating in CO-OP programs for their professional development. Thus, the pressing problem at hand necessitates the development and implementation of a robust CO-OP Loan Administration System tailored to the specific needs and requirements of DJEMC staff members, aiming to streamline financial processes, enhance transparency, and empower staff members with greater control over their financial affairs.

In response to the identified challenges, the proposed solution involves the development and implementation of the "E Loan Evolution: Transforming DJEMC Co-op Lending with Integrated SMS Alert and QR-Code Access". This comprehensive system will leverage modern technology and user-centric design principles to streamline the entire lifecycle of CO-OP loans, from application to repayment. By providing an intuitive and efficient platform for staff members to manage their loan requests and financial obligations, the system aims to eliminate manual inefficiencies, reduce processing times, and enhance overall transparency and accountability in the loan administration process. Key features of the system include online application submission, automated approval workflows, real-time tracking of loan status, secure document management, smart SMS alerts, and quick QR-code

login. Through extensive user testing and feedback mechanisms, the system will be continuously refined and optimized to ensure optimal usability and effectiveness. Ultimately, the implementation of the system represents a proactive step towards addressing the pressing financial management challenges faced by staff members, fostering a more efficient and empowered workforce within the institution.

Project Context

At Don Jose Ecleo Memorial College (DJEMC), the Cooperative Education (CO-OP) program is vital for experiential learning, yet managing CO-OP loans for staff members is hindered by manual processes and lack of transparency. These challenges extend to loan managers who struggle with accurate interest and dividend calculations. Recognizing the need for improved financial management, DJEMC plans to implement an online CO-OP Loan Administration System tailored to its needs. This system aims to streamline processes, enhance transparency, and increase efficiency, ultimately supporting staff development initiatives. The proposed system aligns with DJEMC's goals of educational excellence, promising to empower staff members, promote financial sustainability, and strengthen the institution's reputation as a leader in staff development and education innovation.

Purpose and Description

The purpose of this study is to develop and implement the "E Loan Evolution: Transforming DJEMC Co-op Lending with Integrated SMS Alert and QR-Code Access" to address the challenges faced by staff members and loan administrators in managing CO-OP loans effectively at Don Jose Ecleo Memorial College (DJEMC). This innovative platform leverages modern technology and best practices in financial management to streamline loan application, approval, disbursement, and repayment processes. By doing so, it aims to enhance transparency, efficiency, and accountability within DJEMC's financial operations, ultimately supporting staff members' professional development journeys and contributing to the institution's mission of fostering excellence in education and staff satisfaction.

The "E Loan Evolution: Transforming DJEMC Co-op Lending with Integrated SMS Alert and QR-Code Access" is envisioned as a comprehensive online tool that will revolutionize the management of CO-OP loans at DJEMC. Key features and functionalities of the system include:

- **User-Friendly Interface:** The platform will feature an intuitive and easy-to-navigate interface, ensuring

staff members can interact with the system effortlessly.

- **Smart SMS Alerts:** Staff members will receive real-time SMS notifications about their loan application status, repayment reminders, and other critical updates, enhancing communication and user engagement.
- **QR-Code Login:** The system will offer QR-code login functionality for secure and convenient access, allowing staff members to log in quickly using their mobile devices.
- **Online Application Submission:** Staff members can submit loan applications online, providing necessary details and documentation through a streamlined process.
- **Real-Time Application Tracking:** The system will provide instant updates on the progress of loan applications, enabling staff members to monitor their status and stay informed.
- **Secure Document Management:** Robust security measures will safeguard sensitive financial documents and information, ensuring confidentiality and integrity.
- **Automated Interest and Dividend Calculation:** The platform will automate monthly interest calculations for loans and yearly dividend calculations for

investments, eliminating manual processes and ensuring accuracy.

Through the implementation of the "E Loan Evolution: Transforming DJEMC Co-op Lending with Integrated SMS Alert and QR-Code Access", this study aims to address operational inefficiencies, enhance user experience, and empower staff members with greater control over their financial affairs. By leveraging these advanced functionalities, DJEMC will foster a more efficient and transparent loan administration process, promoting staff satisfaction and institutional excellence.

Research Objectives

The development of the "E Loan Evolution: Transforming DJEMC Co-op Lending with Integrated SMS Alert and QR-Code Access" is guided by both general and specific objectives aimed at enhancing financial management practices and improving the management of CO-OP loans at Don Jose Ecleo Memorial College (DJEMC).

General Objective:

The general objective of this capstone project is to develop and implement the "E Loan Evolution: Transforming DJEMC Co-op Lending with Integrated SMS Alert and QR-Code Access" to streamline loan administration processes and empower staff members with enhanced financial management tools. This platform will leverage modern technology to improve operational efficiency, transparency, and accountability within DJEMC's financial operations.

Specific Objectives:

- To analyze the current loan management processes at DJEMC and identify challenges and inefficiencies faced by staff members and loan administrators.

- To design an intuitive and user-friendly online platform for staff to submit, process, and track CO-OP loan applications seamlessly. This platform will include automated workflows and provide real-time updates on application status.
- To integrate features for automated calculation of monthly loan interest and salary deduction, ensuring accuracy and relieving administrators from manual calculations.
- To implement robust security measures to protect sensitive financial information and ensure compliance with data protection regulations, maintaining confidentiality and integrity.
- To enhance staff financial management practices by providing tools and insights through the platform that enable better decision-making and financial control.
- To ensure the scalability and adaptability of the "E Loan Evolution: Transforming DJEMC Co-op Lending with Integrated SMS Alert and QR-Code Access" to accommodate future growth and changes in CO-OP program requirements at DJEMC.

By achieving these objectives, the study aims to significantly improve the efficiency of loan management processes at DJEMC, foster staff satisfaction through

enhanced financial management capabilities, and contribute to the overall mission of educational excellence and institutional advancement.

Scope and Limitations of the Study

This section provides a clear understanding of what the DJEMC CO-OP Loan Administration System is expected to achieve while also acknowledging the potential constraints and challenges that may be encountered during its implementation and operation.

Scope of the Study

The study, titled "E-Loan Evolution: Transforming DJEMC Co-op Lending with Integrated SMS Alert and QR-Code Access," focuses on developing a comprehensive loan management system tailored for the DJEMC Co-op. The system aims to streamline loan applications, integrate SMS notifications, and utilize QR-code technology for secure transactions. The system caters to four types of users: Co-op Manager, Co-op Treasurer, Payroll Loan Officer, and Members (Loaners), each with distinct roles and permissions.

Co-op Manager

The Co-op Manager has full control over the system, including managing users and overseeing all operations.

Registration Approval: When a member submits a registration request, both the Co-op Manager and the Co-op Treasurer have the authority to review and approve or reject the registration. The system allows either of them to make the final decision, ensuring flexibility and efficiency in the approval process.

Loan Application Approval: The Co-op Manager is also responsible for finalizing loan approvals. After the Co-op Treasurer evaluates a loan application and the Payroll Loan Officer inputs salary data, the Co-op Manager makes the final decision on whether to approve or reject the loan.

User Management: The Co-op Manager manages accounts for all users, including the Co-op Treasurer, Payroll Loan Officers, and Members. They can set permissions, approve account status, and deactivate accounts if necessary.

Co-op Treasurer

Registration Request Approval: The Co-op Treasurer reviews and evaluates member registration requests. They have the authority to approve or reject the registration directly, ensuring that the eligibility criteria are met. This process operates alongside the Co-op Manager's authority, allowing either to finalize the approval.

Loan Application Evaluation: After a loan application is submitted, the Co-op Treasurer evaluates it based on the co-op's criteria. They then forward the application to the Co-op Manager for the final decision. This evaluation may include reviewing loan history and repayment ability

Payroll Loan Officer

Salary Management: The Payroll Loan Officer inputs and manages salary data for co-op members. Since this information is critical for calculating loan eligibility and repayment, they ensure the accuracy and confidentiality of this data.

System Interaction: The Payroll Loan Officer interacts with the system by securely inputting salary details.

They do not have authority to approve loans but play a vital role in providing the salary information needed for automated repayment calculations.

Members (Loaners)

Registration Request Submission: Members can submit a registration request through the system. However, their registration will not be approved immediately. The request is first evaluated by the Co-op Treasurer, then forwarded to the Co-op Manager for final approval.

Loan Application Submission and Status Tracking: Registered members can apply for loans through the system. Once submitted, the loan application is reviewed by the Co-op Treasurer and ultimately approved or rejected by the Co-op Manager. Members will receive SMS notifications about the status of their application. Additionally, members can view the current status of their loan application directly in their account. This allows them to check whether their application is under review, and their validation status, as well as they can view their approved loans and rejected loans providing real-time transparency into the loan approval process.

Loan and Salary Overview: Members can view their original salary, active loan details, salary deductions, and outstanding loan balance. This feature provides a comprehensive summary of their financial standing.

Loan Repayment Progress Overview: Members can view their loan repayment progress, including the percentage of their loan repaid and the number of terms already deducted. This feature allows members to track their loan repayment status, providing a clear view of how much of the loan has been settled and how many repayment terms have been completed. It helps members better understand their remaining balance and the time left for full repayment.

QR Code Access: Upon logging into their account, members can view and download their unique QR code from their profile interface. This QR code will be used for the system's QR code login feature, providing secure and convenient access to their account for transactions and other system interactions.

System Functionalities

Automated Loan Processing: Once the loan is approved by the Co-op Manager, the system automatically calculates the monthly interest, as well as amortizes the principal loan amount over the terms of repayment. Additionally, the system tracks and updates the loan repayment progress based on the approval date and the current date, providing an accurate view of the repayment status. This ensures consistency, accuracy, and real-time updates for both the co-op staff and the members.

Salary-Based Loan Deduction: The system automatically deducts loan repayments from the member's salary in two installments per month: the first deduction covers the period from the 1st to the 15th day, and the second covers the period from the 16th to the last day of the month. The deduction process is calculated according to the predefined repayment schedule, ensuring that payments are collected consistently and without manual intervention, aligned with the member's salary cycle.

Loan Application and Approval Workflow: The system streamlines the loan application process by allowing members to submit loan requests online. These applications are evaluated by the Co-op Treasurer, and

then the Co-op Manager makes the final approval or rejection. Notifications are sent to members through SMS to update them on the status of their application.

Integrated SMS Notification System: The system automatically sends SMS notifications at critical points of interaction, such as registration approval, loan application updates, and loan approval. This keeps members informed and reduces the need for manual communication from the co-op's staff.

QR Code-Based Member Login: Upon successful registration, each member can access and download their unique QR code from their profile interface. This QR code is used for quick and secure login to the system, allowing members to access their accounts efficiently. The QR code eliminates the need for manual login credentials, providing a convenient and secure way to enter the system.

Role-Based Access Control and Security: The system implements role-based access control to ensure that each user can only access the features and data relevant to their assigned role. This functionality helps maintain the integrity and confidentiality of member data by limiting access to sensitive information. Additionally, QR code technology,

combined with secure login credentials, is used to prevent unauthorized access, providing an added layer of security for system interactions and protecting confidential data.

Loan Repayment Monitoring: Members can monitor their loan repayment progress, including the terms deducted and outstanding balances. The system tracks and updates these details automatically, ensuring accuracy in real-time monitoring.

Loan Process History Tracking: The system tracks and records the history of key loan-related actions performed by both the Co-op Manager (Admin) and members. This includes loan application submissions, evaluations, approval, and rejection actions, along with timestamps and user details. Each loan process is logged with the user's role, the action taken (e.g., application submission, loan approval/rejection), and the date and time it occurred. This ensures transparency in loan management, allows for auditing, and provides an accurate record of loan-related activities for accountability and security purposes.

Limitations of the Study

While the system offers numerous features aimed at improving the efficiency and transparency of loan management within the DJEMC Co-op, the study acknowledges several limitations in terms of user access, system functionality, and overall scope.

Co-op Manager Limitations:

Limited to Loan Application Approval and User Management: The Co-op Manager is responsible for approving or rejecting loan applications, but they are not involved in salary management or detailed loan processing. Their focus is primarily on oversight, and while they can manage user accounts, their role in daily loan operations is restricted.

Dependence on Co-op Treasurer for Loan Evaluation: The Co-op Manager cannot evaluate loan eligibility based on financial data or repayment capacity, as these responsibilities fall to the Co-op Treasurer. The manager only makes the final approval after receiving the evaluation report.

Co-op Treasurer Limitations:

Limited to Registration and Loan Evaluation: The Co-op Treasurer's role in the system is restricted to reviewing member registrations and evaluating loan applications. They cannot approve or reject loans, as this authority lies with the Co-op Manager.

No Direct Involvement in Salary Data Input: Although the Co-op Treasurer plays a crucial role in loan evaluations, they do not input or manage salary data, which is the responsibility of the Payroll Loan Officer. Their role is more administrative in terms of reviewing financial documents.

Payroll Loan Officer Limitations:

No Loan Approval Authority: While the Payroll Loan Officer provides necessary salary information for loan eligibility and repayment, they do not have the authority to approve or reject loan applications. Their role is limited to inputting and managing salary data, which is essential for loan calculations.

No Control Over Loan Processing Workflow: The Payroll Loan Officer does not have control over the overall loan approval workflow and is not involved in the

decision-making process beyond the provision of salary data.

Members (Loaners) Limitations:

Restricted to Loan Applications and Status Tracking: Members can submit loan applications and view their loan status, but they do not have the ability to evaluate or approve loans. Their interactions with the system are limited to applying for loans and viewing the status of their applications, loans, and repayment progress.

Limited Loan History Access: Members can view their loan application history and repayment progress, but they do not have access to detailed loan processes such as approval/rejection actions taken by the Co-op Manager or Treasurer, except for the status of their applications.

No Control Over Repayment Adjustments: Members do not have the ability to modify or adjust their repayment terms. All repayment schedules and deductions are calculated and determined by the system based on loan approval and salary details.

System Limitations:

Limited to SMS and QR Code-based Interactions: While the system integrates SMS notifications and QR code-based login for enhanced user experience and security, it does not incorporate additional communication channels, such as email or push notifications. This may limit communication flexibility for both staff and members.

Dependency on Manual Salary Inputs: The system relies on the Payroll Loan Officer for salary data input. Any error or delay in entering salary details can lead to inaccurate loan eligibility calculations and repayment schedules.

No Advanced Reporting: The system tracks loan application processes and repayment progress but does not generate detailed or customizable reports for co-op staff or management. This limits the ability to perform in-depth data analysis or generate comprehensive reports for decision-making.

System Only Handles Loan Processing: The system is designed exclusively for loan application processing, approval, and repayment monitoring. It does not manage other financial services or member-related processes outside of loan management.

Significance of the Study

This study would benefit the following:

DJEMC Staff Members. Empowered with greater financial control, improved accessibility, transparency, and accountability in loan management processes.

DJEMC Loan Administrator. Enjoy reduced administrative workload, increased accuracy, efficiency, and real-time insights for better decision-making.

DJEMC Institution. Supports educational excellence, enhances operational efficiency, and reinforces institutional reputation through innovative financial management practices.

Researchers. This project helps the proponents enhance their ability, knowledge, and skills in developing an algorithm for modern innovation.

Future Researchers. This study would serve as one of their study's bases in developing and enhancing their own future generations' modernized system.

CHAPTER II

REVIEW OF RELATED LITERATURE

In the work by Alagic et al. (2024), the factors crucial for loan approval are emphasized. The authors insist that one should maintain good credit by focusing on having a good credit score and on-time bill pay to increase a chance of getting a loan approved. The authors also elucidated the fact that lenders tend to favor those with a high income, who are assumed to have large repayment capacities. Therefore, it was this point that made them understand the criteria required for evaluating loan applications on grounds of financial responsibility and stability in the process of acquiring a loan.

Synthesis of RRL 1

The authors highlight the important factors that may determine the loan approval process in this study. The authors elaborated how an excellent credit history was essential, underlining that a credit score and outstanding payment for bills allow the individual a higher chance of increasing loan approval. More importantly, they pointed out the lenders' preference towards those individuals with higher income levels, based on the claim that there is more potential repayment ability.

The development and implementation of digital loan platforms have significantly impacted loan performance among micro, small, and medium-sized enterprises (MSMEs). According to Akiate et al. (2024) in the "International Journal of Engineering Applied Sciences and Technology," these platforms enable borrowers to access multiple lenders, thereby improving repayment times and reducing default rates. While demographic factors do not significantly affect these platforms, the researchers emphasize the importance of enhancing social media and client internet engagement, investing in advanced systems for efficient loan disbursement and repayment, and quickly responding to grievances. Moreover, the integration of features such as reminders to prevent unnecessary default charges and the inclusion of telecommunication companies to provide instant loans are crucial. These insights are highly relevant to our study which aims to streamline financial processes and enhance user engagement. By incorporating advanced technology and user-centric design principles, the platform seeks to empower DJEMC staff members with greater control over their financial affairs, ultimately supporting the institution's mission of educational excellence and staff satisfaction.

Synthesis for RRL 2

The authors emphasized that the evolution of digital loan platforms has significantly enhanced loan performance among MSMEs, facilitating access to multiple lenders, improving repayment efficiency, and lowering default rates. Important suggestions include enhancing client internet interaction, investing in advanced systems for loan processing, and promptly addressing concerns. Features such as reminders to prevent default charges and collaborations with telecom firms for instant loans are also pivotal. These findings correspond with our study's objectives of optimizing financial workflows and boosting user engagement among DJEMC staff, thereby promoting educational excellence and staff contentment.

Integrations of SMS alerts in financial systems have been a key feature that would promote security and high user engagement. The study by Ahmad and Kadir (2020) demonstrated the development and implementation of an end-to-end encrypted SMS application, which was an indication of why information, such as notifications from a bank account, has to be handled carefully over SMS. Their study, therefore highlights the vulnerabilities of SMS to unauthorized access and possible threats to security. Such a need requires robust encryption against such threats. It

was well resonated by our study-the need to include smart SMS alerts that would inform users about the status of their loan application, repayment, among other aspects of their financial activity securely. The platform can ensure the confidentiality and integrity of information, thereby enhancing user trust through leveraging encryption and secure communication protocols which do not violate the regulation regarding data protection.

Synthesis for RRL 3

It turns out that incorporating SMS notifications into the financial systems has been fundamental in the provision of security and more user interactions. The author of this research, Ahmad and Kadir (2020), examined the design of the encrypted SMS application focusing on the necessity to protect sensitive information sent by SMS, especially while getting alerts of transactions from the bank account. Their study indicates that SMS communication does not have enough security measures, exposing it to unauthorized access and security issues and therefore underscores a clear necessity for robust encryption. This will be in line with the main objective of our study: integrating smart SMS alerts that can securely notify users about the statuses of loan applications, repayments, and other financial activities. With encryption and other secure communication protocols

used, our platform attempts to ensure confidentiality and data integrity for user financial information, which helps in establishing trust and compliance with these regulations on data protection.

In the study of Razis and Mitropoulos (2022), they introduced a technology-driven online loan core banking system aimed at revolutionizing the loan life cycle process. The system's interoperable architecture, catering to both external and internal banking components, facilitates seamless collaboration among previously isolated functions. This resonates strongly with the objectives of This resonates strongly with the objectives of our study which seeks to streamline financial management processes within cooperative organizations. they also added that the derived workflows from the system cover various aspects, ranging from customer data analysis for assessing creditworthiness to managing loan repayment and closure. This comprehensive approach aligns well with the multifaceted nature of loan administration within cooperative settings, where efficient handling of loan portfolios is crucial for organizational sustainability. Furthermore, the emphasis on restricted human intervention in the loan process, as highlighted by Razis and Mitropoulos (2022), echoes the need identified in the DJEMC CO-OP project to minimize manual tasks and errors through

the implementation of an automated loan administration system. By reducing the probability of errors, such systems can enhance operational efficiency and free up bank resources to focus on addressing business and customer needs, a priority shared by both the authors and the capstone project.

Synthesis of RRL 4

The author introduced a tech-driven online loan core banking system aligning with our goal to streamline financial management in cooperatives. Its interoperable architecture fosters collaboration among functions, fitting the multifaceted nature of loan administration. The focus on workflows, from customer data analysis to loan repayment, emphasizes the comprehensive approach essential for efficient portfolio handling.

Cowling et al. (2023) examines in great detail the detailed borrower characteristics as well as default risks of the EFG loan portfolio for the period between 2009 and 2020. Their study emphasises the role of medium-sized financial institutions, local lending institutions as well as not-for-profit agencies in determining the dynamics of default. It underlines the relevance of understanding the profiles of borrowers and, at the same time, the need to include additional financial and non-financial data in the

analysis. Findings Related To Type of Lender: Among other findings, lower default rates were found to be associated with loans from certain lenders, namely medium-sized financial institutions and large UK banking groups. Those findings tend to indicate that the methods used by those lenders regarding risk screening mechanisms are more effective. These findings reveal the building of a profile when lending to borrowers, risk assessment, and lender behavior and importance in optimizing loan administration processes within a cooperative organization such as DJEMC CO-OP.

Synthesize RRL 5

The author had conducted an in-depth investigation into the borrower characteristics and default risks of the EFG loan portfolio from 2009 to 2020. His findings pinpointed the role of medium-sized financial institutions, local lending institutions, and not-for-profit agencies in determining default dynamics. Their paper therefore elaborates on the topic of importance of knowing profiles of borrowers and adding more information to get a comprehensive view, which may be useful for the improvement of loan administration processes in cooperative organizations such as DJEMC CO-OP.

The study by Usendok et al. (2023) underscores the critical role of credit appraisal, credit risk control, and collection policy in influencing loan recovery within microfinance institutions. Their findings emphasize the importance of robust processes for assessing borrowers' creditworthiness and managing credit risk, which resonates with the objectives of developing the DJEMC Co-op loan administration system. Moreover, the study highlights the significance of having clear strategies and procedures for loan collection in case of defaults, aligning with the need for efficient collection processes supported by the loan administration system. The author's recommendation for microfinance institutions to ensure that credit appraisal is conducted by experienced and competent credit officers further emphasizes the importance of staff expertise and competency development, which are essential considerations for the successful implementation and utilization of the loan administration system within DJEMC Co-op. Thus, the findings of the author provide valuable insights and guidance for optimizing loan administration processes and enhancing financial management practices within cooperative organizations like DJEMC Co-op through the development of the loan administration system.

Synthesis of RRL 6

The authors highlight the pivotal role of credit appraisal, credit risk control, and collection policy in influencing loan recovery within microfinance institutions. Their findings stress the importance of robust processes for assessing borrowers' creditworthiness and managing credit risk, aligning closely with the objectives of developing the DJEMC Co-op loan administration system. Moreover, the recommendation for experienced credit officers highlights the importance of staff expertise, contributing to successful system implementation and utilization within DJEMC Co-op.

Recent innovations in electronic banking have significantly improved the ease and security aspects of financial services. Shanmugapriyan et al. (2022) discussed the QR code technology with an Aadhaar card and biometric authentication as a medium to increase the security level of a transaction. This system helps a person access multiple bank accounts directly through their Aadhaar number instead of a clumsy ATM card and brings about the replacement of such cards by fingerprint recognition systems for verification and identification. With such security mechanisms, this system ensures that transactions involving money are highly secured and efficient as well,

eliminating the weak points of the traditional methods of banking. This research demonstrates the benefits associated with combining QR code technology with biometric authentication that can be applied directly to our objectives. The implementation of similar technologies can improve the security and experience of the loan administration system at DJEMC, thus rendering it a very solid and efficient solution for staff members in terms of their financial transactions.

Synthesis for RRL 7

Recent innovations in electronic banking have greatly enhanced both the convenience and security of financial services. The author, Shanmugapriyan et al. (2022), researched the application of QR code technology merged with the Aadhaar card and biometric authentication in order to guarantee a secure transaction system. Through an Aadhaar number, the system allows a user to manage many bank accounts, abolishing the use of ATM cards and replacing them with a fingerprint recognition system for verification and identification. These tactics ensure safe as well as quick execution of finances, addressing flaws apparent in the traditional banking processes. This study has identified benefits that would be realized from the integration of QR code technology and biometric

authentication in financial systems, significantly more directly associated with our goal. Analogous implementations are expected to ensure better safety as well as enhance the general user experience concerning finance activity management within the DJEMC loan administration system, given to employees an effective means of managing different money affairs.

Lee et al. (2020) investigate the correlation between corporate governance factors and non-performing loans (NPLs) in banks, which offers valuable insights pertinent to our study. Their findings underscore the significant relationship between share collateralization by directors and NPLs, as well as the impact of related party transactions on NPL levels, highlighting the critical role of corporate governance in managing loan risks. Additionally, their study emphasizes the importance of financial policy capacity in sustainable business practices, suggesting that banks' focus solely on superficial financial policies may impede their ability to observe sustainable practices effectively. Moreover, recognizing the significant influence of macroeconomic factors on NPL ratios underscores the need to incorporate considerations of macroeconomic conditions into the design and analysis of the loan administration system.

Synthesis of RRL 8

The authors explore the connection between corporate governance and non-performing loans (NPLs) in banks, offering insights pertinent to our study. Their findings highlight the association between directors' share collateralization and NPL levels, alongside the impact of related party transactions on loan risks, emphasizing the significance of strong corporate governance practices. Furthermore, their research stresses the necessity for banks to adopt comprehensive approaches beyond superficial financial policies to address sustainable business practices. Additionally, acknowledging the influence of macroeconomic factors on NPL ratios underscores the importance of integrating macroeconomic considerations into the loan administration system's design and analysis.

Khafid and Anisykurlillah's (2020) study investigates the effects of various financial factors on Non-Performing Loans (NPL) within cooperative societies, with a particular focus on the Republic of Indonesia Employee Cooperative (KPRI). The research examines the influence of Capital Adequacy Ratio (CAR), Credit Risk, Loan to Deposit Ratio (LDR), and Net Interest Margin (NIM) on NPL, as well as the moderating role of loan monitoring in this relationship. The findings underscore the importance of loan monitoring

as a strategic variable for cooperatives engaged in credit provision, suggesting that effective monitoring mechanisms can significantly suppress NPL levels. This aligns with the objectives of the current study, which aims to enhance staff financial management practices and streamline loan management processes within the cooperative society. By highlighting the significance of loan monitoring in mitigating NPL risks, this research provides valuable insights that can inform the development of the system emphasizing the need for robust monitoring features to improve overall financial stability.

Synthesis of RRL 9

Based on this, it is expected that their study will analyze the influence financial variables will have on Non-Performing Loans at cooperatives, with special regard to the Republic of Indonesia Employee Cooperative (KPRI). This research examines the Capital Adequacy Ratio, Credit Risk, Loan to Deposit Ratio and the Net Interest Margin as determining factors on the level of NPL and considers also the impact of moderation of loan monitoring. This serves to emphasize the importance of proper loan monitoring on cooperatives engaged in credit provision-a well-functioning monitoring system is a good sign that NPL levels could be much lower.

The findings of Abera et al. (2021) reveal critical significance concerning security and privacy in electronic banking, emphasizing such concerns as key considerations for customers. Their research also makes it evident that financial systems do require robust security mechanisms, especially concerning confidential financial information and very tight regulations regarding the protection of data. This finding strikes directly at one of the critical objectives of our research study: "development of robust security controls within the DJEMC CO-OP Loan Administration System." Through this research, we shall get cues that enable our system to take priority emphasis on deploying comprehensive security protocols, where users would feel assured and sensitive financial information secured, and also "be" compliant. As electronic banking interfaces continue to characterise contemporary financial ecosystems, emerging as an important aspect of enhancing user confidence and maintaining integrity in financial transactions within cooperative societies is always the aspect of security and privacy.

RRL 10 Synthesis

Their study underlines the high importance of security and privacy in electronic banking; they point out that security and privacy matter the most to customers. Their research has provided a critical understanding of the issues of security and privacy in financial systems, and above all, it underlines the need for feasible security measures within the financial system to protect sensitive financial data, data protection, and adherence to data protection regulations. This reflects directly with one of our specific objectives of our study as the proposition to develop a robust security measure within the system.

Summary of Synthesis

The review of related literature provides comprehensive insights into key aspects of loan administration and financial management within cooperative organizations. It highlights the critical factors influencing loan approval processes, such as credit history and income levels, underscoring their pivotal role in determining loan outcomes. Additionally, the studies emphasize the transformative impact of digital loan platforms on MSMEs, enhancing access to lenders, improving repayment efficiency, and reducing default rates.

Furthermore, the integration of SMS alerts in financial systems emerges as a crucial feature for enhancing security and user engagement. Ensuring the encryption of sensitive information transmitted via SMS is paramount in safeguarding banking notifications and maintaining user trust. The studies also emphasize the importance of technological innovations, such as QR code and biometric authentication, in enhancing transaction security and user experience within electronic banking.

Moreover, insights into borrower profiling, credit risk management, and effective loan monitoring mechanisms are essential for optimizing loan administration processes. These findings guide the development of robust financial

management practices within cooperative societies like DJEMC CO-OP, aiming to streamline operations, enhance system stability, and mitigate non-performing loan (NPL) risks effectively.

In conclusion, the RRL provided underscores the critical role of integrating advanced technologies, maintaining robust security measures, and implementing efficient financial management strategies to foster operational efficiency and stakeholder satisfaction within cooperative loan administration systems.

CHAPTER 3

TECHNICAL BACKGROUND

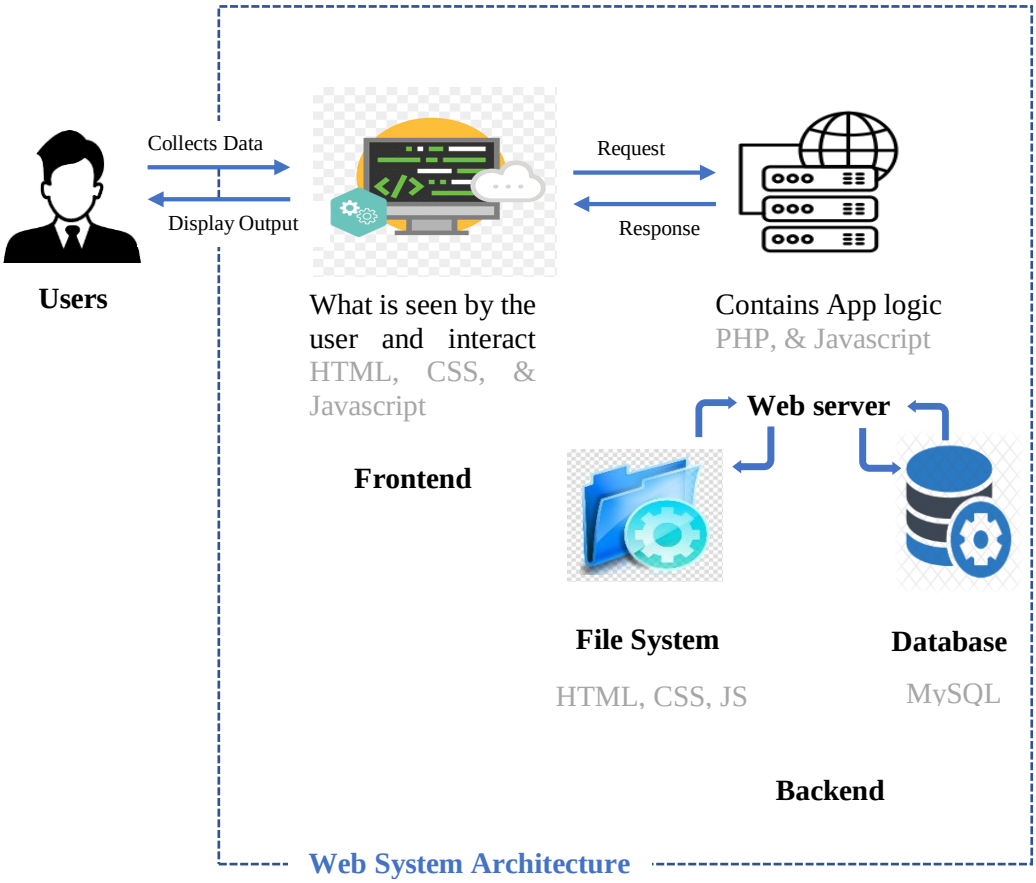


Figure 1. System Architecture of DJEMC Loan System

The Co-op Loan Management System for DJEMC is designed as a comprehensive solution to streamline loan administration processes within cooperative organizations like DJEMC CO-OP. It is built with robust technical foundation leveraging HTML, CSS, JavaScript, PHP, and MySQL to create an efficient, powerful and user-friendly web-

based platform and provide wonderful experience for both the members and the Admin.

HTML: HTML (Hypertext Markup Language) is utilized by the Loan Management System to create the structure and content of web pages. It defines the layout of loan application forms, loan details display tables, navigation menus, and other essential elements of the user interface. By structuring the content, HTML ensures that information is presented in a logical and organized manner, facilitating user interaction and navigation within the system.

CSS: CSS (Cascading Style Sheets) is employed by the Loan Management System to style the HTML elements, enhancing the visual presentation and aesthetics. It allows the system to customize the appearance of text, colors, fonts, spacing, and other design aspects across different web pages. With CSS, the system creates a consistent and visually appealing user interface that aligns with the cooperative organization's branding and enhances the user experience.

JavaScript: JavaScript is utilized by the Loan Management System to add interactivity and dynamic functionality, making it more responsive and engaging for users. It enables the system to implement features such as

real-time form validation, interactive loan calculators, dynamic content updates, and client-side data manipulation. JavaScript code runs directly in the web browser, enabling seamless interaction with users and enhancing the overall usability of the system.

PHP: PHP (Hypertext Preprocessor) is a server-side scripting language utilized by the Loan Management System for implementing dynamic and data-driven functionality. It handles tasks such as processing form submissions, interacting with the MySQL database, generating dynamic web pages, and implementing server-side validation and authentication mechanisms. PHP enables the system to build robust and scalable web applications that can handle complex business logic and user interactions effectively.

MySQL: MySQL is a relational database management system utilized by the Loan Management System to store and retrieve structured data. It provides a secure and efficient way to manage data related to customers, loans, transactions, system configurations, and other essential aspects of loan administration. MySQL enables the system to perform complex queries, manage database transactions, ensure data integrity, and scale the system to accommodate growing volumes of data and users.

The integration of HTML, CSS, JavaScript, PHP, and MySQL plays a pivotal role in the development and functionality of the Loan Management System. HTML structures the content and layout of web pages, CSS enhances visual presentation and consistency, and JavaScript adds interactivity and dynamic features to improve user engagement. On the server side, PHP enables the implementation of dynamic functionality and server-side processing, while MySQL facilitates efficient data storage, retrieval, and management. Together, these technologies form a robust and cohesive framework for building a responsive, user-friendly, and data-driven system tailored to the needs of cooperative organizations like DJEMC CO-OP.

CHAPTER 4

METHODOLOGY

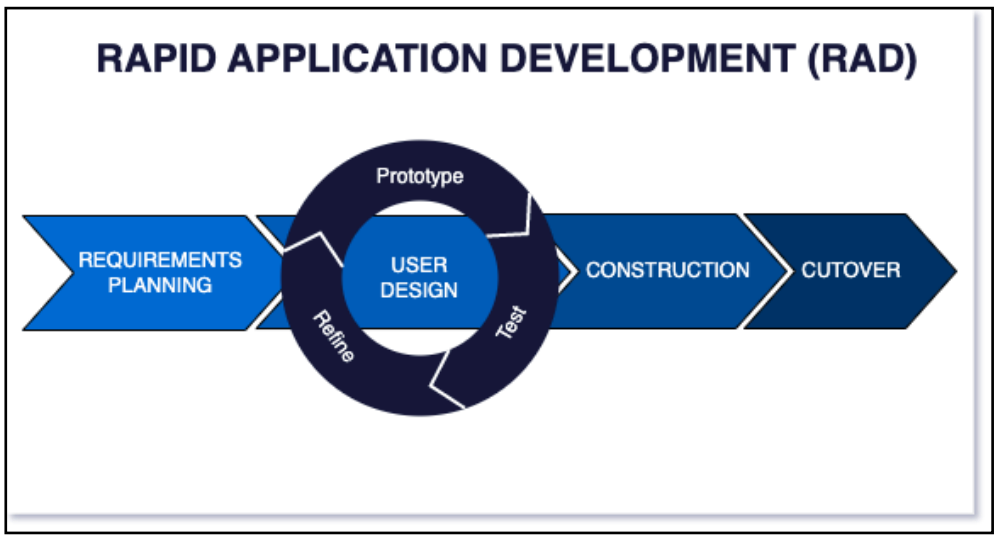


Figure 2. Rapid Application Development Diagram

This study employs the Rapid Application Development (RAD) methodology to develop and implement the " E Loan Evolution: Transforming DJEMC Co-op Lending with Integrated SMS Alert and QR-Code Access". RAD is chosen for its iterative and agile approach, which emphasizes rapid prototyping, continuous feedback, and flexible adaptation to evolving requirements. This methodology is particularly suitable for projects where stakeholder involvement, quick delivery of functional components, and responsiveness to changing needs are critical.

The methodology unfolds through distinct phases: Requirements Planning, User Design, Construction, and

Cutover. Each phase contributes uniquely to the development lifecycle, ensuring that the platform meets the specific operational needs of DJEMC while enhancing user experience and operational efficiency in CO-OP loan management. By leveraging RAD principles, this study aims to deliver a robust and user-centric platform that integrates modern technologies such as smart SMS alerts and QR-code login, enhancing transparency, security, and accessibility for staff members and loan administrators.

Phase 1: Requirements Planning

In the initial phase of Requirements Planning, the study began by engaging in extensive workshops, interviews, and consultations with DJEMC staff, loan administrators, and IT experts. The primary objective was to gather comprehensive system requirements essential for the development of the "E Loan Evolution: Transforming DJEMC Co-op Lending with Integrated SMS Alert and QR-Code Access". These sessions aimed to identify and prioritize key functionalities such as automated workflows, real-time tracking of loan applications, smart SMS alerts for notifications, and QR-code login for enhanced security and user convenience. Through these interactions, the team systematically documented the scope, objectives, and user stories necessary to guide the development process effectively.

Additionally, the Requirements Planning phase involved the creation of a detailed requirements specification document. This document served as a blueprint, outlining the project's goals and the specific functionalities required to streamline DJEMC's CO-OP loan management processes. It encapsulated insights gained from stakeholders, ensuring that the platform would meet both operational needs and regulatory requirements. By

prioritizing requirements based on their impact and feasibility, this phase laid the groundwork for subsequent phases of design, development, and implementation, ensuring alignment with DJEMC's strategic objectives and enhancing the overall efficiency of financial operations.

Phase 2: User Design

Following Requirements Planning, the study transitioned into the User Design phase, which focused on translating gathered requirements into tangible prototypes and mock-ups of the system. The design process prioritized user-centric principles, aiming to create an intuitive and user-friendly interface for staff members and loan administrators. Initial prototypes incorporated features such as a streamlined application submission process, secure document management capabilities, and clear navigation pathways. These prototypes were iteratively refined through usability testing sessions, where DJEMC stakeholders provided valuable feedback on usability, functionality, and interface design.

Throughout the User Design phase, the team collaborated closely with end-users to ensure that the prototypes effectively addressed their needs and preferences. Usability testing sessions facilitated the identification of usability issues and opportunities for improvement,

guiding iterative refinements to the platform's design. Stakeholder approval was sought at key milestones to validate the design choices and ensure alignment with DJEMC's CO-OP loan management goals. By the conclusion of this phase, the finalized design of the platform was established, incorporating enhancements based on user feedback and usability testing outcomes, setting the stage for the subsequent phases of development and deployment.

Phase 3: Construction

In the Construction phase of the "E Loan Evolution: Transforming DJEMC Co-op Lending with Integrated SMS Alert and QR-Code Access" study, the development team focused on building the core functionalities and components of the system. This phase aimed to convert the user design into an operational system that met the outlined requirements from the previous phases.

The construction of the system began with implementing the automated loan processing functionality. This feature enables the system to calculate the monthly interest and amortize the principal loan amount over the terms of repayment. The system tracks and updates the loan repayment progress, ensuring that the loan status is accurate and up-to-date for both members and the co-op staff. Alongside this, the salary-based loan deduction feature was

developed, where the system automatically deducts loan repayments from members' salaries in two installments per month, based on the member's predefined repayment schedule.

To streamline loan applications, the loan application and approval workflow was implemented, allowing members to submit their loan applications online. The Co-op Treasurer evaluates these applications, after which the Co-op Manager makes the final approval or rejection. This workflow significantly enhances efficiency in the loan approval process. Furthermore, an integrated SMS notification system was set up, which automatically notifies members about their registration approval, loan application updates, and loan approval status. This eliminates the need for manual communication, ensuring that members stay informed at critical points of interaction.

The QR code-based member login system was also developed, providing secure and convenient access for members to log into the system using a unique QR code generated upon registration. This feature enhances security and user convenience, as members can now avoid manual login credentials. Additionally, role-based access control was integrated to ensure that users only access features relevant to their roles, maintaining data security and integrity.

Finally, the loan repayment monitoring and loan process history tracking features were constructed. These features allow members to track their repayment progress in real time and monitor the actions taken by the Co-op Manager and other users throughout the loan process. This ensures transparency, accountability, and accurate loan management.

Phase 4: Cutover

The Testing phase was essential to ensure that the system functioned as intended and met the requirements defined in the earlier phases. In this phase, the system underwent various levels of testing, including unit testing, integration testing, and user acceptance testing (UAT).

Unit testing was performed to validate individual components of the system, such as the loan calculation algorithms, SMS notification triggers, and the QR code generation process. These tests ensured that each function operated correctly in isolation. Integration testing followed, which focused on verifying that the different system components—such as the automated loan processing system, SMS notifications, and role-based access control—worked seamlessly together.

User acceptance testing was conducted with stakeholders, including the Co-op Manager, Co-op Treasurer, Payroll Loan Officer, and members. The team provided the stakeholders with access to the system to evaluate its usability and functionality. Feedback was gathered on areas such as the loan application workflow, SMS notifications, and the QR code login feature. Any identified issues were addressed, and refinements were made based on the feedback to improve the user experience and ensure that the system aligned with the operational needs of DJEMC.

The testing phase also involved load testing to assess the system's performance under varying user loads. This ensured that the system could handle the number of concurrent users expected during peak usage periods without performance degradation.

By the end of the Testing phase, the system was confirmed to be fully functional and ready for deployment, with all critical features working smoothly and meeting both user and stakeholder expectations.

System Evaluation

In the System Evaluation phase, the system's quality was assessed based on the ISO/IEC 25010 software quality model, which focuses on eight key quality characteristics: Functional Suitability, Performance Efficiency, Compatibility, Usability, Reliability, Security, Maintainability, and Portability. The evaluation tool used consisted of two parts: Part I collected personal information from the users involved in the evaluation, while Part II focused on assessing the system's attributes based on the aforementioned quality characteristics. To ensure the effectiveness of the evaluation tool, a validation process was conducted, where expert feedback was gathered from system administrators, subject matter experts, and the research advisor. The evaluation was performed using a 5-point Likert scale, with responses ranging from "Strongly Disagree" to "Strongly Agree."

Likert-Scale Description	Scale	Interval
Strongly Disagree	1	1.0-1.7
Disagree	2	1.8-2.5
Neutral/Uncertain	3	2.6-3.3
Agree	4	3.4-4.1
Strongly Agree	5	4.2-5.0

Table 1. Likert-Scale Description Utilized in System Evaluation

Sixteen respondents, including admins, co-op members, and IT professionals, participated in the evaluation of the system. Unlike random sampling, the selection of respondents was based on availability and proximity, ensuring representation from those directly associated with the co-op and the system's intended user base.

Respondents	**N**	**Percentage**
Admins	3	18.75%
Co-op Members	8	50%
IT Professionals	5	31.25%
Total	16	100%

Table 2. Distribution of Respondents

By utilizing a validated evaluation tool and engaging a varied group of respondents, the study sought to gather detailed feedback on the system's functionality, efficiency, compatibility, usability, reliability,

security, maintainability, and portability. This information aimed to provide a thorough evaluation of the system's performance and highlight opportunities for enhancement or future development.

For the system’s Functional Suitability, users rated the system’s ability to meet functional requirements effectively, yielding a high mean score of 4.3, indicating strong satisfaction. Performance Efficiency was assessed based on response times and resource usage, scoring 4.2, reflecting efficient operation under various conditions. In terms of Compatibility, the system scored 3.9, suggesting it performed adequately across different environments but may require further adjustments for full compatibility. Usability received the highest score of 4.5, indicating that users found the system intuitive and easy to navigate. Reliability, reflecting the system's consistency and uptime, scored 4.4, showing users were satisfied with its stability. For Security, which evaluated the system's ability to protect data and prevent unauthorized access, the system scored 4.1, showing adequate security measures were in place. Maintainability, with a score of 4.0, indicated that users found the system relatively easy to maintain and update. Finally, Portability received the lowest score of 3.8, suggesting

that the system could be challenging to adapt to different environments without additional effort.

Overall, the results indicated that the system performed well in most quality areas, particularly in usability, reliability, and functional suitability, all of which had high mean scores. However, the lower score in portability suggests that further improvements are needed to ensure the system can be easily transferred to different environments. These findings provide valuable insights that will guide the refinement and future updates of the system.

CHAPTER V

RESULTS AND DISCUSSION

This chapter presents the findings from the evaluation of the developed system, supported by screenshots illustrating its features and functionalities. The results of the system evaluation provide insights into its performance based on specific criteria such as functionality, usability, reliability, security, and maintainability. Feedback from the respondents, including co-op members, admins, and IT professionals, has been analyzed to determine the system's effectiveness and identify areas for potential improvement.

Additionally, screenshots of the system's user interfaces, processes, and key functionalities are included to visually demonstrate its capabilities and how it addresses the objectives set in the study. The discussion integrates both qualitative and quantitative data to offer a comprehensive assessment of the system's strengths and areas requiring refinement. This ensures a clear understanding of the system’s overall impact and its alignment with the intended goals.

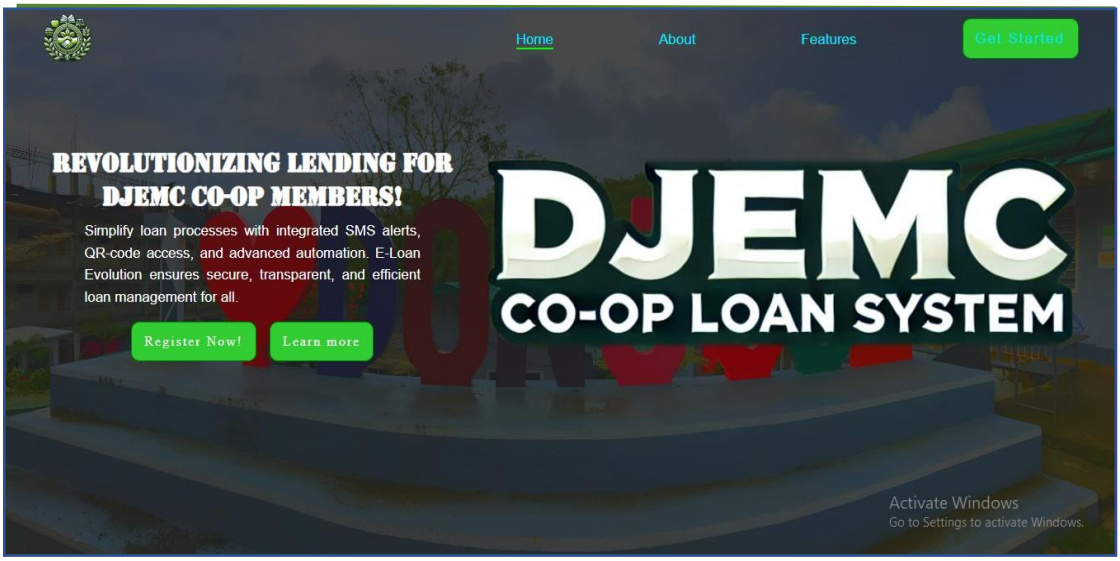


Figure 3. Landing Page

The page shown in figure 3 is the landing page of the system. With this landing page, the user can now easily navigate through the system. This 3 buttons shown in figure 3 is used for navigation. The "Register Now!" can navigate the user to the membership registration of the system. The "Learn more" button navigates the user to the about page. And the "Get Started" button navigates the user to the login page of the system.

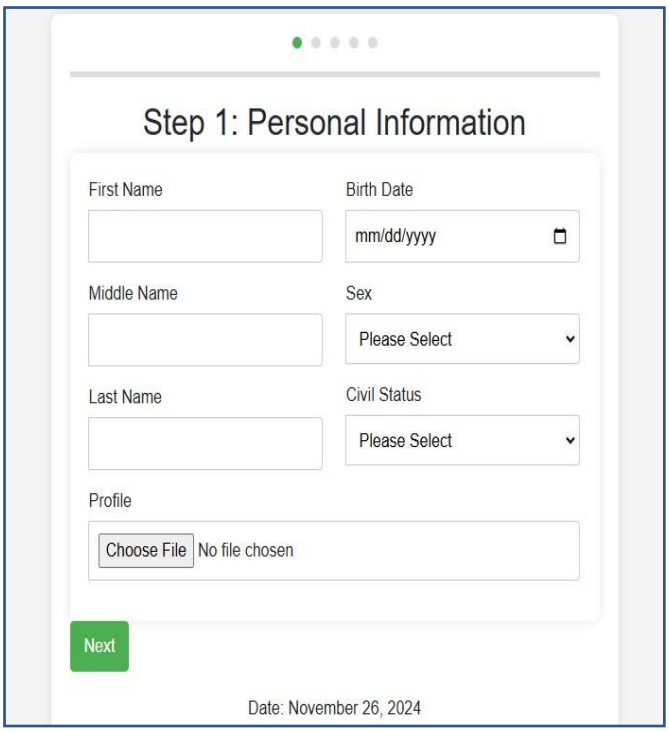


Figure 4. Membership Registration

The page shown in figure 4 is the registration page where the member or those who wants to be a member of the co-op registers. The design of this page is very user friendly and easy to navigate. This is a multi-step form for more organization.

The page shown is figure 5 is the member login page. This is design for easy navigation. The "Login as Admin" link allows admin to navigate to the admin login page while the exit button navigates the user to the landing page of the system.

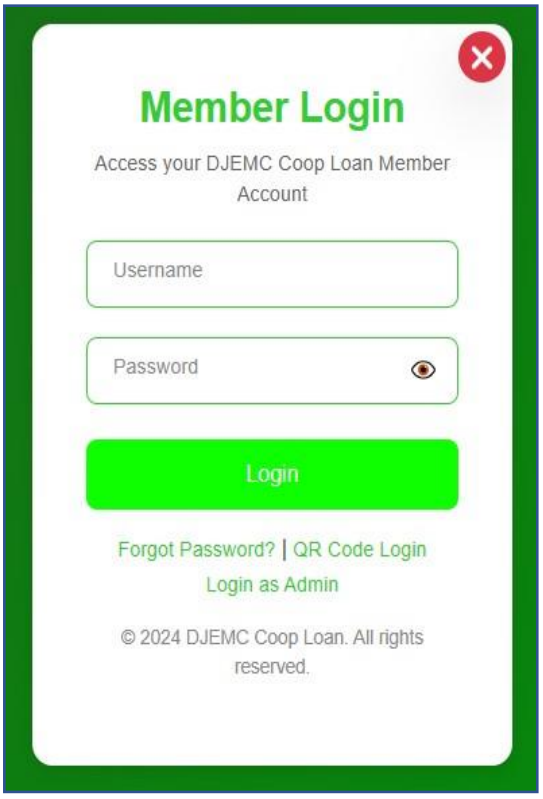


Figure 5. Member Login

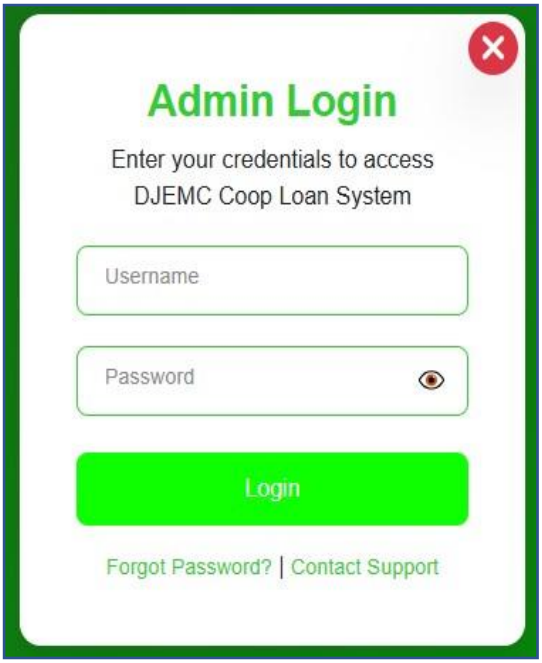


Figure 6. Admin Login

The page shown in figure 6 is the admin login page. This is a user-friendly design where the admin inputs their credentials to access the loan management system.

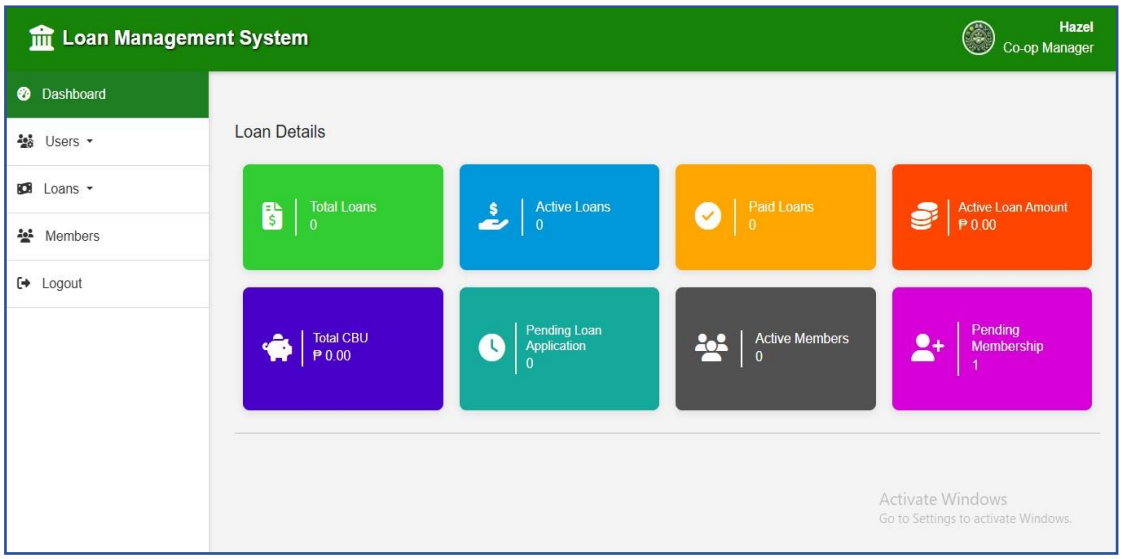


Figure 7. Admin Dashboard

The page shown in figure 7 the admin dashboard. This page allows the admin to view information of the Co-op Loan. It is design in a simple and straightforward manner. Each boxes allows the admin to navigate through different pages of the system, the same for the sidebar as well. However, some navigations are restricted to each admin

depending on their role. For instance, if your role is a payroll officer, you can only input salary data but you can't access other loan functionalities such as managing loan data or even managing members.

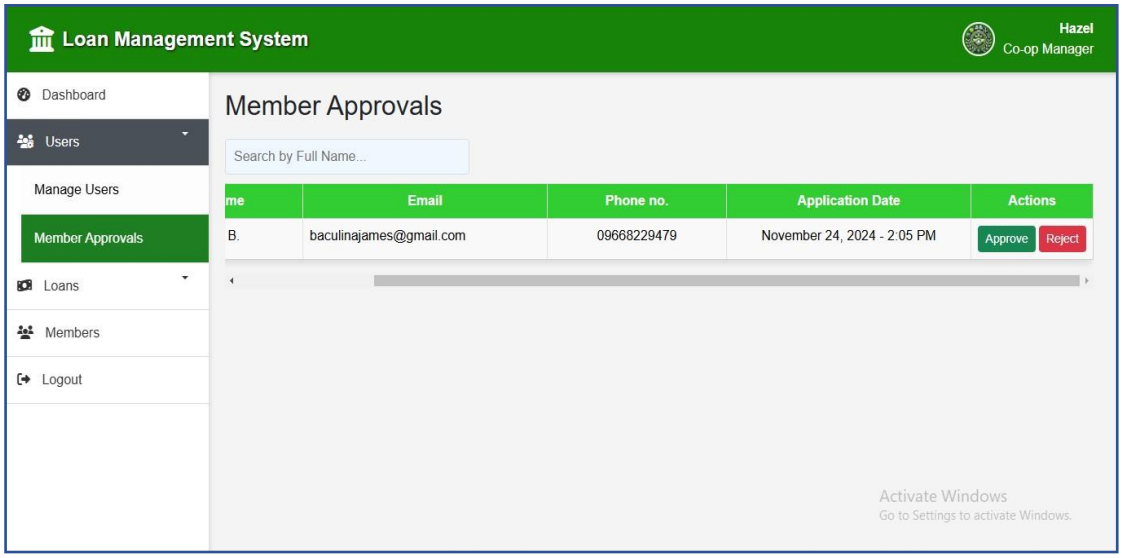


Figure 8. Member approvals(Admin)

The page shown in figure 8 is the Member Approval page. This is where the admin particularly the manager or the treasurer approves membership application. The design is very straightforward with the two buttons the approval and rejection.

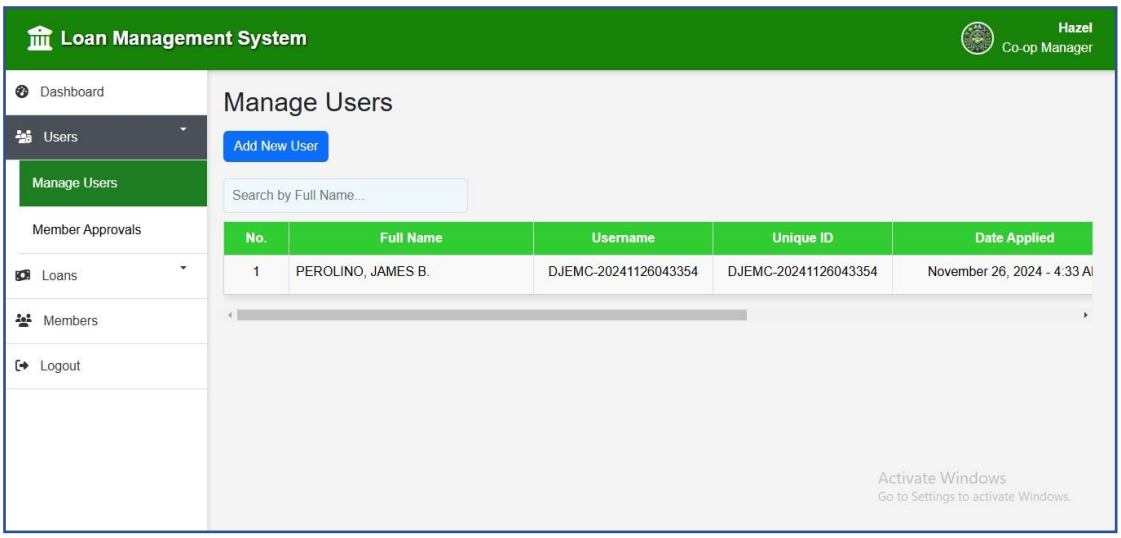


Figure 9. Manage Users(Admin)

The page shown in figure 9 is the Manage Users page where the admin manages the members of the co-op. The members are displayed in table format. In the last column of the table are action buttons. The manager and the treasurer has an access to this interface, however, the payroll officer don't have to this page since the she is only responsible for inputting salary data.

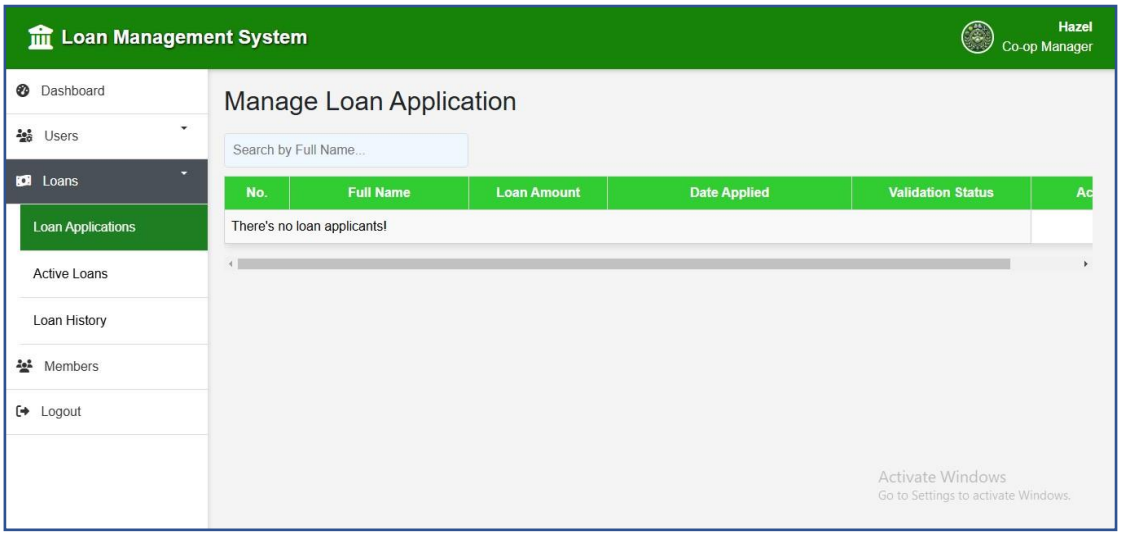


Figure 10. Loan Application(Admin)

The page shown in figure 10 is the loan application interface of the admin. This is where the data of the loan application is displayed. The action column in the table contains two buttons which approval and rejection. However, there is a difference between the role of the Co-op manager and Co-op treasurer. The approval of the treasurer is only for validation of the loan application, but the final approval of the loan application is for the manager. On the other hand, the payroll officer doesn't have access to this interface.

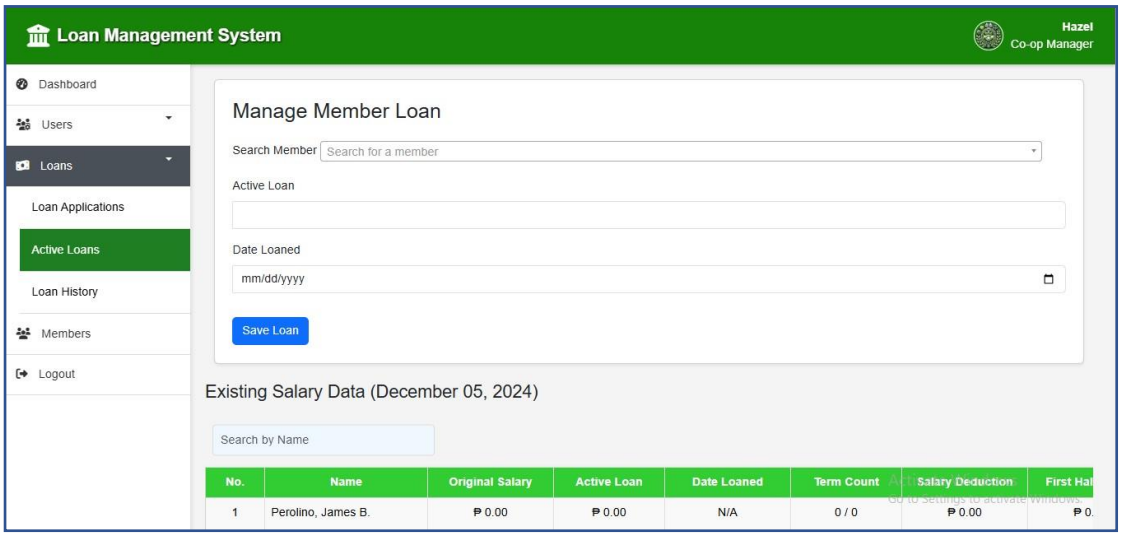


Figure 11. Active Loans(Admin)

The page shown in figure 11 is the active loan page where the members are displayed with their corresponding loan data as well as their salary data in halves. The form above allows the admin (manager or treasurer) to existing or newly applied loan directly for the members. This is

only available to those members who don't currently have an active loan.

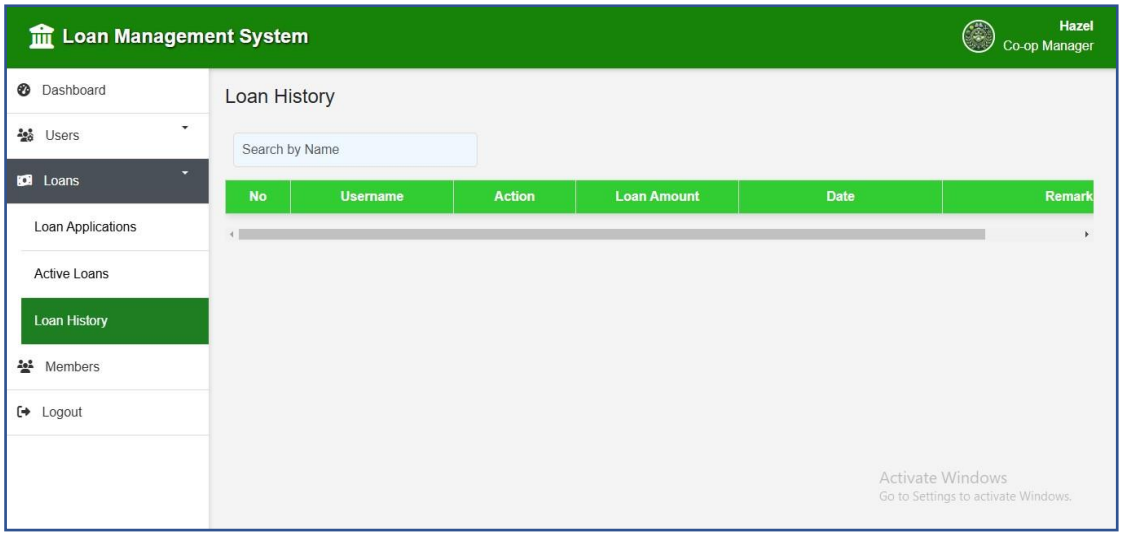


Figure 12. Loan History(Admin)

The page shown in figure 12 is the loan history page. This is the page where all the history pertaining to loan processes is recorded. All the users have this access but is limited by their role. For instance, the member's history data contains only the loan activity of the member.

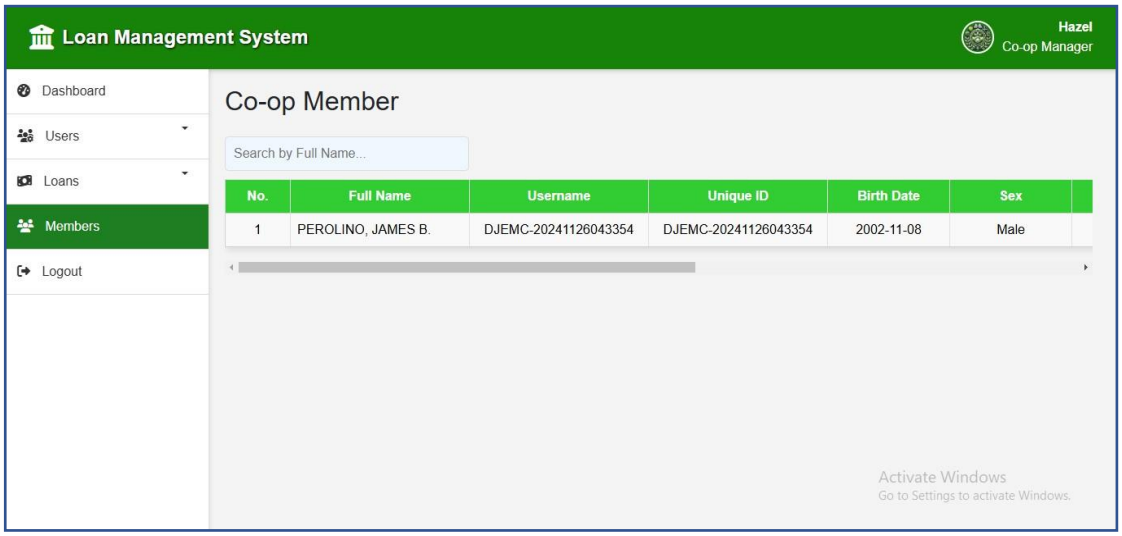


Figure 13. Members(Admin)

The page shown in figure 13 is the members page where the members of the co-op is displayed in an organized manner. this is only a display of data and there's no operational buttons involved. This interface is available to all the admins of the system.

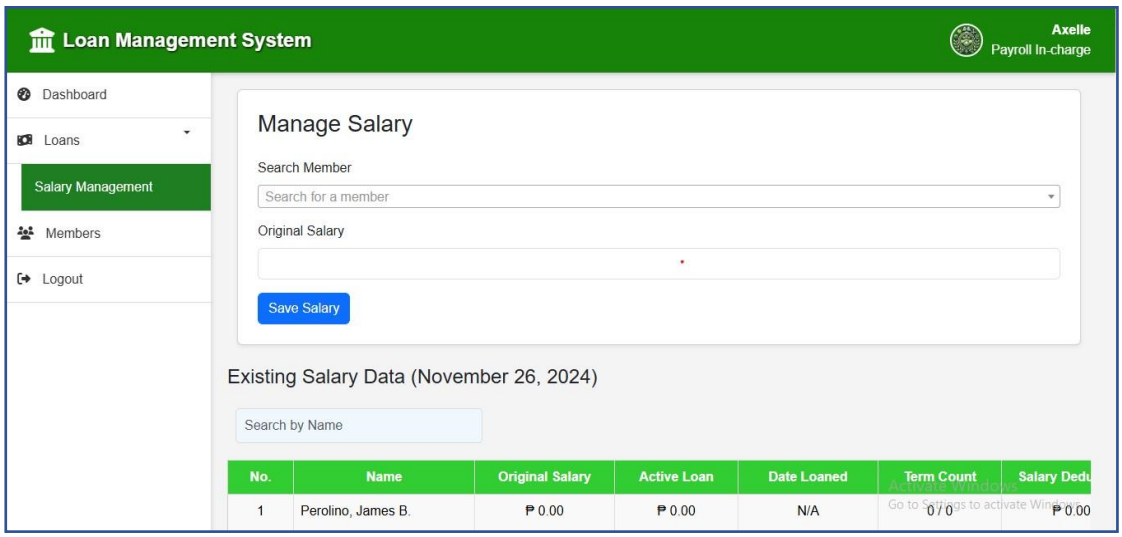


Figure 14. Salary Management(Admin)

The UI shown in figure 14 is the salary management page where the payroll officer inputs salary data of the member. This page the only page where the payroll officer can manage. There's no other user can access this page only the payroll officer.

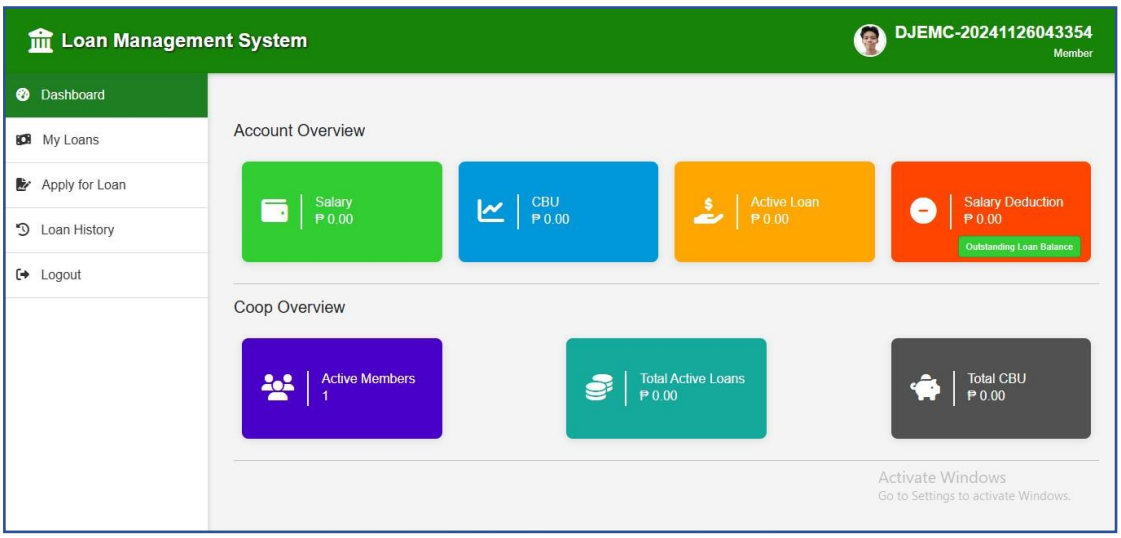


Figure 15. Member Dashboard

The UI shown in figure 15 is the dashboard of the member. The username of the user is set to default username, which is the unique id, upon first use. This member can then edit their username as well as their information. The dashboard displayed the account overview of the user as well as the overview of the co-op.

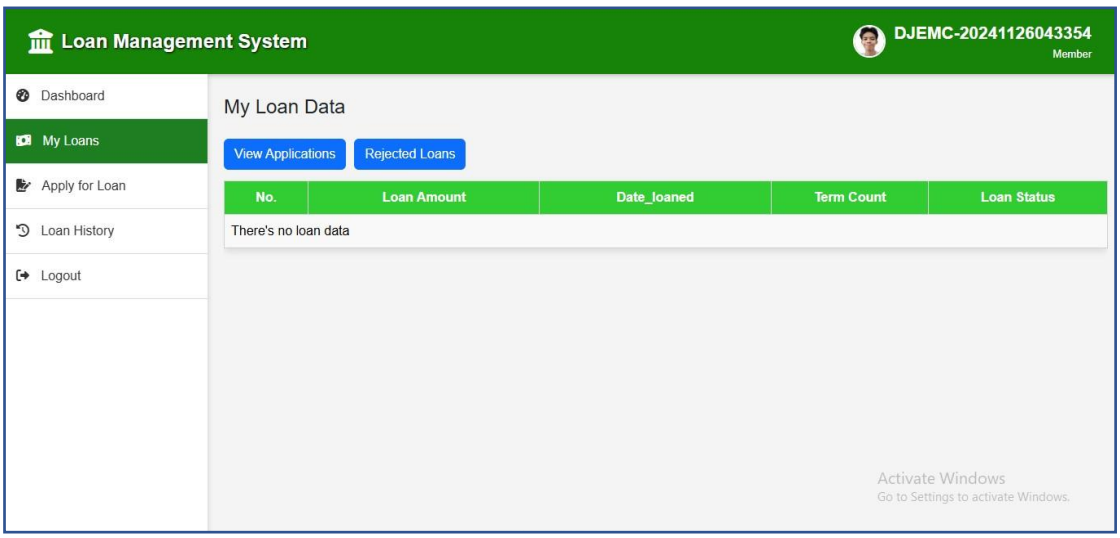


Figure 16. Member Loan

The page shown in figure 16 is the loan page of the member. This is where the loan data of the member is displayed. It has two buttons, the view application and the rejected loans, which navigates the user to the application and the rejected loan page.

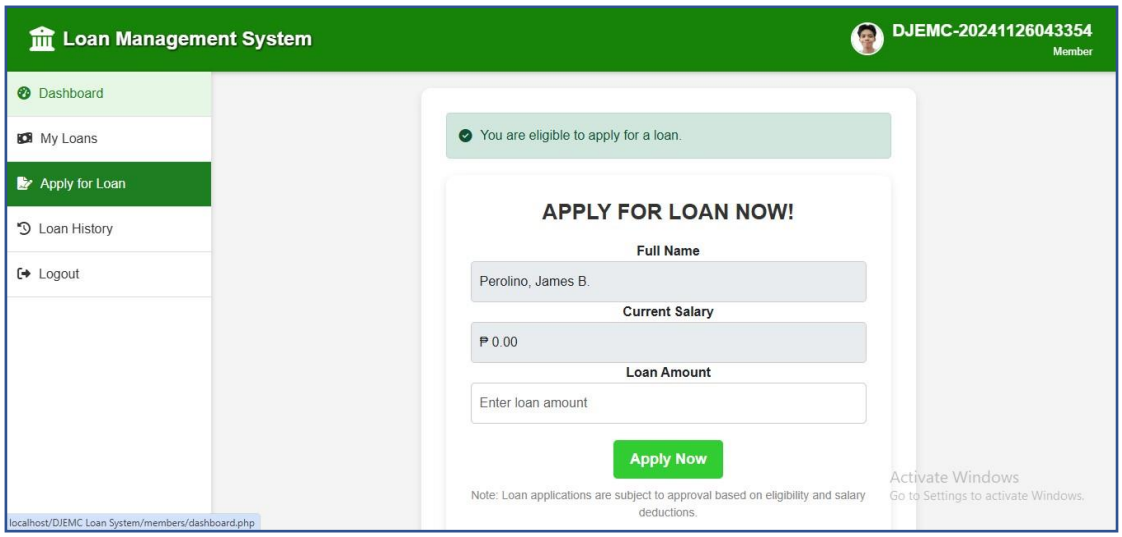


Figure 17. Apply for Loan (member)

The UI shown in figure 17 is the loan application page of the member. This is the page where the member submits their loan application. The member is only eligible to apply for loan if he/she had no active loan. Otherwise, the member cannot apply for loan and the data that is displayed is not the application form but the current loan application data and payment progress.

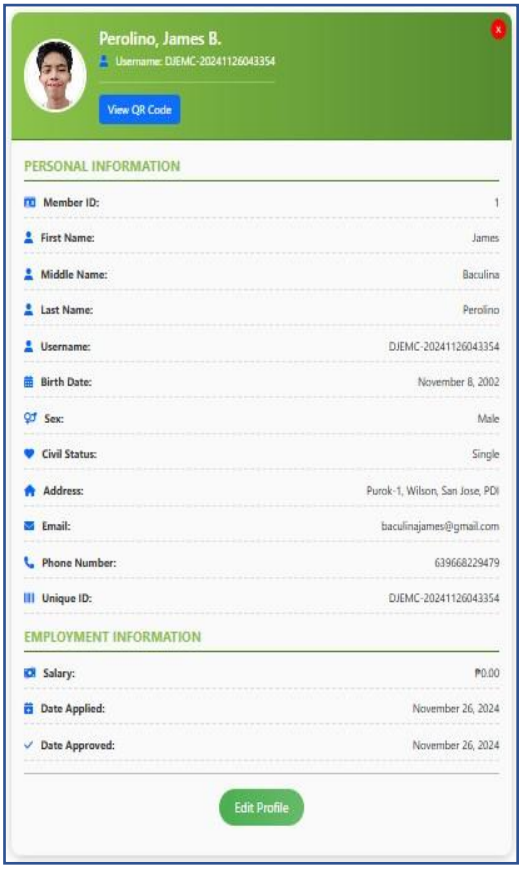


Figure 18. Member profile

The page shown in figure 18 is the profile page of the member. The interface is designed in an organized manner and a user-friendly layout. The edit profile in the bottom allows the member to navigate to the edit profile page while the view QR code button display the qr code of the member.

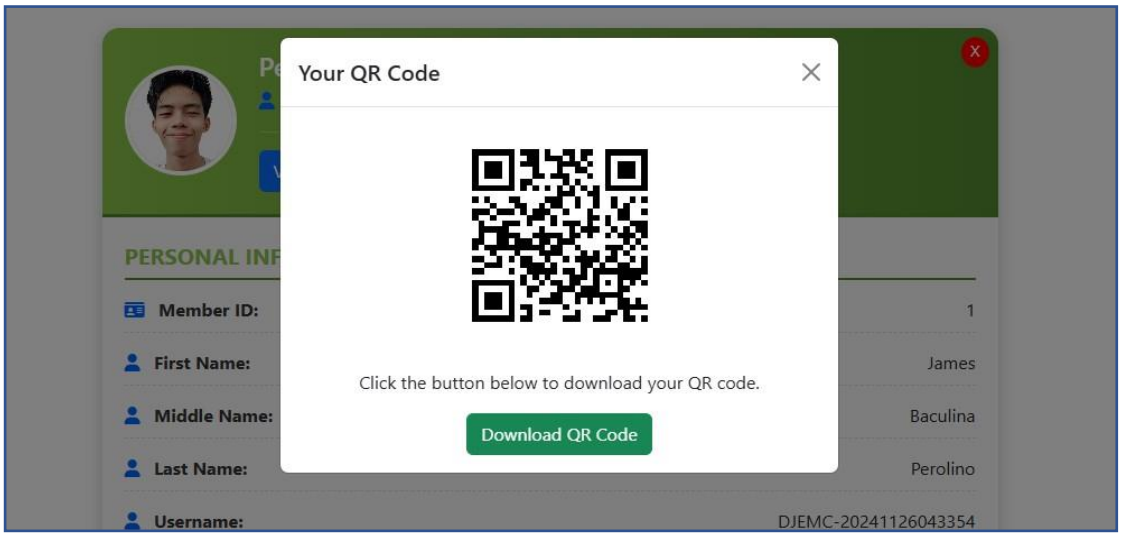


Figure 19. Member QR-Code

The UI displayed in the figure 19 is the qr-code of the member. This is displayed in a user-friendly manner and it also allows the user to download their qr-code which will then be used for quick login just by using their QR-code.

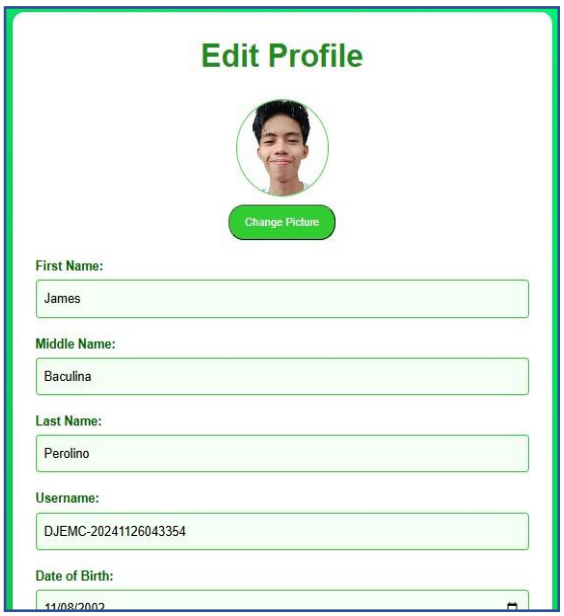


Figure 20. Edit Profile

The page shown in figure 20 is the edit profile page where the members can update their personal information including their profile picture. Aside from personal information, they can't edit their salary data and other loan related data.

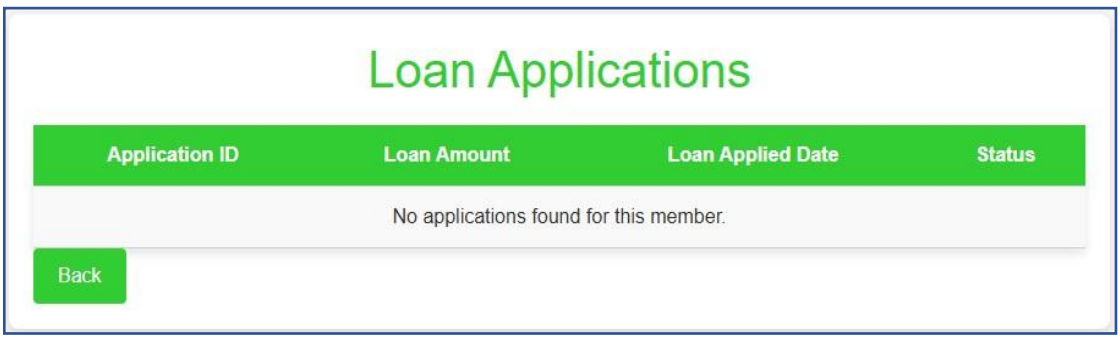


Figure 21. View Loan Application

The UI displayed in figure 21 is the view loan application page of the member where loan application is displayed along with its application status.

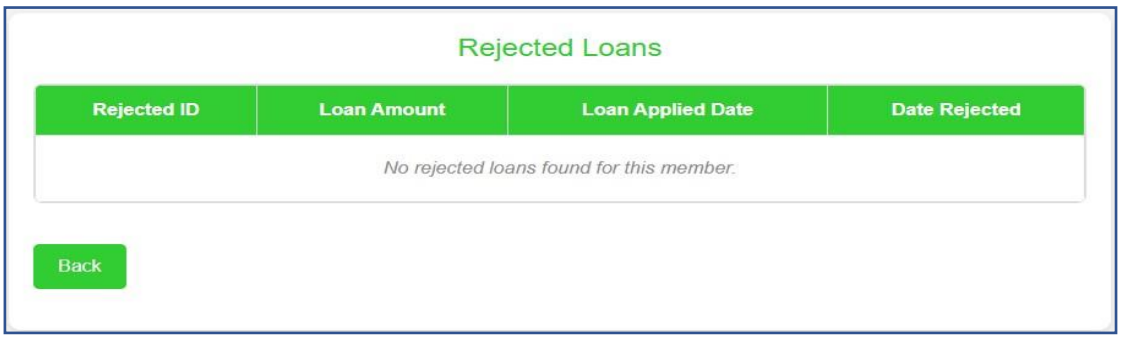
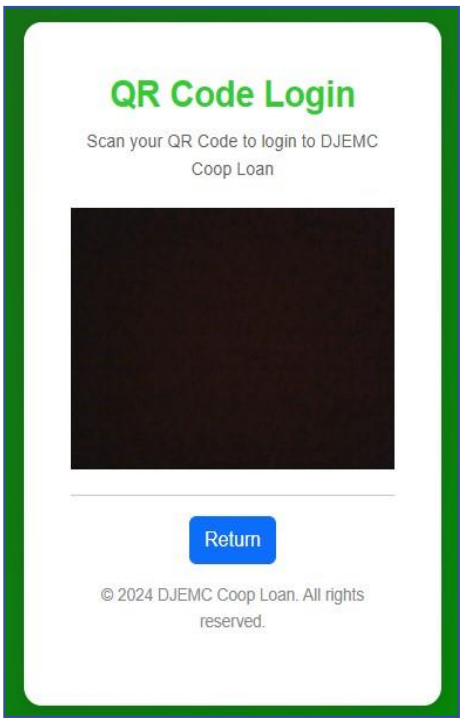


Figure 22. Rejected Loans

The interface displayed in the figure 22 is the rejected loan page of the member. This page is where rejected loan application of the user is displayed.



The UI shown in the figure 23 is the QR-code login page where the user can login to their account using their QR-code for convenience.

Figure 23. QR-code Login

System Evaluation Results

The system evaluation results are presented in this section, following the ISO/IEC 25010 Software Quality Model framework. The evaluation assessed the system based on eight key quality characteristics: functionality, efficiency, compatibility, usability, reliability, security, maintainability, and portability.

A total of 16 respondents participated in the evaluation, comprising 3 administrators, 5 IT professionals, and 8 co-op members. These respondents provided valuable feedback on various aspects of the system's design, implementation, and performance. Their diverse perspectives ensured a comprehensive assessment of the system's capability to meet user needs while maintaining technical standards.

The results highlight the system's strengths, identify areas for improvement, and confirm its alignment with the goals of the study. The evaluation scores and feedback from respondents have been consolidated and analyzed to offer a detailed understanding of the system’s overall quality.

Questions	Rating	Description
FUNCTIONALITY		
1.1 The system performs all loan-related processes (application, approval, and repayment) efficiently and accurately.	4.75	Strongly Agree
1.2 The system's features are reliable and function as expected during operations.	4.6875	Strongly Agree
1.3 The system effectively prevents errors or inconsistencies in loan transactions.	5	Strongly Agree
EFFICIENCY		
2.1 The system processes loan transactions quickly and without delays	4.5	Strongly Agree
2.2 The automation of loan calculations and processes reduces the time spent on manual tasks.	4.6875	Strongly Agree
2.3 The system minimizes redundant steps in loan management, streamlining operations effectively.	4.6875	Strongly Agree
COMPATIBILITY		
3.1 The system runs seamlessly on the devices and browsers commonly used by the intended users.	4.6875	Strongly Agree
3.2 The system is compatible with the existing infrastructure at DJEMC Co-op.	4.625	Strongly Agree
3.3 The system design in adaptive to screen sizes and resolutions.	4.8125	Strongly Agree
USABILITY		
4.1 The system interface is user-friendly and intuitive for all user roles (Manager, Treasurer,	4.6875	Strongly Agree

Payroll Officer, and Members).		
4.2 I can quickly learn how to use the system without needing extensive training.	4.625	Strongly Agree
4.3 Navigating through the system's features and functionalities is straightforward and easy to understand.	5	Strongly Agree
RELIABILITY		
5.1 The system consistently performs as expected during loan processing and related transactions.	4.6875	Strongly Agree
5.2 The system minimizes errors or inaccuracies in loan calculations and application status updates.	4.4375	Strongly Agree
5.3 The system is stable and does not crash during usage.	4.625	Strongly Agree
SECURITY		
6.1 The system effectively protects sensitive loan and user data from unauthorized access.	4.625	Strongly Agree
6.2 The role-based access control ensures that only authorized users can access specific system features.	4.8125	Strongly Agree
6.3 The system comply with relevant data privacy regulations.	4.6875	Strongly Agree
MAINTAINABILITY		
7.1 The system's design allows for easy updates and modifications to meet changing requirements.	4.8125	Strongly Agree
7.2 The system is adaptable to changes in	4.75	Strongly Agree

user needs and requirements.		
7.3 The developers actively respond to user feedback and concerns.	4.8125	Strongly Agree
PORTABILITY		
8.1 The system can be accessed and used effectively across different devices (e.g., desktops, tablets, smartphones).	4.9375	Strongly Agree
8.2 The web portal layout is responsive, ensuring a consistent user experience across various screen sizes and resolutions.	4.8125	Strongly Agree
8.3 The system performs well regardless of the browser or operating system used.	4.9375	Strongly Agree

Table 3. System evaluation result by question.

Category	Rating	Description
1. Functionality	4.81	Strongly Agree
2. Efficiency	4.62	Strongly Agree
3. Compatibility	4.71	Strongly Agree
4. Usability	4.77	Strongly Agree
5. Reliability	4.58	Strongly Agree
6. Security	4.71	Strongly Agree
7. Maintainability	4.79	Strongly Agree
8. Portability	4.90	Strongly Agree
Total mean:	4.74	Strongly Agree

Table 4. System evaluation result by category.

The system evaluation results, based on the ISO/IEC 25010 categories, were derived from responses to targeted questions within each category. These questions provided insights into the respondents' perceptions of the system's quality and performance across different dimensions. Below is an in-depth discussion of each category and how the corresponding results align with the system's functionalities and user needs:

Functionality

The system achieved a high functionality score of 4.81, demonstrating its effectiveness in handling loan-related processes such as application, approval, and repayment. Respondents strongly agreed that the system performs these tasks efficiently and accurately, with features that reliably function as intended. The system also effectively prevents errors or inconsistencies in loan transactions, ensuring a smooth and reliable operational workflow. This result underscores the system's capability to meet its intended objectives, providing robust support for co-op operations.

Efficiency

Efficiency received a score of 4.62, reflecting the system's ability to process transactions quickly while reducing the reliance on manual tasks. Respondents appreciated how the system automates loan calculations and streamlines operations, minimizing redundant steps and enhancing overall workflow. Although slightly lower than other categories, this score highlights areas for potential optimization to ensure even faster transaction processing and improved efficiency in future iterations.

Compatibility

With a score of 4.71, compatibility highlights the system's seamless integration into the co-op's existing infrastructure and its adaptability to commonly used devices and browsers. Respondents found the system to run smoothly across different platforms, ensuring accessibility for all users. The design's responsiveness to varying screen sizes and resolutions further enhances its usability, confirming its alignment with the technological needs of the co-op.

Usability

The system’s usability received a strong score of 4.77, reflecting its intuitive and user-friendly interface. Respondents agreed that navigating the system’s features is straightforward and requires minimal training, making it accessible to users with varying technical skills. The simplicity of the interface ensures that all user roles—Manager, Treasurer, Payroll Officer, and Members—can effectively use the system, reducing the learning curve and enhancing user satisfaction.

Reliability

Reliability scored 4.58, indicating that the system consistently performs as expected, with minimal errors or inaccuracies during loan processing and related transactions. Users acknowledged the stability of the system, though occasional minor issues were noted. This score points to the system's dependability while also suggesting an opportunity to further enhance its stability to achieve even greater reliability.

Security

Security earned a score of 4.71, showcasing the system’s ability to protect sensitive loan and user

data effectively. Respondents commended the implementation of role-based access control, which ensures that only authorized users can access specific features. Compliance with data privacy regulations also contributed to this high score, reflecting the system's commitment to maintaining user trust and data protection.

Maintainability

Maintainability was rated at 4.79, demonstrating the system's adaptability to changing requirements and user needs. Respondents appreciated the ease with which updates and modifications could be made to the system, as well as the developers' proactive responsiveness to feedback. This category highlights the system's readiness for future enhancements, ensuring long-term usability and relevance.

Portability

Portability achieved the highest score of 4.90, reflecting exceptional accessibility and versatility. Respondents strongly agreed that the system performs seamlessly across different devices and platforms, with a responsive design that ensures consistent user experiences across various screen sizes and resolutions. This result underscores the system's

strength in providing flexibility and ease of use in diverse environments.

The overall grand mean of 4.74 across all categories indicates a high level of satisfaction among respondents. This result affirms the system's strengths in delivering quality performance, usability, and adaptability, while also highlighting areas for further improvement, particularly in efficiency and reliability. The evaluation validates the system's effectiveness in addressing the operational needs of the co-op and provides a roadmap for its continued development.

CHAPTER VI

CONCLUSIONS, SUMMARY AND RECOMMENDATIONS

6.1 SUMMARY

The study, E-Loan Evolution: Transforming DJEMC Co-op Lending with Integrated SMS Alert and QR-Code Access, aimed to develop a loan administration system tailored to the operational needs of DJEMC Co-op. The system was designed to streamline the loan application, approval, and repayment processes while integrating SMS notifications and QR-code technology for secure member access. By implementing role-based access control, the system addressed the distinct requirements of four user roles: Co-op Manager, Co-op Treasurer, Payroll Loan Officer, and Members.

The research utilized the Rapid Application Development (RAD) methodology to ensure iterative feedback and adaptability during system development. System evaluation was conducted using the ISO/IEC 25010 framework, measuring eight key categories: functionality, efficiency, compatibility, usability, reliability, security, maintainability, and portability.

Evaluation results confirmed the system's effectiveness in achieving its objectives, reflected in an impressive grand mean score of 4.74 across all categories.

Functionality scored 4.81, showcasing the system's robust capabilities in handling loan processing tasks accurately and reliably. Efficiency, with a score of 4.62, highlighted the system's ability to automate calculations and streamline workflows, minimizing manual efforts while ensuring swift processing. Compatibility achieved 4.71, demonstrating the system's seamless integration with existing infrastructure and its responsiveness across devices and browsers. The usability score of 4.77 emphasized the intuitive and user-friendly interface, enabling ease of use for all user roles with minimal training requirements.

Reliability, scoring 4.58, reflected the system's stability and consistent performance, though minor issues suggested areas for further improvement. The security score of 4.71 highlighted the effective implementation of role-based access control and adherence to data privacy regulations, ensuring robust protection for sensitive information. Maintainability, at 4.79, underscored the system's adaptability to evolving requirements and ease of implementing updates, ensuring long-term relevance. Lastly, portability received the highest score of 4.90, showcasing the system's exceptional versatility and responsiveness across devices and platforms, delivering a consistent and flexible user experience.

These comprehensive results validated the system's outstanding performance, confirming its suitability for deployment at DJEMC Co-op while identifying opportunities for enhancing efficiency and reliability in future iterations.

While the system demonstrated exceptional results, areas for further optimization were identified, particularly in enhancing efficiency and reliability. Nonetheless, the study successfully delivered a comprehensive solution that addresses the co-op's lending operations with a modern, secure, and automated approach.

6.2 CONCLUSION

The E Loan Evolution: Transforming DJEMC Co-op Lending with Integrated SMS Alert and QR-Code Access system has successfully met its objectives, effectively modernizing the loan management processes at DJEMC Co-op. The development and implementation of this system have streamlined loan application procedures, improved approval workflows, and enhanced the tracking of repayments. Through its integration of SMS notifications and QR code access, the system has provided an accessible and secure platform for both staff and members, ensuring a seamless user experience. The evaluation of the system's performance, using the ISO/IEC 25010 framework, showed exceptional results in functionality, usability, security, and portability, highlighting the system's strengths in these critical areas.

However, the study also identified several limitations, including restricted user roles, the dependency on manual salary data input, and the system's focus primarily on loan management with limited communication channels. The roles of the Co-op Manager, Co-op Treasurer, and Payroll Loan Officer were clearly defined, yet the study revealed that expanding their responsibilities or improving their access to the system

could enhance operational efficiency. Additionally, the lack of advanced reporting features and the reliance on manual input for salary data presented challenges that could affect the system's overall performance and accuracy in the long term.

To address these limitations and further enhance the system, it is recommended to expand the communication methods to include email and push notifications, automate salary data input to reduce errors, and introduce advanced reporting tools for better data analysis and decision-making. By incorporating these improvements, the system can evolve into a more robust and comprehensive solution that supports the growing needs of DJEMC Co-op. In conclusion, while the E Loan Evolution system represents a significant advancement in loan management, future updates and enhancements are necessary to ensure its scalability and long-term success in transforming the co-op's financial operations.

6.3 RECOMMENDATIONS

Based on the findings and limitations identified in the study, several recommendations are proposed to enhance the effectiveness and functionality of the E Loan Evolution: Transforming DJEMC Co-op Lending with Integrated SMS Alert and QR-Code Access system.

1. **Enhance Reporting Capabilities:**
    - Add advanced reporting features to allow the generation of customizable, detailed reports. These reports would provide deeper insights into loan trends, repayments, member activity, and overall system performance, which can assist in better decision-making by the management.
2. **Implement a Statement of Account Feature:**
    - Based on feedback from an IT professional, include a Statement of Account feature that allows members to view a detailed summary of their loan balances, payments, and outstanding amounts. This feature would promote transparency and give users better control and understanding of their financial status.
3. **Introduce Multi-User Communication and Role Enhancements:**

- Allow for more flexibility in user roles and communication capabilities. For example, the system could allow loan officers and managers to send direct messages to members regarding their loan status or any updates directly through the platform.

4. Integration with Savings and Investment Accounts:

- Extend the system to manage member savings accounts, investments, and dividends, alongside loans. This will provide a centralized platform for all member-related financial activities, fostering more efficient financial management.

5. Automated Dividend Distribution:

- Implement automated systems for calculating and distributing dividends to members based on their investments or savings. This feature could reduce manual workload for staff and increase accuracy and transparency in dividend distribution.

6. Automated Financial Reports and Analytics:

- Introduce features for generating automated financial reports such as balance sheets, income statements, and cash flow statements. These reports would be invaluable for management to track the financial health of the co-op and ensure transparency in financial operations.

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APPENDICES

APPENDIX A

APPENDIX B

SURVEY QUESTIONNAIRE

E LOAN EVOLUTION: TRANSFORMING DJEMC CO-OP LENDING WITH INTEGRATED SMS ALERT AND QR-CODE ACCESS

This survey forms an integral part of the Bachelor of Science in Information Technology study at Don Jose Ecleo Memorial College, with the objective of determining user acceptance of the "E Loan Evolution: Transforming DJEMC Co-op Lending with Integrated QR-Code Access." The insights gained from this research will be instrumental in improving the system.

NOTE: The data collected is for survey purposes only. Your answers on the questions below will be kept confidential.

I. USER ACCEPTANCE TEST

Instruction: Respond to each statement by indicating your level of acceptance. Mark check (✓) to your answer using the following rating scale:

5 - Strongly Agree
4 - Agree
3 - Neutral
2 - Disagree
1 - Strongly Disagree

FUNCTIONALITY	RESPONSE				
	1	2	3	4	5
1.1 The system performs all loan-related processes (application, approval, and repayment) efficiently and accurately.					
1.2 The system's features are reliable and function as expected during operations.					
1.3 The system effectively prevents errors or inconsistencies in loan transactions.					

EFFICIENCY	**RESPONSE**				
	1	2	3	4	5
2.1 The system processes loan transactions quickly and without delays					
2.2 The automation of loan calculations and processes reduces the time spent on manual tasks.					
2.3 The system minimizes redundant steps in loan management, streamlining operations effectively.					
COMPATIBILITY	**RESPONSE**				
	1	2	3	4	5
3.1 The system runs seamlessly on the devices and browsers commonly used by the intended users.					
3.2 The system is compatible with the existing infrastructure at DJEMC Co-op.					
3.3 The system design in adaptive to screen sizes and resolutions.					
USABILITY	**RESPONSE**				
	1	2	3	4	5
4.1 The system interface is user-friendly and intuitive for all user roles (Manager, Treasurer, Payroll Officer, and Members).					
4.2 I can quickly learn how to use the system without needing extensive training.					
4.3 Navigating through the system's features and functionalities is straightforward and easy to understand.					

RELIABILITY	**RESPONSE**				
	1	2	3	4	5
5.1 The system consistently performs as expected during loan processing and related transactions.					
5.2 The system minimizes errors or inaccuracies in loan calculations and application status updates.					
5.3 The system is stable and does not crash during usage.					
SECURITY	**RESPONSE**				
	1	2	3	4	5
6.1 The system effectively protects sensitive loan and user data from unauthorized access.					
6.2 The role-based access control ensures that only authorized users can access specific system features.					
6.3 The system comply with relevant data privacy regulations.					
MAINTAINABILITY	**RESPONSE**				
	1	2	3	4	5
7.1 The system's design allows for easy updates and modifications to meet changing requirements.					
7.2 The system is adaptable to changes in user needs and requirements.					
7.3 The developers actively respond to user feedback and concerns.					

PORTABILITY	RESPONSE				
	1	2	3	4	5
8.1 The system can be accessed and used effectively across different devices (e.g., desktops, tablets, smartphones).					
8.2 The web portal layout is responsive, ensuring a consistent user experience across various screen sizes and resolutions.					
8.3 The system performs well regardless of the browser or operating system used.					

APPENDIX G

Interview Question (Data Gathering)

1. **What is the rule of payroll?**

   Answer. Responsible for managing the salary, including the salary deduction.

2. **When to deduct the salary?**

   Answer. Every 15 days

3. **If mangutang ang loaner naa bay aggrement kung pila niya ka bulan bayaran?**

   Answer. Nag depends sa loan amount sa loaner, 7k below is 3 months and above 7k is 6 months

4. **How many percent is the monthly interest?**

   Answer. 3% the monthly interest

5. **What is your way of loan payment?**

   Answer. Only salary deduction

6. **If the loaner has larger salary, can avail larger loan amount?**

   Answer. All are equal

7. **What are the loan categories in your co-op?**

   Answer. Only salary loan

Loan Calculation

- Maximum amount to loan is 15,000.
- If loan amount is less than or equal to 7,000, then the loan term is 3 months.
- If loan amount is greater than 7,000, then the loan term is 6 months.
- Interest rate for loan is fixed to 3%
- Salary deduction happens in first half and second half of the month

Example:

Member Salary: 25,000

Loan amount : 10,000

Loan term: : 6 months (12 terms for months in half)

Monthly Interest: MI = loan amount * 0.03

MI = 10,000 * 0.03

MI = 300

Loan deduction: principal loan / terms

Loan deduction = 10,000 / 12

Loan deduction = 833.33

Total Salary Deduction = Loan deduction + MI

Total Salary Deduction = 833.33 + 300

Total Salary Deduction = 1133.33

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Educational Background

	Year Graduated
ELEMENTARY	
San Juan Elementary School	2007-2008
SECONDARY	
Don Ruben Edera Ecleo Sr. Memorial National High School	2012-2013
TERTIARY	
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Educational Background

	Year Graduated
ELEMENTARY	
San Jose Elementary School	2014-2015
SECONDARY	
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Personal Details

Age: 21 years' old

Birth Date: August 13, 2003

Birthplace: Surigao City

Nationality: Filipino

Gender: Male

Fathers' Name: None

Mothers' Name: Lenie S. Ecleo

Educational Background

	Year Graduated
ELEMENTARY	
Central Elementary School	2014-2015
SECONDARY	
Don Ruben Edera Ecleo Sr. Memorial National High School	2020-2021
TERTIARY	
Don Jose Ecleo Memorial College Bachelor of Science in Information Technology	PRESENT

JAYLE MAE P. EVIOTA

P-3 New Mabuhay, Dinagat, Dinagat Islands

Jayleeviota06@gmail.com

09667034931

Personal Details

Age: 24 years' old

Birth Date: May 17, 2000

Birthplace: Escolta, Dinagat, Dinagat Islands

Nationality: Filipino

Gender: Male

Fathers' Name: Jayky F. Eviota

Mothers' Name: Liza P. Eviota

Educational Background

	Year Graduated
ELEMENTARY	
New Mabuhay Elementary School	2011-2012
SECONDARY	
Dinagat School of Fisheries	2019-2020
TERTIARY	
Don Jose Ecleo Memorial College Bachelor of Science in Information Technology	PRESENT

FEBIE P. MANAGA

White Beach, Dinagat, Dinagat Islands

managafebie@gmail.com

09306254606

Personal Details

Age: 22 years' old

Birth Date: February 9, 2002

Birthplace: Dinagat Hospital

Nationality: Filipino

Gender: Female

Fathers' Name: Gilbert Managa

Mothers' Name: Genalyn Managa

Educational Background

	Year Graduated
ELEMENTARY	
Dinagat Central Elementary School	2014-2015
SECONDARY	
Dinagat School of Fisheries	2020-2021
TERTIARY	
Don Jose Ecleo Memorial College Bachelor of Science in Information Technology	PRESENT