

*SMART COOP: A TRANSACTION AND LOAN MANAGEMENT SYSTEM WITH AI
POWERED DOCUMENT ENHANCEMENT FOR PALTOK (SFM) CREDIT
COOPERATIVE*

**A Thesis Proposal
Presented to the Faculty of the
Information and Communications Technology Program
STI College Munoz-EDSA**

**In Partial Fulfilment
of the Requirements for the Degree
Bachelor of Science in Computer Science**

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ENDORSEMENT FORM FOR PROPOSAL DEFENSE

TITLE OF RESEARCH: **SMART COOP: A TRANSACTION AND LOAN MANAGEMENT SYSTEM WITH AI POWERED DOCUMENT ENHANCEMENT FOR PALTOK (SFM) CREDIT COOPERATIVE**

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In Partial Fulfilment of the Requirements
for the degree Bachelor of Science in Computer Science
has been examined and is recommended for Proposal Defense.

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APPROVAL SHEET

This thesis proposal titled **SMART COOP: A TRANSACTION AND LOAN MANAGEMENT SYSTEM WITH AI POWERED DOCUMENT ENHANCEMENT FOR PALTOK (SFM) CREDIT COOPERATIVE**, prepared and submitted by **Erlyesar Rivera; Mark Jones Rivera; Juan Miguel Somera; and Raul Verano**, in partial fulfillment of the requirements for the degree of Bachelor of Science in Computer Science, has been examined and is recommended for acceptance and approval.

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ABSTRACT

Title of research: **SMART COOP: A TRANSACTION AND LOAN MANAGEMENT SYSTEM WITH AI POWERED DOCUMENT ENHANCEMENT FOR PALTOK (SFM) CREDIT COOPERATIVE**

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Degree: **Bachelor of Science in Computer Science**

Key words: **Web-Based, Transaction Management, AI driven, Document Enhancement, Paltok(SFM) Credit Cooperative**

The proponents examined the existing operations of Paltok (SFM) Credit Cooperative and identified significant inefficiencies in managing online transactions and verifying member-submitted documents. Although the cooperative utilizes a FoxPro-based local accounting system to process walk-in transactions such as payments, deposits, and loan applications the system is limited to on-site use and is not capable of handling online submissions. As a result, members are forced to send proof of payments, deposit information, and loan forms through various external channels such as Facebook Messenger and email, causing scattered records, verification delays, and additional workload for the accounting staff.

To address these challenges, the proponents developed **SMART COOP: A Transaction and Loan Management System with AI-Powered Document Enhancement for Paltok (SFM) Credit Cooperative**. The proposed web-based system centralizes all online member transactions into a single, secure platform where members can upload and monitor their submissions. Integrated Artificial Intelligence automatically enhances uploaded images to improve clarity and verification accuracy. Overall, the system aims to streamline cooperative operations, reduce manual errors, improve processing time, and strengthen transparency and accountability across all digital financial transactions—ultimately enhancing both member experience and institutional efficiency.

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INTRODUCTION

In today's digital era, financial institutions and cooperatives are transitioning from traditional, paper-based systems to digital platforms that offer efficiency, transparency, and accessibility. The rapid evolution of web-based technologies has enabled organizations to provide members and clients with real-time access to financial transactions and account information. According to TechTarget (n.d.), web-based applications allow users to interact with systems directly through a browser without requiring local installation, making them accessible anytime and anywhere. They also simplify maintenance, enhance real-time data processing, and reduce infrastructure costs by relying on remote servers rather than on-site systems.

Despite the growing demand for digital services, many cooperatives continue to rely on manual operations that require members to visit their offices in person to pay obligations or submit their loan applications. This conventional process often results in delays, long waiting time and inconvenience—particularly for members who live far from their cooperative's location. To address these limitations, the integration of **web-based systems** has become a strategic approach for enhancing member experience and streamlining operations.

In relation to web-based applications, the use of a **SMART COOP: A TRANSACTION AND LOAN MANAGEMENT SYSTEM WITH AI POWERED DOCUMENT ENHANCEMENT FOR PALTOK (SFM) CREDIT COOPERATIVE** offers an innovative solution that combines accessibility and transparency with modern data security practices. Before anything else, the definition of a Transaction Management System must first be established. A Transaction Management System is a digital platform designed to record, organize, and process all financial transactions made by members of an organization, such as deposits, payments, and loan applications. The system serves as a centralized hub where members can upload their transaction slips, submit loan applications, and monitor their transaction status in real time.

Through automation and artificial intelligence (AI) enhancement, the system ensures that submitted files are processed accurately, reducing manual encoding errors and improving verification speed.

According to MHC Automation (n.d.), implementing a document management system enables organizations to reduce physical storage requirements and associated costs by digitizing documents and moving them to a centralized repository. This shift helps guard against data loss through built-in backup and recovery functions and significantly improves organizational workflows by enabling employees to quickly locate and share documents rather than manually tracking paper records. The system also improves version control and organization by providing a full document history and ensuring that users access the most recent version. Furthermore, it supports regulatory compliance by structuring documents in line with legal requirements, grants wider access across devices and departments, enhances security through permissions and audit-trail capabilities, and fosters collaboration across teams—all of which make the system scalable and better aligned for business growth (MHC Automation, n.d.).

With the benefits of web-based applications and the capabilities of an Electronic Document Management System (EDMS) enhanced by artificial intelligence already discussed, the main goal of the proponents is to develop a Web-Based Transaction Management System Enhanced by Artificial Intelligence. The system aims to streamline workflows, improve organization in handling online transactions, and enhance operational efficiency within the cooperative. Ultimately, this project seeks to address the challenges posed by poor-quality and inefficient submission of online transactions by incorporating AI-driven automation for document processing and verification.

In support of the principles outlined in Republic Act No. 9520, also known as the *Philippine Cooperative Code of 2008*, cooperatives are encouraged to adopt practices that promote transparency, accountability, and efficiency in their operations. The proposed Web-Based Transaction Management System enhanced by Artificial Intelligence.

Background of the problem

The **Paltok (SFM) Credit Cooperative (PCC)** is a community-based, non-profit financial organization established in **1967** in **Barangay Paltok, Quezon City**. For more than **58 years**, the cooperative has been dedicated to promoting savings, responsible lending, and mutual financial support among its members. Its mission is to provide accessible and sustainable financial services to improve the economic well-being of its members and their families.

At present, the cooperative operates a single branch located within Barangay Paltok and employs a total of 11 personnel who handle the organization's day-to-day operations. These include positions such as the manager, cashier, tellers, loan officers, accountants, collectors, treasurer, liaison officer, and maintenance staff. The cooperative operates from Monday to Saturday, 8:00 AM to 5:00 PM, serving both walk-in members from the community and those communicating remotely through social media and email.

The organizational structure of Paltok (SFM) Credit Cooperative follows a functional hierarchy designed to ensure efficient management and accountability. At the top of the structure is the **General Assembly**, composed of all cooperative members who serve as the highest governing body. Under the General Assembly are three major committees: the **Board of Directors, Audit Committee, and Election Committee**.

The **Board of Directors**, consisting of nine members, oversees the overall operations and policy-making of the cooperative. It supervises key departments such as the **Credit and Collection Department, Education and Training Committee, and Mediation and Conciliation Committee**, which are responsible for credit management, member education, and conflict resolution, respectively.

Supporting the Board are the officers, including the **Chairperson, Vice Chairperson, Secretary to the Board, Treasurer, and General Manager**, who coordinate the cooperative's day-to-day functions. The **General Manager** directly oversees the **Accounting, Cashiering, Loan, and Operations Departments**, ensuring that financial and administrative procedures are properly implemented. The **operational staff**—

composed of tellers, cashiers, loan officers, collectors, maintenance personnel, and liaison officers—manage daily transactions, loan processing, collections, and other member-related services.

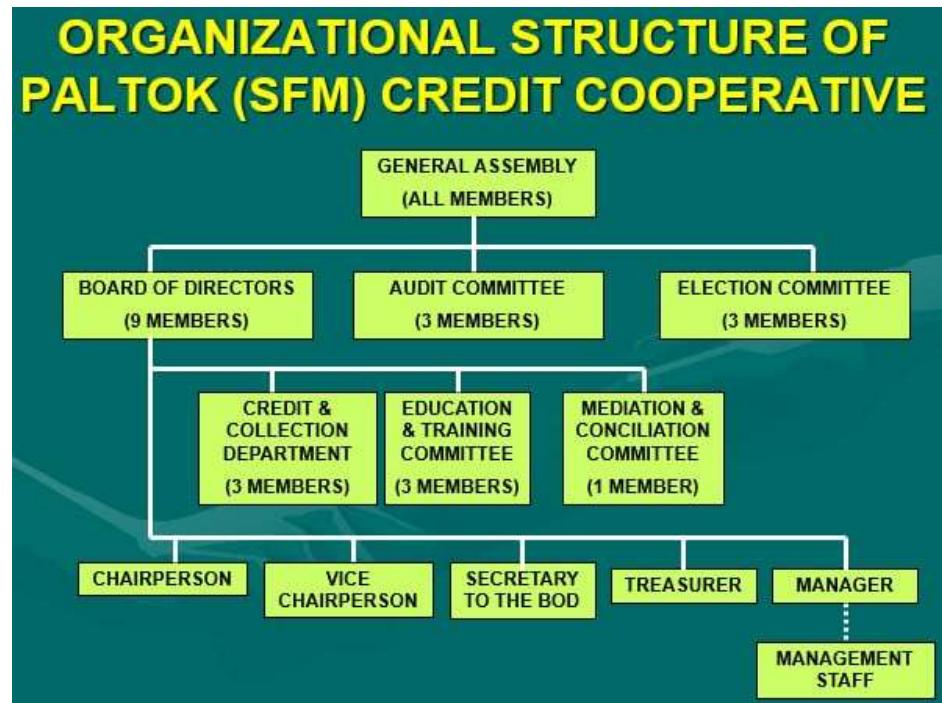


Figure 1 Organization Structure of Paltok (SFM) Credit Cooperative

The Paltok (SFM) Credit Cooperative currently has approximately 2,700 active members as of February 2025, these members consist of residents of Barangay Paltok and nearby communities, as well as long-time members who have relocated outside Metro Manila or abroad but continue to maintain active accounts and participate in cooperative programs.

During the pandemic, Paltok Credit Cooperative began accepting online transactions such as loan applications, Statement of Account (SOA) requests, and payments through over-the-counter and online bank transfers. This initiative was implemented to accommodate members living outside the community who were unable to visit the office due to mobility restrictions. However, even after the pandemic, the cooperative continued to accept online submissions instead of reverting to the traditional walk-in process. While this setup provided convenience to members, it also led to management difficulties, as transactions were submitted through multiple platforms—including Facebook Messenger, email, and even employees' personal accounts—resulting in disorganized records, verification delays,

and increased workload for the accounting department.

The role of the cooperative is to provide its members with financial services such as savings, share capital management, and loan programs. It also aims to promote socio-economic growth by offering accessible and community-driven financial assistance to its members. The cooperative plays a vital role in improving the economic well-being of its members, fostering trust, and supporting financial inclusion within the local community.

The Paltok (SFM) Credit Cooperative loaning services are:

Regular Loan – it is the main lending window of the cooperative.

- a. Productive – granted for purpose of augmenting capital for business, small scale or medium scale business ventures
- b. Providential – proceeds of which will be used to support one's education, for house repair, to pay bills and other financial obligations, court litigation requiring payment of fees or death of close relative

RES. NO. 500-04-24-2010-A

GUIDELINES FOR REGULAR LOANS

1. Deposit Requirement: based on the member's deposits (share capital, savings deposit, time deposit and pre-need savings)
2. Mode of Payment: Payment of loans can be made from three (3) months to twelve (12) months.
3. Application for Loans: Members can file their loan application from Monday to Friday during office hours and Saturday from 8:00am to 11:00am only and shall be received and served by the clerk on a first served basis. Loan applications shall be properly and complete filled up by the borrowers and the co-makers. The borrowers shall be informed of their monthly obligation corresponding to the loan granted.
4. Renewal of loans shall be allowed only after 50% of the loan has been paid up.

5. Approval and disapproval of Loans: The Credit and Committee meets every Saturday to approve or disapprove loans filed within a week. Approved loans are understood to have met all the basic requirements. Loans that cannot be decided by the committee are submitted to the Board of Directors for approval. All disbursements shall be paid in check. Loans more than Php50,000.00 shall be encashed at the authorize bank and loans of less than Php50,000.00 can be encashed at the office depending upon the availability of funds.
6. Rate of Interest and Other Fees Collected: An advance interest based on the term of payment shall be deducted from the amount of loan. *Table 1* presents the rate of interest to be deducted from the amount borrowed. *Table 2* shows the rate of service fees while *Table 3* shows the rate of loan redemption fund. Filing fee is 0.5% regardless of the loan applied for. For share capital build- up, 1% shall be deducted from the loan.

Table 1 Rate of Interest

Loan Term	Rate of Interest
3 months	2.46%
4 months	3.075%
5 months	3.69%
6 months	4.305%
7 months	4.92%
8 months	5.535%
9 months	6.15%
10 months	6.765%
11 months	7.38%
12 months	8%

Table 2 Rate of Interest

Loan Term	Rate of Service Fee
3-6 months	1.50%
7-12 months	3%

Table 3 Rate of Loan Redemption Fund (LRF)

Amount of Loan	Rate of LRF	Loan Term
Php100 - Php150,000	0.50%	1-12 months
	0.75%	Over 12 months
Php151,000 - Php200,000	0.50%	1 - 6 months
	1%	7 - 12 months
	1.50%	Over 12 months
Php201,000 - Php250,000	0.75%	1 - 6 months
	1.50%	7 - 12 months
	2.25%	Over 12 months

7. Coverage of LRF is up to Php250,000.00 only
8. The unpaid balance in excess of Php250,000.00 shall be paid fully by the borrower.
9. Borrowers are also required to maintain a savings deposit of Php3,000.00 for the Php200,000.00 and above loan application
10. Requiring members to issue Post Dated Checks for loans amounting to Php100,000.00 and above.
11. Non-employee members whose loan has an exposure of Php200,000.00 and above shall submit all the following requirements before the approval of the loan:
 - a. TCT – to act as collateral
 - b. PDC – equal to the number of months to pay
 - c. DTI – Business permit
 - d. 3 months bank statement and or bank book (proof of financial capability)
12. Members who fail to pay their obligation/s within 90 days shall be considered as a Delinquent Member,

Paltok (SFM) Credit Cooperative uses a structured interest and service fee schedule:

Minimum Term (3 Months)

- Interest Rate: 2.46%
- Service Fee: 1.5%
- Filing Fee: 0.5%
- Loan Redemption Fund (LRF): 0.5%
- Mandatory Share Capital Build-Up: 1%

Members applying for a Regular Loan equivalent to twice (2x) their share capital are required to have a co-maker as part of the cooperative's risk-mitigation policy. For first-time applicants of the double-capital loan, a mandatory interview with the Credit and Collection Committee is conducted to assess the member's payment behavior, financial capacity, and overall credit standing. After this initial interview, succeeding applications for double-capital loans no longer require another interview but remain subject to the Committee's approval and evaluation.

Meanwhile, loan applications with an amount equal to or below the member's share capital undergo a faster process and are typically approved within the same day, provided that all required documents are complete and the member has no outstanding issues or irregularities in their payment history.

EMERGENCY LOAN

RES. NO. 500-04-24-2010-F

Guidelines for Emergency Loan (EL)

1. *The Emergency loan is available for Class A members only with more than Php10,000.00 share capital. The Management shall interview the applicant and a record of income and expenses from the applicant member shall be submitted.*
2. *Amount will be on a capacity base from a minimum amount of Php2,001.00 to a maximum of Php10,000.00.*

3. *Payable in one (1) month only.*
4. *An interest of 1.23% and service fee of 2.5% shall be deducted from loan proceeds. Interest and service fee shall be applied proportionally for delays in payment.*
5. *Class A – members who have never incurred delay in payment.*
6. *It was consensus of the body that a member who misses even 1 day payment only after the due date shall have their privilege suspended for six (6) months.*
7. *A member whose Emergency Loan is unpaid 90 days after availment shall be considered a Delinquent Member.*
8. *A member whose privilege is suspended for six (6) months of suspension shall be considered a delinquent member.*
9. *Patronage refund is not applicable on interest on emergency loan.*

The Paltok (SFM) Credit Cooperative (PCC) operates under a structured management system that ensures efficient service delivery, transparency, and accountability in all financial transactions. Each department performs specific roles essential to the daily operations of the cooperative. The following outlines the key personnel and their corresponding responsibilities:

Administrator / Manager

The Administrator or Manager oversees the overall operations of the cooperative. This position is responsible for implementing policies, managing staff performance, and approving all major financial transactions. Under the proposed system, the Administrator will also verify and approve online registration and loan applications.

Accounting Department

The Accounting Department maintains the cooperative's financial records, reviews teller transactions, and verifies payments made through bank partners or e-wallets. This

department ensures that all transactions are accurately recorded in the cooperative's accounting system. In current process accounting head is the responsible in all incoming online transaction.

Treasurer

The Treasurer manages the cooperative's cash flow, monitors fund disbursements, and ensures that all financial resources are properly allocated and safeguarded. This position works closely with the Accounting Department and the Manager in preparing financial statements and approving fund requests.

Cashier / Teller

The Teller or Cashier handles daily member transactions such as deposits, withdrawals, and loan payments. Using the existing FoxPro-based system, all teller transactions are automatically posted to the local server.

Loan Officer

The Loan Officer manages loan applications, verifies member eligibility, and prepares payment schedules. Currently, all loan processing is manual and paper-based. With the proposed system, the Loan Officer will evaluate online loan applications submitted through the web platform.

Liaison Officer

The Liaison Officer coordinates with external agencies, government offices, and partner financial institutions. This role includes document submission, permit renewal, and assisting in compliance-related activities. The Liaison Officer also supports

communication between departments to maintain workflow efficiency.

Collector

The Collector is responsible for visiting members within or outside the community to collect payments for loans, savings, or share capital contributions. This role helps facilitate transactions for members who are unable to visit the cooperative office regularly.

Maintenance Staff

The Maintenance Staff ensures that the cooperative's physical premises, facilities, and equipment are well-maintained. Their support contributes to the overall safety and cleanliness of the workplace, promoting a professional environment for both employees and members.

The Accounting Head is primarily responsible for managing all online transactions of the cooperative. She collects inquiries and submissions from various communication platforms such as Facebook, Yahoo Mail, Gmail, and Viber. Some members even send messages directly to the personal social media accounts of employees. After gathering all the messages, the Accounting Head segregates them according to their respective departments—Accounting, Loan Department, or Member Relations Officer—and stores them on her computer's local drive. These are then manually distributed to each department through the office network.

For transactions related to payments, the Accounting Head carefully examines the uploaded deposit slips or screenshots to ensure that the image is clear, stable, and readable for faster verification. She then cross-checks the transaction against the cooperative's bank passbook and the member's account record to confirm if the payment schedule is accurate. If there are late payments, she manually computes the fines and deducts them from the

deposited amount. Once verified, she acknowledges the member's payment by replying through the same communication channel and provides a breakdown of their transaction.

In the current system, the computation of penalties for delayed payments follows a cumulative penalty structure. This means that each unpaid balance continues to accrue a fixed monthly penalty until it is fully settled. The teller or accounting personnel manually checks the member's loan schedule and identifies overdue payments. After confirming the number of days past due—excluding the 5-day grace period applied to each due date except the last payment—the staff calculates the penalty amount. For instance, example if a member misses a payment in April, a fixed penalty amount is added each succeeding month until payment is made. As shown in the computation table, a ₱20 penalty accumulates monthly for every overdue amount or 2% of the remaining due amortization, resulting in a growing total the longer the delay continues. This process, while functional, is time-consuming and highly prone to human error since it relies on manual calculation. By automating this penalty computation through the proposed system, the cooperative can minimize manual workload, ensure accuracy, and provide real-time updates to both members and accounting personnel.

For the Loan Department, online loan form submissions are strictly monitored. The submitted loan application form must be completely filled out, clear, and readable; otherwise, it will be declined. Members are also required to submit a selfie while holding their passbook and a valid government-issued ID for identity verification. If the loan form is acceptable, it proceeds to the loan processing stage, where the Loan Supervisor computes the net proceeds manually using Microsoft Excel. These rates are computed on the loan's principal amount and are designed to maintain fairness and sustainability within the cooperative's lending operations. The increment in interest and service fees for longer terms reflects the increased financial risk and administrative cost associated with extended repayment periods.

According to **Section 2 – Condition of Loans** of the *Articles and By-Laws of Paltok (SFM) Credit Cooperative*, the **Board of Directors** shall prescribe the terms and conditions

governing the granting of loans. This includes determining the maximum amount that may be granted to a member, the rate of interest which is set at **1.25% per month** based on the remaining balance deducted in advance along with the fines for payment defaults, the maximum period of repayment, and other factors that facilitate efficient loan operations. Furthermore, these regulations are established to safeguard the interests of both members and borrowers. Members who settle their outstanding obligations before the end of the loan term are not entitled to any refund of interest or related charges. In determining the applicable rate of interest, the Board shall be guided by the cooperative principle of service above profit, ensuring that lending operations remain fair, ethical, and aligned with the organization's mission to promote mutual financial support among its members.

SECTION 2. Condition of Loans. The Board of Directors shall prescribe the terms and conditions for the granting of loans, the maximum amount that may be granted a member, the rate of interest at 1.23% per month based on remaining balance deducted in advance, fines for payment in default, maximum period of payment and all other factors that will facilitate the loaning operation and safeguard the interest of the members and the borrowers. Members who shall pay their outstanding obligations before the end of the loan term are not entitled for refund of interest or any part thereof.

In determining the rate of interest, the Board shall be guided by the overriding principles of service above profit.

Figure 2 Section 2 of the by laws of Paltok (SFM) Credit Cooperative

After computation, the supervisor forwards the form to the manager for checking and approval. The final step is handled by the Accounting Department, which issues the corresponding check to the teller for disbursement. The approved loan amount is then credited to the member's bank account or e-wallet.

Interview with the Accounting Head

To gain a deeper understanding of the internal challenges faced by the cooperative, an interview was conducted with **Ms. Cheryl Marie B. Lanceta**, Accounting Department Head of Paltok (SFM) Credit Cooperative, on **October 15, 2025**, at the cooperative office.

The discussion focused on the accounting department's operational concerns, particularly the burden of managing the growing volume of daily online transactions, including online payments and digital submissions of loan application forms. The interview also explored the department's readiness and adaptability toward digital transformation, emphasizing the need for a more organized and centralized system to improve workflow efficiency and accuracy.

Ms. Lanceta emphasized that digitalization would bring significant advantages to the cooperative, especially now that many members reside outside the community or are occupied with work. She noted that digital transformation would "help speed up services and make transactions more accessible for members," but also acknowledged existing difficulties in verification, manual checking and organizing online transaction.

According to Ms. Lanceta, one of the persistent challenges faced by the department is the manual verification of member inquiries and loan forms received through Facebook Messenger or email. Many members send transaction slips or scanned loan applications online, but the accounting head is the only have the access on the official social media platform of the company as per their policy because the other department are not allowed to see the accounting transaction.

She added that a secure online document management system would be highly beneficial to both the accounting and other departments. Having a standardized format for online loan form submission and a secure document upload feature similar to institutional platforms such as PAG-IBIG would simplify their verification process. She explained that such a system would not only ensure convenience for members but also provide safety and authenticity for the cooperative's operations.

Ms. Lanceta concluded by expressing optimism about the study, saying that if the system were developed successfully, it would greatly assist the cooperative's accounting department daily workload operations and help both staff and members experience genuine progress toward modernization and transparency.

Transcript of Interview with Accounting head

Interviewer: Raul Verano

Interviewee: Ms. Cheryl Marie B. Lanceta, Accounting

Date: 10/15/2025

Location: Paltok (SFM) Credit Cooperative Office

Raul: Good morning, Ma'am. Gusto ko lang po sanang malaman kung ano po sa tingin ninyo ang mas makakabuti para sa cooperative pagdating sa digitalization?

Ms. Lanceta: Good morning, Raul. Sa totoo lang, maganda talaga ang digitalization para sa cooperative, lalo na ngayon na marami sa mga miyembro natin ay nasa labas ng community o busy sa trabaho. Malaking tulong 'yan para mapabilis ang serbisyo. Pero syempre, may mga problema rin kaming nae-experience.

Raul: Ano po 'yung mga problema na 'yon, Ma'am?

Ms. Lanceta: Halimbawa, 'yung mga miyembro na nag dedeposit sa bangko o kaya bank transfer hindi sila pare parehas ng pinag sesendan minsan sa facebook minsan sa email, kahit nga sa personal na account ng employado nag sesendan sila, siyempre ang hirap I monitor lahat ng platform na un, e madami din kaming ginagawa, maraming trabaho ang accounting lalo na financial institution tayo ndi kami makafocus sa trabaho namin, kaya minsnsa meron kaming hindi na acknowledge na deposit kasi nga hindi ko Nakita yung deposit na un. Tapos hihimay himayin ko pa yun kasi hindi lahat sa accounting meron din sa loan department minsan meron din sa members relation department, kaya kung mag kakaroon lang Talaga kami nang iisang platform tapos automatic mapupunta sa kanya kanyang department ang bilsis nun, tapos pag na automate din ung pag compute naming ng fines and loan deductions, bibilis Talaga trabaho namin ang mababawasan din ang workload ng accounting department.

Raul: Ah, so 'yun po talaga 'yung main concern?

Ms. Lanceta: Oo, kasi mahirap talaga ung proseso naming ngayon, antagal na ng kooperatiba pero hanggang ngayon may mga manual pa din kami, nalampasan na kami ng ibang mga batang kooperatiba. Sila puro automated na ang workflow nila. Meron akong alam na kooperatiba meron silang management platform dun sila nag sha share ng mga work, and paperless na sila,

Raul: So ibig sabihin, Ma'am, kung magkakaroon ng platform like web-based application na kung saan lahat ng online submission ng documents dun mapupunta tapos automatic na mapupunta sa kanyan kanyang department at automation ng computation ng fines and loan deductions malaking tulong po 'yon sa accounting at sa ibang department?

Ms. Lanceta: Oo, malaking tulong talaga. Pramis, saka panahon na din na pumasok kami sa paperless kasi sobrang daming document na hardcopy ang kooperatiba.

Raul: Salamat po, Ma'am sa time. Malaking tulong po ito sa study namin para mas ma-identify kung ano talaga ang dapat i-improve sa ating cooperative.

Ms. Lanceta: Walang anuman, Raul. Sana nga ma-develop 'yang system na 'yan kasi malaking tulong talaga sa operation ng koop yan, abangan naming yan

Verified by Interviewee:


Ms. Cheryl Marie B. Lanceta
ACCOUNTING-PALTOK(SFM)CREDIT
COOPERATIVE

Figure 3 Transcript of Interview with the Accounting head

Addressing these operational challenges requires an innovative yet practical solution that leverages the cooperative's existing infrastructure while introducing advanced digital technologies. The proposed **Web-Based Transaction and Loan Management System**

with AI Powered Document Enhancement for Paltok (SFM) Credit Cooperative aim to provide members with a centralized, secure, and efficient platform for uploading transaction slips, submitting loan applications, and managing their financial records online. This system is especially beneficial for members who are residing outside the community, working abroad, or have limited time to visit the cooperative office in person.

The integration of **artificial intelligence (AI)** will automate document enhancement and verification, ensuring that uploaded proofs of payment and loan forms are clear, readable, and accurate.

By bridging the cooperative's technological gap, this study aims to enhance accessibility, improve workflow efficiency, and promote transparency within the organization. Beyond Paltok (SFM) Credit Cooperative, this system serves as a scalable and cost-effective digital transformation model that other community-based cooperatives may adopt to modernize their services and improve operational performance.

Overview of the current state of the technology

The company has been using a basic accounting system since the early 2000s. The system is primarily used to record member transactions over the counter. The teller or cashier identifies each transaction as a deposit, payment, or withdrawal, then enters the member's unique passbook number to access their account.

For *loan payments*, the teller reviews the borrower's payment schedule and determines whether penalties should be applied for late payments. A five-day grace period is granted for each due date, except for the final payment, which must be settled on or before the specified due date. If the payment exceeds the grace period, the teller manually computes the corresponding fines by counting the number of days past due and applying the appropriate penalty rate based on the cooperative's standard computation procedure.

For *loan applications*, members fill out a loan form, and the loan clerk evaluates the member's credit capacity based on their share capital and savings. If eligible, the loan clerk manually computes the loanable amount using Microsoft Excel according to the official

rate. The results are then encoded into the current accounting system, which generates the payment schedule. The manager reviews the documents and computations, while the accounting department performs the final verification and issues a bank check. The teller or cashier then releases the funds, depending on cash availability.

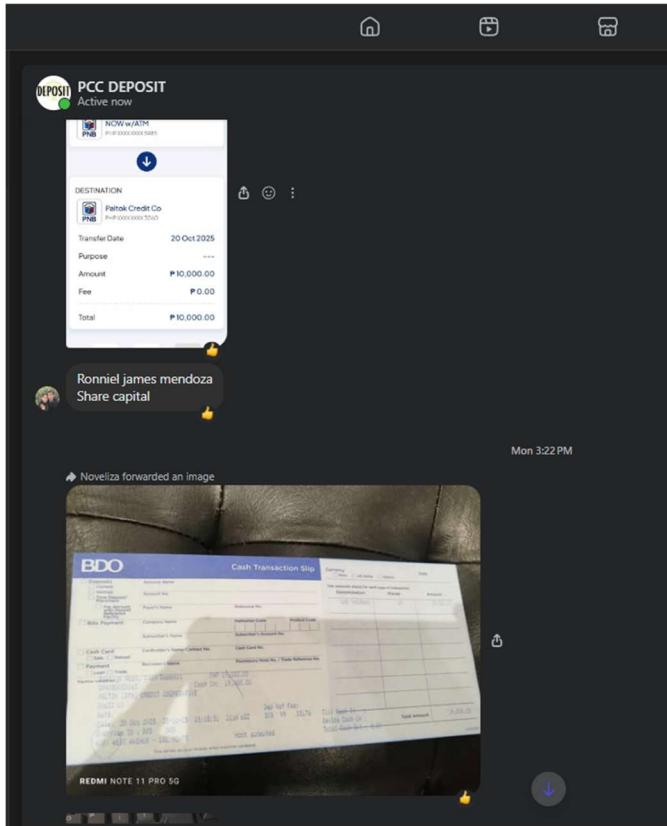
For *members depositing or paying via bank* (over the counter or online transfer), they inform the company through its official Facebook page or email. Some members also call the office to confirm their deposit. They provide a photo of the deposit slip indicating whether the payment is for savings, share capital, or loan payment.

RES. No. 500-09-22-2018-E

Payment of Loans/Deposit Through Bank

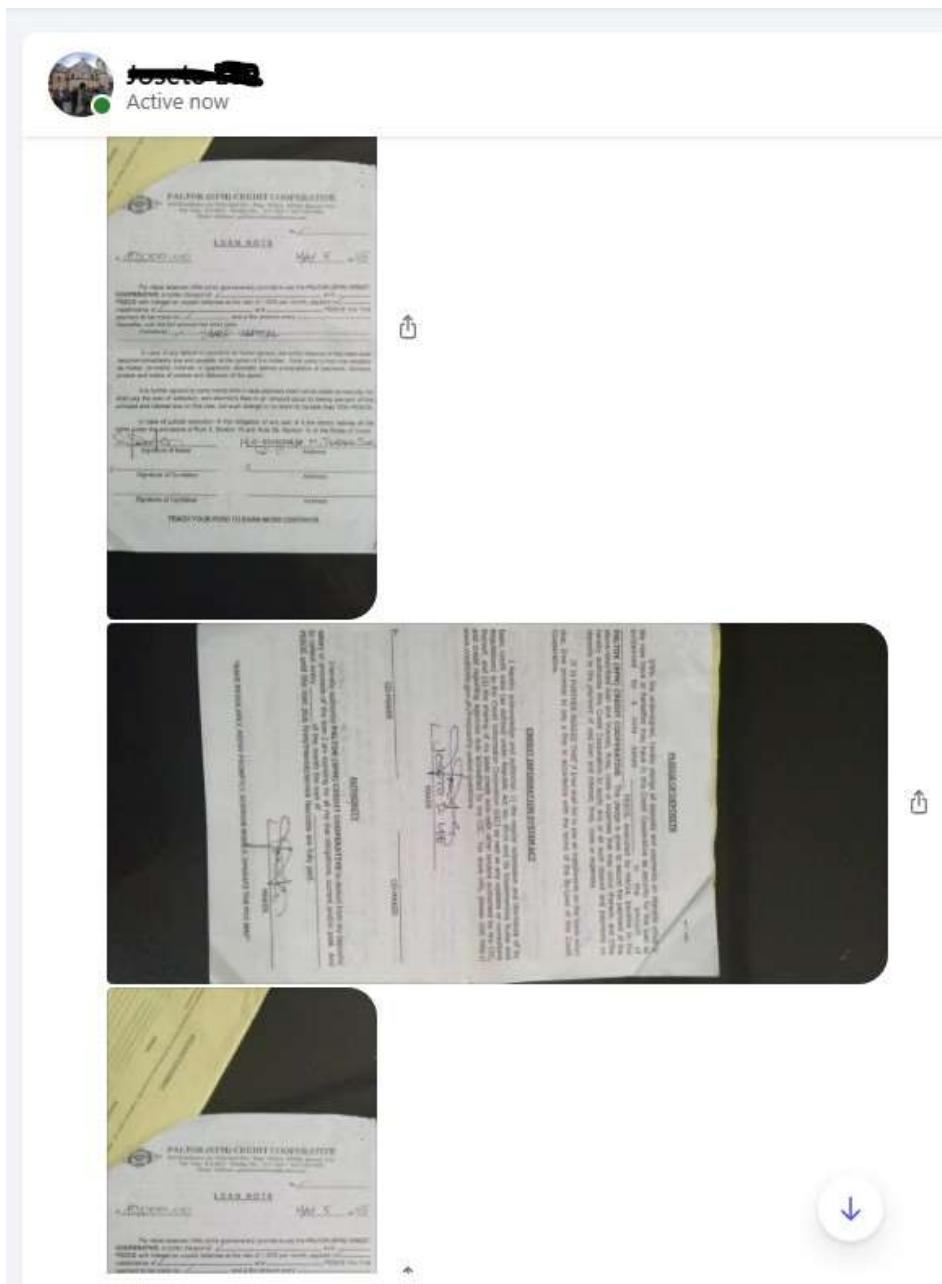
The Members who repay their loans or make deposits through bank must show their deposit slips as evidence before the amount can be credited / applied to his / her account.

Figure 4 Members Proof of Deposit sent Thru FB Messenger



However, the company does not have a proper documentation system for online transactions. The photos of deposit slips and transaction proofs are only saved on the office computer. If the computer malfunctions or needs to be formatted, all saved photos are permanently deleted. The bookkeeper also lacks proper documentation procedures regarding these online transactions. All online deposits are manually recorded in the accounting department's logbook with the printed copy of deposit slips or transaction slips. Regarding online loan applications, the company currently lacks a formal procedure for accepting them. Members usually send their filled-out loan form and an authorization letter for crediting the loan proceeds to their designated e-wallet or bank account through the official Facebook page, email, or even personal social media accounts of employees. Members are required to send clear and stable photos of all three pages of the loan application and authorization forms, ensuring all signatures are visible. However, some members encounter issues such as misaligned or blurry photos, or incomplete information. Once the documents are confirmed, the loan clerk manually computes the loan amount using Microsoft Excel based on the requested amount.

Figure 5 Loan Application form of member sent thru Facebook Messenger



At present, the online requests are reviewed by the accounting head only, who manually forwards them to the appropriate department for processing.

Table 4 Use Case and Description of Paltok Credit Cooperative

Use Case	Descriptions
Walk in Transaction processing	<i>The member visits the cooperative to perform a transaction (deposit, withdrawal, or inquiry). The teller encodes the transaction into the <u>Accounting</u> system, which automatically posts the entry and stores it in the local server. An official receipt (OR) is printed for the member.</i>
Loan Application Submission	<i>Members manually fill out paper-based loan forms and submit them to the loan officer. The loan officer verifies eligibility, encodes loan details into the <u>Accounting</u> system, prints the loan schedule, and issues a withdrawal slip for loan release.</i>
Balance Inquiry	<i>Members inquire about their account balances by visiting the office, calling, or sending messages through Facebook Messenger or email. Due to message volume and manual checking, responses may be delayed or missed.</i>
Data Storage and Posting	<i>All teller or cashier transactions are automatically posted to the local Accounting System server. Accounting staff are responsible only for verifying payments made through external channels such as bank partners or e-wallets, which members must report by sending transaction slips via Facebook Messenger or email.</i>
Passbook Update	<i>Members present their passbooks at the cooperative for manual updating. Balances are printed, requiring the member's physical presence at the office.</i>

Withdrawal & PCL Process Flowchart:

Process Flow	Activities
<pre> graph TD A((A)) --> B[WITHDRAW OR PCL] B --> C[VERIFICATION OF RECORD] C --> D{ELIGIBLE?} D -- NO --> A D -- YES --> E[VOUCHER AND CHECK PREPARATION] E --> F[APPROVAL OF THE AUTHORITY] F --> G[RELEASE OF PROCEEDS] </pre> <p>The flowchart illustrates the process for withdrawal or PCL. It begins with a member informing the Cashier about their transaction. The Cashier then verifies the member's record. An eligibility check follows, leading to one of two paths: if 'NO', the process loops back to the start; if 'YES', it proceeds to voucher and check preparation, followed by approval of the authority, and finally the release of proceeds.</p>	<ol style="list-style-type: none"> 1. The member will inform the Cashier if he/she is going to attend withdraw from his/her deposits or make a loan for PCL or both. 2. The Cashier will verify his/her record if he/she is eligible to his/her transaction. If not eligible, the Cashier will explain it to the member. 3. If eligible, the Cashier will prepare a voucher for his/her transaction. If he/she will withdraw more than Php4,000.00 the Cashier will request a check to the Finance Officer. 4. The voucher must be signed for the approval of the Authorized person before the releasing of his/her transaction. 5. The Cashier will release the proceeds of his/her transaction.

Table 5 Process Flow and Activities of Paltok (SFM) Credit Cooperative in Withdrawal and PCL

Loan Process Flowchart:

Process Flow	Activities
<pre> graph TD A((A)) --> BA[LOAN APPLICATION DOCUMENTATION] BA --> CB[VERIFICATION FOR COMPLETENESS] CB --> DC{COMPLETE?} DC -- NO --> CB DC -- YES --> EA[RECORDS VERIFICATION] EA --> FA[CERTIFIED BY THE LOAN CLERK] FA --> GA[NOTED BY THE MANAGER / TREASURER] GA --> HA[CREDIT COMMITTEE FOR APPROVAL OR DISAPPROVAL] HA --> I1[/1/] </pre>	<ol style="list-style-type: none"> 1. The loan applicant submits filled up application form together with passbook and other supporting documents as needed / required to the applied loan to the Office Clerk. 2. The Office Clerk makes an initial assessment of the loan application in terms of completeness of data, signatures and documents required. If not complete, the application must be return to the applicant. 3. When application documents are complete,, the Office Clerk checks/verify the records of the applicant and his/her co-maker for existing loans and deposits. Then turn-over the application to the Loan Clerk. 4. The Loan Clerk gives remarks / endorsement / notation about the records of the applicant. 5. Loan application is noted by the Manager or Treasurer. 6. Once loan eligibility and loanable amount is determined from records, the application is forwarded to the Credit Committee for approval or disapproval of the loan application. If the applicant is a new borrower, he/she must fill-up personal data sheet, then the CRECOM will conduct an interview and CI. If the loanable amount is above the approving authority of the CRECOM, the loan application is endorsed to the Board of Directors for approval

Table 6 Process Flow and Activities of Paltok(SFM) Credit Cooperative in Loan Processing

Process Flow	Activities
<pre> graph TD 1{1} --> Decision{APPROVED / DISAPPROVED} Decision -- YES --> Clerk[LOAN CLERK FOR COMPUTATION] Clerk --> Certified[CERTIFIED THE COMPUTATION] Certified --> Check[CHECK FOR THE APPROVED LOANS] Check --> Voucher[VOUCHER AND CHECK PREPARATION] Voucher --> Release[CHECK RELEASE] Decision -- NO --> Returned[RETURNED TO APPLICANT] </pre>	<p>7. Once loan applications are approved, the Loan Clerk will make a computation for the net proceeds. If the application was disapproved, the Loan Clerk will return the application to the applicant and explain the remarks/reason of the Credit Committee.</p> <p>8. The Accountant will certify the computation of loan done by the Loan Clerk.</p> <p>9. The Finance Officer will give the check to the Cashier.</p> <p>10. The Cashier will prepare the voucher and check.</p> <p>11. Check is released by the Cashier to the member.</p>

Table 7 Process Flow and Activities of Paltok(SFM) Credit Cooperative in Loan Processing

Statement of the Problem

General Problem:

How to create a centralized web-based system that consolidates all member online transactions, enhances document verification accuracy through AI, and minimizes the manual processing burdens currently faced by the Accounting and Loan Departments?

According to the conducted interview, the Accounting Department Head explained that the current process of submitting online deposits and loan applications through Facebook Messenger and email and even in the employee personal social media account is difficult to manage, particularly during the verification stage. As of October 2025, the number of electronic documents and online transactions has increased to an average of 200 per day, compared to virtually none in 2020. This significant rise has greatly increased the workload of the Accounting Department, making transaction monitoring and verification more time-consuming and difficult to manage manually. Many members use aliases or alternative names on social media platforms, making it challenging to accurately identify and validate the sender, further complicating tracking and documentation and may lead to double posting. This practice occasionally results in unforwarded or misplaced documents, causing processing delays and disorganized records.

To demonstrate how the system replaces manual financial processing, the following figures present the existing method used by the cooperative in computing loan proceeds and penalties. These samples illustrate the traditional Excel-based calculations performed by the Accounting Department when evaluating loan applications and determining applicable deductions, service fees, interest rates, and net proceeds. Likewise, the penalty computation table shows how fines are manually calculated based on the member's remaining monthly due and the number of days past the scheduled payment date.

These examples represent the current manual workflow that the proposed system aims to automate, ensuring consistent, accurate, and efficient computation while reducing the risk of human error. The succeeding figures provide a clear basis for comparison between the

manual process and the automated computation module integrated into the proposed Web-Based Transaction Management System.

Account of:		Amortization Schedule					
Type of Loan	RL	Principal Loan	A	20,000.00	Member's Name:	-	RL
Loan Amount					Loan Type:		
Less:					Loan Amount:	20,000.00	
Unearned Interest	2.46%	492.00			Terms:	3 mos	
Service Fee	1.50%	300.00			Monthly Amort.:	6,666.67	
Filing Fee	0.50%	100.00					
LRF	0.50%	100.00					
SC	1%	200.00	B	1,192.00			
		A - B		18,808.00	Date	Amortization	Balance
Less: Other Deductions					November	30 2025	20,000.00
					December	30 2025	6,666.67 13,333.33
					January	30 2026	6,666.67 6,666.67
					February	30 2026	6,666.67 -
							I hereby agree on amortization schedule of my loan.
Net Amount		Net Proceeds		18,808.00			
Terms:					Member-Borrower		
Date of 1st Payment:					Date:		
Date of Loan							

If payment has been made, please call us the details of your payments: Passbook No., OR Nos. at 371-60-77 or fax your Official Receipts or Deposit slip in case you deposited thru our depository bank at 371-12-58, for confirmation of your payment.

Figure 6 Computation of Regular Loan Thru Spreadsheet

Computation of penalties for delayed payments										
	Payments	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total Amount Due
Jan	1,000									
Feb	1,000									
Mar	1,000									
Apr	0	1,000								1,000
		20	20	20	20	20	20	20	20	160
May	0		1,000							1,000
			20	20	20	20	20	20	20	140
Jun	0			1,000						1,000
				20	20	20	20	20	20	120
Jul	0				1,000					1,000
					20	20	20	20	20	100
Aug	0					1,000				1,000
						20	20	20	20	80
Sep	1,000									
Oct	1,000									
Nov	1,000									5,600
Dec	1,000									6,600

Figure 7 Computation of penalties for delayed payments

Specific Problems:

How to create a module that will develop to centralized and monitor all online transaction across multiple digital channels?

According to the Business Commerce Institute (n.d.), decentralized filing systems often lead to inconsistent standards, as different departments may develop incompatible methods of organizing and storing documents. This inconsistency makes it difficult to share information efficiently or perform organization-wide searches, ultimately reducing productivity and transparency within the organization. Furthermore, Smart-IT (n.d.) emphasized that implementing an Electronic Document Management (EDM) system not only helps organizations reduce operational costs but also enables the creation of more transparent and secure processes. Such systems are crucial for improving competitiveness and minimizing risks in today's dynamic digital environments. When members submit their proof of deposits or loan applications through Facebook Messenger, email, or even the personal social media accounts of employees, the Accounting Head is tasked with gathering all these documents from multiple platforms, compiling them manually, and verifying their authenticity before forwarding them to the respective departments. This decentralized and repetitive process makes it difficult to maintain organized records, consumes a significant amount of time, and increases the risk of overlooking, double posting or misplacing transactions due to the high volume of inquiries received daily.

The Accounting Head manually checks messages from members sent through various social media platforms or directly to employees. After gathering all transactions, the Accounting Head determines whether each transaction is intended for the Accounting Department, Loan Department, or Member Relations Department, and then manually distributes them accordingly. This process is time-consuming and adds to the daily workload of the accounting operations, which are already heavily burdened with multiple responsibilities.

How to create a module that automatically and accurately compute the loan proceeds of the members?

The different type of loan and terms affects the computation of proceeds. After getting all the information of loans, the terms, amount, type of loan, the calculations of the net proceeds of the member are calculated by the Loan supervisor manually, which can be time consuming and can cause inaccuracies due to human error. The current system does not have the capability of automatically calculate the net proceeds since its only made for monitoring of deposits and loan schedule of payment

When calculating deductions for the net proceeds, the loan supervisor needs to open a spreadsheet and manually enter the principal loan amount. This process is time-consuming, especially since there are different types of loans and varying deduction percentages. Due to the loan system follows an *advance interest rule*.

How to create a module that automatically and accurately compute payment fines?

When the teller or cashier receives the member's account details and discovers that the account is overdue, they manually count the number of delayed days and apply the corresponding percentage of fines. This process can be time-consuming, especially for accounts that are several months or even years past due and delinquent accounts.

How to create a module that enhance uploaded proof-of-payment and deposit documents using AI to support faster and more accurate verification by the Accounting Department?

While the accounting head checking all submitted documents, Accounting head use a photo editor to edit the image into printable image to have a clean, readable hardcopy for internal documentation.

How to create a module that will generate the reports (online deposits in specific partner bank, submitted loan for the specific month and type of loan, total loans via online)?

After the Accounting Head records all online payments and distributes other inquiries to their respective departments, he verifies the ownership of each bank deposit on the

following day. He ensures that all online deposits appear in the bank passbook. All successful deposits are then manually recorded in a logbook, followed by the preparation of a report showing the total bank balance and total online transactions. The report must have no floating amounts. A floating deposit occurs when a member makes a deposit but fails to send the proof of transaction slip, sends it through an unmonitored platform, or uses an alias on social media or email. This verification process is time-consuming, as the Accounting Head must cross-check various platforms to ensure all deposits are properly accounted for and no floating amounts remain in the bank records. Meanwhile, the Loan Supervisor stores all online loan applications on his computer, verifies the information in the submitted photos and print it then manually records the loan type, amount, and date of release in a spreadsheet then convert to pdf. These online loan entries are then merged with reports from walk-in loan applications. This manual reporting process is time-consuming and prone to human error, especially during the consolidation of online and walk-in loan data.

Objectives of the study

General Objective:

To create a secure, centralized web-based transaction management system that consolidates all member online submissions into one (1) platform, incorporates AI-driven document enhancement for accurate verification, and reduces the manual processing workload of the cooperative's Accounting and Loan Departments.

The proponents will develop a system that centralizes all online submissions—such as transaction slips, deposit confirmations, and loan applications—into a single, secure platform to improve efficiency, accuracy, and transparency in processing member transactions. In addition, the system will include features that support the day-to-day operations of the Accounting and Loan Departments by automating the computation of loan net proceeds and penalty charges, thereby reducing manual workload and minimizing processing errors.

Specifically, the system will utilize Artificial Intelligence (AI) to automate document enhancement and assist in the verification process, ensuring that uploaded files—such as deposit slips and loan application documents—are clear, readable, and valid before undergoing review. The system will also feature automated computation modules for loans and penalties, enabling the Accounting and Loan Departments to accurately calculate loan proceeds, interest charges, and fines for both online and walk-in transactions without the need for manual computation.

Specific Objectives:

To create a module that will centralize, monitor, verify and acknowledge all online transactions such as deposit slips, loan applications, and other inquiries and member request in real time

The proponents will develop a centralized module that consolidates all online submissions such as uploaded transaction slips, loan applications, and member inquiries into a single, secure web-based platform. This eliminates the need for members to send transactions through multiple channels such as Facebook Messenger, email, or personal employee accounts. The module will streamline data flow by storing all digital submissions in a unified database accessible only to authorized personnel. A transaction monitoring dashboard will allow departments to view, verify, approve, or reject submissions directly, with the system automatically notifying members of the status of their transactions. This centralization improves accuracy, department coordination, and prevents overlooked or duplicate entries.

To create a module that will enhance uploaded files using Artificial Intelligence (AI).

The proponents will design an AI-enhanced uploading feature that automatically improves the quality of submitted documents by removing unnecessary backgrounds, flattening pages, and applying filters to make images clearer and more readable. This module ensures

that uploaded deposit slips and loan forms meet the required quality for verification, reducing delays and human errors. By automating document enhancement, the AI feature allows faster validation by the Accounting Department and ensures consistent quality control across all submissions.

To create a module that will automate the computation of loan proceeds and applicable fines.

The proponents will develop a computation module capable of automatically calculating loan proceeds based on standardized cooperative rates, including interest charges, service fees, filing fees, LRF, and mandatory share capital build-up. The same module will calculate fines for late payments using the cooperative's penalty rules, including the five-day grace period and 1–2% cumulative charges. This automation reduces the manual workload of the Accounting and Loan Departments while ensuring consistency, accuracy, and fairness in all financial computations.

To create a module that will generate reports and analytics of online transactions for management review.

The proponents will design a reporting module that compiles and summarizes essential operational data, such as total loan applications, online deposits per partner bank, and approved transactions within a specified period. The module will allow reports to be exported in PDF or Excel formats. These analytics will provide administrators with clear insights into online transaction trends and operational performance, supporting data-driven decision-making within the cooperative.

Scope and limitations of the study

This study focuses on the development of a Web-Based Transaction Management System

enhanced with Artificial Intelligence (AI) to support the digital operations of Paltok (SFM) Credit Cooperative. The system is designed to provide a centralized, secure, and efficient platform for managing member registrations, online deposits, loan applications, and loan payments. It replaces the cooperative's decentralized online process—previously conducted through Messenger, email, and personal employee accounts—with a unified digital environment dedicated to online transactions.

For internal operations, the system features an Admin Dashboard that streamlines the workflows of the Accounting Department, Loan Department, and Management. Key processes such as deposit verification, fines computation, loan evaluation, loan approval tracking, and loan release status updates are centralized to strengthen accuracy, security, and accountability. The system ensures that **no financial transaction is auto-posted**, thereby preserving the Accounting Department's critical role in validating and approving all monetary entries.

AI technologies are integrated to improve the clarity of uploaded documents and assist staff in verifying proofs of payment, deposit slips, and other member-submitted files. The system also automates loan computation, penalty calculation, and the generation of PDF loan computation sheets, reducing manual errors and improving overall financial precision.

The system includes a comprehensive Member Dashboard, which serves as the primary interface for cooperative members. After completing the online registration process, members can access their accounts to view real-time balances for Share Capital, Savings, and Time Deposits. The dashboard also allows members to submit online deposit forms, upload proof of payments, file loan applications, monitor current loan balances, review amortization schedules, and track loan application statuses.

In addition to transactional features, the Member Dashboard also serves as an information and engagement platform. It displays the **Cooperative's History, Vision and Mission**, and updated **news, announcements, and advisories**. Promotional materials and informational content may also be showcased, including **Pre-Membership Education (PME) video presentations** designed to educate and encourage prospective members before registration. This transforms the dashboard into a comprehensive digital orientation

tool, reducing the need for physical briefings and increasing member awareness about the cooperative's programs and services.

Overall, the project aims to minimize the manual workload of the Accounting and Loan Departments, reduce processing delays, and improve operational efficiency, accuracy, and accountability across the cooperative's digital transaction processes.

User Levels

The system has five (5) user levels, namely Admin, Accounting Head, Loan Officer, Member, and Guest.

The *Admin Level* has access to all modules in the system, including the account verification, transaction management. The admin is responsible for managing user accounts, approving member registrations, verifying transactions, and ensuring the overall integrity of the system. The admin also has access to the file maintenance module, allowing the addition, updating, and deletion of data records stored in the database. The *Accounting Head Level* has access to modules that handle the validation of payment transactions, verification of uploaded deposit slips, and monitoring of online inquiries. The Accounting Head can generate financial reports, verify loan payments, compute penalties, and update transaction statuses. This user level ensures accuracy and accountability of all transactions, including fines computation and the proper posting of verified deposits. The *Loan Officer Level* has access to the loan processing modules, which include reviewing online loan applications, evaluating member eligibility. The Loan Officer also coordinates with the Accounting Head for fund release and with the admin for final verification of approved loans. The *Member Level* is designed for cooperative members who have successfully registered in the system. Members can log in using their verified credentials and view their transaction history, including deposits, payments, and loan status. They can also upload transaction slips or proof of payment, submit online loan applications, and receive notifications once their submissions are verified. Members can also track their loan balances, share capital, savings, time deposits and loan schedules. The *Guest Level* will have limited access intended for the management staff who need to view basic member

information for verification and communication purposes. Users under this level can view a member's full name, address, contact number, government-issued identification, and current job information. This allows them to verify member details or reach out for official communication when necessary. However, the Guest Level cannot update member requests, access uploaded documents, or perform any transaction-related activities within the system.

Front-End Modules

Login Module

This module serves as the secure entry point for all system users, including the Admin, Accounting Head, Loan Officer, Manager, and Member. Upon accessing the system, users select their login type—Member or Management Staff—ensuring that each user is directed to the appropriate dashboard and role-based system privileges. For security, all first-time users must change their default password upon initial login. A built-in “**Forgot Password**” feature allows users to reset their credentials through their registered email address, ensuring secure account recovery and preventing unauthorized access.

Registration Module

This module enables legitimate cooperative members to register for online access by providing their **Passbook Number**, **Full Name**, **Contact Number**, and **Email Address**. Upon submission, the system generates and sends a **One-Time Password (OTP)** to verify the member's identity. Once the OTP is validated, the registration request is forwarded to the Admin for approval. This ensures that only legitimate, verified members—who have already completed the Pre-Membership Education Seminar (PMES) and received their assigned Passbook Number—can access the system.

Home Page Module

The home page dynamically displays the available modules based on the logged-in user's role.

- **Members** can access their dashboard, view balances (Share Capital, Savings, Time Deposits), upload transactions, apply for loans, and track their loan status.
- **Management Staff** such as Admin, Accounting, and Loan Personnel can access verification modules, loan processing tools, system logs, and reports.

This role-based display ensures ease of navigation and prevents unauthorized access to restricted system features.

Transaction Upload Module

This module allows members to upload images, screenshots, or scanned copies of their deposit slips, loan payment proofs, and other required documents. The integrated AI-powered enhancement engine automatically improves clarity by correcting brightness, removing noise, straightening the document, and detecting incomplete or unreadable portions.

- If the document is enhanced successfully → forwarded for verification.
- If the AI detects missing information or unreadable content → the system alerts the member to re-upload a clearer document.

This automation ensures faster verification and reduces manual workload for the Accounting Department.

Online Loan Application Module

This module allows members to file their loan applications online by completing the required fields such as loan type, amount, term, and purpose.

The module automatically checks:

- Whether the member has paid at least 50% of their existing loan;
- Whether the requested amount exceeds the member's Share Capital;
- Whether a co-maker is required.

After submission, members can view their loan application status (Acknowledged, For Approval, Approved, Released) through their dashboard. The approved application is also automatically formatted as a printable loan form for cooperative processing.

User Profile Module

This module displays and manages the member's personal and demographic information, including contact number, address, government IDs, work details, spouse details, and dependents.

Members may update their information, subject to verification by the Admin to maintain data integrity and comply with cooperative policies.

Back-End Modules

File Maintenance Module

This module manages all critical system data including User Accounts, Loan Records, Member Profiles, Transaction Logs, and AI Enhancement Logs.

Key features include:

- Adding, updating, deactivating, or revalidating member and staff accounts
- Managing reference tables such as loan types, bank partners, interest rates, and service fees
- Handling database backups and cleanup routines
- Logging all administrative actions for audit compliance and traceability

This module ensures that system data remains accurate, secure, and well-maintained.

AI Verification Module

This module automates the validation of uploaded files through AI-based document enhancement and analysis. It performs the following tasks:

- Enhances document clarity for better readability

- Detects tampering, blurred text, or missing details
- Flags unreadable or suspicious documents
- Routes questionable files for **manual review** by the Accounting Head

This hybrid AI + human verification approach ensures accuracy, prevents fraud, and protects financial integrity.

Report Generation Module

This module allows the Admin, Accounting Head, Loan Supervisor, and Manager to generate comprehensive operational reports such as:

- Daily deposit summaries
- Verified payments and pending transactions
- Monthly loan applications, approvals, and releases
- Time deposit earnings
- Member masterlists and transaction history

Reports can be exported in **PDF** or **Excel**, making them suitable for documentation, board meetings, and audits.

Notification Module

This module manages system alerts and communication between users.

Key notifications include:

- Transaction status updates (Verified, Rejected, For Review)
- Loan application progress
- AI enhancement issues requiring re-upload
- Admin alerts for pending verifications
- Email and in-system notifications for all critical events

This module ensures efficient and timely communication across departments and between the cooperative and its members.

Limitations:

1. The system does not automate loan approvals or releases.
2. The system does not automatically deposit loan proceeds to members' bank accounts.
3. The system is not integrated with external banking platforms or third-party payment gateways.
4. The system does not process withdrawals.
5. The system is limited to internal operations and member-initiated online transaction. External integrations such as automated bank API's SMS notifications, and mobile app versions are not included in this phase of development.

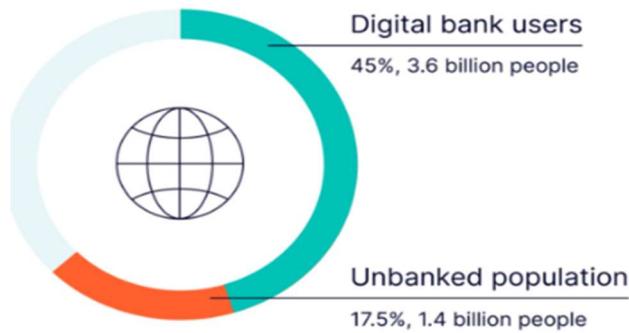
LITERATURE REVIEW

Review of related literature, studies, or systems

Integration in Digital Financial Systems

In recent years, the financial industry has undergone rapid digital transformation through the adoption of web-based systems, mobile banking. Digitalization has improved accessibility, accuracy, and efficiency in financial transactions, enabling institutions to provide faster and more transparent services. According to SEON's *Neobanking Index: The State of Digital Banks in 2023–2025*, the Asia-Pacific (APAC) region continues to lead the global shift toward digital banking. Customers increasingly demand seamless online experiences, data security, and transparency from financial service providers (SEON, 2025).

Global Population Banking Usage



The report highlights that more users are engaging with neobanks — fully digital financial institutions — due to the convenience of remote transactions, 24/7 accessibility, and lower operational costs. However, it also emphasizes that fraud prevention, digital onboarding, and identity verification remain major challenges. These challenges mirror those of cooperatives like Paltok (SFM) Credit Cooperative, where verification issues and decentralized message-based transactions lead to inefficiency and confusion.

Artificial Intelligence (AI) in Automation of Document and Transaction Processing

According to IBM (2020), the integration of artificial intelligence in document automation provides several key benefits such as improved operational flexibility, faster processing of verification and compliance tasks, reduced manual labor, and increased organizational efficiency. The study further emphasized that AI-driven systems accelerate digital transformation by automating repetitive data-handling tasks, enabling organizations to allocate human resources to higher-value work.

According to Revan Siddappa and Bhadurgatte (2021), AI-powered Document Management Systems (DMS) utilize technologies such as machine learning, natural language processing (NLP), and optical character recognition (OCR) to automatically classify, extract, and organize information from uploaded documents. This process significantly improves accuracy, speeds up data retrieval, and ensures proper documentation management.

Furthermore, a systematic study by Springer (2023) found that integrating AI into administrative procedures minimizes human error, enhances transparency, and improves verification accuracy within organizations. It also promotes consistency in processing large volumes of transactions and documents while maintaining data integrity and compliance with institutional standards.

Electronic Document Management Systems (EDMS) also contribute to operational efficiency. Cognidox (2023) explains that EDMS prevents “document anarchy” through structured filing, access control, version management, and centralized storage. These features address the disorganized and decentralized document submissions typically encountered in cooperatives using multiple communication platforms.

The proposed SMART COOP system addresses these gaps by combining AI-powered document enhancement, EDMS features, centralized transaction routing, automated computation, and cooperative-specific reporting. This integration ensures that the study does not duplicate prior work but contributes a unique, comprehensive solution to modern cooperative digitalization.

Local Related Systems

digiCOOP by NATCCO

One of the leading digital innovations in the Philippine cooperative sector is digiCOOP, developed by the National Confederation of Cooperatives (NATCCO). digiCOOP is a cloud-based financial technology platform that enables cooperatives and their members to perform online savings, loan applications, digital wallet transactions, and inter-cooperative payments. The system allows members to register and manage their cooperative accounts using mobile or desktop devices, while administrators can monitor real-time transactions, approve loan applications, and maintain accurate financial records. According to digiCOOP (2023), the platform aims to “*empower cooperatives to digitally transform their operations and improve financial inclusion through secure and transparent digital services.*”

This objective aligns closely with the goals of the proposed Web-Based Transaction Management System Enhanced by Artificial Intelligence which also seeks to centralize and automate online transactions, promote transparency, and strengthen the cooperative’s digital infrastructure.

Unlike digiCOOP, which operates as a nationwide platform connecting multiple cooperatives, the proposed system focuses specifically on improving the internal transaction management of a community-based cooperative. It emphasizes AI-driven automation for document verification, loan proceeds and fines computation.

KAYA 2.0 (Key Application for Your Advancement)

Another notable system is KAYA 2.0, also introduced by NATCCO. It is a mobile-based platform that allows cooperative members to perform digital payments, fund transfers, and account management through integration with their cooperative’s financial services. KAYA 2.0 primarily targets inter-cooperative networking and nationwide financial inclusion, while the proposed system focuses on addressing localized operational

challenges.

The proposed system provides a tailored solution for centralized document handling, internal verification, and transparent loan processing within a single cooperative—making it more applicable to smaller organizations seeking affordable and secure digital tools.

Credit and Risk Management Loan Application System (CRMLAS)

The Credit and Risk Management Loan Application System (CRMLAS), utilized by several smaller cooperatives in the Philippines, automates the loan evaluation and approval process by digitizing borrower profiles, risk assessments, and loan documentation. While CRMLAS effectively reduces manual workload and improves accuracy, it lacks direct member-facing features such as document uploading, transaction monitoring, and application tracking—functions that the proposed system intends to provide. Through the analysis of existing systems like CRMLAS, the researchers identified a gap in affordable, AI-enhanced, specifically designed for small, community-based cooperatives.

The proposed Web-Based Transaction Management System Enhanced by Artificial Intelligence to fill this gap by offering a centralized, transparent, and automated platform that modernizes cooperative operations while maintaining accessibility and member trust.

NATCCO–Twala Digital Document Automation for Cooperatives

In 2023, NATCCO partnered with Twala, a Philippine blockchain-powered digital signature and document automation platform, to accelerate the digital transformation of cooperatives nationwide. The collaboration enables cooperative organizations to process transactions, sign documents, and verify records securely digital identity systems (BusinessWorld, 2023). According to NATCCO, the initiative aims to “*provide cooperatives with a secure, paperless environment that ensures authenticity, prevents document tampering, and simplifies verification across departments.*”

This system demonstrates how blockchain technology extends beyond financial transactions to securing document workflows and member authentication. Similarly, the proposed Web-Based Transaction Management System with AI-Based Document

Enhancer and Loan & Fines Computation Integrated aligns with this initiative by emphasizing transparency, automation, and security. However, unlike NATCCO–Twala, which functions on a national scale, the proposed system focuses on a community-based cooperative—offering a localized, practical, and cost-effective digital solution.

Cooperative Development Authority (CDA) Digital Platforms

The Cooperative Development Authority (CDA) has initiated several digital platforms to help Philippine cooperatives embrace online governance and compliance systems. Among these are the Electronic Cooperative Registration Information System (E-CoopRIS) and the Cooperative Assessment Information System (CAIS), which allow cooperatives to submit registration documents, payments, and compliance reports online. While the CDA's digital systems primarily focus on registration, compliance, and member profiling, the proposed system addresses a more specific operational need—facilitating transaction uploads, AI-based document verification, and blockchain-secured financial records that go beyond regulatory functions.

Exploring the Digital Transformation Readiness of Selected Multipurpose Cooperatives in Bukidnon

Calao and Tumamak (2025) studied the digital transformation readiness of selected multipurpose cooperatives in Bukidnon, focusing on three dimensions: digital infrastructure, digital literacy, and organizational culture toward innovation. Their findings revealed significant disparities in technology adoption, limited infrastructure, and varying levels of readiness among cooperatives. The study concluded that while many cooperatives are motivated to adopt digital tools, improvements in internet connectivity, digital literacy, and organizational support are essential for successful implementation. This insight is valuable to the proposed system, emphasizing the importance of building the cooperative's technical capacity and ensuring staff readiness to sustain a digitally integrated platform. In the long term, the proponents aspire for the proposed system to evolve and expand its functionalities, similar to large-scale digital ecosystems such as digICOOP and KAYA 2.0. With continuous improvement and future integration, the system could eventually support inter-cooperative transactions and contribute more broadly to the digital transformation of

the cooperative sector in the Philippines.

Synthesis

The reviewed studies collectively highlight the importance of digital transformation in the cooperative sector. Web-based platforms enhance accessibility and transparency, while AI integration automates critical processes such as document verification, loan computation, and error detection. Moreover, this technology guarantees data immutability and transparency, addressing long-standing issues of record tampering and inconsistent verification present in manual systems. These references provided the proponents with essential knowledge and practical insights into the structure, development, and implementation of the Web-Based Transaction Management System Enhanced by Artificial Intelligence, which aims to streamline operations, reduce human error, and promote accountability in cooperative financial transactions.

**SMART COOP: A TRANSACTION AND LOAN MANAGEMENT SYSTEM
WITH AI POWERED DOCUMENT ENHANCEMENT FOR PALTOK (SFM)**
CREDIT COOPERATIVE

Overview of the project

The proposed project introduces a web-based transaction management system aimed at improving the Paltok (SFM) Credit Cooperative's online service processes by consolidating all member transactions into a unified and secure digital platform. The system enables members to conveniently submit deposits, loan applications, loan payments, and statement-of-account requests online, while ensuring that all submissions are properly routed to the appropriate cooperative departments for verification and approval.

To enhance accuracy and reduce manual checking, the system integrates Artificial Intelligence (AI) to improve the clarity of uploaded documents used for verification, such as deposit slips and proof-of-payment images. It also automates essential internal computations, including penalty charges and loan proceeds, helping minimize human error and reducing the processing workload of the Accounting and Loan Departments.

Through the centralization of online transactions and the introduction of automated support tools, the project seeks to streamline cooperative operations, lessen verification delays, strengthen accountability, and provide members with a more efficient and accessible digital service experience. While the system focuses exclusively on online submissions and back-office processing, teller operations remain handled by the cooperative's existing accounting system. Future integration with the cooperative's main database may be implemented if the organization formally adopts the platform.

This section includes the following: System Design Specification, which discusses the system's overall structure, process flow, and essential requirements for operation;

Methodology, which explains the software development life cycle (SDLC) used and the activities conducted in each development phase; and **Hardware/Software Requirements**, which detail the necessary components used in developing and implementing the proposed system.

System design specification

Minimum Requirements

The following are the minimum requirements that the system needs to run optimally: Windows 11 Home 64-bit, Ryzen 3 2200G, 4 GB RAM.

System Models

Flowchart

The system flowchart represents the end-to-end process of how transactions move between the **Member Dashboard** and the **Admin Dashboard** within the proposed Web-Based Transaction Management System. The flow begins when a registered member logs into the system and performs an action such as viewing account information, uploading a payment, or submitting a loan application. For each transaction, the member provides the required information and uploads supporting documents through the Member Dashboard.

Once a submission is made, the uploaded file is processed by the **AI-Based Document Enhancement Module**, which automatically improves clarity, removes noise, and checks for missing or unreadable content. If the AI detects issues that cannot be enhanced, the system prompts the member to resubmit the document. Valid and enhanced files are then stored in the system's database.

After enhancement, the system automatically routes the transaction to its corresponding workflow through the **Admin Dashboard**. Payment submissions are directed to the **Accounting Department** for verification and fines computation, while loan applications are forwarded to the **Loan Department** for initial evaluation. The system ensures that each

transaction reaches the correct department without manual forwarding.

During verification, authorized staff review the enhanced documents and use the **Automated Computation Module** to determine fines, loan proceeds, interest rates, and other applicable financial details. Once validated, staff update the transaction status (e.g., “For Verification,” “Acknowledged,” “For Approval,” “Approved,” “Released”), and the system automatically notifies the member through their dashboard and registered email.

The process ends with all approved and verified transactions being posted and stored in the centralized database. This ensures that all digital activities are traceable, securely logged, and accessible for reporting and audit purposes. The flowchart highlights how the system reduces manual workload, enhances accuracy through automation, and maintains the cooperative’s required validation and approval controls.

Figure 8 Member Dashboard Flow chart

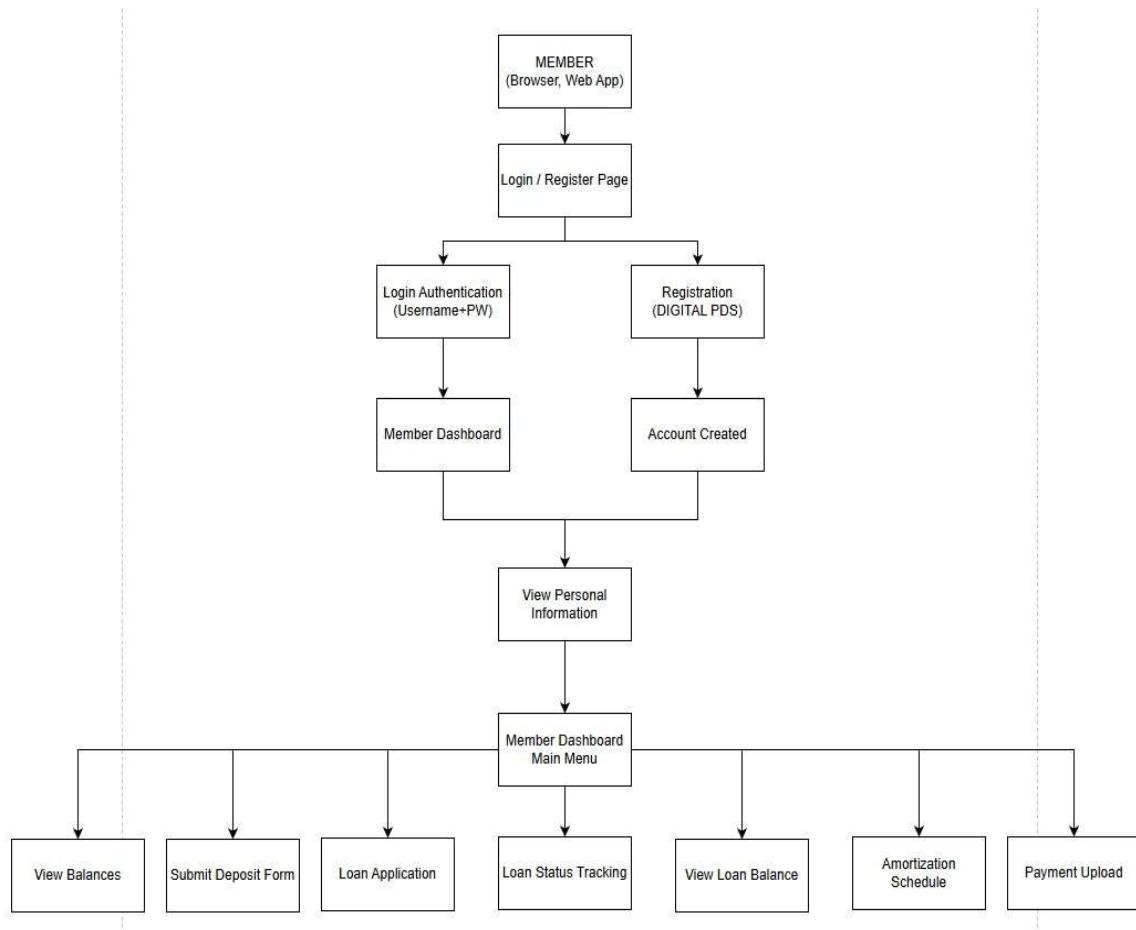


Figure 9 Deposit Flow chart of proposed System

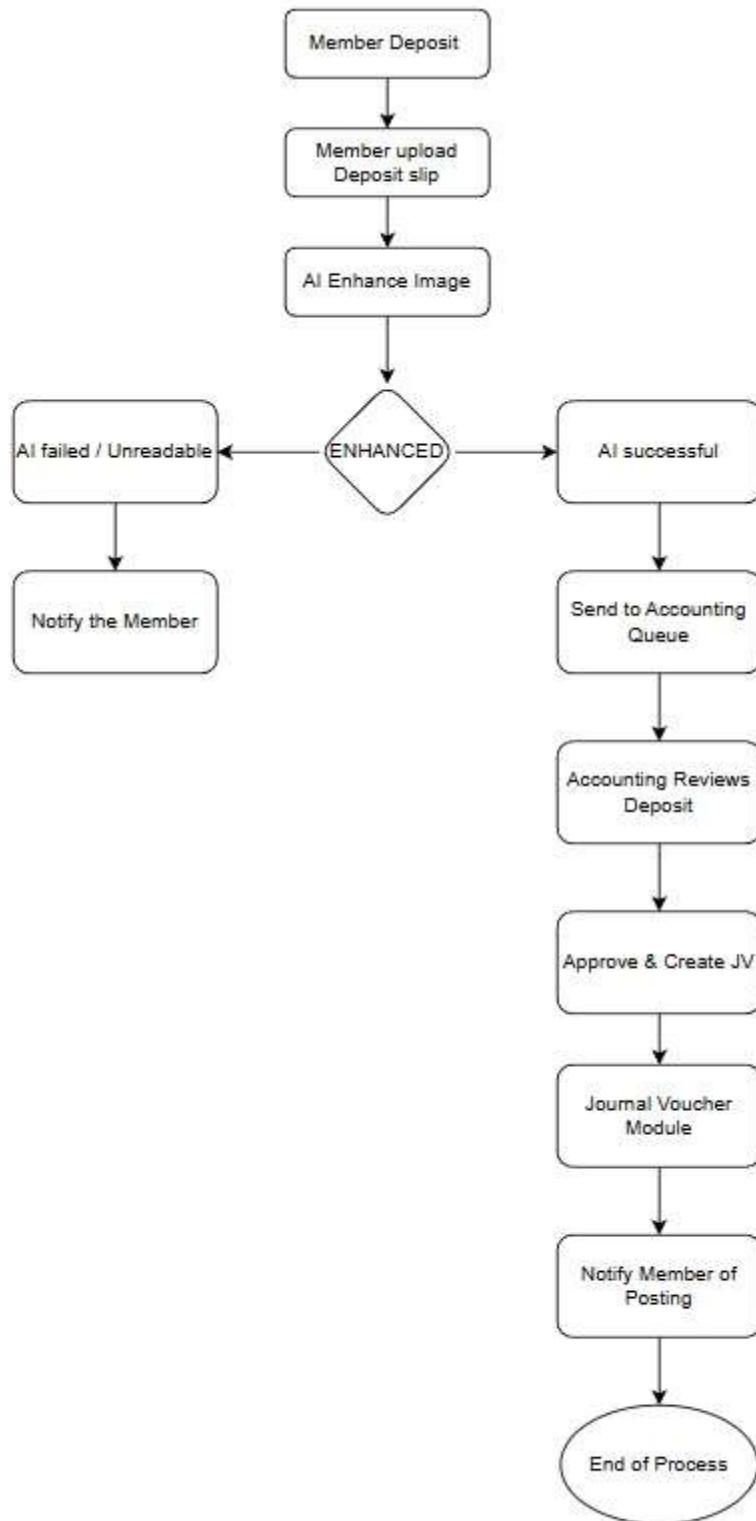


Figure 10 Loan Flow chart of proposed System

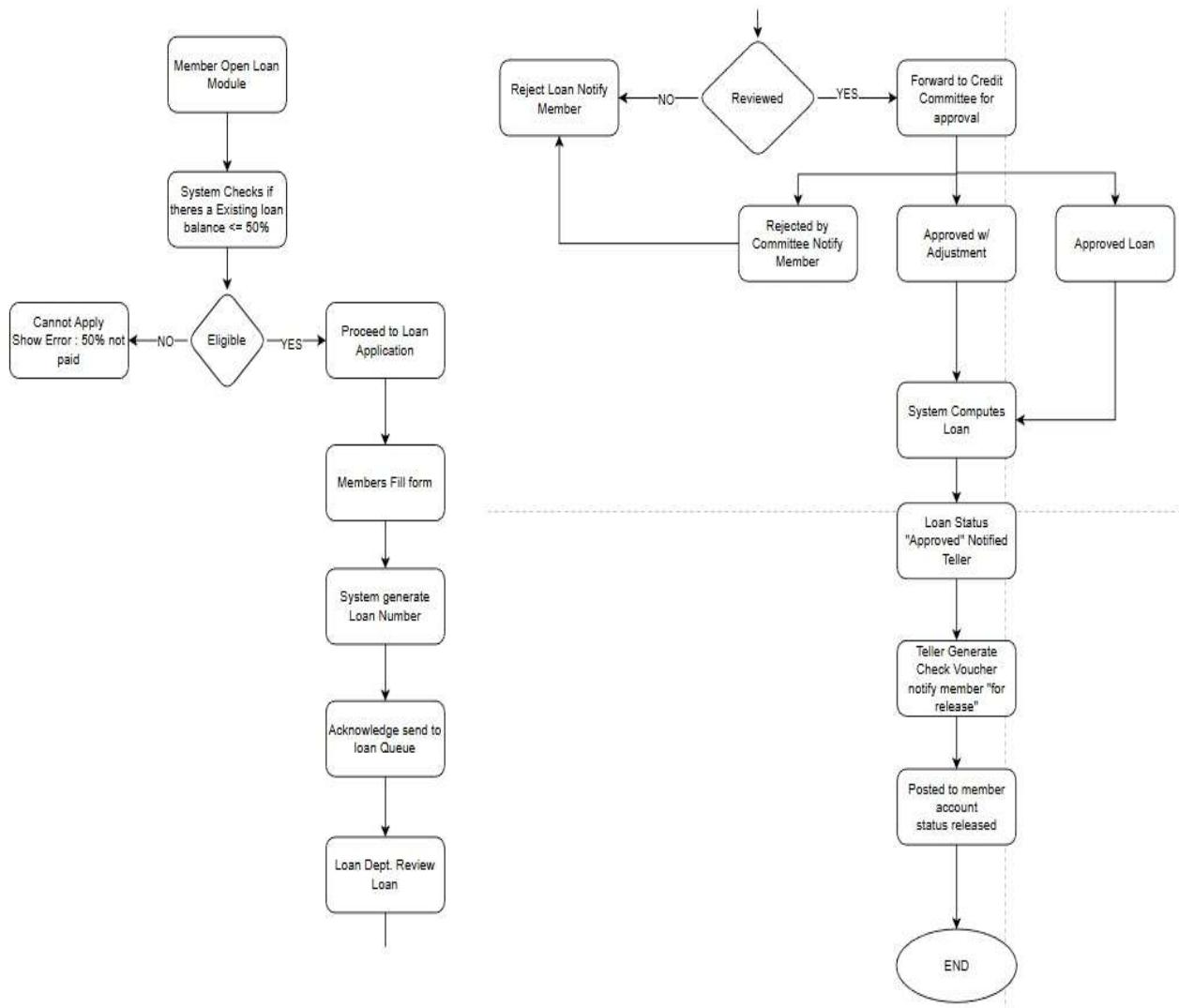
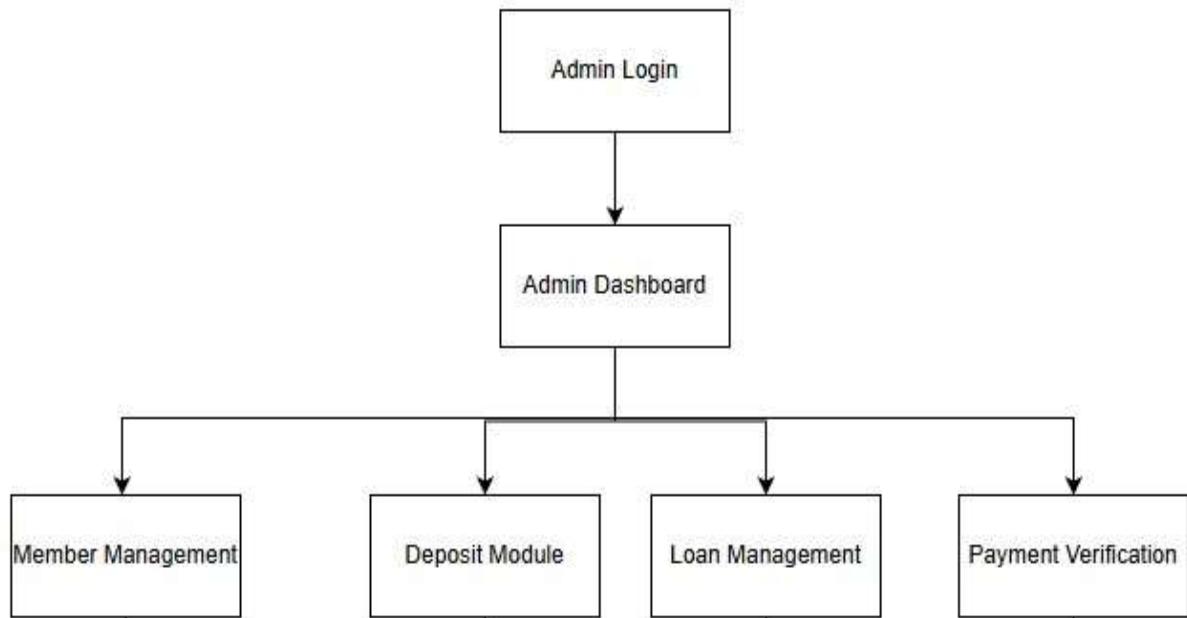


Figure 11 Admin Dashboard Flow chart



AI Enhancement Input Process Output (IPO)

The AI Enhancement Module begins with member-uploaded files, which may include images or scanned PDFs of transaction documents. These files serve as the primary inputs for the enhancement process. Once received, the system performs a series of automated image-processing tasks, including resizing, rotation, and cropping to properly align the document. Additional improvements such as denoising, shadow removal, brightness and contrast correction, and sharpening are applied to ensure clarity and legibility. The module also performs perspective flattening to correct angled images and includes a readability check to determine whether the document is clear and print-ready. After processing, the system generates outputs in the form of enhanced and properly aligned documents that meet verification standards. It also assigns a quality status—approved or flagged for manual review—and automatically notifies the appropriate staff for further action.

INPUTS	<ul style="list-style-type: none"> • Member-uploaded • images/PDFs
PROCESS	<p>1. AI Enhancement</p> <ul style="list-style-type: none"> • Resize, rotate, crop • Denoise • Shadow removal • Sharpen details • Brightness/contrast correction • Perspective flattening • Readability Check • Clear enough for printing? • Document positioned correctly?
OUTPUTS	<ul style="list-style-type: none"> • Enhanced, clear, print-ready documents • Quality status (Approved/Flagged) • Notification to relevant staff

Figure 12 AI Enhancement IPO

OpenCV

To implement the AI-based document enhancement process, the system utilizes OpenCV, a widely used open-source computer vision library. OpenCV provides a robust set of tools for image manipulation, allowing the system to remove noise, correct lighting inconsistencies, sharpen text details, and flatten skewed perspectives without requiring complex machine learning algorithms. Its efficiency makes it ideal for processing member-submitted images that often contain shadows, blur, or uneven angles due to improper capture. By integrating OpenCV into the enhancement pipeline, the system is able to automatically convert raw images into clean, standardized, and print-ready documents, significantly reducing manual verification time and improving the accuracy and consistency of the cooperative's transaction processing.

Entity-Relationship Diagram (ERD)

The entity-relationship diagram (ERD) illustrates the logical relationship among the entities that make up the database structure of the proposed Web-Based Transaction Management System. Each entity represents a database table that stores specific information required for processing online transactions, document verification, and computation.

At the center of the database is the User Table, which stores all member and staff information such as user ID, passbook number, full name, contact details, role, and login credentials. The User Table serves as the main reference for other related entities.

On the left side of the diagram are reference tables such as User Role, Department, and Transaction Type, which classify the user level (e.g., Admin, Accounting Head, Loan Officer, or Member) and determine access privileges.

On the right side of the User Table are operational tables such as Transaction Table, Document Table, Loan Table, and Payment Table. The Transaction Table records every online activity submitted by the member, while the Document Table stores enhanced files processed by the AI module for verification. The Loan Table contains details of loan applications, including loan amount, term, interest rate, and computed net proceeds, whereas the Payment Table logs online deposits and their verification status.

The AI_Log Table records the system's enhancement and computation activities for auditing and transparency, while the Notification Table manages all alerts sent to members and staff regarding status updates.

Each entity is connected through primary and foreign key relationships to ensure data integrity, efficient data retrieval, and secure cross-referencing between modules. Refer to the figure below for the Entity-Relationship Diagram (ERD) of the proposed system.

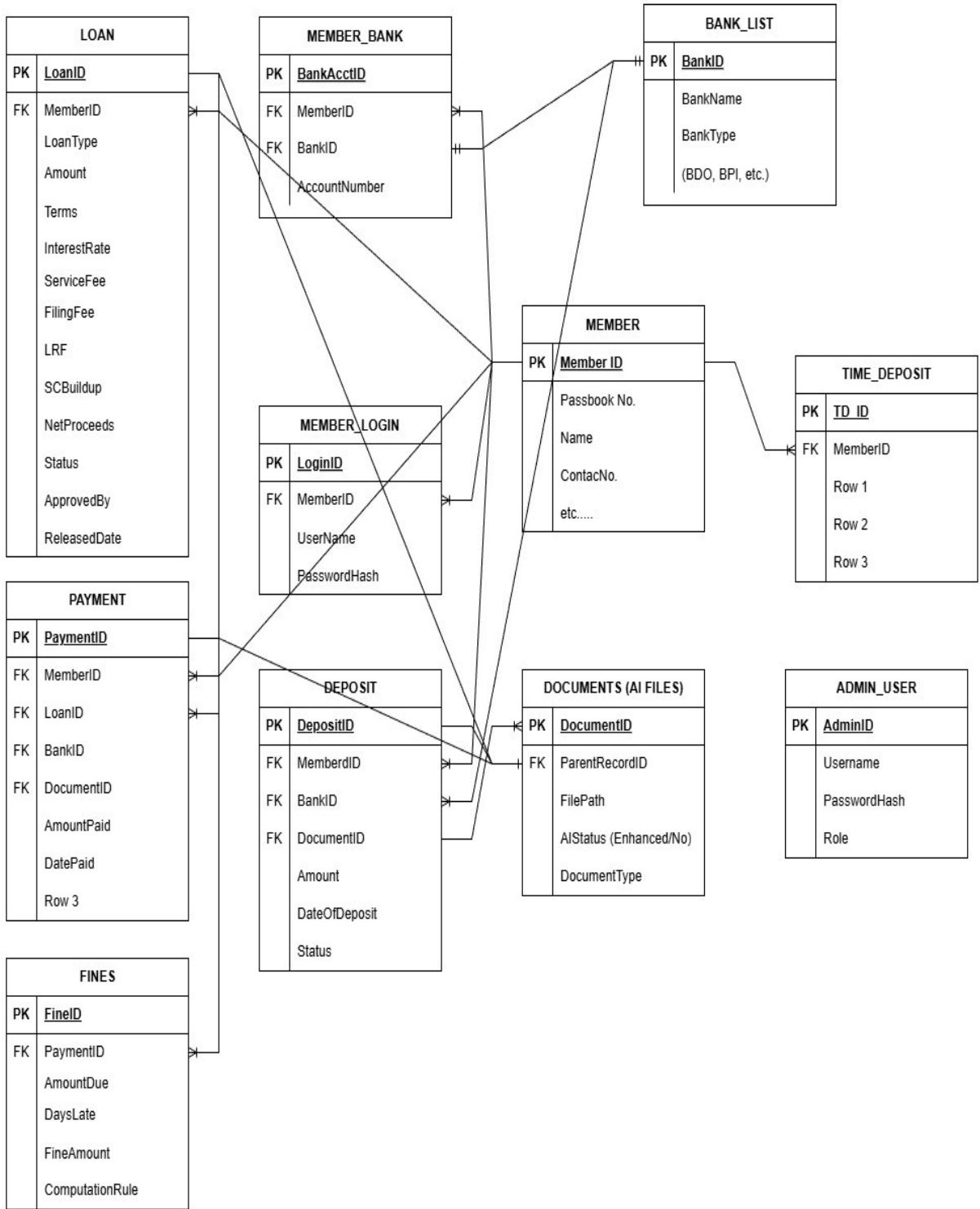


Figure 14 Entity Relationship Diagram SMART COOP

Hierarchical Input-Process-Output Diagram (HIPO)

The Hierarchical Input-Process-Output (HIPO) diagram illustrates the structure and functional hierarchy of the **AI-Driven Web-Based Transaction Management System**. It breaks down the system into major modules and sub-functions for clear documentation and understanding of how each component contributes to the overall operation of the system.

Figure 13 presents the top-level structure of the 1.0 Web-Based Transaction Management System, which serves as the core framework of the proposed solution. This figure illustrates how all major components—such as member transactions, AI-assisted processing, administrative verification, notifications, and database storage—interact within a unified platform. It provides a high-level overview of how inputs from members flow into the system, undergo processing through automated and manual workflows, and produce validated outputs securely stored in a centralized database. This top-level diagram establishes the foundation for understanding the succeeding subsystem diagrams.

Figure 15 HIPO of the modules of the proposed system

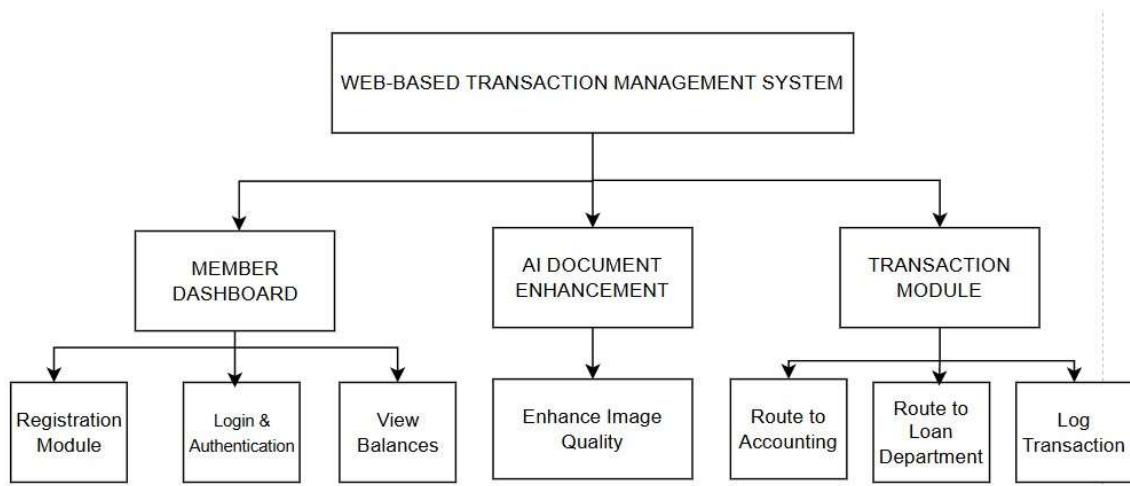


Figure 14 illustrates the 5.0 Admin Dashboard / Management Module, which encompasses all internal functions performed by authorized cooperative staff. This module includes member management, verification of deposits and payments, loan evaluation and approval, fines and loan computation, reporting tools, and system configuration settings. The figure highlights how administrative users interact with system data, apply validations, update transaction statuses, and manage financial records. It represents the operational core that ensures accuracy, accountability, and compliance with the cooperative's internal processes.

Figure 16 HIPO of Admin module

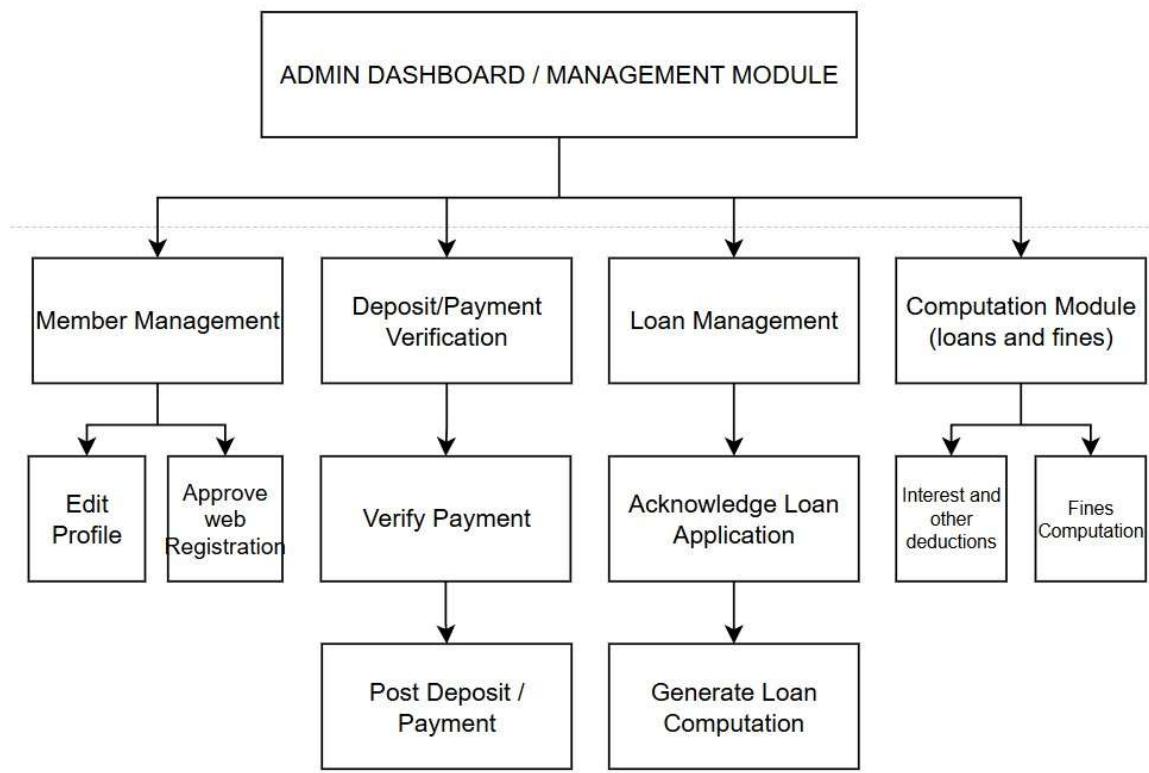


Figure 15 shows the 6.0 Notification & Communication Module, responsible for delivering real-time updates and alerts to both members and administrators. This module manages system-generated notifications, email alerts, and dashboard messages that inform users about transaction statuses, approvals, rejections, and required actions. The figure demonstrates how notifications are triggered by system events and routed appropriately, ensuring consistent communication and improving transparency across all digital interactions within the cooperative.

Figure 17 HIPO of Notification module

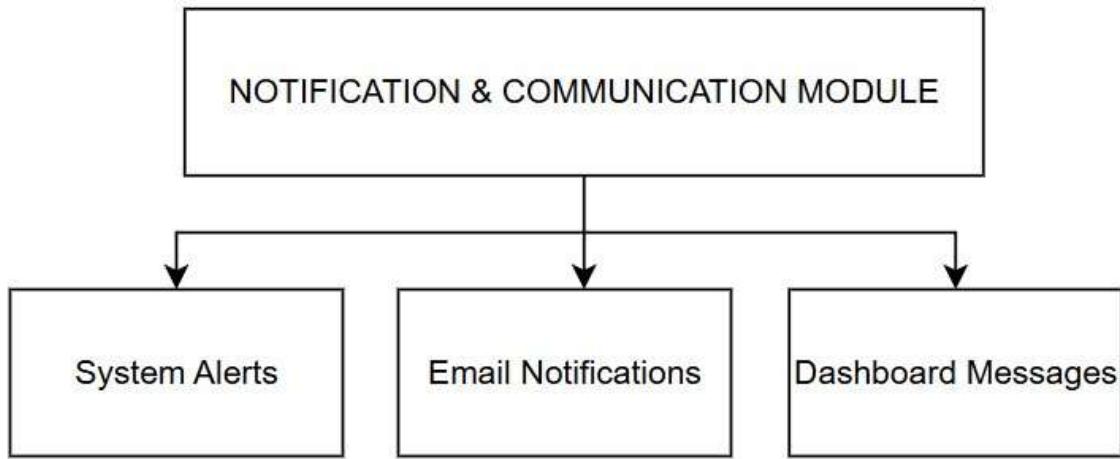
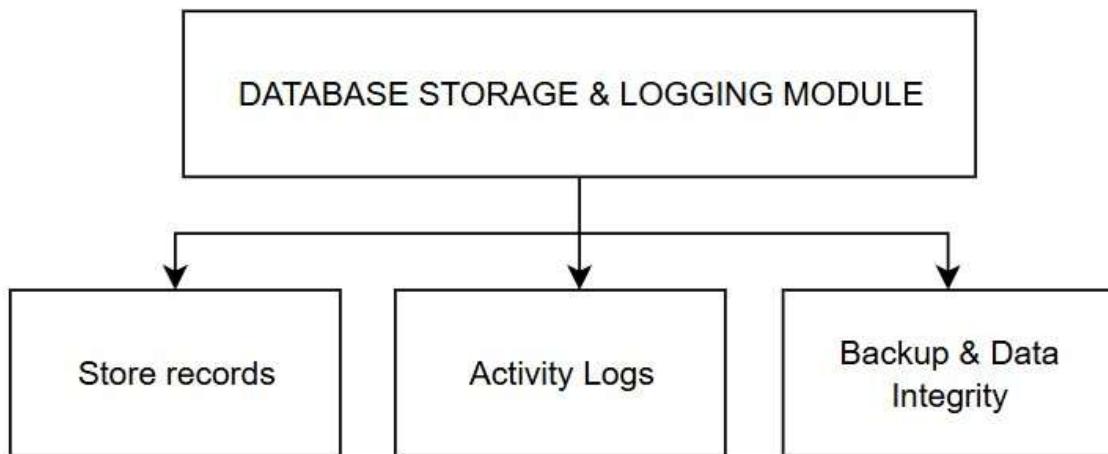


Figure 16 presents the 7.0 Database Storage & Logging Module, which serves as the system's central data repository. This module securely stores member records, transaction data, enhanced documents, logs, and system configurations. The figure illustrates the structure and role of the database in maintaining data integrity, supporting audit trails, and ensuring that all processed information remains accessible, traceable, and protected. It represents the backbone of the entire system, enabling reliable long-term recordkeeping and operational stability.

Figure 18 HIPO of Database module

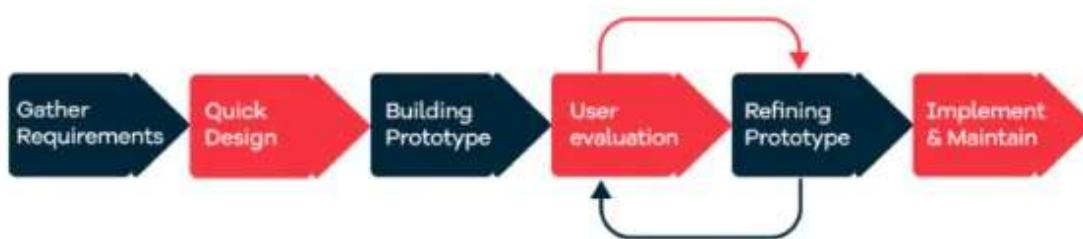


METHODOLOGY

The proponents will use the Prototyping Model as the development methodology for the system. The Prototyping Model is a software development approach in which an initial prototype is created, tested, and continuously refined based on user feedback until an acceptable version is achieved. This model consists of six Software Development Life Cycle (SDLC) phases: Requirements, Quick Design, Build Prototype, User Evaluation, Refining Prototype, and Implement & Maintain (Martin, 2022).

The iterative loop between **User Evaluation** and **Refining the Prototype** enables the proponents to identify issues early and adjust system features according to user needs and expectations. Through this process, a fully functional and user-validated prototype can be developed and implemented once it meets the requirements of the cooperative.

Figure 19 Prototype model



Taken from: <https://pagepro.co/blog/what-is-a-software-prototype-and-how-to-build-one/>

Requirements gathering and analysis

A requirement analysis is the first step in developing a prototyping model. The system's requirements are defined in detail during this phase. During the process, system users are interviewed and surveyed to determine what they expect from the system. In this phase, the proponents brainstormed the things that are needed for the development of the system and asked for advice of the adviser. After listing all the things needed, the proponents then

gathered the initial requirements for the system through interviewing with the Accounting Head. After gathering enough information, the proponents then present the gathered information to the thesis adviser which then analyzes if the information is concise or not. If the information gathered is not sufficient, the proponents will conduct another interview with the Accounting Head.

Quick design

The second step is a preliminary design or a quick design. A simple system design is created at this stage. It is, however, not a complete design. It provides the user with a high-level overview of the system. The quick design aids in the development of the prototype. With the information gathered, the proponents constructed a flowchart and the hierarchical input-process-output diagram to illustrate the flow of the current Transaction Management process and the process of each module to be used in the proposed system so that it can be visualized clearly. The proponents also created a sample user interface design for basis of what will be the direction of the layout of the system.

Build Prototype

Based on the information gathered during the Quick Design phase, an initial prototype is developed in this stage. This prototype serves as a scaled-down version of the intended system. The proponents begin the initial development process by creating the first version of the user interface and defining the basic functions of each module. Both the design and functionality are derived from the insights gathered during the Requirements Gathering, Analysis, and Quick Design phases.

Initial user evaluation

In this phase, the proposed system is presented to the client for initial evaluation. This step helps identify the strengths and weaknesses of the working prototype. Feedback, comments, and suggestions from the client are gathered and relayed to the developers for refinement.

During this evaluation, the adviser reviews the system's workflow and user interface design

and provides a list of improvements or additional features that need to be implemented. Likewise, the intended beneficiaries of the system evaluate the prototype and give feedback regarding necessary revisions or enhancements.

This phase may be repeated multiple times, depending on the changes required based on the feedback from the adviser, thesis panelists, or users. The prototype is refined continuously until it meets the expected standards and functional requirements.

Refining Prototype

This phase focuses on improving and refining the prototype based on the feedback and suggestions provided by the users. The refinement process continues until all user requirements are met and the final prototype is completed.

During this stage, the proponents incorporate the necessary revisions aligned with the comments and recommendations from the thesis adviser, thesis panelists, and system users. Once the improvements are applied, the updated prototype is returned to the user evaluation phase for further review. This cycle repeats until the prototype fully satisfies the expected functionality and design standards.

Implement and Maintain

In this phase, the finalized system—developed based on the approved prototype—is thoroughly tested and deployed for actual use. Regular maintenance is then performed to ensure smooth operation, minimize downtime, and prevent system failures.

Once the thesis panelists and end-users confirm that the prototype meets all requirements and expectations, the proponents may recommend the official implementation of the proposed system to replace or enhance the existing process. The system should be continuously maintained to support new features, address bugs, and adapt to future operational needs.

Hardware/Software

Desktop / Laptop

A desktop computer is a stationary device typically placed on a table and used together with peripherals such as a keyboard, mouse, and monitor (Computer Hope, 2021c). A laptop, also known as a notebook, is a portable computer powered either by batteries or an AC adapter and is designed to provide performance comparable to a desktop system (Computer Hope, 2021b).

For this study, the proponents will utilize both desktop and laptop computers to develop, test, and operate the proposed system. These devices will be used to run development tools, simulate user interactions, and ensure that the system functions properly across different screen sizes. Laptops will also be used to check the responsiveness and usability of the web-based system when accessed through mobile browsers.

Software

Visual Studio Code:

According to Mustafeez (2022), Visual Studio Code is a free and open-source text editor developed by Microsoft. It is lightweight yet powerful, supporting a wide range of programming languages such as JavaScript, PHP, Python, and C++. VS Code allows developers to install extensions for debugging, code linting, version control, and web development, making it a highly flexible development environment. For this study, Visual Studio Code will be used to develop both the user interface (HTML, CSS, JavaScript) and the backend functionality (PHP and MySQL queries) of the proposed web-based system.

HTML:

Also known as Hypertext Markup Language, it determines the structure of the web pages (Chris, 2021)

CSS:

Also known as Cascading Style Sheets, it is a simple design language that is intended to simplify the process of making presentable web pages (Tutorials Point, n.d.).

JavaScript:

According to W3Schools (n.d), JavaScript is a programming language that is used in the Web. It can change both HTML and CSS and can validate, manipulate, and calculate data.

Figma:

Figma is a cloud-based interface design and prototyping software that enables developers to create and test UI layouts in real time. According to UX Collective (2021), Figma supports collaborative editing, responsive prototypes, and seamless sharing, making it suitable for rapid design iteration. In this study, Figma is used during the Quick Design and Prototype Development phases to create wireframes, mockups, and interactive previews of the web application.

XAMPP (Apache, PHP, MySQL):

According to Prasad (2020), XAMPP is an open-source local server environment that bundles Apache, PHP, and MySQL, allowing developers to simulate a live server on a desktop or laptop. It is widely used for developing and testing dynamic websites before deployment.

This software will be used to run the system locally, process backend scripts, store data, and manage the system database for online transactions.

MySQL Database:

MySQL is a widely used relational database management system designed for fast, reliable, and secure storage of structured data. According to Oracle (2022), MySQL is capable of handling high-volume transactional systems through efficient indexing, relational

mapping, and query optimization.

The proposed system will use MySQL to store member information, uploaded documents, transaction logs, computed loan results, fines records, and system notifications.

AI Image Processing Libraries (OpenCV):

OpenCV is an open-source computer vision library designed for real-time image processing. According to Bradski (2021), OpenCV is commonly used for applications involving image enhancement, noise reduction, contrast adjustment, and detection of visual artifacts.

In this study, OpenCV Python-based libraries will be used for the **AI Document Enhancement Module**, improving clarity and readability of uploaded files before verification.

Statistical Treatment of Data

To analyze the data gathered from the respondents, the proponents used **descriptive statistics**, specifically the **weighted mean**, to interpret the level of acceptance of the proposed *Web-Based Transaction Management System with AI-Driven Document Enhancement and Loan & Fines Computation*. Weighted mean is appropriate because the survey utilized a **five-point Likert scale**, which measures the respondents' perception based on different levels of agreement.

The formula for the weighted mean is as follows:

$$\bar{X} = \frac{\sum(W \times X)}{N}$$

Where:

W = Weight assigned to each response

X = Frequency of each response

N = Total number of responses

The following Likert Scale was used in interpreting the weighted mean results:

Scale	Range	Verbal Interpretation
5	4.21-5.00	Strongly Agree
4	3.41 – 4.20	Agree
3	2.61 – 3.40	Neutral
2	1.81 – 2.60	Disagree
1	1.00 – 1.80	Strongly Disagree

This statistical treatment was applied to measure:

- Members' acceptance of transitioning from multi-platform submissions (Facebook, Gmail, Yahoo Mail) into a single centralized web-based platform.
- The perceived usefulness of AI-based document enhancement.
- The overall readiness of members to adopt the proposed web system.

In addition to the survey, qualitative data were gathered through structured interviews with the Accounting Department Head and the Loan Department Supervisor. Their feedback was analyzed using thematic analysis, focusing on recurring issues such as verification delays, disorganized submissions, double postings, and manual computation workload.

The combination of quantitative (weighted mean) and qualitative (interview thematic analysis) provided a comprehensive assessment of the users' needs, expectations, and readiness for system adoption, ensuring that the developed prototype addresses actual operational challenges within the cooperative.

Data Gathering Procedure

The data gathering process was conducted to obtain accurate and relevant information regarding the feasibility, acceptance, and operational need for the *Smart Coop: A Transaction And Loan Management System With Ai Powered Document Enhancement For Paltok (SFM) Credit Cooperative*

The proponents used **two (2) primary data-gathering techniques** an online survey administered to cooperative members, and structured interviews with key personnel of the Accounting and Loan Departments.

Preparing the Research Instruments

The proponents designed a survey questionnaire using **Google Forms**, consisting of Likert-scale items intended to measure members' perceptions regarding:

- Their current difficulties with online transactions,
- Their acceptance of a centralized online platform,
- Their willingness to adopt a web-based system, and
- Their perceived usefulness of AI-enhanced document verification.

A separate interview guide was prepared for the Accounting Head and Loan Department Supervisor to gather in-depth insights about the operational issues, verification delays, and the impact of multiple-platform submissions on their daily workload.

Survey Administration

The link to the online questionnaire was distributed to **100 randomly selected active members** of the cooperative. Respondents voluntarily participated and were assured that their responses would be used solely for academic purposes. In the span of a scheduled week, all 100 responses were successfully collected from member participants.

Conducting Interviews

The proponents arranged formal interviews with:

- The Accounting Department Head
- The Loan Department Supervisor

The interviews focused on identifying specific challenges in the existing online transaction process, including issues with unfiltered submissions through Facebook Messenger, Gmail, Yahoo Mail, Viber, Telegram, and personal employee accounts. The interviews also examined the difficulties in verifying and editing uneven, blurred or poorly captured documents incomplete information of loan application form.

Data Organization and Processing

Responses from the survey were automatically recorded and organized by Google Forms into spreadsheets. These results were exported to allow computation using the weighted mean formula for each item. Interview responses were transcribed, grouped, and analyzed using thematic analysis, helping identify common operational issues such as double posting, document loss, identity mismatches, and verification delays.

Final Integration of Findings

Both quantitative and qualitative results were combined to validate the need for the proposed system. The findings served as the basis for system requirements, workflow design, and module development, including the AI Document Enhancement Module and the Automated Loan & Fines Computation Module.

Research Instrument

The researchers utilized two main instruments in gathering the necessary data for the study: Survey Questionnaire, and Interview Guide.

Survey Questionnaire

The questionnaire was designed using a five-point Likert scale to measure the level of agreement of members on statements related to system acceptance, usability, and perceived benefits. The survey form consisted of the following sections:

- **Section A:** Respondent Profile
- **Section B:** Current Online Transaction Experience

- **Section C:** Perceived Need for a Centralized Web Platform
- **Section D:** Acceptability of AI-Based Document Enhancement
- **Section F:** Overall System Acceptance

Interview Guide

A semi-structured interview guide was created to gather detailed insights from cooperative personnel. The guide contained open-ended questions focusing on:

- Problems in the current online transaction process,
- Issues caused by multi-platform communication,
- The volume of daily electronic document submissions,
- The burden of manual verification and computation, and
- Expectations from a centralized web-based system.

Interview data were used to support and contextualize the findings from the survey results.

Presentation, Analysis, and Interpretation of Data

the results gathered from the survey conducted among 100 cooperative members and the interviews with the Accounting Head and Loan Department Supervisor. The data were analyzed using Weighted Mean and Verbal Interpretation to determine members' perceptions regarding the proposed *Web-Based Transaction Management System with AI-Driven Document Enhancement and Automated Features*.

Additionally, qualitative insights from personnel interviews are integrated to validate operational issues and the necessity for the system.

Respondent's Profile

A total of 100 cooperative members participated in the survey. Respondents included

members from various age groups, membership durations, and transaction habits (walk-in vs. online). The diversity of respondents provides a reliable representation of the cooperative's membership base.

Survey results on the current online transaction process

Indicators	Weighted Mean	Verbal Interpretation
1. Difficulty in sending documents through different platforms (FB, Gmail, YahooMail, etc.)	4.52	Strongly Agree
2. Delay in receiving confirmation or feedback	4.48	Strongly Agree
3. Documents sometimes become lost or overlooked	4.60	Strongly Agree
4. Inconsistent communication with multiple employees	4.55	Strongly Agree
5 Poor quality or unreadable images cause verification delays	4.62	Strongly Agree

CONCLUSION AND RECOMMENDATIONS

The main objective of the proponents is to develop an effective solution to the long-standing problems and weaknesses present in Paltok (SFM) Credit Cooperative's handling of online transactions, document submissions, and loan verification. The cooperative's reliance on a FoxPro-based accounting system—which is limited only to walk-in transactions—resulted in scattered online submissions, delays in document verification, manual computation errors, and increased workload for the accounting and loan departments.

With the introduction of the **SMART COOP: A Transaction and Loan Management System with AI-Powered Document Enhancement**, the cooperative now benefits from a modernized, centralized, and more efficient platform for managing digital transactions. The system replaces the fragmented process of receiving member submissions through various online channels with a single, secure web-based environment that provides clarity, organization, and transparency. Features such as AI-enhanced document processing, automated computation of loan proceeds and penalties, centralized monitoring of deposits and payments, and real-time notifications significantly simplify the cooperative's operational flow compared to the previous manual system.

The proponents were able to develop a fully functional system that streamlines online transactions while complementing the cooperative's existing walk-in processes. Members can now register online, view balances, upload proof of payments, apply for loans, and track their transaction status without needing to visit the office. Internally, the Admin Dashboard provides structured workflows for verification, approval, posting, and reporting—reducing human error and improving coordination across departments. The integration of AI for document enhancement further mitigates issues caused by unclear or tampered uploads, enabling faster and more accurate validation.

Based on the results of the system development and evaluation, the proponents conclude that the web-based transaction management system greatly benefits Paltok (SFM) Credit Cooperative by improving efficiency, promoting transparency, reducing manual workload, and enhancing the overall user experience for both members and cooperative staff. The

system offers a more simplified, reliable, and accurate process that supports the cooperative's financial operations and prepares it for future digital transformation.

In light of the findings and successful implementation of the system, the proponents put forward the following recommendations for future researchers and for the cooperative itself:

1. Explore the system integration with the existing FoxPro accounting System for the future enhancements may include fully synchronizing the online system with the cooperative's legacy FoxPro database to prevent duplicate encoding.
2. Consider developing a mobile application version will increase accessibility for members, especially those who prefer mobile banking and online payments.
3. Improve and diversify digital payment options by integrating in payments platform like GCASH QR code scanning, MAYA, and Direct Bank API.

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Pandey, M., Arora, M., Arora, S., Goyal, C., Gera, V. K., & Yadav, H. (2023). AI-based Integrated Approach for the Development of Intelligent Document Management System (IDMS). *Procedia Computer Science*, 230, 725–736.
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What is web-based accounting software? (2023, March 29). Sage Advice US. <https://www.sage.com/en-us/blog/glossary/what-is-web-based-accounting-software/#gate-ab515c6e-7e90-4c2f-a67e-113872516e8b>

Calendar of Activities

This should contain the detailed sequence of activities that the proponents will undergo in completing the thesis project. This should discuss the activities, purpose or objectives of each activity, persons involved, and the resources needed in chronological order of execution. In the succeeding paragraphs, there should be no indentations, paragraphs are justified with left alignment. Delete this highlighted section and replace it with your activities.

Budgetary Estimate

This should enumerate the resources that will be used from the beginning until the completion of the entire project. This is presented in tabular format. Fill in the table below.

Budgetary Estimate

Quantity	Specifics	Approximate Cost

Human Resources

The following pages contain the curriculum vitae of the researchers and the Adviser's Acceptance Form.

Curriculum Vitae of
Raul A. Verano Jr.
18 Kundiman St. Brgy. Paltok SFDM Quezon City
Verano.raul@yahoo.com
09278501379

EDUCATIONAL BACKGROUND

Level	Inclusive Dates	Name of school/ Institution
Tertiary	2023 - Current	STI College Munoz-EDSA
High School	2000 – 2004	Judge Juan Luna Highschool
Elementary	1994 – 2000	Bayanihan Elementary School

PROFESSIONAL OR VOLUNTEER EXPERIENCE

Inclusive Dates	Nature of Experience/ Job Title	Name and Address of Company or Organization
2016 – Present	Liaison Officer	Paltok (SFM) Credit Cooperative
2015 – 2016	Collector	Classic Fine Food Inc.
2009 – 2014	IT Tech	Blu Sun Soft. Lab

SKILLS

SKILLS	Level of Competency	Date Acquired
Computer Hardware Technician	Expert	Present
Communication	Intermediate	Present
JAVA programming	Basic	2024

TRAININGS, SEMINARS OR WORKSHOP ATTENDED

Inclusive Dates Title of Training, Seminar or Workshop

May 2025	Building High Performance Team
June 2024	Java Fundamentals
November 2022	Online Technical Compliance Workshop for Submitting Entities

Listed in reverse chronological order (most recent first).

ADVISER'S ACCEPTANCE FORM

NAME OF PROPONENTS: <Name of Researchers>
 <Name of Researchers>
 <Name of Researchers>
 <Name of Researchers>

APPROVED RESEARCH TITLE: <Title of Approved Research>

AREA OF STUDY: <Area of Research and Field of Study>

CONFORME:

<Given Name MI. Family Name of Thesis Adviser>

Thesis

APPROVED BY:

<Given Name MI. Family Name of Thesis Coordinator> Date: <day Month, year>
Thesis Coordinator

NOTED BY:

<Given Name MI. Family Name of Program Head>
Program Head

REFERENCES

Your reference list should appear at the end of your paper. It provides the information necessary for a reader to locate and retrieve any source you cite in the body of the paper. Each source you cite in the paper must appear in your reference list; likewise, each entry in the reference list must be cited in your text. Your references should begin on a new page separate from the text of the manuscript; label this page REFERENCES centered at the top of the page (bold, but do not underline or use quotation marks). All text should be double-spaced, just like the rest of the text.

Basic Rules

- All lines after the first line of each entry in your reference list should be indented one-half inch from the left margin. This is called hanging indentation.
- Authors' names are inverted (last name first); give the last name and initials for all authors of a particular work unless the work has more than six authors. If the work has more than six authors, list the first six authors and then use et al. after the sixth author's name to indicate the rest of the authors.
- Reference list entries should be alphabetized by the last name of the first author of each work.
- If you have more than one article by the same author, single-author references or multiple-author references with the exact same authors in the exact same order are listed in order by the year of publication, starting with the earliest.
- When referring to any work that is NOT a journal, such as a book, article, or Web page, capitalize only the first letter of the first word of a title and subtitle, the first word after a colon or a dash in the title, and proper nouns. Do not capitalize the first letter of the second word in a hyphenated compound word.
- Capitalize all major words in journal titles.
- Italicize titles of longer works such as books and journals.
- Do not italicize, underline, or put quotes around the titles of shorter works such as journal articles or essays in edited collections.

The following rules for handling works by a single author or multiple authors apply to all references in your reference list, regardless of the type of work (book, article, electronic resource, etc.)

Single Author: Last name first, followed by author initials.

Example:

Berndt, T. J. (2002). Friendship quality and social development. *Current Directions in Psychological Science*, 11, 7-10

Two Authors: List by their last names and initials. Use the ampersand (&) instead of “and.”

Example:

Wegener, D. T., & Petty, R. E. (1994). Mood management across affective states: The hedonic contingency hypothesis. *Journal of Personality & Social Psychology*, 66, 1034-1048.

Three to Six Authors: List by last names and initials; commas separate author names, while the last author name is preceded again by ampersand.

Example:

Kernis, M. H., Cornell, D. P., Sun, C. R., Berry, A., & Harlow, T. (1993). There's more to self-esteem than whether it is high or low: The importance of stability of self-esteem. *Journal of Personality and Social Psychology*, 65, 1190-1204.

More Than Six Authors: If there are more than six authors, list the first six as above and then “et al.,” which stands for “and others.” Remember not to place a period after “et” in “et al.”

Example:

Harris, M., Karper, E., Stacks, G., Hoffman, D., DeNiro, R., Cruz, P., et al. (2001). Writing labs and the Hollywood connection. *Journal of Film and Writing*, 44(3), 213-245.

Organization as Author: Name of Organization. (year)

Example:

American Psychological Association. (2003).

Unknown Author:

Example:

Merriam-Webster's collegiate dictionary (10th ed.).(1993). Springfield, MA: Merriam-Webster.

NOTE: When your essay includes parenthetical citations of sources with no author named, use a shortened version of the source's title instead of an author's name. Use quotation marks and italics as appropriate. For example, parenthetical citations of the two sources above would appear as follows: (Merriam-Webster's, 1993) and ("New Drug," 1993).

Two or More Works by the Same Author: Use the author's name for all entries and list the entries by the year (earliest comes first).

Example:

Berndt, T.J. (1981).; Berndt, T.J. (1999).

When an author appears both as a sole author and, in another citation, as the first author of a group, list the one-author entries first.

Example:

Berndt, T. J. (1999). Friends' influence on students' adjustment to school. *Educational Psychologist*, 34, 15-28. Berndt, T. J., & Keefe, K. (1995). Friends' influence on adolescents' adjustment to school. *Child Development*, 66, 1312-1329.

References that have the same first author and different second and/or third authors are arranged alphabetically by the last name of the second author, or the last name of the third if the first and second authors are the same.

Example:

Wegener, D. T., Kerr, N. L., Fleming, M. A., & Petty, R. E. (2000). Flexible corrections of juror judgments: Implications for jury instructions. *Psychology, Public Policy, & Law*, 6, 629-654.

Wegener, D. T., Petty, R. E., & Klein, D. J. (1994). Effects of mood on high elaboration attitude change: The mediating role of likelihood judgments. *European Journal of Social Psychology*, 24, 25-43.

Two or More Works by the Same Author in the Same Year: If you are using more than one reference by the same author (or the same group of authors listed in the same order) published in the same year, organize them in the reference list alphabetically by the title of the article or chapter. Then assign letter suffixes to the year. Refer to these sources in

your essay as they appear in your reference list, e.g.: “Berdnt (1981a) makes similar claims...”

Example:

Berndt, T. J. (1981a). Age changes and changes over time in prosocial intentions and behavior between friends. *Developmental Psychology*, 17, 408-416.

Berndt, T. J. (1981b). Effects of friendship on prosocial intentions and behavior. *Child Development*, 52, 636-643.

Article in Journal Paginated by Volume: Journals that are paginated by volume begin with page one in issue one, and continue numbering issue two where issue one ended, etc.

Example:

Harlow, H. F. (1983). Fundamentals for preparing psychology journal articles. *Journal of Comparative and Physiological Psychology*, 55, 893-896.

Article in Journal Paginated by Issue: Journals paginated by issue begin with page one every issue; therefore, the issue number gets indicated in parentheses after the volume. The parentheses and issue number are not italicized or underlined.

Example:

Scruton, R. (1996). The eclipse of listening. *The New Criterion*, 15(30), 5-13.

Article in a Magazine

Example:

Henry, W. A., III. (1990, April 9). Making the grade in today's schools. *Time*, 135, 28-31.

Article in a Newspaper: Unlike other periodicals, p. or pp. precedes page numbers for a newspaper reference in APA style. Single pages take p., e.g., p. B2; multiple pages take pp., e.g., pp. B2, B4 or pp. C1, C3-C4.

Example:

Schultz, S. (2005, December 28). Calls made to strengthen state energy policies. *The Country Today*, pp. 1A, 2A.

Note: Because of issues with html coding, the listings below using brackets contain spaces that are not to be used with your listings. Use a space as normal before the brackets, but do not include a space following the bracket.

A Translation

Example:

Laplace, P. S. (1951). A philosophical essay on probabilities. (F. W. Truscott & F. L. Emory, Trans.). New York: Dover. (Original work published 1814).

Note: When you cite a republished work, like the one above, work in your text, it should appear with both dates: Laplace (1814/1951).

Edition Other Than the First

Example:

Helper, M. E., Keme, R. S., & Drugman, R. D. (1997). The battered child (5th ed.). Chicago: University of Chicago Press.

Article or Chapter in an Edited Book: When you list the pages of the chapter or essay in parentheses after the book title, use “pp.” before the numbers: (pp. 1-21). This abbreviation, however, does not appear before the page numbers in periodical references, except for newspapers.

Example:

O’Neil, J. M., & Egan, J. (1992). Men’s and women’s gender role journeys: Metaphor for healing, transition, and transformation. In B. R. Wainrib (Ed.), Gender issues across the life cycle (pp. 107-123). New York: Springer.

Government Document

Example:

National Institute of Mental Health. (1990). Clinical training in serious mental illness (DHHS Publication No. ADM 90-1679). Washington, DC: U.S. Government Printing Office.

Report From a Private Organization

Example:

American Psychiatric Association. (2000). Practice guidelines for the treatment of patients with eating disorders (2nd ed.). Washington, D.C.: Author.

Conference Proceedings

Example:

Schnase, J.L., & Cunnias, E.L. (Eds.). (1995). Proceedings from CSCL '95: The First International Conference on Computer Support for Collaborative Learning. Mahwah, NJ: Erlbaum.

Electronic Sources- Article From an Online Periodical: Online articles follow the same guidelines for printed articles. Include all information the online host makes available, including an issue number in parentheses.

Example:

Bernstein, M. (2002). 10 tips on writing the living Web. A List Apart: For People Who Make Websites, 149. Retrieved from <http://www.alistapart.com/articles/writeliving>

Newspaper Article

Example:

Parker-Pope, T. (2008, May 6). Psychiatry handbook linked to drug industry. The New York Times. Retrieved from <http://www.nytimes.com>

Online Lecture Notes and Presentation Slides: When citing online lecture notes, be sure to provide the file format in brackets after the lecture title (e.g. PowerPoint slides, Word document).

Example:

Roberts, K. F. (1998). Federal regulations of chemicals in the environment [PowerPoint slides]. Retrieved from <http://siri.uvm.edu/ppt/40hrenv/index.html>