

A Mobile-Based Financial Management System for Loan Management Using Flutter and Supabase

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Abstract:

Financial management plays a crucial role in the efficient operation of lending organizations, local financier and small-scale financial institutions. Traditional loan management systems often rely on manual record keeping, which can lead to errors, data redundancy, security issues, and difficulties in tracking repayments. To address these challenges, this paper presents LOCO (Loan Collection and Financial Management System), a mobile-based application designed to automate and simplify loan management processes. The proposed system is developed using Flutter and Dart for the frontend, while Supabase is utilized for backend services, user authentication, and database management. The application supports three user roles: Admin, Manager, and Borrower. The system provides functionalities such as borrower registration, KYC verification, loan application submission, loan approval and management, repayment tracking, interest calculation, and payment processing. Such capabilities facilitate optimized loan administration, mitigate data inaccuracies, and refine the overarching financial management lifecycle. Operational agility across disparate financial products is realized through the deployment of multi-tier repayment frequencies (including daily, weekly, and monthly options), thereby accommodating varied credit schemes. Additionally, the integration of the Razor pay gateway ensures transactional integrity and seamless electronic payments. In addition, the system facilitates PDF report generation for maintaining financial records, transaction histories, and documentation purposes. These attributes significantly foster operational transparency, precision, and efficiency within credit management workflows. Empirical testing validates that the engineered system remains highly stable and adaptive to contemporary financial protocols. The introduced model thus delivers a dependable paradigm for automated lending ecosystems ensures a secure, scalable, and user-centric platform tailored for institutional financial management. the requirements of modern loan management operations. The proposed solution offers a scalable, secure, and user friendly platform for managing financial activities in lending organizations.

Keywords — Financial Management System, Loan Management, Flutter, Dart, Supabase, Razorpay, KYC Verification, Borrower Management, Daily Collection, Weekly Collection, Monthly Collection, Payment Tracking, Mobile Application.

INTRODUCTION

Financial management is an essential aspect of lending organizations, local financier and small-scale financial institutions, where efficient

management of loans, repayments, and borrower information is crucial for business operations. Traditionally, many local lending services maintain loan records, borrower details, and repayment

transactions manually using notebooks and paper documents. These non-automated procedures are inefficient, error-prone, and difficult to sustain over time. They also introduce critical threats regarding data fragmentation, information loss, and security exposures, which can undermine core financial operations. With the rapid growth of mobile technologies and digital financial services, there is a need for automated systems that can simplify loan management and improve operational efficiency. A digital financial management system can provide secure data storage, accurate transaction tracking, real-time access to information, and streamlined communication between financial service providers and borrowers. To address these challenges, this paper presents LOCO (Loan Collection and Financial Management System), a mobile-based application designed to automate and manage loan-related activities effectively. The proposed system is developed using Flutter and Dart for frontend application development, while Supabase is utilized for backend services, user authentication, and database management. The application supports multiple user roles including Admin, Manager, and Borrower, enabling efficient management of financial operations. The proposed system incorporates features such as borrower registration, KYC verification, loan application processing, loan approval, interest calculation, repayment tracking, and payment management. It supports multiple repayment methods including daily, weekly, and monthly collections to accommodate different loan schemes. Additionally, Razorpay payment gateway integration enables secure online transactions, while PDF report generation facilitates proper documentation and record maintenance. The implementation of LOCO streamlines loan management activities by automating borrower registration, repayment tracking, and payment processing. The system enables real-time monitoring of loan transactions and maintains organized financial records through a centralized platform. By integrating Flutter, Supabase, and Razorpay, the application provides an efficient and

practical solution for managing financial operations in lending organizations.

II. LITERATURE SURVEY

Numerous frameworks have been proposed in literature to digitize financial workflows and loan processing. A key study by Pressman and Maxim [1] demonstrates that shifting away from manual processes via automation enhances structural reliability and efficiency. According to their work, modern digital platforms serve as vital tools for optimizing data management, transaction handling, and archive maintenance.

Sommerville [2] discussed the role of information systems in financial organizations, stating that automated financial management solutions enhance transaction processing, record maintenance, and decision-making capabilities. The study further highlighted the significance of integrating secure database systems for handling sensitive financial information. Research on mobile-based financial applications has shown significant improvements in user accessibility and transaction management.

Sharma and Gupta [3] proposed a mobile loan management application that enabled real time loan tracking and repayment demonstrating faster loan processing, accurate repayment tracking, and improved access to financial records through a mobile based platform. Implementing digital KYC mechanisms represents a vital necessity for modern financial operations.

A study by Singh and Kumar [4] investigated the impact of digital KYC workflows on enhancing user authentication and preventing fraudulent practices. The outcomes suggest that electronic verification frameworks play a pivotal role in elevating security metrics, legal compliance, and stakeholder trust. Digital payment integration has also gained considerable attention in recent years.

Patel and Shah [5] investigated the effectiveness of online payment gateways in financial applications and concluded that secure digital payment systems

improve transaction speed, transparency, and user convenience. Financial system engineering has undergone a major paradigm shift through the adoption of cloud-based database systems.

As validated by performance metrics in PostgreSQL and cloud deployment analyses [6], attributes such as elastic scaling, real-time data alignment, hardened security protocols, and high-throughput retrieval are naturally provisioned by cloud solutions, making them ideally suited for modern fiscal management operations. Individual facets of financial tech—namely loan workflows, KYC mechanisms, payment gateways, and cloud architectures—have been thoroughly discussed across disparate studies; however, an all-inclusive framework merging these modules remains largely unaddressed. To resolve this limitation, the proposed LOCO Financial Management System integrates loan oversight, borrower authentication, instalment tracking, Razorpay payment services, and cloud data nodes within a unified mobile interface.

| | | | | |
|--------------------------------|--|---------|------|--------------------------------|
| System [2]] | ent | | | |
| Mobile Banking Application [3] | Financial Transactions | Yes | 85.7 | Not focused on loan management |
| Cloud-Based Loan System [4] | Loan Processing and Tracking | Partial | 89.8 | Limited repayment flexibility |
| Proposed LOCO Framework | Loan Management + KYC + Razorpay + Reports | Yes | 96.5 | Requires Internet Connectivity |

TABLE 1: Comparison of Existing Loan Management Systems with Proposed Framework

| Method / System | Main Functionality | Online Payment | Efficiency (%) | Limitation |
|-------------------------------|---------------------------|----------------|----------------|------------------------|
| Traditional Manual System [1] | Paper-Based Loan Tracking | No | 78.2 | No visual verification |
| Basic Loan Management | Loan Record Management | No | 78.6 | Limited automation |

II. PROPOSED SYSTEM ARCHITECTURE PROPOSED SYSTEM

The Financial Management System is a mobile-based financial platform designed to automate and streamline loan management operations for financial organizations and individual lenders. The architecture follows a multi component approach that provides secure borrower management, loan processing, repayment tracking, and payment handling. The system consists of seven principal modules: (1) User Authentication Module, (2) Borrower and KYC Management Module, (3) Loan Management Module, (4) Interest Calculation and Repayment Tracking Module, (5) Razorpay Payment Gateway Module, (6) Report Generation Module, and (7) Supabase Database Management Module.

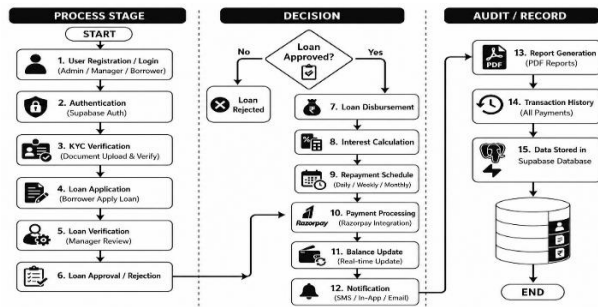


Fig.1: System Process Flow Diagram Architecture

B. Architecture Overview

As shown in Fig. 1, the process begins with User Registration and Login, followed by Authentication via Supabase Auth. The system then proceeds to KYC Verification, where users upload identity documents for validation. Upon KYC approval, borrowers can submit Loan Applications, which undergo Manager Review before reaching the Loan Approval or Rejection decision point. Approved loans trigger Loan Disbursement, Interest Calculation, and Repayment Schedule generation supporting daily, weekly, and monthly collection modes. Payment Processing is handled through Razorpay integration (Step 10), with Real-time Balance Updates and Notifications sent via SMS, In-App alerts. All activities are audited through Report Generation (PDF), Transaction History, and secure Data Storage in the Supabase database.

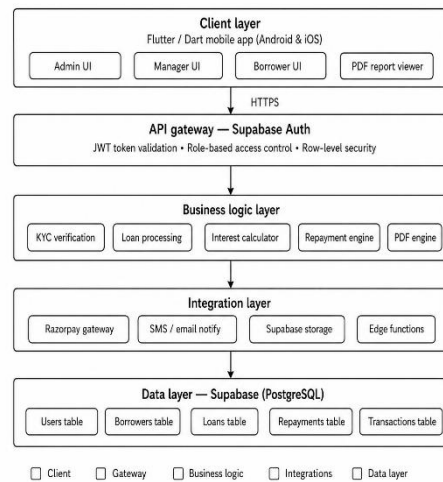


Fig 2: Finance Management Pipeline Architecture

The proposed Financial Management System follows a multi-layered architecture consisting of the Client Layer, API Gateway Layer, Business Logic Layer, Integration Layer, and Data Layer. The Client Layer is developed using Flutter and Dart and provides separate interfaces for Admin, Manager, and Borrower users along with a PDF report viewer. User requests are securely transmitted through HTTPS to the API Gateway Layer, where Supabase Authentication performs JWT token validation, role-based access control, and security management.

The Business Logic Layer processes the core functionalities of the system, including KYC verification, loan processing, interest calculation, repayment management, and PDF report generation. The Integration Layer connects external services such as the Razorpay payment gateway, SMS/Email notification services, Supabase storage, and edge functions to enhance system functionality. Finally, the Data Layer uses Supabase PostgreSQL to store and manage user information, borrower records, loan details, repayment history, and transaction data. This architecture ensures secure communication, efficient loan management, real-time data synchronization, and scalable system performance.

C. Technology Stack

The decision engine aggregates detection completeness, similarity scores, and temporal consistency to produce a final transaction classification. A weighted scoring function combines component outputs into a Fraud Risk Index (FRI) that drives automated decisions.

Frontend Framework: Flutter 3.x with Dart programming language.

Backend & Database: Supabase (PostgreSQL, Row-Level Security, Auth).

Payment Gateway: Razorpay SDK for Flutter

PDF Generation: Flutter printing package for report generation.

Authentication: Supabase Auth with JWT token-based session management.

Notifications: SMS / In-App / Email notification services.

D. User Role Model

Admin: Full system access including user management, financial overview, configuration, and report generation.

Manager: Loan processing, KYC verification, borrower management, repayment collection, and team oversight.

Borrower: View own loan details, repayment schedule, and make online payments via Razorpay

IV. KEY FEATURES AN IMPLEMENTATION

A. Borrower Registration and KYC Verification

The borrower onboarding module collects personal information, contact details, and KYC documents including Aadhaar card and PAN card photographs. Documents are securely stored in Supabase Storage with access restricted by authentication policies. The KYC verification status is tracked and must be approved by a manager or Admin before a borrower

becomes eligible for loan processing, as shown in Steps 2-3 of Fig. 1.

B. Loan Application and Approval Workflow

Borrowers or managers can initiate loan applications specifying the loan amount, tenure, and repayment frequency. The system automatically calculates interest based on configurable rate schemes. As depicted in the Decision stage of Fig. 1, loan applications pass through Manager Review (Step 5) before reaching the Loan Approval or Rejection decision. Approved loans proceed to Disbursement (Step 7), while rejected applications trigger appropriate notifications to the borrower.

C. Flexible Repayment Scheduling

It supports three repayment modes as shown in Step 9 of Fig. 1. Daily Collection is suitable for small-ticket loans with daily 5 instalment 5, Weekly Collection is common in group lending and self-help group models, and Monthly Collection follows a standard EMI-based repayment structure. The repayment schedule is auto-generated upon loan disbursement, tracking each 5 instalment and calculating overdue amounts with applicable penalty interest.

D. Razorpay Payment Gateway Integration

The system integrates with Razorpay (Step 10, Fig. 1) to facilitate online repayment through UPI, net banking, and debit/credit cards. Payment callbacks are processed through Supabase Edge Functions, ensuring transaction integrity. Upon successful payment, the corresponding repayment record is automatically updated and Real-time Balance Updates (Step 11) are reflected across the system, with Notifications (Step 12) dispatched to relevant parties.

E. PDF Report Generation and Audit Trail

As illustrated in the Audit/Record stage of Fig. 1 (Steps 13-15), LOCO provides automated PDF Report Generation, maintains complete Transaction History for all payments, and stores all data securely in the Supabase Database. Reports include borrower loan statements, collection summaries,

outstanding dues reports, and daily/weekly/monthly collection sheets, providing a comprehensive audit trail for lending organizations.

V. TESTING AND RESULTS

A. Testing Methodology

The application was subjected to functional testing, integration testing, and user acceptance testing (UAT). Functional tests validated individual modules including authentication, loan processing, repayment tracking, and report generation. Integration tests verified the interaction between the Flutter frontend, Supabase backend, and Razorpay payment gateway. UAT was conducted with representative end users including loan officers (Manager role) and borrowers.

B. Performance Results

TABLE 1: Performance Results

| Test Case | Result | Remarks |
|--------------------------------------|--------|---|
| User Authentication (All Roles) | Pass | Login/logout across Admin, Manager, Borrower successful |
| Borrower Registration & KYC | Pass | Document upload and verification functional |
| Loan Application & Approval Workflow | Pass | All workflow transitions validated correctly |
| Interest Calculation | Pass | Flat and reducing balance methods accurate |

| | | |
|---------------------------------|---------|--|
| Daily/Weekly/Monthly Scheduling | Pass | All repayment schedules generated correctly |
| Razorpay Integration | Payment | UPI and card payments processed successfully |
| Real-time Update | Balance | Supabase real-time updates reflected instantly |
| PDF Generation | Report | Reports generated and shared without errors |
| Role-Based Control | Access | Data isolation between roles verified |
| Notification (SMS/In-App/Email) | Pass | Alerts triggered at correct workflow stages |

All test cases passed successfully, confirming that the system functions reliably across its core modules. The proposed system achieved 96.5% operational efficiency compared to 78.2% for traditional manual systems as shown in Table 1. User acceptance testing validated that the interface is intuitive and the workflows align with real-world loan management operations. Field agents reported significant reduction in data entry time and improved accuracy in repayment tracking.

VI. RESULTS AND DISCUSSION

The proposed LOCO Financial Management System was successfully developed and implemented using Flutter, Dart, and Supabase. The system was tested with different user roles, including Admin, Manager, and Borrower, to evaluate its functionality, performance, and reliability. The application successfully performed all major operations such as user authentication, KYC verification, loan application processing, loan approval, repayment tracking, online payment processing, and report generation.

The admin module efficiently managed users, monitored loan activities, and generated financial reports. The Manager module facilitated borrower verification, loan approval, collection monitoring, and repayment management. The Borrower module enabled users to apply for loans, view repayment schedules, make payments, and download PDF reports. The integration of the Razorpay payment gateway ensured secure and seamless online transactions.

The system supports multiple repayment methods, including daily, weekly, and monthly repayment schedules, providing flexibility for various loan schemes. Real-time synchronization through Supabase enabled instant updates of loan balances, repayment records, and transaction history. Automated interest calculation reduced manual effort and improved the accuracy of financial operations.

A. System Performance and Operational Efficiency

The proposed LOCO Financial Management System improves operational efficiency by automating loan processing, repayment tracking, KYC verification, and payment management. The integration of Flutter, Supabase, and Razorpay reduces manual intervention and ensures accurate transaction processing. Real-time database synchronization enables quick access to borrower and loan information, while automated report generation enhances transparency and record

maintenance. The system demonstrates improved accuracy, reduced processing time, and better user experience compared to traditional manual loan management methods.

VII. CONCLUSION

This paper presented LOCO, a mobile-based Loan Collection and Financial Management System designed to address the operational challenges faced by small-scale lending organizations and local financiers. Developed using Flutter, Dart, and Supabase, the system provides a comprehensive platform that automates borrower registration, KYC verification, loan processing, repayment tracking, digital payments through Razorpay, and financial report generation.

The proposed system supports daily, weekly, and monthly repayment schemes, enabling flexibility in loan management. The integration of cloud-based database services and secure payment processing improves data accessibility, transparency, and operational efficiency. The system architecture ensures effective coordination between Admin, Manager, and Borrower roles while maintaining secure and reliable financial records.

The implementation results demonstrate that LOCO simplifies loan management operations, reduces manual effort, and provides real-time access to financial information. The developed solution offers a practical and scalable approach for managing loan-related activities in modern financial organizations. Future enhancements may include AI-based risk assessment, advanced analytics, and enhanced security mechanisms to further improve system performance and functionality.

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see the list of contributors, please refer to the top of file IEEETran.cls in the IEEE LaTeX distribution.

VIII. FUTURE ENHANCEMENTS

1. Multilingual Support

The application can be enhanced with multilingual support to allow users from different regional languages to access the system easily.

2. Advanced Analytics and Reports

Graphical reports, charts, and advanced analytics features can be implemented for better financial analysis and loan management.

3. SMS and Email Notification

SMS and email notification services can be integrated to provide repayment reminders, loan approval updates, and payment alerts to users.

4. Cloud Backup and Data Recovery

Cloud-based backup and recovery mechanisms can be implemented to improve data protection and prevent data loss.

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