JOURNAL ON COMMUNICATIONS

ISSN:1000-436X

Scopus®

REGISTERED

www.jocs.review

Share Pay: AI Expenses sharing Website

Prof. Madhavi Sadu[1], Vaidik Gampawar[2], Faizurrehman Mirza[3], Lobhas Thekale[4], Sumit Bhoyar[5], Karan Nagrale[6]
Student, Department of Computer Science and Engineering,
Assistant Prof. Department of Computer Science and Engineering,
Rajiv Gandhi College of Engineering, Research and Technology, Chandrapur, 442401.

Abstract: ***Managing shared expenses within groups—such as friends, roommates, or teams—often leads to confusion, missing records and miscalculations when handled manually. Existing tools typically offer only basic splitting functions and lack essential features such as automated reminders, transparent settlement tracking, or intelligent insights. To address these limitations, Share Pay is developed as a web-based platform that streamlines the entire process of recording, splitting and settling group expenses. The system enables users to create groups, add participants, log transactions and view updated balances in real time. It supports both equal and customizable split methods that allow flexibility for various scenarios. A dedicated settlement module helps users clearly identify outstanding dues while the dashboard provides an organized overview of spending activity. Built using modern web technologies, Share Pay aims to deliver a simple with reliable and scalable solution that enhances transparency and reduces the effort involved in managing shared financial responsibilities.***

Keywords: Expense Management, UPI Integration, Convex Backend, Real-time Collaboration, AI Insights, Financial Technology.

1. INTRODUCTION

Shared expenses have become a routine part of everyday interactions, whether among students living together, colleagues organizing events, families managing household budgets or friends planning trips. Despite this, many groups still rely on informal methods such as chat messages, handwritten notes or spreadsheets to track contributions and settle outstanding amounts. These manual approaches often lead to inconsistent records, calculation errors and misunderstandings regarding who owes what. As digital transactions grow more common, users increasingly expect tools that provide accuracy, transparency and convenience in managing shared financial activities.

While several mobile and web applications currently exist to assist with expense tracking, many fall short in offering a complete and automated solution. Most tools provide only basic splitting features, lack integrated settlement options or do not update balances in real time. Users are also often unable to access meaningful insights into their spending

behaviour or receive timely reminders about pending dues, leading to delayed settlements.

To address these issues, **SharePay** is introduced as a modern, web-based expense management system designed to simplify group financial coordination. The platform enables users to create groups, record shared expenses, divide costs through flexible split options and monitor settlements with improved clarity. Real-time synchronization ensures that all participants remain informed about their current balances as the centralized dashboard provides a comprehensive view of financial activity within each group. Built using contemporary technologies such as Next.js, Convex and Tailwind CSS, Share Pay aims to deliver a seamless experience that supports scalability and future enhancements including UPI-based payments and AI-driven financial insights.

2. PROJECT REVIEW

Effective management of shared expenses remains a persistent challenge for groups of all sizes. A review of common practices and existing tools reveals several recurring issues that highlight the need for a more efficient and automated solution.

1. **Challenges in Tracking Shared Expenses**
   Many users struggle to maintain accurate records of group expenditures. When multiple people contribute at different times it becomes difficult to keep track of payments, verify previous entries and ensure that everyone has paid their fair share. The absence of a centralized record often leads to confusion and unnecessary disputes.

2. **Errors Due to Manual Calculations**
   Numerous groups still rely on manual calculations, chat messages, or simple calculators to divide expenses. These methods are highly prone to human error especially when dealing with multiple transactions or uneven splits. Mistakes such as duplicate entries, incorrect amounts or missing contributions are common, leading to inaccurate balances.

3. **Lack of a Unified Expense Management Platform**
   A major limitation of traditional methods is the absence of a single platform where all expense-related data can be stored and accessed. Instead records are scattered across notes, chats, spreadsheets and individual memories. Without a unified system, retrieving historical transactions or validating old entries becomes challenging.

4. **No Integrated UPI-Based Settlement System**
   Most existing tools do not provide built-in UPI payment settlement. Users must switch between applications to clear dues, increasing the chances of missed payments or delayed settlements. Without real-time confirmation, it becomes difficult to verify whether a transaction was completed successfully.

5. **Missing Automated Reminders and Notifications**

For many groups, delayed payments are common because there is no system to remind users about pending dues. Without automated reminders such as email notifications group members may forget to settle amounts which slows down the overall settlement process.

6. Insufficient Insights and Financial Analytics

Existing tools rarely provide meaningful financial analysis. Users often lack access to summaries, expense categories or visual representations of their spending habits. Without such insights, it becomes harder to understand patterns make informed decisions or identify areas for better financial management.

3. LITERATURE REVIEW

Efficient management of shared expenses has become increasingly important as digital transactions continue to replace traditional cash-based interactions. Despite this shift, many individuals and groups still rely on informal methods such as handwritten notes, messaging apps or basic spreadsheets to keep track of contributions and settlements. These approaches are highly prone to human error and lack the structure needed to support transparent and reliable financial coordination. As a result, recent research has focused on developing systems that automate expense recording, support secure payment interactions and provide timely feedback to users.

Several studies highlight the limitations of early expense-tracking applications which largely depend on manual data entry and lack intelligent mechanisms for validating or synchronizing records across multiple users. These systems often struggle when updates are made by different participants at different times, resulting in inconsistencies and inaccurate balances. To overcome such challenges, modern platforms emphasize automation through real-time updates, cloud-based storage and improved user accountability.

Research on digital payment technologies particularly the Unified Payments Interface (UPI) demonstrates its potential for integration into expense-management platforms. UPI is recognized for its immediate transaction capabilities, low latency and reliable security features. However, the studies also note important practical concerns such as network dependencies, API reliability and the need for secure backend validation. Incorporating UPI into expense-sharing systems can streamline settlements though it requires careful handling of security protocols and error cases.

Recent advancements in automated financial processing have explored the use of OCR, receipt scanning and AI-based classification of expenses. These techniques significantly reduce manual workload by extracting transaction details directly from images or documents. Although accurate under ideal conditions, OCR systems are sensitive to poor image quality and require substantial computational resources and model training. While the current Share Pay platform prioritizes simplicity through manual entry and the existing literature shows strong potential for future integration of OCR-driven automation.

Studies focusing on financial dashboards further emphasize the value of transparent visualization tools for users. Dashboards displaying spending patterns, pending balances and historical transactions can enhance awareness and improve group coordination. However, many existing tools fail to consolidate all relevant information in one place or lack mechanisms for notifying users about overdue payments.

Another recurring theme in the literature is the importance of automated notifications. Delays in settlements frequently occur because users forget their pending dues. Research on email-based and app-based reminder systems demonstrates that automated alerts significantly improve the timeliness of payments and reduce conflicts within groups.

Overall, existing research indicates a strong need for a comprehensive expense-sharing solution that integrates automated calculations, secure authentication, real-time synchronization and payment capabilities. The proposed **Share Pay** system builds on these insights by combining modern web technologies with features such as automated reminders, flexible splitting options, and real-time updates thereby addressing many of the shortcomings identified in earlier studies.

Title & Author	Methodology	Limitations
1. Digital Expense Tracking System – A. Patel et al.	Web-based system with manual expense entry and sharing using centralized database.	Lacks payment integration; reminders not automated; relies on manual input.
2. Mobile Group Expense Manager – S. Reddy	Android app that records and splits group expenses with local storage.	No cloud sync; no UPI integration; limited to small groups.
3. UPI-Based Payment Automation – R. Shah	System uses UPI APIs for secure, instant transactions and settlement tracking.	Dependent on internet connectivity and third-party API reliability.
4. Smart Bill Splitter with OCR – Gupta & Verma	OCR with image processing to detect amounts and auto-add expenses.	OCR fails for unclear images; high computation cost; requires model training.
5. Group Finance Dashboard – Lakshmi et al.	Analytics-based dashboard for tracking group expenses, insights, and charts.	No automated dues reminder; lacks integrated payment system.
6. Automated Email Alert System – K. Nair	SMTP-based reminder module for periodic notifications.	Depends on email server stability; reminders may be ignored by users.
7. Secure Authentication for Web Apps – Williams et al.	Multi-factor authentication with encrypted credential storage.	Adds complexity; may affect user experience if not optimized.
8. Cloud-Based Finance Manager – H. Mehta	Uses cloud database for storing user expenses and group data.	Data accuracy depends on proper synchronization; performance drops offline.
9. Real-Time Payment Tracking – D. Kumar	Tracks incoming/outgoing payments using server-side validation.	Limited support for failed or pending transactions; reconciliation needed.
10. Lightweight Web Expense Manager – S.	Simple CRUD-based expense tracker with group	Basic functionality only; lacks reminders, dashboard,

Roy	categorization.	and payment integration.

4. PROBLEM STATEMENT

Managing shared expenses within groups whether among friends, roommates, colleagues, or travel companions often becomes complicated when there is no centralized and automated system to record and track transactions. Users commonly face difficulties determining who paid, how much each member owes, and whether pending amounts have been settled. When calculations are done manually or tracked across multiple platforms such as chat applications, notes, or spreadsheets, errors and inconsistencies become frequent, resulting in confusion and potential disagreements.

Many existing expense-sharing tools do not offer essential features such as integrated UPI payment settlement, automated reminders for pending dues, or real-time synchronization across users. As a result, payments may be delayed, balances may not update promptly, and users must switch between multiple applications to complete a single settlement. Furthermore, the lack of secure authentication and unified data management reduces transparency and reliability in group financial interactions.

These limitations highlight the need for a dedicated, user-friendly platform that can automate expense tracking, support flexible splitting methods, streamline settlements, send timely reminders, and maintain accurate records through secure storage and real-time updates. Addressing this gap is essential for improving clarity, accuracy, and convenience in group expense management.

5. RESEARCH GAP

Although several expense-sharing applications exist today, many of them provide only partial solutions and fail to address the full range of challenges users encounter during group financial coordination. A closer review of available tools and existing research reveals several critical gaps that remain unaddressed:

1. **Limited Automation**

   Most current systems still require frequent manual inputs for calculations, settlements, and confirmations. The absence of automated processes often leads to inconsistent records and increased chances of error.

2. **Lack of Integrated UPI-Based Settlements**

   While digital payments are now common, many expense-sharing platforms do not support direct UPI-based settlement within the application. Users must switch to external payment apps, resulting in missed or delayed payments and a lack of verified transaction status.

3. **Inconsistent Real-Time Synchronization**

A number of solutions fail to update balances and expense entries instantly across all group members. This inconsistency causes mismatched information, confusion, and difficulty in maintaining accurate shared records.

4. Minimal Analytical Insights

Existing tools typically do not provide meaningful insights into spending patterns, group-wise expenditure trends, or predictive financial analytics. Without such intelligence, users cannot easily assess their financial behaviors or make informed decisions.

5. Absence of a Unified Dashboard

Many platforms scatter information across multiple screens or modules, forcing users to navigate extensively to view group expenses, balances and historical records. A centralized dashboard that consolidates all critical financial data is often missing.

6. Weak Accountability and Reminder Systems

Delayed payments frequently occur because most tools lack automated reminders or notifications for pending dues. Without systematic alerts, users may overlook settlements, contributing to delays and misunderstandings.

6. RESEARCH OBJECTIVES

The primary goal of this research is to design and implement a comprehensive, user-friendly platform that simplifies the management of shared group expenses. To achieve the following specific objectives are established:

1. **Develop a centralized web-based system**

   To create a unified platform where users can record, track, and manage shared expenses across different groups without relying on manual or fragmented methods.

2. **Enable real-time updates and settlement tracking**

   To ensure that all users receive immediate updates on new expenses, outstanding balances, and settlements through a modern backend infrastructure that maintains consistent synchronization.

3. **Integrate automated reminders and notifications**

   To minimize delays in payments by providing timely alerts to users about pending dues or upcoming settlements through automated reminder mechanisms.

4. **Support flexible expense splitting methods**

To allow users to divide expenses using multiple approaches such as equal, unequal or percentage-based splits ensuring greater accuracy and adaptability to different group scenarios.

5. **Provide UPI-based settlement capabilities**

To simplify the payment process by enabling UPI-based transactions directly within the system, thereby reducing the need to switch between applications and improving clarity in settlement verification.

6. **Generate AI-driven insights and analytical summaries**

To enhance user awareness and financial understanding by offering intelligent insights, spending summaries and patterns generated through data analysis.

7. **Design an intuitive dashboard for comprehensive visibility**

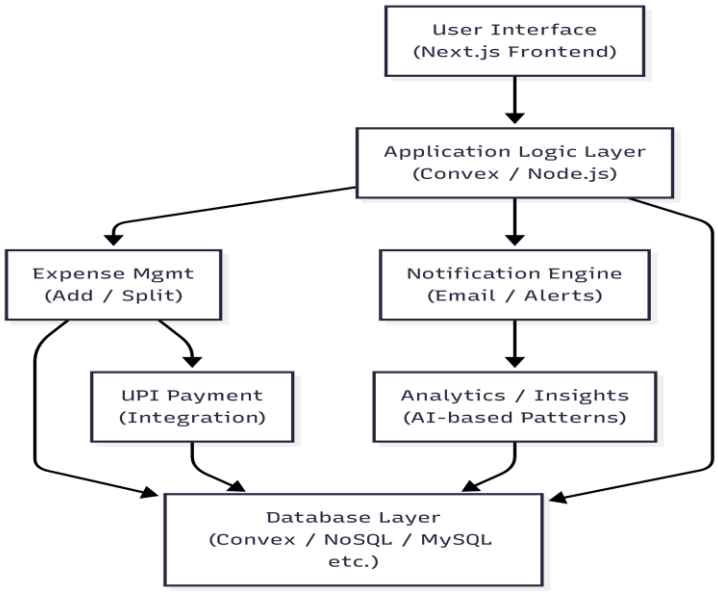
To present all group expenses, balances, and historical data within a centralized and user-friendly interface that improves navigation, awareness and decision-making.

7. RESEACH QUESTIONS (ANY TWO)

1. How can a web-based platform automate the recording, splitting, and settlement of shared group expenses to reduce human errors and improve transparency?

2. To what extent does integrating UPI-based payments and automated reminders help in ensuring timely settlements and reducing missed or delayed dues among group members?

8. BLOCK DIAGRAM



Fig, Architectural Flow of the SharePay Expense Management System

9. FLOWCHART FOR IMPLEMENTED MODEL

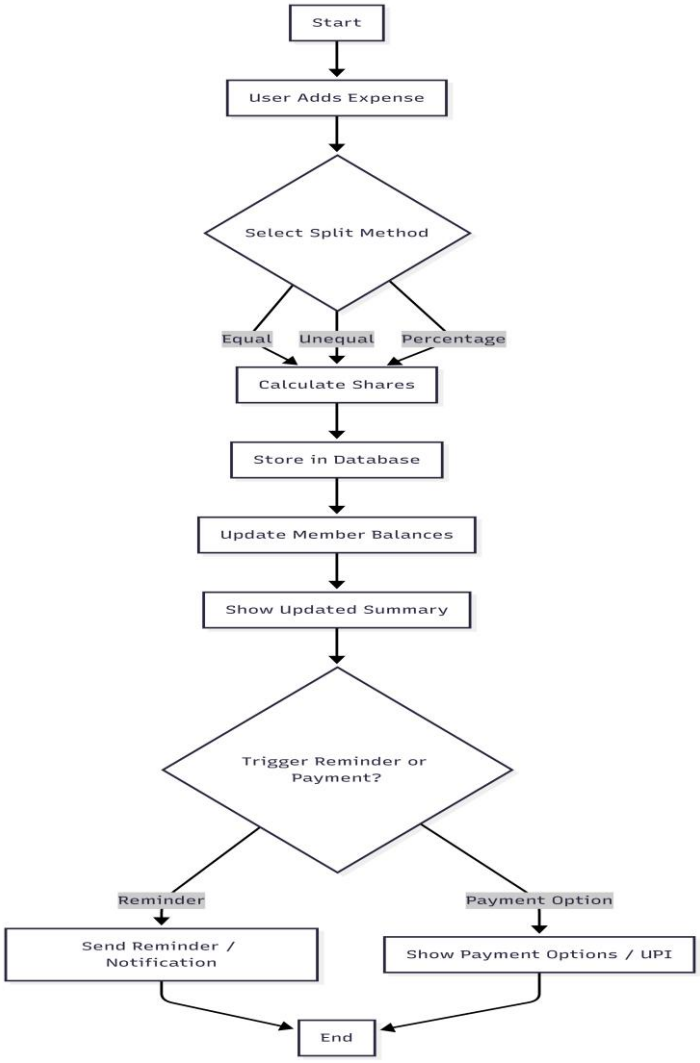


Fig., Process Flow of the Expense Recording and Settlement Module

10. ALGORITHM (Expense Splitting & Settlement)

Algorithm: Expense Recording, Splitting, and Balance Update

Step 1: Start

Step 2: Input the total expense amount **A**, the user who paid (payer **P**), and the list of group members **G[]** involved in the transaction.

Step 3: Select the **splitting method**, which may be:

- Equal split
- Unequal split
- Percentage-based split

Step 4:
If **equal split** is selected:
Compute each member's share as:
share = A / total_members

If **unequal split** is selected:
Accept custom share values for each member in **G[]**

If **percentage-based split** is selected:
For each member **Mi**, calculate:
share[Mi] = A × percentage[Mi]

Step 5: For each member **Mi** in the group:
Update their balance as:
balance[Mi] = balance[Mi] + share[Mi]

Step 6: Deduct the entire amount **A** from the payer **P's** balance to reflect the payment contribution.

Step 7: Store the complete transaction—including amount, payer, shares, and timestamp—into the database.

Step 8: Recompute settlement details to determine updated "who owes whom" relationships.

Step 9: Send notifications to users to inform them of updated balances or settlement requirements.

Step 10: End.

11. PARTIAL RESULTS (What Has Been Achieved So Far)

The development of the Share Pay system has progressed significantly, with several core modules successfully implemented and tested. The following milestones have been achieved:

1. **User Registration and Authentication**

A functional user registration and login module has been developed. Users can securely create accounts and access the system using validated credentials.

2. **Group Creation and Member Management**

The platform now supports creating new groups and adding members to them. This module ensures that expense tracking is organized and tailored to specific groups.

3. **Expense Entry with Equal Splitting**

The basic expense entry feature is operational, allowing users to record expenses and automatically divide the amount equally across all participating members.

4. **Real-Time Database Connectivity**

The system successfully integrates with the backend database, enabling real-time updates of expenses, balances, and group activity.

5. **Group Dashboard Implementation**

A dynamic dashboard is functioning, displaying current group expenses, member contributions, and overall spending patterns in an organized format.

6. **Automated Reminder System (Partially Completed)**

An initial version of the automated email reminder module has been implemented. It can notify users about pending dues, with additional improvements planned for future phases.

7. **Settlement Calculation Testing**

The settlement module has undergone testing with smaller datasets and efficiently computes who owes whom, ensuring accurate balance reconciliation.

12. PROPOSED WORK

The proposed work outlines the architectural components and planned enhancements for the **Share Pay** expense-sharing system. The design emphasizes automation, scalability, secure transactions, and real-time collaboration to deliver a complete financial coordination platform.

1. **User Interface Layer (Frontend – Next.js + Tailwind CSS)**

The frontend provides a clean, responsive, and intuitive interface built using Next.js and Tailwind CSS. This layer enables users to register and log in securely, create and manage groups, add, view, and edit expenses, track individual and group balances, initiate UPI settlement requests, and access

spending summaries and insights. Real-time interactions—such as updated expense lists and balance changes—are supported through integrated APIs and WebSocket-like communication enabled by the backend framework.

2. **Application Logic Layer (Backend – Convex / Serverless Functions)**

The backend manages the core business logic of the platform and ensures accuracy, consistency, and secure data transactions.

The **Expense Management Module** handles the creation, updating, and deletion of expenses. It also processes different types of splits, including equal, unequal, and percentage-based contributions, and updates user balances instantly across all connected devices.

The **Settlement & Payment Module** is responsible for generating "who owes whom" relationships, initiating UPI payment links for smooth settlement, and validating the status once payments are successfully completed.

The **Notification & Reminder Module** sends automated reminders for pending dues, triggers notifications at scheduled intervals, and alerts users whenever new expenses or settlements are added.

Finally, **Real-Time Synchronization** ensures that all group updates are instantly reflected across every member's device. By using Convex or a similar real-time backend, users always see the latest information without needing to refresh the page.

3. **Database Layer (Cloud Database – Convex Storage / SQL Alternative)**

A cloud-backed database will store all system data securely, including user profiles and authentication details, group information with member lists, expense records along with timestamps, settlement logs with payment statuses, and notification or activity logs. The database design will prioritize normalization, quick query performance, and real-time event propagation.

4. **External Systems and API Integrations**

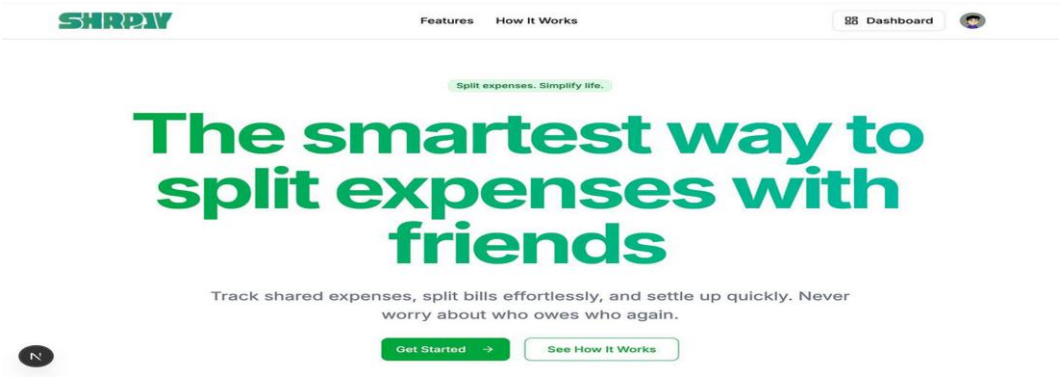
To enhance the system's functionality, several external integrations are planned. The UPI Payment Gateway Integration will handle the generation of secure UPI payment requests, track completion or failure status, and log settlement confirmations for accurate record-keeping.

Additionally, an Email Service Provider will be used to send automated reminders, deliver settlement confirmations, and notify users about important alerts.

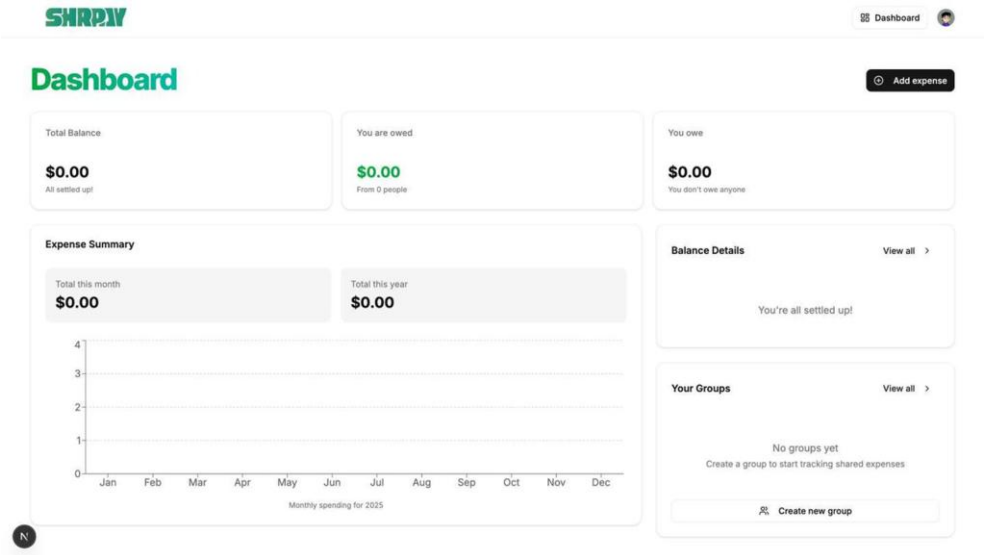
In the future, AI Insights will also be introduced to categorize expenses using trained AI models, provide monthly spending predictions, and offer personalized financial recommendations to users.

13. MODULES TO BE DEVELOPED

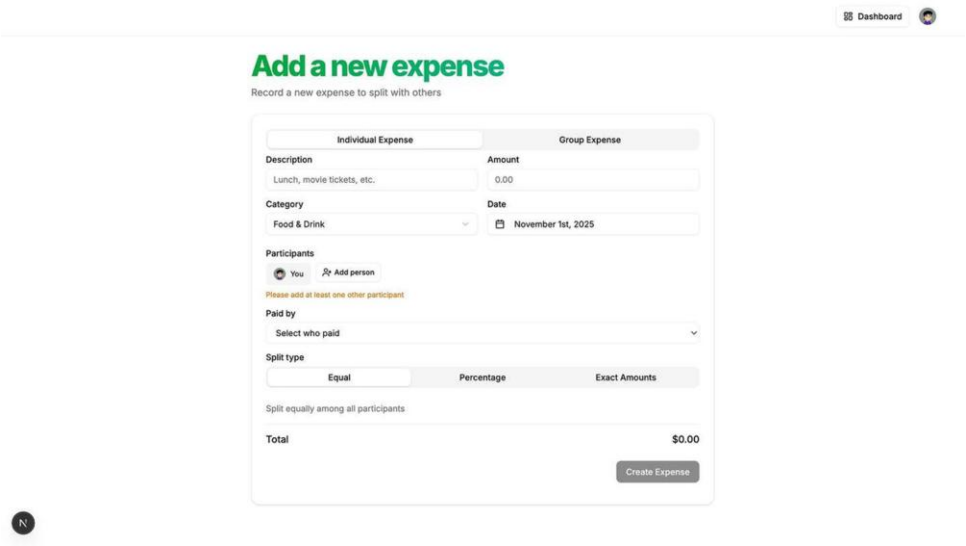
1. User Interface & Authentication Module



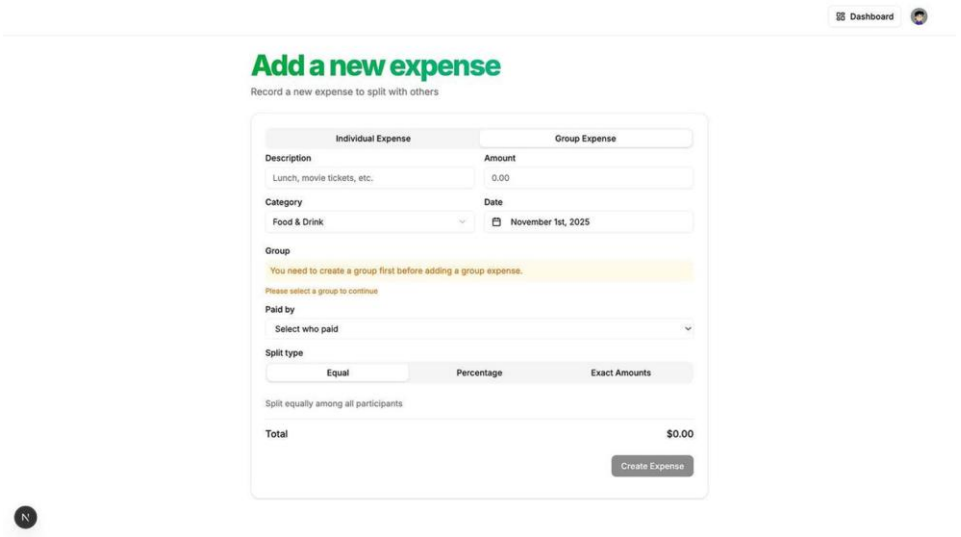
2. Dashboard & Overview Module



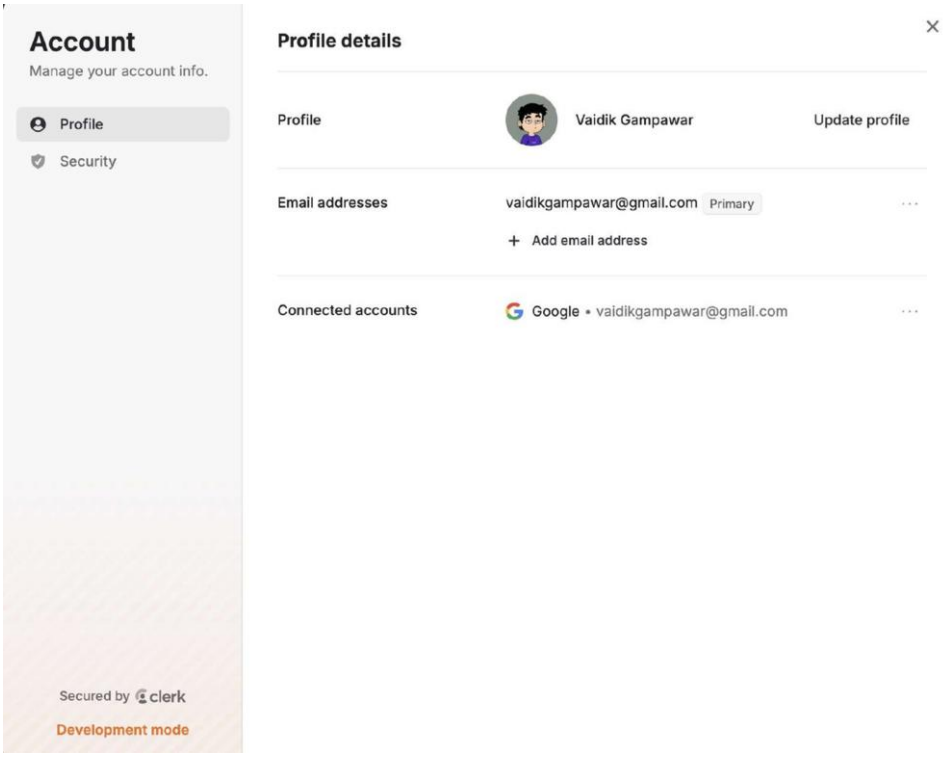
3. Individual Expense Management Module



4. Group Expense Management Module



5. Profile & Account Management Module



14. CONCLUSION

The **SharePay** system presents an effective and modern solution for managing shared group expenses by addressing the key limitations found in traditional and existing digital methods. Through features such as flexible expense splitting, real-time synchronization, automated reminders, and transparent settlement tracking, the platform significantly reduces the likelihood of calculation errors and misunderstandings among group members.

The partial implementation demonstrates the feasibility of the system, with successful integration of core components including user authentication, group creation, expense entry, dashboard visualization, and preliminary settlement functionalities. These early results indicate that the platform is capable of supporting accurate and efficient financial coordination within groups.

As the system continues to evolve, the integration of UPI-based payments and AI-driven insights will further enhance automation and user experience. These advancements have the potential to transform Share Pay into a comprehensive and intelligent financial assistant that not only simplifies expense management but also promotes better financial awareness and accountability among users.

15. REFERENCES

[1] NPCI, “Unified Payments Interface (UPI) – Technical Specifications,” 2023.

[2] Kumar, A., Gupta, S., “Digital Payment Trends in India,” Int. J. Applied Finance, 2022.

[3] Shah, R., “UPI-Based Secure Payment Processing,” IEEE Smart Banking, 2021.

[4] Jain, P., “Digital Transaction Platforms Review,” J. Financial Technologies, 2023.

[5] Patel, A., Reddy, K., “Web-Based Expense Sharing System,” IJCA, 2021.

[6] Roy, S., “CRUD-Based Expense Manager,” Int. J. Web Engineering, 2022.

[7] Lakshmi et al., “Expense Analytics Dashboard,” J. Data Science Applications, 2023.

[8] Muller, J., “Real-time Web Synchronization,” ACM Computing Surveys, 2023.

[9] Nguyen, T., “Event-driven Scalable Architectures,” IEEE Cloud Computing, 2021.

[10] Sharma, A., “Performance Optimization of Next.js Apps,” ICWT, 2022.

[11] Verma, R., Gupta, M., “OCR-Based Bill Splitting,” Int. J. Image Processing, 2022.

[12] Mehta, H., “Cloud-Based Finance Manager Using ML,” J. Cloud Computing Research, 2021.

[13] Li, Z., Wang, C., “AI-Driven Financial Analytics,” IEEE TKDE, 2023.

[14] Williams, J., Brown, L., “Secure Web Authentication,” IEEE InfoSec, 2022.

[15] Rahman, F., “Security in FinTech Applications,” Int. J. Cyber Security, 2021.

[16] Singh, A., “User-centric Design for FinTech Web Apps,” HCI Journal, 2022.

[17] Krishnan, P., “Mobile Expense Management System,” IJMCA, 2020.

[18] Suresh, M., “Automation in Financial Applications,” IEEE Automation Letters, 2021.

[19] Das, R., “Human Error Reduction in Shared Billing,” Finance & Tech Review, 2022.

[20] Mohammed, I., “Survey on AI-Powered Financial Tools,” Expert Systems Journal, 2023.