

ExpenseWave – Smart Expense Splitter

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Abstract

ExpenseWave is a group-oriented expense management application developed to simplify the process of sharing and settling costs among multiple users. The system enables users to record shared expenses, organize participants into groups, and calculate individual contributions automatically. It also provides reminder notifications for pending payments and graphical summaries that help users understand their spending patterns. By integrating group-based expense tracking with notification and visualization features, ExpenseWave promotes transparency, accuracy, and timely settlement of shared financial obligations.

Introduction

Managing shared expenses has become an essential requirement in daily life, particularly in situations such as shared accommodation, group travel, or collaborative events. In such cases, participants often contribute varying amounts at different times, making manual tracking difficult and prone to errors. Traditional methods like verbal communication, handwritten records, or informal messaging lack reliability and frequently result in confusion or delayed payments.

To address these challenges, a structured digital solution is required that can systematically record expenses, calculate fair distributions, and clearly indicate outstanding balances for each participant. ExpenseWave is designed to meet this need by offering an organized and user-friendly platform that ensures clarity and accountability in group expense management.

Literature Review

1. Expense Tracking and Budget Planning Systems:

Several studies have focused on applications that help users monitor personal spending by categorizing expenses and comparing them against predefined budgets. These systems primarily aim to improve individual financial discipline and long-term planning. However, they provide limited support for scenarios involving multiple users sharing expenses.

2. Machine-Learning-Based Expense Classification:

Research has explored the use of machine learning techniques, such as Naive Bayes classifiers, to automatically categorize expenses based on transaction details. While these methods improve accuracy and reduce manual effort, they are mainly designed for expense analysis rather than calculating cost distribution among group members.

3. Digital Billing and AI-Assisted Systems

Some approaches integrate digital billing and artificial intelligence to automate data entry by extracting information from invoices or transaction records. Although these systems enhance automation and scalability, fair expense splitting among multiple users is often not their primary focus.

4. Web-Based and Voice-Enabled Applications

Modern expense applications have also introduced web-based platforms and voice-enabled interfaces to improve accessibility. Despite these advancements,

most such systems are designed for single-user operation and lack structured support for collaborative expense sharing.

5. Smart Personal Expense Management Tools:

Other studies describe “smart” expense managers that help individuals keep track of their everyday outflows through user-friendly interfaces, reminders, and simple analytics. Such tools often provide charts to visualize how much has been spent in different areas and may send alerts when spending crosses certain thresholds. When they enhance visibility into personal financial habits, they generally do not provide structured support for tracking balances between different people.

6. Voice-Enabled and Web-Based Expense Applications:

There are also works that explore full-stack web platforms and voice-driven interfaces for recording and monitoring spending. In these projects, users can interact with the system through browser-based dashboards or speech commands to add new entries and review summaries. These contributions highlight the role of modern interaction modalities in making financial tools more accessible, but they still treat the user primarily as a single account holder instead of a member of a group who shares costs.

7. Everyday Expense Logging for Individuals:

Additional work has examined lightweight tools designed simply to help people record their routine purchases and view them in a structured way. These systems typically offer basic tables or lists, along with optional graphs that show where money is being spent over time. Their contribution lies in simplicity and ease of adoption, but they do not usually address the complexities that arise when several people contribute to a common pool of expenses.

8. Online Income and Outflow Trackers:

Some research focuses on web applications that capture both income and expenditures, enabling users to see their net financial position and trends over longer periods.

System Architecture

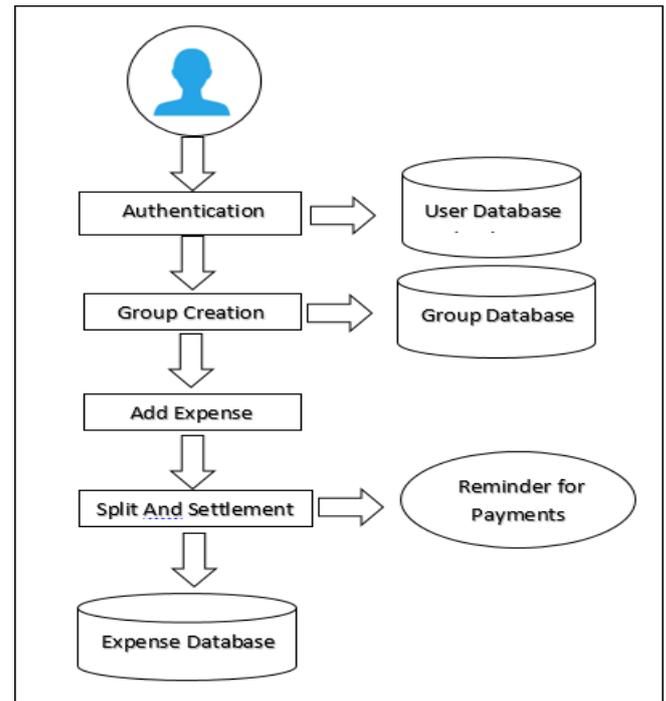


Fig. System Architecture of ExpenseWave The diagram illustrates a basic architecture for a group expense-sharing app like Splitwise. Users begin with Authentication, verifying credentials to access the user database for profiles and login info. Group Creation then lets them form or join groups, storing details like member lists in the Group Database. Add expense records bills, payers, amounts, and shares into the Expense Database as the central lodger. Split and Settlement processes these to calculate balances—who owes whom—using rules like equal or percentage splits. It updates net debts and marks payments as settled.

Reminder for Payments scans unpaid amounts and sends alerts via push, email, or SMS. Data flows sequentially: authentication → groups → expenses → splits → reminders. Relational databases link everything for efficient queries. The design ensures simplicity, security, and real-time balance tracking.

Conclusion

ExpenseWave aims to make shared expense management straightforward and transparent for everyday users. By organizing costs around groups, it clarifies who contributed what and how much each member currently owes. A simple interface, combined with reminders, helps participants settle dues on time and avoid misunderstandings. Statistical summaries and visual overviews further support quick insight into spending patterns and contribution distribution. Overall, ExpenseWave offers a compact yet effective approach

to collaborative expense tracking and splitting.

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