

YNAB(you need a budget)

Kshiteesh Mani ,Harsh Bhansali ,Kashik Jha

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1 Abstract

In an era where financial stability and savvy budgeting are more crucial than ever, the Expense Tracker app emerges as a vital tool aimed at revolutionizing personal finance management. Amidst a backdrop of fluctuating economic conditions and the growing complexity of individual financial portfolios, the need for an intuitive, comprehensive expense management solution is palpable. Statistics indicate a significant portion of individuals struggle with budget adherence, often leading to financial stress and instability. The Expense Tracker app is designed to address these challenges by offering a straightforward platform for tracking, categorizing, and analyzing personal expenses. By leveraging cutting-edge technology for automated transaction detection and providing deep insights into spending patterns, the app aims to equip users with the knowledge to make informed financial decisions, thereby fostering better financial health and planning.

KEYWORDS: Automated Transaction Detection, Budget Management, Cross-Platform Application, Data Visualization, Expense Tracking, Financial Analytics, Flutter, Personal Finance Management, Sqflite, User Authentication

2 Introduction

2.1 Scope

1. **User Authentication:** Secure user authentication ensures data privacy and a personalized experience.
2. **Expense Logging:** Users can easily add, edit, and delete expenses, with details such as date, category, amount, and notes. The app can also automatically detect transactions from messages.

3. **Expense Categories:** Offers pre-defined and customizable categories for organized spending tracking.
4. **Budget Management:** Enables setting monthly budgets for various categories and alerts users when nearing or exceeding these limits.
5. **Data Visualization:** Generates charts and graphs for visual spending pattern analysis and monthly trend insights.
6. **Search and Filter:** Facilitates easy location of specific expenses with comprehensive search and filter options.
7. **Export and Backup:** Allows for expense data exportation in formats like CSV and PDF, alongside data backup functionalities for safety.
8. **User Settings:** Users can customize app settings, including themes and notification preferences, for a tailored app experience.

Developed with the Flutter framework and utilizing Sqflite for local data storage, the Expense Tracker app promises a seamless cross-platform experience for both Android and iOS users. This combination of a responsive UI and robust backend storage solutions positions the Expense Tracker app as an indispensable tool for individuals aiming to navigate their financial landscapes with ease and confidence.

3 Literature Survey

Balathas et al. [1] introduced 'Money Empire: Intelligent Assistant for Personal Finance Management,' addressing the critical issue of managing personal finances in the context of reducing poverty and debt, with a particular focus on Sri Lanka. The paper identifies inefficient personal financial planning as a significant contributor to financial instability, highlighting the inadequacies of traditional methods such as manual record-keeping. In response, the authors propose 'MoneyEmpire,' a comprehensive mobile application designed to automate personal finance management. This application stands out by featuring automated detection of bank transaction SMS alerts, bill upload and processing capabilities, customizable bill splitting, and an analytical dashboard to provide users with insightful financial behaviors. The solution aims to minimize user effort while enhancing accuracy and efficiency in personal financial management.

Critiquing the limited functionality of existing personal finance applications, which primarily act as mere data repositories without offering meaningful analysis or automation, 'MoneyEmpire' addresses

user concerns regarding security and the integration of multiple bank accounts. By integrating automated data extraction, expense tracking, and financial planning tools, 'MoneyEmpire' seeks to fill a market gap. Its design principles focus on user-centered interaction, simplifying personal finance management and making it accessible and effective for a broader audience. This innovative approach aims to empower individuals to manage their finances better, contributing ultimately to financial literacy and stability.

Sabab et al. [2] introduced 'eExpense: A Smart Approach to Track Everyday Expense,' a novel application for automating personal expense tracking via an Android app. The app's core functionality leverages Optical Character Recognition (OCR) technology for automatic extraction of transaction details from scanned bills and receipts, alongside monitoring income through SMS alerts from bank accounts. Aimed at simplifying personal finance management, eExpense provides a comprehensive overview of financial transactions, both income and expenses, to calculate and present users' balance on a monthly and yearly basis. Its primary goal is to minimize manual tracking efforts, enhancing efficiency and reducing error-proneness.

eExpense distinguishes itself by addressing the manual data entry limitations prevalent in existing finance tracking applications. It achieves automation through OCR for digitizing receipt information and SMS parsing for bank transactions. The app boosts user convenience by incorporating features like budget setting, expense categorization, and financial data visualization through pie charts and calendar views. The paper highlights the app's user-friendly design and smart features, such as automated category suggestion and target allocation notifications, contributing to a more intuitive personal finance management experience. Usability testing with participants from diverse age groups underscored eExpense's effectiveness in easing personal finance tracking efforts, notably benefiting older users.

Johri et al. [3] presented 'Expense Management System' at the 2023 4th IEEE Global Conference for Advancement in Technology (GCAT), introducing an innovative mobile application for automating personal finance tracking and management. Facing the challenges of budget maintenance and debt avoidance in an increasingly digital financial environment, the authors propose a system that simplifies financial oversight through technology. Utilizing transaction information from SMS alerts linked to financial accounts and App Crawler tools, the app provides a comprehensive analysis of financial inflows and outflows, aiming to offer users a detailed insight into their spending habits via user-friendly interfaces, diagrams, and visualizations.

The methodology of the Expense Management System is centered around the automated extraction and categorization of financial transactions from SMS notifications, complemented by data presentation through intuitive diagrams and layouts. This strategy not

only facilitates users' understanding of their spending patterns but also supports informed financial decision-making. The application integrates AI tools for personalized recommendations and financial goal setting, automating the tracking of income and expenses. Anticipated future enhancements include tax regime integration for automatic tax calculations, enhanced recommendations, and family financial planning features, underscoring the application's potential to transform personal financial management through a user-friendly, efficient, and effective platform.

Bhatele et al. [4] presented 'TrackEZ Expense Tracker' at the 2023 4th International Conference for Emerging Technology (INCET), showcasing an innovative web application designed to streamline personal expense tracking. Acknowledging the daily financial management challenges, the authors introduce a user-centric platform that automates the recording of daily expenditures and incomes, advancing beyond the conventional manual and paper-based approaches. This digital diary enhances financial management ease and eliminates the need for manual calculations, featuring real-time income and expense updates, entry deletion capabilities, and graphical financial data representations, providing a holistic view of a user's financial health.

Leveraging a two-tier architecture, TrackEZ utilizes Django for its framework, HTML, CSS, and JavaScript for the web interface, and SQLite for database management, ensuring a robust and insightful analytics system on spending patterns. The application offers a clean, responsive interface for logging income and expenses, visualized through dynamic charts and graphs for improved financial planning and analysis. Bhatele et al. emphasize TrackEZ's efficiency in saving users' time and aiding informed financial decision-making, positioning the 'TrackEZ Expense Tracker' as an essential tool for simplifying expense tracking and enabling users to meet their financial goals effectively.

Koo and Khor [5] explore the development of a mobile application titled 'Expense Tracking with Tesseract Optical Character Recognition v5: A Mobile Application Development,' designed to automate personal expense tracking via receipt data capture and analysis. Utilizing the Tesseract Optical Character Recognition (OCR) version 5, the application aims to digitize information from physical receipts efficiently, employing Tesseract OCR's LSTM technology for character recognition. This approach offers a novel solution to the traditionally manual and labor-intensive expense tracking process. An evaluation with 20 real-life receipts underscores the application's effectiveness in recognizing and processing receipt data, despite accuracy challenges with low-quality images.

The study demonstrates the mobile application's satisfactory performance in character and word recognition, particularly in unit price

recognition, as evidenced by low Character Error Rate (CER) and Word Error Rate (WER). Usability is further affirmed through a System Usability Scale (SUS) evaluation, yielding a commendable score indicative of a positive user experience. Koo and Khor highlight the potential of integrating OCR technology into financial management tools, emphasizing the application's role in enhancing financial tracking and planning. Despite certain limitations, such as recognition accuracy with poor-quality images, the research suggests future exploration of advanced OCR models to improve accuracy, contributing significantly to the personal finance management field by simplifying and enhancing the accuracy of personal expense tracking through advanced technology.

Yurochkin, Horoshiy, and Karpukhin [6] introduce 'Development of an Application for Expense Accounting,' a research paper detailing a novel mobile application designed to enhance personal finance management by automating the tracking of expenses from receipts. Utilizing Tesseract OCR for text recognition and Python for image pre-processing, the application addresses the challenge of accurately extracting and categorizing data from various receipt formats, considering the diversity in design and lighting conditions. The developed adaptable algorithm ensures effective data extraction, covering essential details such as store names, dates, item details, and costs, thereby enabling users to efficiently monitor their spending patterns and laying a groundwork for improved financial planning and management.

A distinctive aspect of the application is its ability to divide expenses among multiple users, a feature particularly useful for shared expenditures among roommates or during group outings, filling a gap in existing expense tracking applications. Developed as a Progressive Web Application (PWA) utilizing the Flask framework, the application is noted for its compatibility with the latest versions of Tesseract OCR and its effectiveness in recognizing Russian text. With a user-friendly interface for scanning receipts, viewing expense statistics, and managing shared expenses, the application not only offers a practical tool for personal finance management but also anticipates future enhancements. These improvements aim to expand the range of supported retail outlets and refine the app's functionality, addressing the evolving needs in personal finance management.

Sakthivel et al. [7] developed the 'Personal Expense Tracker Application,' providing a digital solution for managing and tracking personal finances, which underscores the importance of budget control and financial planning in the modern fast-paced lifestyle. By automating the expense tracking process, the application helps users maintain a detailed record of their financial transactions, encouraging conscious spending and saving habits. Featuring a user-friendly interface, the application supports user enrollment through email ver-

ification, enables setting of saving amounts, and defines expense limits, facilitating the analysis of financial activities on a daily, monthly, and yearly basis in both graphical and excel formats for easy access and printing. The application's unique capability to predict income and expenditure patterns through data mining techniques stands as its distinctive proposition, aiding in more informed financial decision-making. Catering to both individual and organizational needs, the application simplifies the expense management process, illustrating the potential to transform traditional pen-and-paper budgeting into a streamlined digital method. This transformation not only conserves time and energy but also increases the accuracy and reliability of financial tracking. Moreover, the application features alerts for users when spending exceeds preset limits, fostering improved financial discipline and management. Future enhancements are aimed at optimizing algorithm selection and expanding dataset analysis to enhance the application's applicability and effectiveness in personal financial management.

Patil et al. [8] introduce 'Personal Expenses Tracker,' a paper that showcases an innovative tool aimed at assisting individuals with their financial management by tracking expenditures meticulously. Adaptable as a notebook, spreadsheet, or mobile app, this tool enables users to set budgets across various predefined categories—like groceries, transportation, and entertainment—allowing for the detailed logging of purchases. This functionality facilitates users in comparing their spending against their budgets and fine-tuning their financial strategies to effectively meet their financial goals, thereby empowering them to take charge of their financial health and make informed decisions.

The methodology of the Personal Expenses Tracker emphasizes the importance of consistent monitoring, categorization, and analysis of expenditures to identify potential savings and adjust budgets accordingly. It advocates for a structured financial management approach, including the choice of tracking method, organization of expenses into categories, and regular review and analysis to understand spending patterns for necessary adjustments. This systematic process aids users in achieving their financial objectives and managing their personal finances more efficiently. The paper also provides an overview of the system, including details on the user interface, authentication, expense categorization, reporting capabilities, data storage, and security measures. By highlighting benefits such as improved financial management, informed decision-making, debt avoidance, reduced financial stress, and better financial planning, Patil et al. promote the widespread adoption of expense trackers as vital tools for personal financial management.

Thomas, Lekshmi, and Mahalekshmi [9] detail the development of a web application 'Expense Tracker' aimed at streamlining the

management of daily expenses. This application seeks to eradicate manual calculations by systematically tracking expenses and utilizing data mining to forecast income and expenditure trends. Designed to accommodate three user roles—admin, manager, and staff—it offers varied privileges, from account management to report generation. The application's core objective is to automate expense tracking, thereby simplifying financial management and enhancing strategic financial oversight through predictive analysis.

The technological infrastructure of 'Expense Tracker' comprises NetBeans for Java development, Dreamweaver for web design, and MySQL for database management, addressing the shortcomings of existing systems reliant on manual record-keeping. By implementing the Least Squares Algorithm for data analysis, the application facilitates accurate financial trend forecasting. This approach not only introduces a more efficient method for financial management but also enhances financial awareness, promotes effective money management, and improves decision-making capabilities, marking a significant step forward in digital financial solutions.

Yadav, Malhotra, and Tripathi [10] delve into the fusion of smart home technology with expense management systems in their paper 'Smart Expense Management Model for Smart Homes.' This research highlights the potential to enhance household budgeting efficiency and effectiveness through the automation of expense tracking and categorization, equipped with smart home capabilities. The proposed model aims to provide homeowners with detailed insights into their spending patterns, facilitating the monitoring of both fixed and variable expenses. This enables the identification of savings opportunities and supports informed financial decision-making, underlining the significance of aligning expenses with income and the role of technology in fostering financial awareness and stability.

The model represents a notable leap in personal finance management by leveraging smart home technologies to automate the documentation and analysis of household expenses. This methodology not only eases budgeting efforts but also offers actionable insights for more resource-efficient and financially sound outcomes. By integrating expense management systems into the smart home ecosystem, the paper illustrates the power of technology to tackle daily challenges, offering a vision for the future where technology-driven solutions enhance financial health and planning.

Velmurugan and Usha [11] discuss 'Expense Tracker Application,' an Android-based app designed for efficient management and tracking of users' daily expenses. Serving as a digital diary, it enables users to log expenditures and categorize them, enhancing financial management. The app's user-friendly interface aims to minimize manual calculations, featuring capabilities for tracking expenses on a daily, weekly, and monthly basis, managing budgets, visualizing

spending through graphs, and maintaining an expense history. Positioned as an answer to conventional budgeting challenges, it facilitates easy monitoring of financial outflows and aids users in making informed spending decisions.

The motivation behind developing the Expense Tracker Application stems from the need for a more organized and manageable method of tracking daily expenses, providing users with tools to stay within budget and comprehend their spending patterns via analytics and graphical representations. This endeavor marks a notable advancement in personal finance management tools, capitalizing on mobile technology to ensure user accessibility, convenience, and profound insights into financial habits. As technological advancements continue to shape our lives, applications like these become indispensable in promoting better financial health and planning among individuals.

Saxena, Joshi, and Dangi [12] detail the development of 'Income and Expense Tracker - An Android Application,' aimed at simplifying the management of users' daily, weekly, monthly, and yearly finances. The application facilitates expense categorization, bill image addition, location data inclusion, and expense amount input, with data stored for future reference. It allows users to sort and view expenses across different time frames and provides graphical representations of spending patterns, streamlining budget management and enhancing financial tracking effectiveness.

The application addresses existing system shortcomings, such as poor user-friendliness and data maintenance, by integrating bill payment reminders and graphical financial data analysis. Developed with Flutter and Firebase, it showcases the potential of modern technology to improve personal finance management, offering a solution that outperforms traditional budget tracking methods like manual logs or Excel sheets. The 'Income and Expense Tracker' application, with its user-centered design and innovative features, marks a significant progression in personal finance application development.

Papers	OCR	Graph	Budget Prediction	Balance	Future Planning	Efficiency and Effectiveness	SMS Reading
[1]	✓	✓	✓	✓	✓	✓	✓
[2]	✓	✓	×	✓	×	✓	✓
[3]	×	✓	×	✓	✓	×	✓
[4]	×	✓	×	✓	×	✓	×
[5]	✓	×	×	×	×	✓	×
[6]	✓	×	×	✓	✓	×	×
[7]	×	✓	✓	✓	×	✓	×
[8]	✓	✓	✓	✓	×	×	✓
[9]	✓	✓	✓	×	✓	✓	×
[10]	✓	×	✓	✓	✓	×	×
[11]	✓	✓	✓	✓	✓	✓	✓
[12]	×	×	×	✓	×	✓	×

Table 1: Feature comparison of various mental health apps.

3.1 Research Gap

The literature survey across the twelve papers reveals a consensus on the growing necessity for advanced personal finance management tools that leverage technology to enhance user experience, accuracy, and efficiency. A prevalent research gap identified is the integration of comprehensive financial management solutions into everyday life, bridging the divide between traditional manual tracking and modern digital automation. While several papers propose innovative applications for tracking expenses, utilizing OCR technology, and applying AI for personalized financial advice, there remains a gap in seamlessly integrating these solutions with users' financial ecosystems. This includes a lack of emphasis on holistic financial health, where expense tracking, budget planning, savings goals, and investment strategies are interconnected within a single platform. Additionally, there is a notable absence of solutions that effectively incorporate the dynamics of household budgeting, shared expenses, and the management of variable income streams, particularly for gig economy participants. Furthermore, the literature points to an opportunity for enhancing user engagement through more predictive analytics, personalized financial insights, and gamification strategies to encourage healthier financial behaviors. Addressing these gaps could significantly contribute to the development of more holistic, user-centric financial management tools that cater to the diverse needs of modern users, promoting financial literacy and stability in a technologically evolving landscape.

3.2 Objectives

1. Develop a comprehensive personal finance management application that combines expense tracking, budget planning, and savings goals in a unified interface.
2. Enhance the user experience by incorporating Automated SMS Reading (ASR) for the effortless logging of transactions and extraction of financial data from text messages.
3. Leverage Artificial Intelligence (AI) and predictive analytics to offer customized financial advice, optimize budgets, and analyze spending behaviors for more informed financial decisions.
4. Provide solutions for effective household budgeting and the management of shared expenses, catering to the diverse financial scenarios and responsibilities of users.
5. Create a user-centric design that simplifies financial management, making the application accessible and appealing to a wide range of users.

6. Offer detailed visual representations and reports of financial activities, delivering insights that users can act on to improve their financial well-being.
7. Continuously refine and update the application based on user feedback and the latest trends in financial management to ensure it remains a valuable resource for users.

3.3 Contribution/Novelty

1. Convenient Expense Tracking: The app simplifies personal finance management by allowing users to easily track and record their expenses, aligning with SDG targets on promoting financial literacy and inclusion.
2. Categorization of Expenses: By enabling users to categorize their spending, the app fosters awareness and encourages responsible consumption patterns, directly supporting SDG goals related to sustainable economic growth and consumption.
3. Budget Setting and Monitoring: The app's feature to set and monitor budgets for various categories aids in fostering responsible financial planning and management, contributing to economic stability and sustainable consumption.
4. Detailed Reports and Analytics: Providing users with comprehensive reports and analytics on their spending habits empowers them with the knowledge to make informed decisions, promoting economic growth and ensuring patterns of consumption that are more sustainable.
5. Search and Filter Capabilities: The ease of searching and filtering expenses enhances the user experience, making financial management more accessible and efficient, thereby supporting broader financial inclusion goals.
6. Data Export for Analysis: By allowing the export of expense data, the app facilitates deeper financial analysis and planning, promoting sustainable economic growth through informed decision-making.
7. Automated SMS Reading: This feature streamlines the tracking of expenses by automatically capturing and categorizing financial transactions from SMS alerts, enhancing the app's efficiency and user-friendliness.

4 Methodology

4.1 PROCESS MODEL

The Agile methodology stands out for its adaptability and user-centric approach in app development projects like YNAB. It divides the project into small, manageable segments, allowing for regular adjustments based on user feedback and changing requirements. This iterative process fosters close collaboration between developers and stakeholders, ensuring the product evolves in line with user needs. Agile's emphasis on cross-functional teams enhances efficiency, enabling rapid development and continuous improvement. By prioritizing continuous delivery, Agile ensures that the product consistently meets high standards, aligning closely with user expectations and market trends, making it an ideal choice for the dynamic world of app development.

4.2 LLD

1. **Languages and Frameworks:** Utilizes Dart with the Flutter framework for crafting cross-platform application logic and UI components. Implements Material Design for UI consistency across Android and iOS.
2. **Database:** Employs SQLite for local data storage, managed via the sqflite Flutter package. Designs a database schema to store entities such as user profiles, transactions, categories, and budgets, supporting CRUD operations for data management.
3. **Automatic SMS Reading (ASR):** Integrates ASR functionality for automatic transaction detection, defining the structure for parsing SMS messages and updating transaction records accordingly.

4.3 HLD

1. **Application Architecture:** Adopts a modular architecture comprising the Presentation Layer for UI, the Business Logic Layer (BLoC) for application logic, and the Data Layer for data management, ensuring a clear separation of concerns.
2. **Flutter Integration:** Leverages Flutter for developing a unified codebase that runs on both Android and iOS platforms, detailing the use of widgets and state management practices for a responsive user experience.

3. **User Interface Design:** Specifies the design and navigation flow of the application, focusing on simplicity and user engagement through intuitive navigation and interactive elements.
4. **Security and Data Protection:** Describes encryption and secure storage practices for protecting user data within the SQLite database, alongside the implementation of user authentication for accessing the app's features.

5 Results

6 Conclusion

The development and deployment of the Expense Tracker app represent a significant stride towards enhancing personal financial management for individuals across diverse economic backgrounds. By delivering a user-friendly, intuitive platform for tracking, categorizing, and analyzing expenses, the app successfully addresses the common challenges of budget adherence and financial planning. Through its comprehensive set of features—from secure user authentication and automated expense logging to sophisticated data visualization tools—the app empowers users to gain a thorough understanding of their financial habits. This, in turn, enables them to make informed decisions that lead to better budget management and financial health.

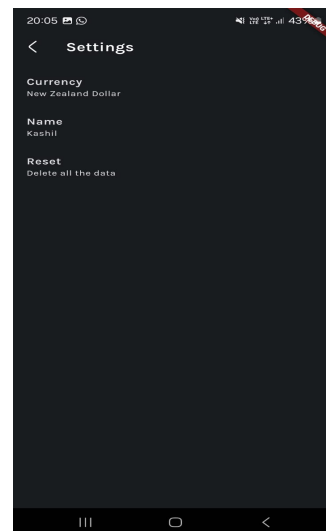
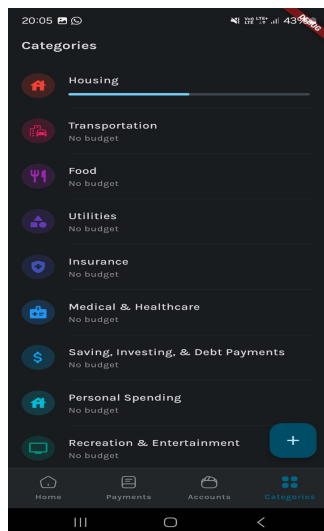
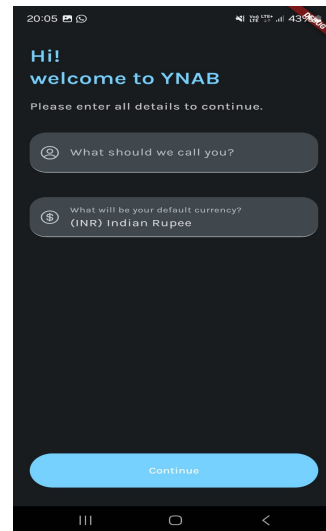
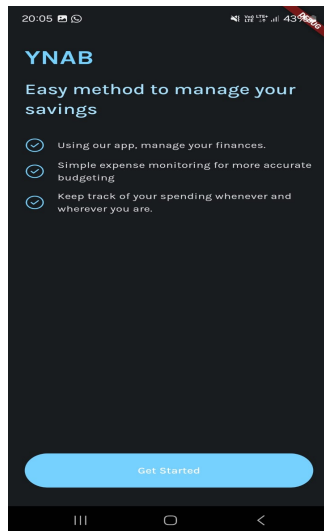
The implementation of advanced technologies such as Flutter for cross-platform functionality and Sqflite for efficient local data storage has ensured that the app is not only reliable but also accessible on a wide range of devices. The positive reception and utilization of the Expense Tracker app highlight its effectiveness in meeting the needs of its users, providing them with a powerful tool to navigate their financial landscapes confidently.

In conclusion, the Expense Tracker app has achieved its primary objective of providing a simple and efficient solution for personal finance management. The inference drawn from its development and usage is clear: with the right tools, individuals can take control of their financial destinies. The app stands as a testament to the potential of technology to transform personal finance, promising ongoing improvements and innovations in the realm of financial management apps.

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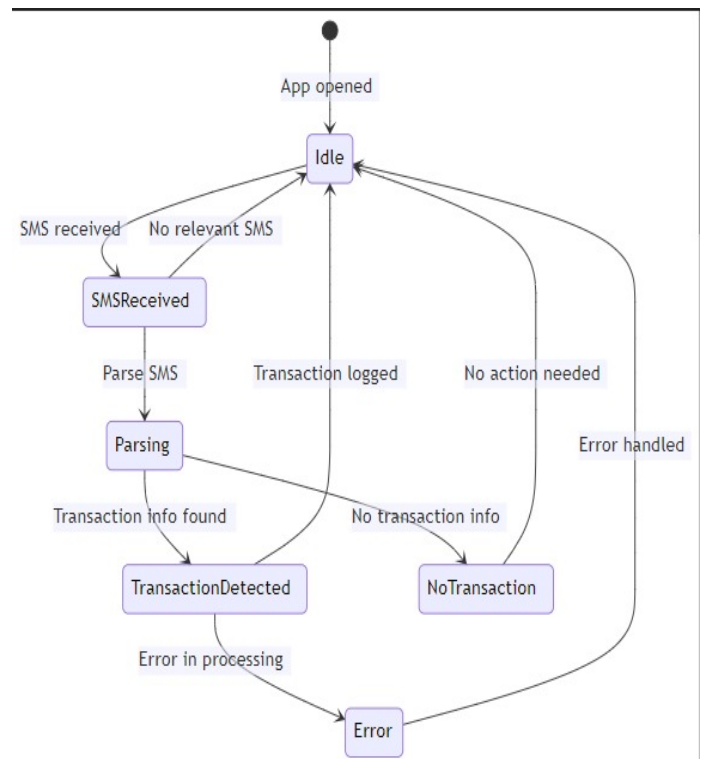
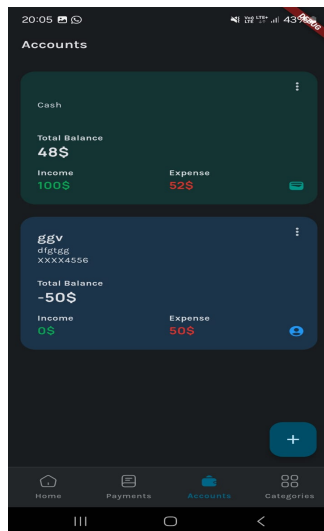
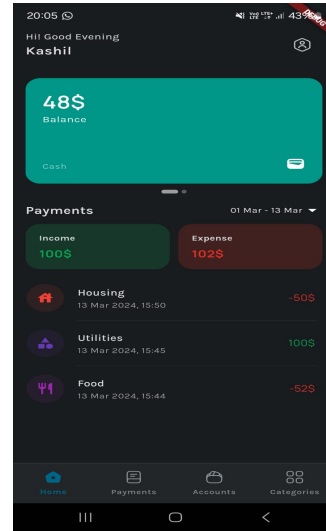
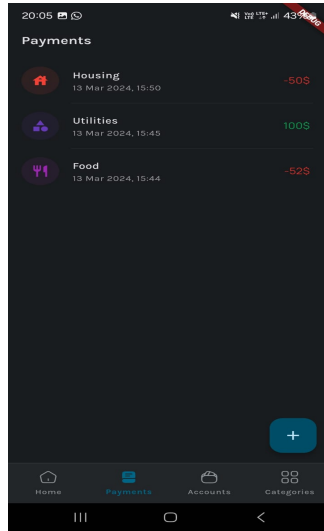


Figure 1: ASR

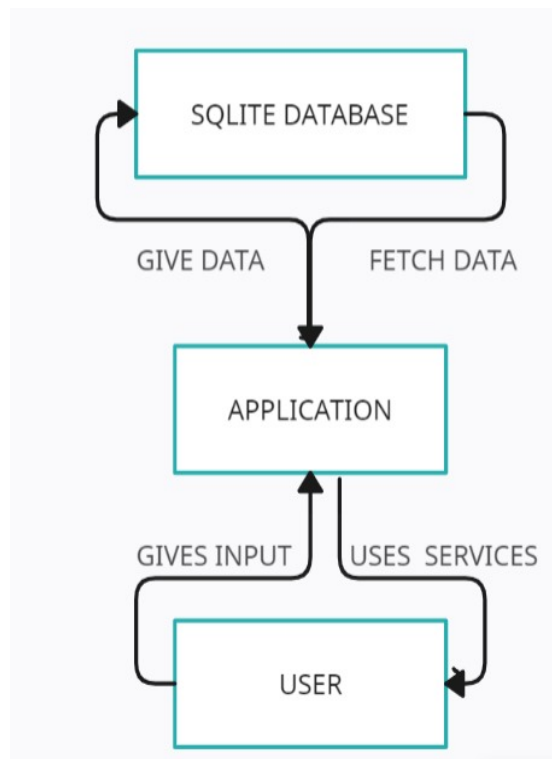


Figure 2: HLD

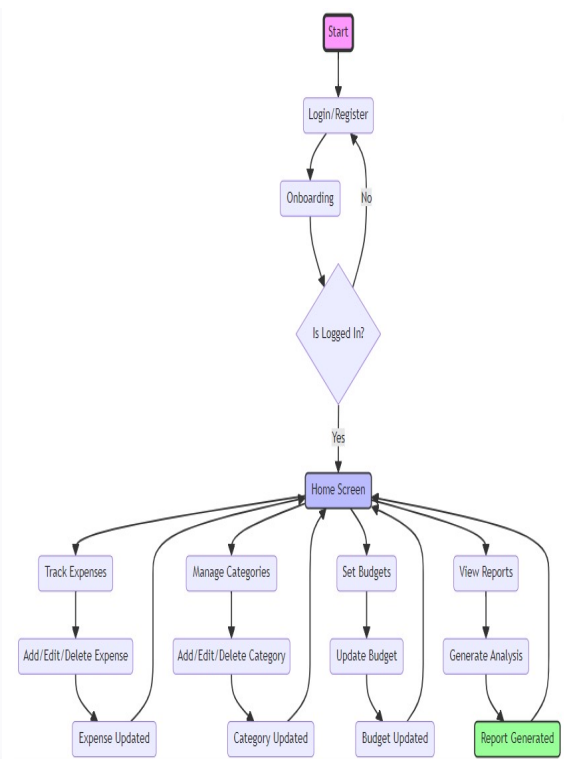


Figure 3: LLD