

An-Najah National University



Faculty of Engineering and Information Technology

Computer Engineering Department

Software Graduation Project



Outlay

Students: Nehaya Nsarra & Sundos Ramadan

Supervisor: Dr. Sufyan Samara

2025/2026

Presented in partial fulfilment of the requirements for Bachelor degree in Computer Engineering.

Table of Contents

Acknowledgment	2
Abstract	3
Chapter 1: Introduction	4
1.1 General Background	4
1.2 Problem Statement	4
1.3 Objectives	5
1.4 Scope	5
1.5 Significance and Importance	7
1.6 Organization of the Report	7
Chapter 2: Constraints	8
2.1 Limited Time	8
2.2 Technical Challenges	8
Chapter 3: Literature Review	9
3.1 Existing Solutions Analysis	9
Chapter 4: Methodology	10
4.1 Technical Preferences	10
4.2 System Architecture	13
4.3 System Features Implementation	14
Chapter 5: Results and Discussion	38
5.1 Project Outcomes	38
5.2 Feature Implementation Success	39
5.3 Market Validation and User Adoption	40
5.4 Innovation Contributions	40
Chapter 6: Conclusions and Recommendations	42
6.1 Conclusions	42
6.2 Recommendations for Future Development	43
6.3 Strategic Recommendations	45
Chapter 7: References	46

Acknowledgment

First and foremost, I would like to express my deepest gratitude to my supervisor, Dr. Sufyan Samara, for his invaluable guidance, constructive feedback, and unwavering support throughout this project. his expertise and insightful suggestions were instrumental in shaping the direction and quality of this work.

I am also profoundly grateful to my family for their constant encouragement, patience, and understanding during the challenging phases of this project. Their unwavering belief in my abilities gave me the strength to persevere and achieve my goals.

Additionally, I extend my sincere appreciation to the faculty members of the Computer Engineering Department for equipping me with the knowledge and skills necessary to undertake this project. Finally, I would like to thank my fellow students for their valuable feedback and suggestions, which greatly contributed to the development process.

Abstract

The proposed project, Outlay, is a mobile application that combines expense management with artificial intelligence to provide users with an intelligent financial and lifestyle assistant.

The importance of this project lies in addressing a common real-world problem: many individuals struggle to track their daily expenses, maintain a healthy spending balance, and avoid overspending on unnecessary or unhealthy items. Outlay seeks to provide a modern, AI-driven solution that enhances financial awareness, promotes healthier spending habits, and supports long-term savings goals.

The project covers several important aspects including: expense tracking (manual and AI-based), monthly budget management, automated reporting with visual charts, lifestyle and health-related expense analysis, and personalized notifications.

The main objectives are to help users manage their income and expenses more effectively, encourage responsible financial behavior, and integrate health awareness into daily financial decisions.

The methodology involves developing a cross-platform mobile application using Flutter for the frontend, Node.js for the backend, and MySQL for data storage. AI models such as Google ML Kit (ocr) will be integrated for image recognition and spending pattern analysis.

Although there are existing expense management applications (e.g., Mint, PocketGuard), Outlay is unique because it incorporates AI-based image recognition for expense entry and lifestyle health tracking, offering a smarter and more comprehensive solution compared to existing systems.

Chapter 1: Introduction

1.1 General Background

In today's fast-paced digital world, managing personal finances efficiently has become a crucial aspect of everyday life. Traditional methods of tracking expenses, savings, and financial goals through manual logs, spreadsheets, or mental calculations are often time-consuming, error-prone, and insufficient for gaining real insights into spending habits.

With the increasing complexity of daily expenses and lifestyle-related purchases, individuals are seeking smarter ways to monitor, control, and optimize their financial behavior. Modern users expect solutions that are **intuitive, automated, and insightful**, providing them with instant feedback on their spending patterns, financial health, and savings progress.

Outlay emerges as a comprehensive financial management platform designed to meet these evolving needs. By combining **manual and AI-powered expense tracking, goal management, health-related spending analysis, and intelligent notifications**, Outlay empowers users to take control of their finances. Its multi-platform support for **mobile and web**, along with features such as **personalized recommendations, multilingual and multi-currency support, and interactive charts**, makes it a modern, user-friendly tool for enhancing financial awareness and promoting healthier spending habits.

1.2 Problem Statement

Many individuals face significant challenges in managing their personal finances effectively. Traditional approaches to tracking expenses, savings, and financial goals rely heavily on manual record-keeping, spreadsheets, or memory, which often results in disorganized data, inaccurate calculations, and a lack of meaningful financial insights. These limitations lead to poor financial awareness and difficulty in making informed financial decisions.

Several key problems arise from these traditional financial management methods:

- **Lack of Expense Visibility:** Users struggle to clearly understand where their money is being spent on a daily, monthly, and yearly basis, making it difficult to control unnecessary expenses.
- **Manual Tracking Errors:** Manually entering and categorizing expenses is time-consuming and prone to human error, leading to incomplete or inaccurate financial records.
- **Absence of Intelligent Analysis:** Traditional tools fail to provide smart insights into spending behaviour, savings trends, or the health impact of food-related purchases.
- **Difficulty in Managing Financial Goals:** Users often find it challenging to plan long-term financial goals such as purchasing a car or managing monthly instalments without proper tracking and reminders.
- **Low User Engagement:** Without intelligent notifications or automated reminders, users may forget to log expenses or stop using financial tracking tools altogether.

Outlay addresses these challenges by offering an intelligent, user-centered solution that integrates automated expense tracking, AI-powered analysis, goal management, and smart notifications, enabling users to gain full control over their financial and lifestyle-related decisions.

1.3 Objectives

The primary goal of **Outlay** is to provide an intelligent financial management application that helps users track expenses, manage income, and improve savings using artificial intelligence. The specific objectives include:

- **Simplify Expense Tracking:** Enable users to record expenses easily through manual entry or AI-based receipt analysis.
- **Organize Financial Data:** Automatically categorize transactions and generate clear daily, monthly, and yearly reports.
- **Enhance Savings and Goal Management:** Help users monitor savings and manage financial goals with instalment tracking.
- **Leverage Artificial Intelligence:** Use AI to extract data from receipts and analyze financial and food-related spending.
- **Promote Health Awareness:** Provide nutritional insights and personalized recommendations based on food purchases.
- **Ensure Accessibility:** Support multi-language, multi-currency usage across web and mobile platforms.
- **Encourage Consistent Usage:** Send smart reminders when users are inactive for a defined period.

1.4 Scope

Outlay is an intelligent financial management application designed to help users track expenses, manage income, improve savings, and gain financial and health insights using artificial intelligence.

Core Features:

- Automatic wallet creation for each user upon registration
- Income management with real-time balance updates
- Manual expense entry with category-based classification
- AI-powered receipt scanning for automatic expense extraction and storage
- Daily, monthly, and yearly financial reports with detailed summaries

Expense, Goals, and Savings Management:

- Categorized expense tracking and budget organization
- Financial goal creation with instalment and progress tracking
- Savings analysis across multiple months

AI-Based Health and Financial Insights:

- Food expense classification and nutritional analysis
- Personalized health and financial recommendations
- AI-powered food and financial expert interaction

User Settings and Accessibility:

- Secure user profile and password management
- Multi-language and multi-currency support
- Cross-platform availability on mobile and web

Notifications and Security:

- Smart inactivity notifications after two days of non-usage
- Secure data handling and privacy-focused design

1.5 Significance and Importance

The development of **Outlay** addresses the growing need for intelligent personal financial management solutions and provides significant value to users seeking better control over their spending, savings, and financial well-being.

Market Relevance:

With the rapid expansion of digital financial tools and increased awareness of personal budgeting and financial literacy, users are increasingly seeking smart applications that simplify expense tracking and savings management. Studies show that individuals who actively track their expenses are more likely to improve their saving habits and reduce unnecessary spending.

Personal Financial Impact:

- **Improved Financial Awareness:** Helps users clearly understand their income, expenses, and saving patterns through detailed reports and visual analytics.
- **Better Savings Behaviour:** Encourages consistent saving and goal achievement by providing structured goal management and progress tracking.
- **Time Efficiency:** Reduces the manual effort required to manage finances through AI-powered receipt scanning and automated categorization.
- **Informed Decision-Making:** Enables users to make smarter financial choices based on data-driven insights.

Technological Innovation:

Outlay leverages artificial intelligence to analyse receipts, spending behaviour, and food purchases, offering both financial and health-related insights. The integration of financial analytics with nutritional analysis distinguishes Outlay from traditional expense tracking applications.

Social and Health Value:

By promoting responsible spending and healthier food choices, Outlay contributes to improved financial stability and personal well-being. The application empowers users to adopt balanced lifestyles while reducing financial stress and encouraging long-term financial planning.

1.6 Organization of the Report

This report is structured to provide a comprehensive overview of the **Outlay** project development:

- **Chapter 2** discusses the constraints and challenges encountered during the development process, including technical limitations, data privacy considerations, and time management issues.
- **Chapter 3** presents a literature review of existing personal finance and expense management solutions, highlighting gaps that **Outlay** aims to address.
- **Chapter 4** details the methodology, including the technical architecture, technology stack, AI integration, and implementation strategies used in developing the application.
- **Chapter 5** presents the results and outcomes of the project, showcasing key features, performance metrics, and user experience achievements.
- **Chapter 6** concludes the report with final observations, lessons learned, and recommendations for future enhancements and improvements.

Chapter 2: Constraints

Limited Time

The development of **Outlay** faced several time-related constraints that required careful planning and prioritization:

- **Learning Curve:** Since the project involved integrating modern technologies such as Flutter for cross-platform development and AI tools for receipt analysis and health insights, significant time was spent learning these frameworks, understanding best practices, and exploring available packages and libraries.
- **Academic Balance:** Balancing project development with academic coursework, examinations, and other university commitments demanded effective time management and often resulted in compressed development schedules.
- **Feature Prioritization:** Due to limited time, it was necessary to prioritize core financial and expense management features over advanced functionalities, focusing on delivering a minimum viable product that provides essential expense tracking, savings management, and AI insights.
- **Testing and Debugging:** Limited time impacted the depth of testing phases, requiring efficient debugging strategies and concentrated quality assurance efforts on the most critical components, such as wallet management, AI receipt analysis, and financial reporting.

Technical Challenges

Several technical constraints influenced the development of **Outlay** and required innovative solutions:

- **Database Performance:** The initial database design needed optimization to efficiently handle concurrent expense entries, AI receipt processing, and goal tracking without performance degradation.

- **Cross-Platform Consistency:** Ensuring a consistent and responsive user experience across mobile (iOS & Android) and web platforms, while respecting platform-specific design guidelines, presented ongoing challenges.
 - **Real-Time Data Updates:** Implementing real-time updates for income, expenses, savings progress, and AI-generated insights across multiple devices required careful management of data consistency and conflict resolution.
 - **Third-Party Integrations:** Integrating with external services such as AI-based receipt scanning, nutrition analysis APIs introduced dependencies that required careful handling to maintain system reliability.
 - **Security Implementation:** Basic security measures were implemented to ensure the protection of user data and financial information, through authentication mechanisms, data isolation, and secure server-side storage, without compromising the usability of the application
-

Chapter 3: Literature Review

3.1 Existing Solutions Analysis

The personal finance and expense management market includes several established applications, each with distinct approaches and target users. This analysis examines existing solutions to identify opportunities for improvement and differentiation.

Applications like **Mint** and **YNAB (You Need a Budget)** provide basic expense tracking, budgeting, and financial overview. While effective for simple personal finance needs, they often lack advanced AI-powered insights and health-related financial analysis.

PocketGuard offers intuitive budgeting tools and expense categorization but has limited customization for goal tracking and lacks integration with AI-driven receipt analysis.

Goodbudget provides envelope-based budgeting and manual expense entry but lacks real-time data updates, AI integration, and nutrition-related spending insights.

Analysis of Market Gaps

Most existing solutions focus on either basic financial tracking or budget management, but few integrate **AI-driven insights, health analytics, and goal management** in a single platform. Common limitations include:

- Lack of AI-based receipt processing for automated expense extraction
- Limited personalized financial advice based on spending patterns
- Minimal integration with external APIs for authentication and advanced analytics
- Insufficient mobile experience compared to modern web applications
- Limited ability to analyse nutrition-related expenses and provide health insights

Opportunity Identification

The analysis shows an opportunity for a solution that combines **intuitive user interface, AI-powered analytics, and multi-platform accessibility**, while providing secure authentication and personalized recommendations. **Outlay** addresses these gaps by:

- Using **Google API** for seamless login and user authentication
- Integrating **OpenAI API** to analyse receipts, categorize expenses, and provide both financial and nutritional insights

- Offering cross-platform support on **mobile and web**
- Providing goal tracking, savings analysis, and personalized health advice based on spending patterns

Technological Evolution

Recent advances in **AI, cloud computing, and API integrations** have enabled smarter financial management solutions. Modern users expect:

- Real-time expense tracking and savings updates
- AI-powered insights for better financial decision-making
- Integration across multiple platforms with seamless user experiences

Outlay leverages these technological advancements to deliver a unified solution that combines financial management, goal tracking, and health analytics into a single, intelligent platform.

Chapter 4: Methodology

- 4 The development of **Outlay** followed a systematic approach that combined modern software development practices with user-centered design principles. This methodology ensured the creation of a robust, scalable, and user-friendly financial management application. By integrating AI technologies, cross-platform development tools, and secure authentication methods, the project aimed to deliver a comprehensive solution for expense tracking, goal management, and health-related financial insights.

4.1 Technical Preferences

The technology stack for **Outlay** was carefully selected to ensure optimal performance, scalability, and maintainability while providing a smooth user experience across mobile and web platforms.

4.1.1 Frontend Framework – Flutter

Flutter was chosen as the primary frontend framework for its ability to create high-performance, native-like applications for iOS, Android, and web from a single codebase. Key advantages include:

- **Cross-Platform Development:** One codebase for mobile and web reduces development time and maintenance efforts.
- **Rich UI Components:** Flutter's widget library enables polished and responsive interfaces that meet modern user expectations.

4.1.2 Backend – Node.js with Firebase Integration

- **Node.js Core Backend:** Chosen for its event-driven architecture and high performance, suitable for handling real-time expense tracking and AI requests.
- **Firebase Services Integration:**
 - **Firebase Authentication:** Provides secure Google OAuth login using **Google API** for seamless user authentication.

4.1.3 Database – MySQL

- **Reliable and Efficient:** MySQL was selected for its reliability and performance for handling user wallets, expenses, goals, and AI-generated insights.
- **Structured Data Management:** Supports organized storage of financial data and user profiles with efficient querying.

4.1.4 Third-Party APIs

- **Google API:** Used for secure OAuth-based login and user authentication.

- **OpenAI API:** Utilized to process AI features such as receipt analysis, expense categorization, and personalized financial and nutritional insights.

4.1.5 Development Tools

- **Visual Studio Code:** Primary IDE for Flutter and Node.js development.
- **Git/GitHub:** Version control and collaborative development workflows.
- **Postman:** API testing to ensure backend reliability.

4.2 System Architecture

The **Outlay** platform follows a modern, scalable architecture designed to handle concurrent users, real-time updates, and integration with external AI and authentication services. The architecture combines the reliability of a traditional backend with the real-time capabilities of Firebase services.

4.2.1 Hybrid Architecture Design

Multi-Layer Architecture: The system implements a clear separation of concerns across multiple layers:

- **Presentation Layer:** Flutter applications for mobile (iOS & Android) and web handle the user interface, real-time updates, and client-side logic, including offline capabilities.
- **Application Layer:** Node.js backend manages complex business logic, processes API requests, handles authentication workflows, and coordinates communication between system components.
- **Firebase Layer:** Firebase Authentication is used to provide secure user login through Google OAuth, facilitating authentication and enhancing secure access to the application.
- **Data Layer:** MySQL database stores all persistent data, including user wallets, expenses, financial goals, and AI-generated insights, with a structured schema supporting efficient querying and multi-user access.

4.2.2 Integration Architecture

External Service Integration: The platform seamlessly integrates with external services through well-defined APIs:

- **Authentication:** **Google API** provides secure OAuth login and user verification.
- **AI Services:** **OpenAI API** processes receipt scanning, expense categorization, and provides financial and nutritional insights.
- **Data Synchronization:** Real-time updates between the backend, Firebase, and client applications ensure data consistency across devices.
- **File Management:** User documents and receipts are managed locally or on the backend server, ensuring secure storage and accessibility without relying on external cloud storage services.

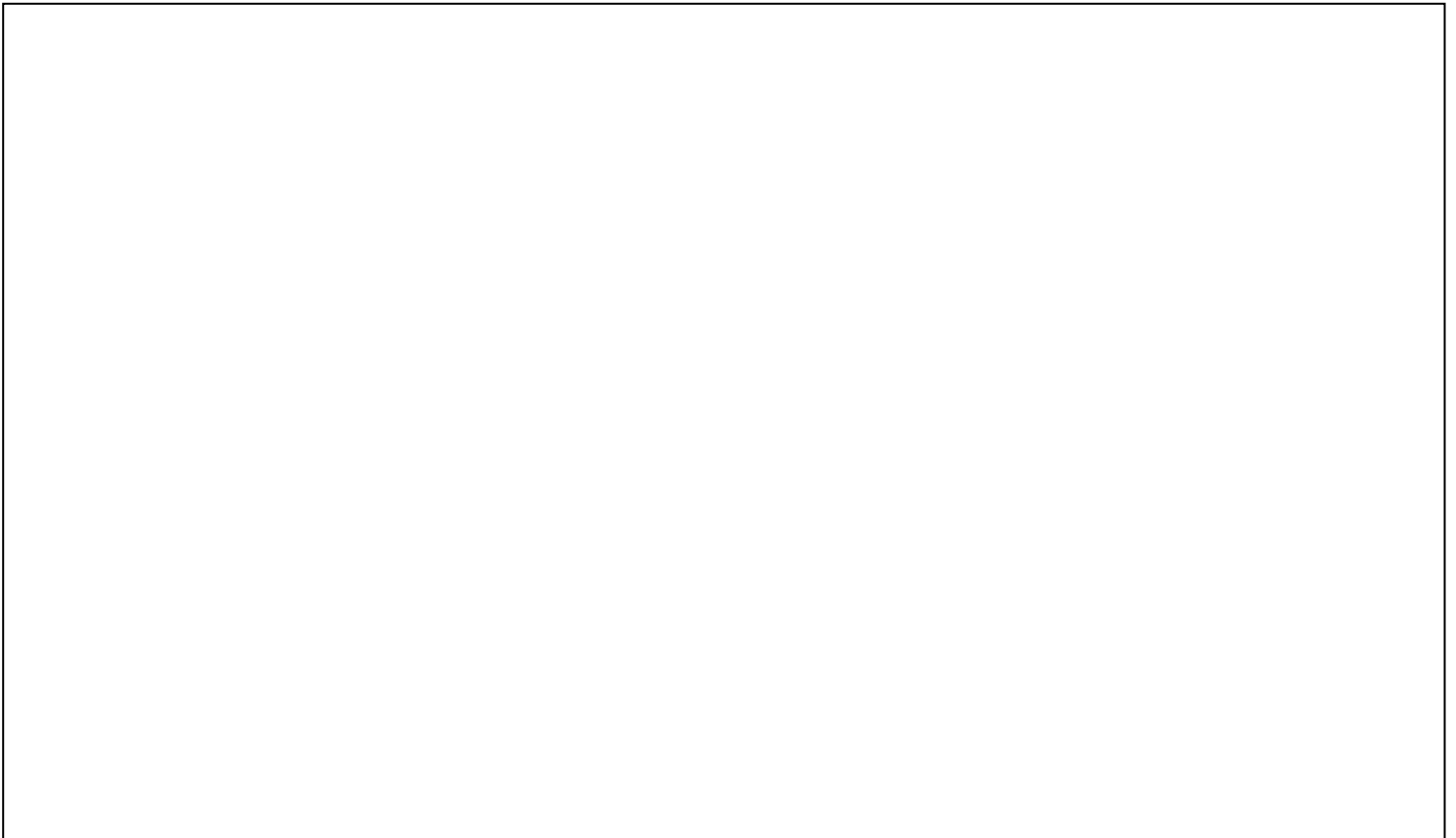
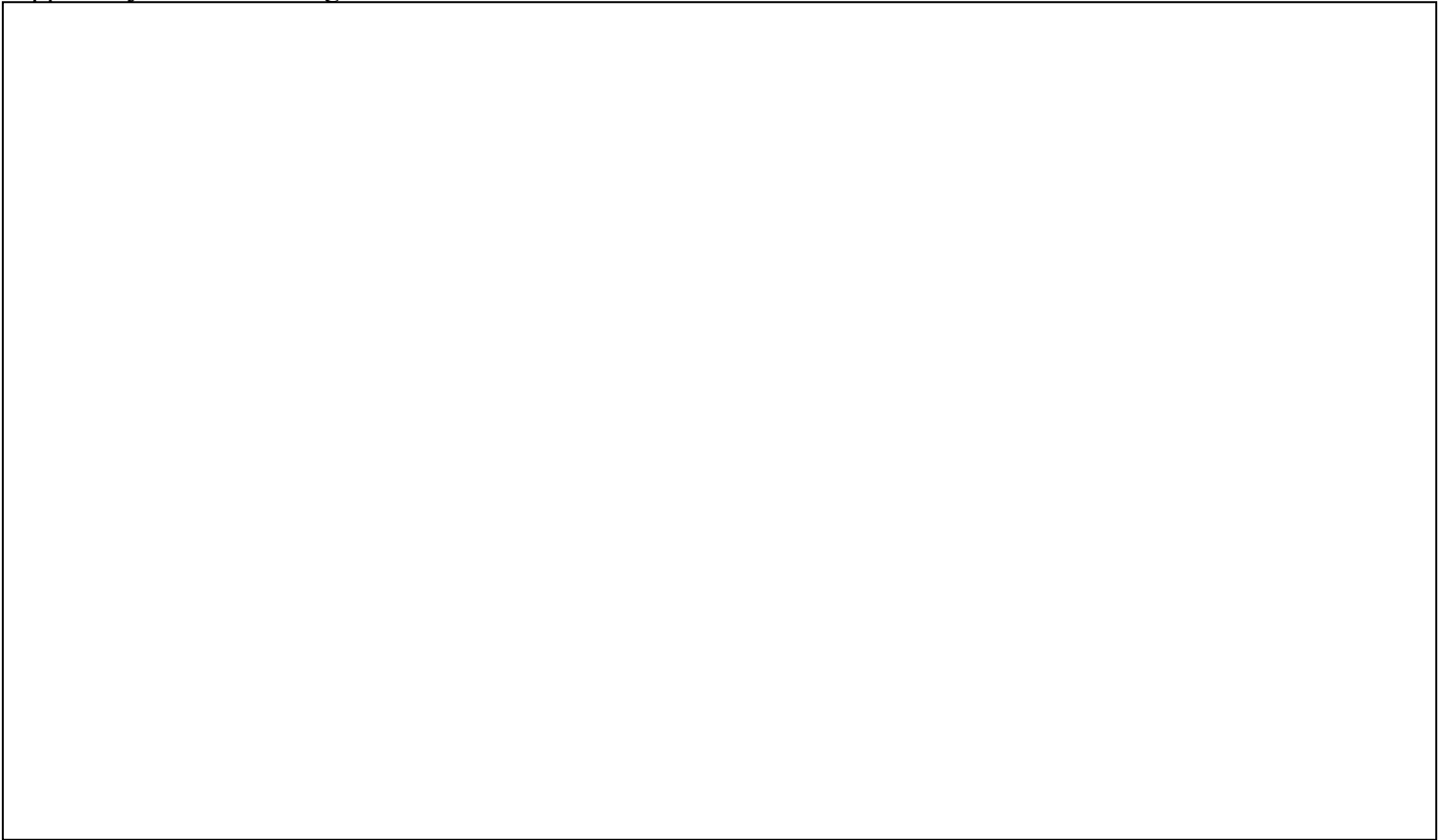
4.3 System Features Implementation

Onboarding screens



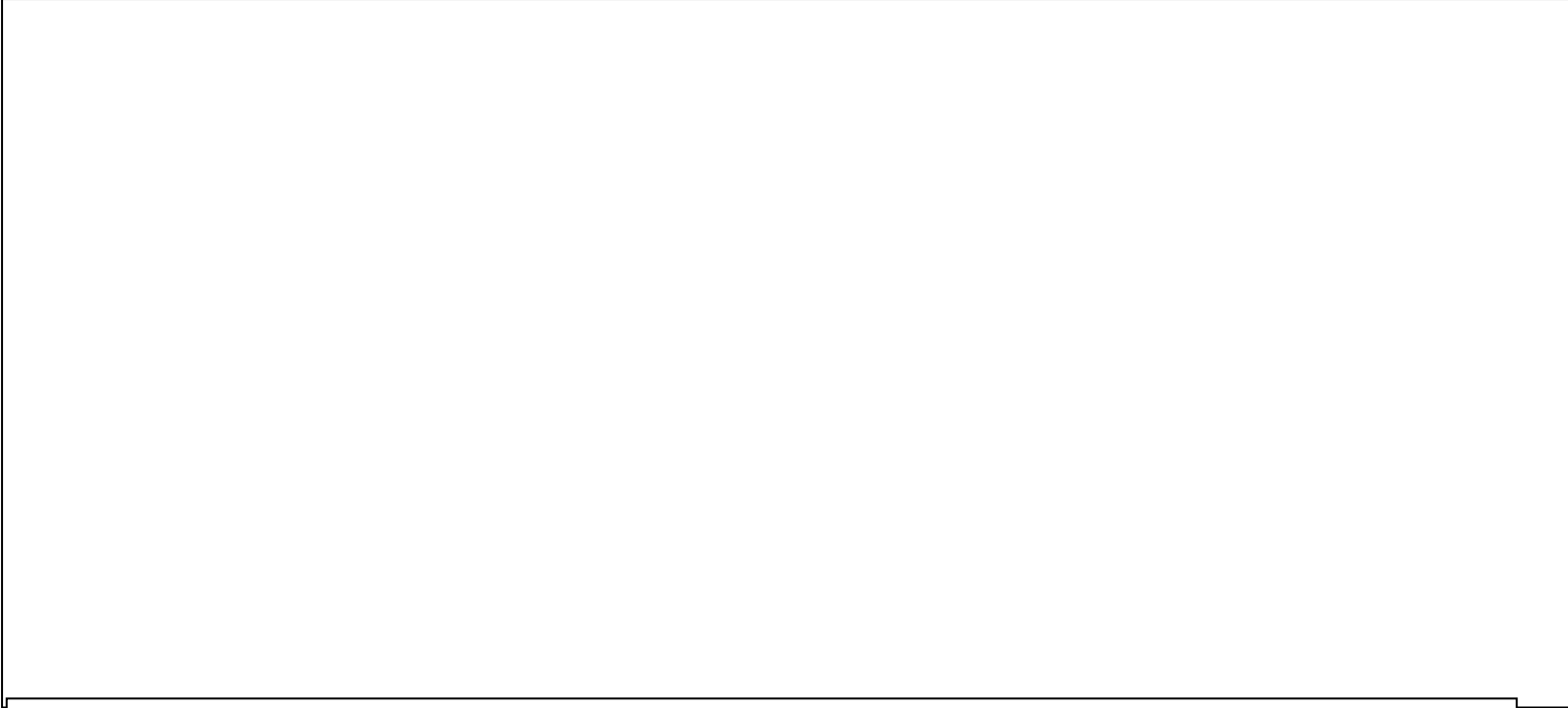
Login and Signup screens

Outlay provides flexible authentication options for users. They can create a new account through the registration screen, sign in using their existing credentials, or log in quickly using Google Sign-In. This allows users to access the app easily while choosing the method that suits them best.



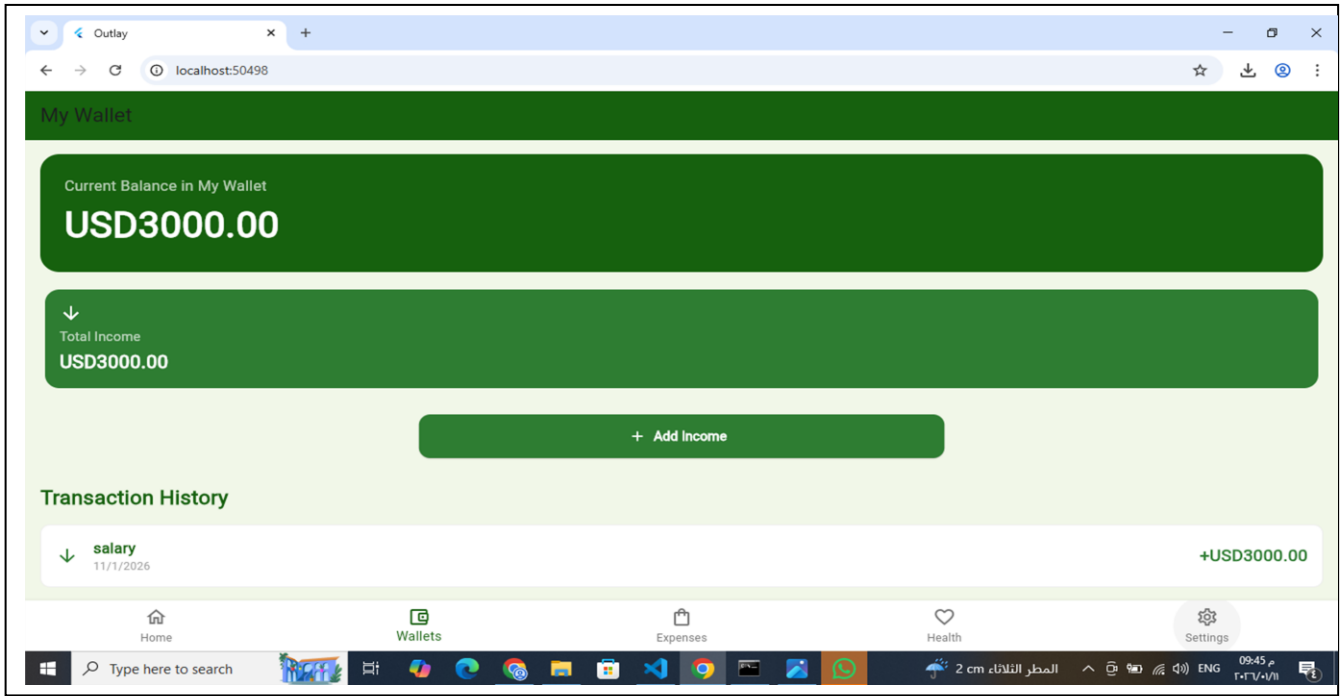
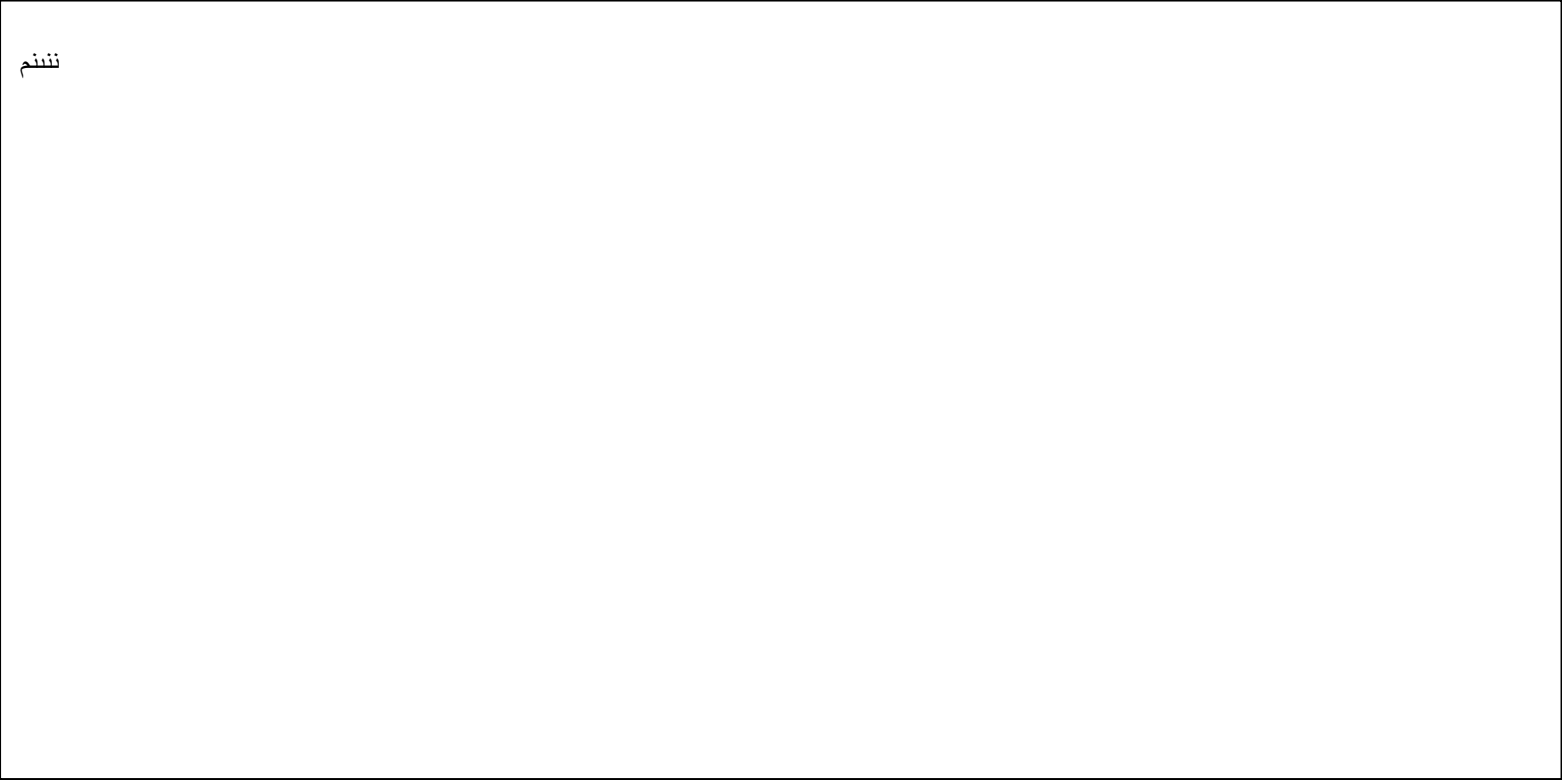
Home Screen

The Home Screen is the main dashboard of the Outlay app. It provides users with an overview of their financial status, including a dynamic image carousel, total wallet balance, and remaining balance. Users can view detailed expense reports by day, month, or year, displayed through charts and categorized spending summaries, helping them easily track and analyse their expenses.



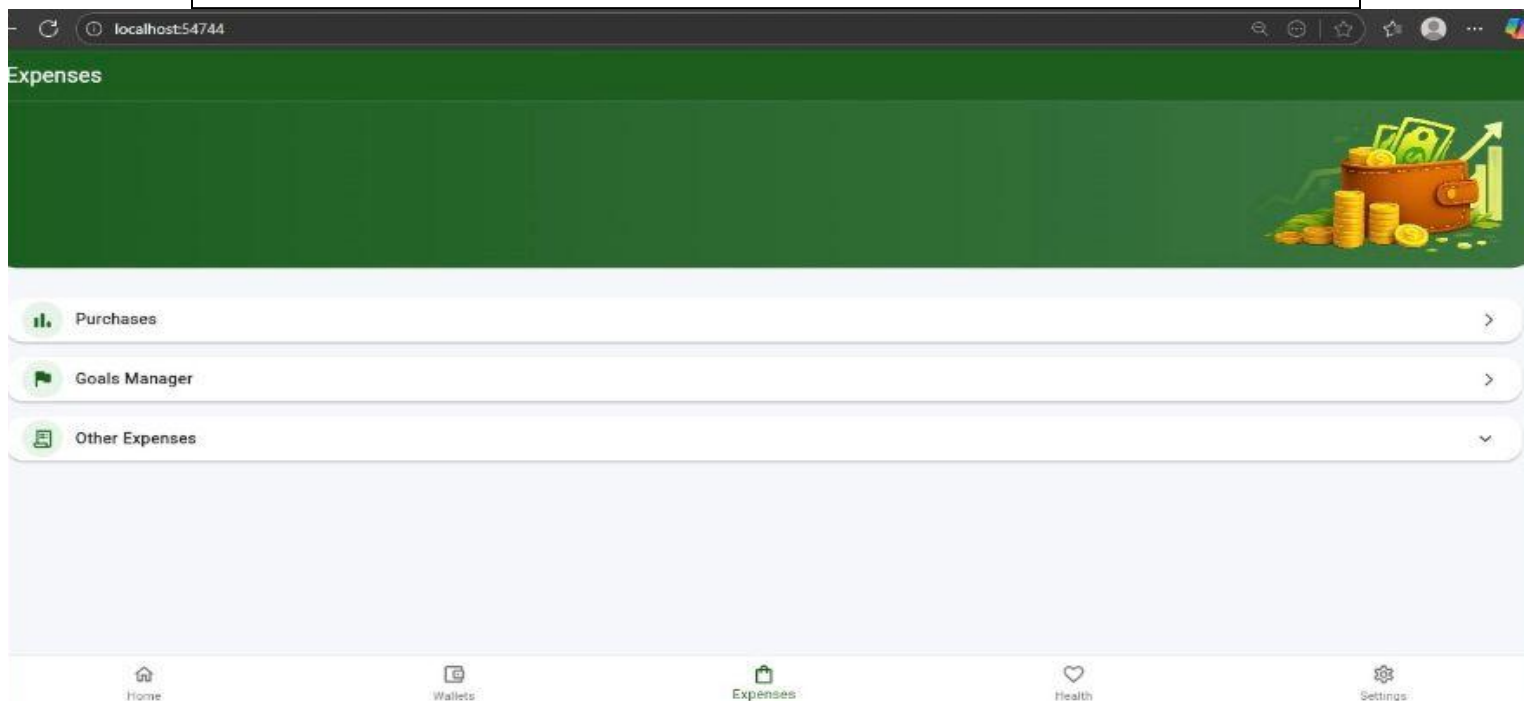
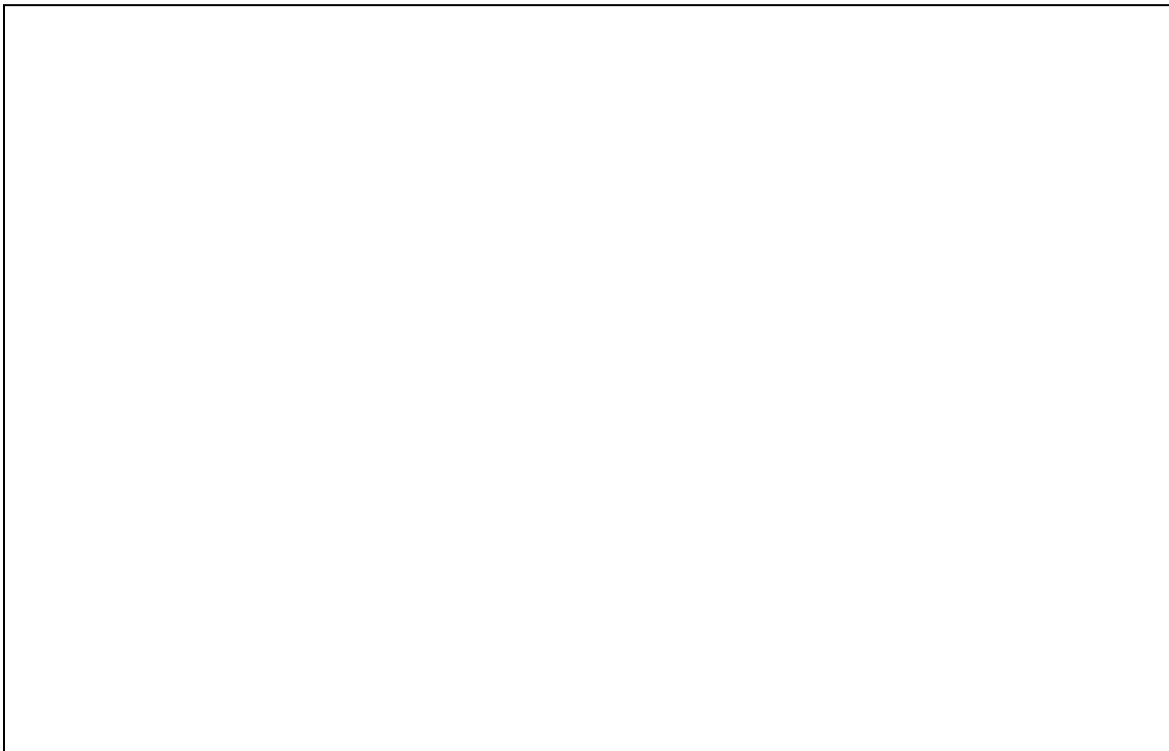
Wallet Screen

Wallet Screen is the main page responsible for managing the user’s financial wallet in the **Outlay** application. It displays the **current wallet balance** with the selected currency, along with a clear summary of **total income**. The screen allows users to **add income**, and all transactions are saved and reflected instantly in the balance. Additionally, it provides a **transaction history list**, and helps users track their finances in a simple and organized way.



Expenses Screen

is designed to help users manage and organize their spending in a clear and structured way. This screen provides three main sections: **Purchases**, **Goals Manager**, and **Other Expenses**. The Budget section allows users to navigate to budget planning and analysis, while the Goals Manager enables tracking financial goals such as saving for specific purchases. The **Other Expenses** section allows users to manually record additional expenses by entering a description and amount, with automatic validation to ensure sufficient wallet balance. All expenses are securely saved, the wallet balance is updated in real time.



Purchases Screen

allows users to manage their budgets using two flexible approaches: **Manual Screen** and **AI-Mode Screen**. The screen uses a bottom navigation bar to switch easily between the two modes, providing a smooth and intuitive user experience.

1. Manual Screen

Allows users to manually add, update, and delete daily expenses with details like amount, item name, category, and date.

Expenses are organized into predefined categories, and the total spending is displayed for easy tracking. All data is synced with the server, ensuring persistence.

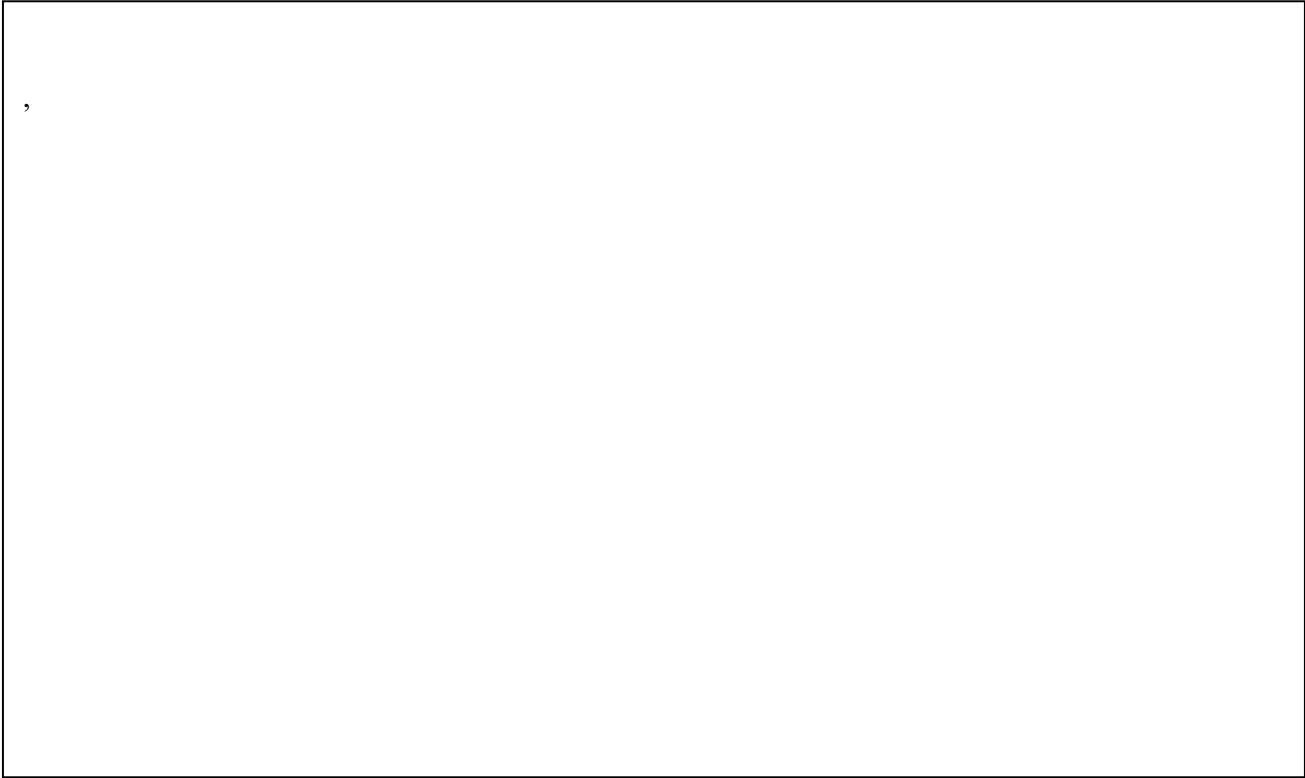
The screen also includes notifications to remind users to record expenses regularly, promoting consistent financial management.

منن

2. AI-Mode Screen

users capture or select receipts and automatically analyzes them using OCR and AI to extract items, amounts, and categories.

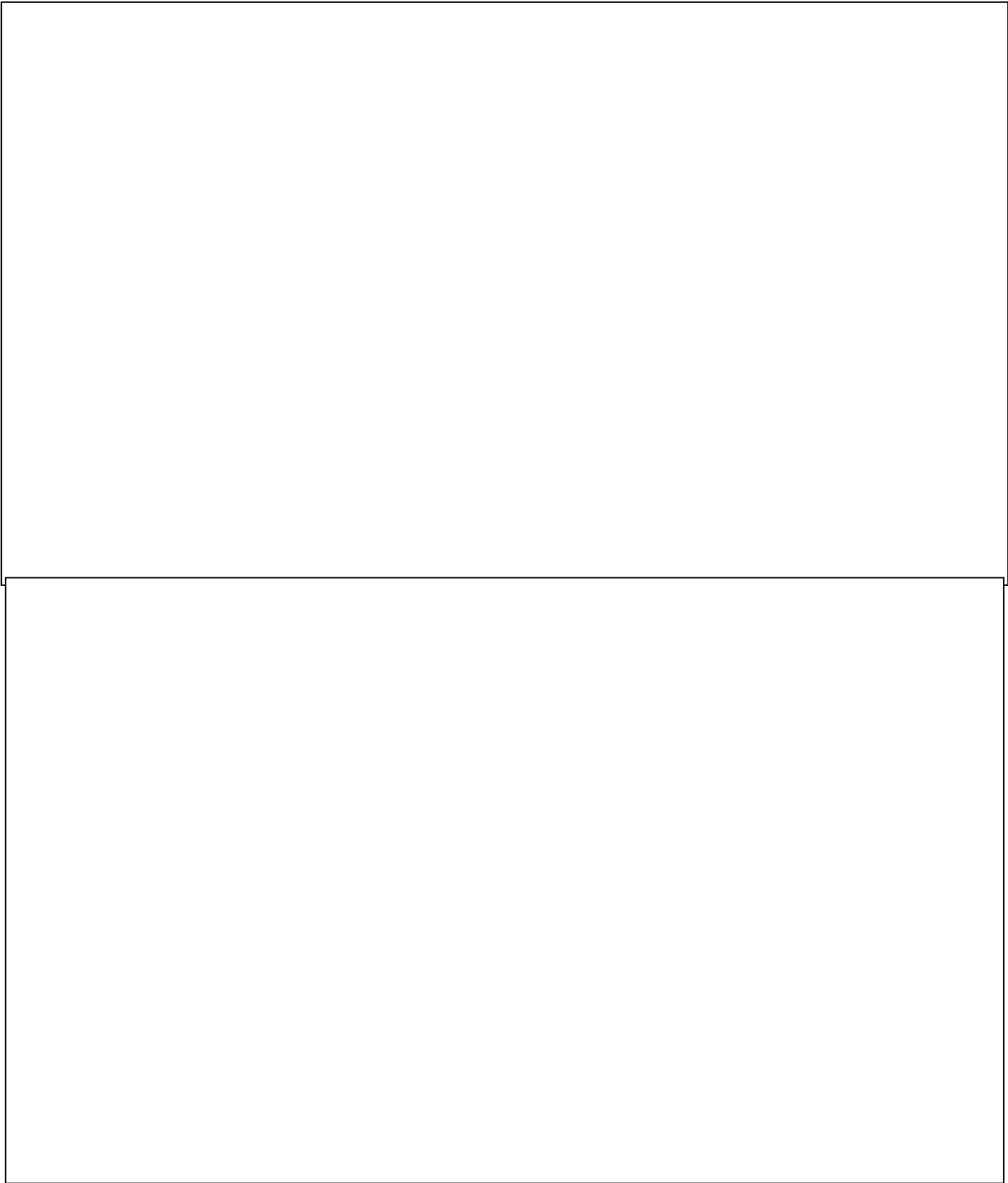
Extracted expenses can be viewed, edited, and saved to the database. The screen also displays recently saved expenses, allowing users to update or delete them through an interactive and user-friendly interface.

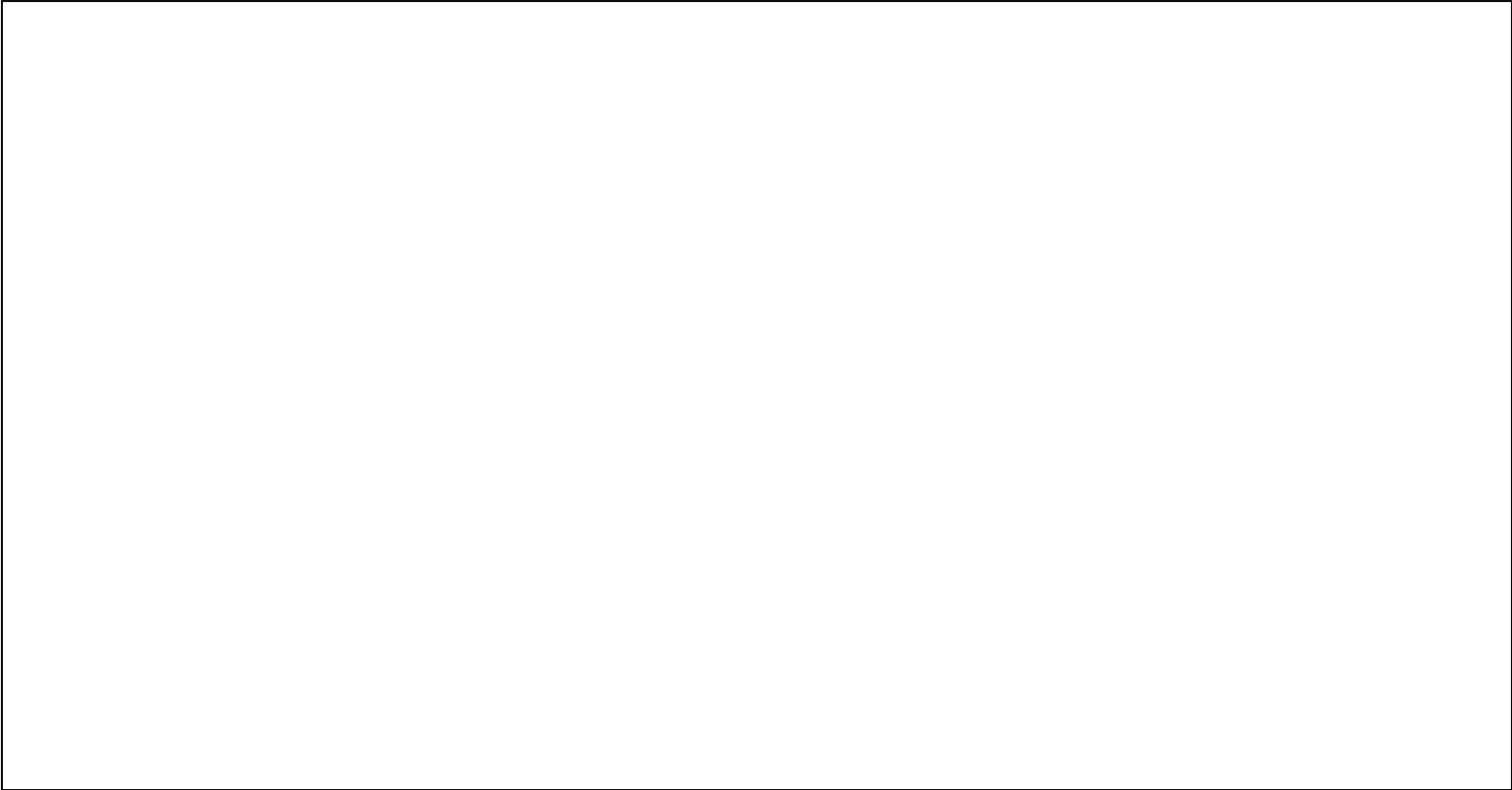


Goals Manager's Screen

The **Goals Manager** screen allows users to view, create, and manage their financial goals, showing progress, saved amounts, and remaining balances.

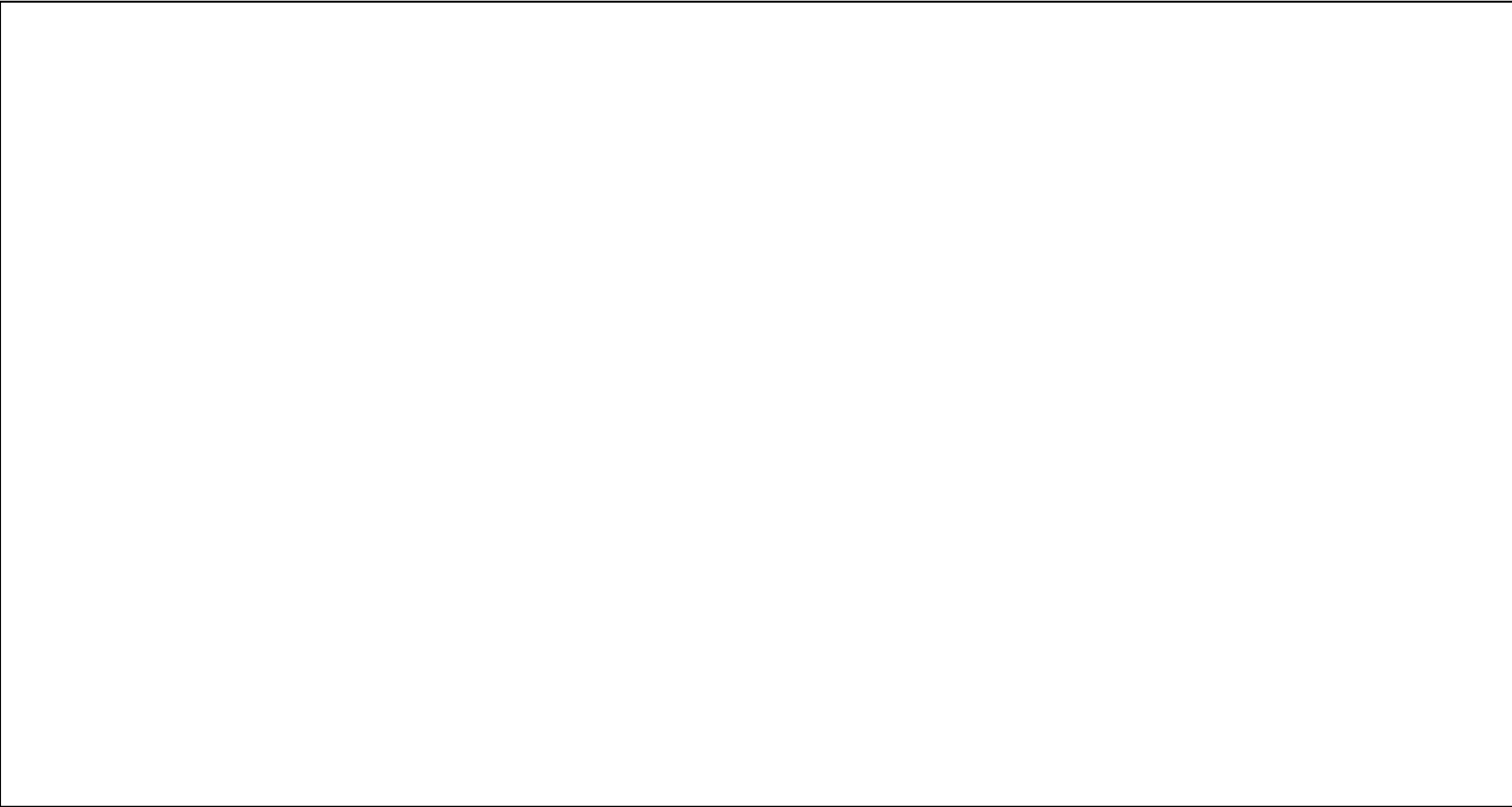
Users can add funds to a goal directly from their wallet, with real-time updates to both the goal and wallet balance.

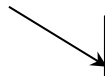




Health & Saving Screens

The Health Screen provides an overview of the user’s financial and food health.
It displays the monthly income, expenses, savings, and a financial health score with visual indicators.
The AI Financial Coach analyzes spending patterns and offers personalized advice for healthier habits.
It also tracks food choices, showing the proportion of healthy vs. junk meals and detailed category insights.



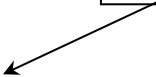


When clicked, it will
show the healthy and
junk food.

Savings Insights Screen

This page provides a detailed analysis of the user’s saving behavior over time. It visualizes monthly savings, income, and expenses using interactive charts and performance indicators. The page also includes an AI-driven savings coach that offers personalized feedback to help users improve their saving habits.

When clicks, it will show saving insight screen.



Savings Intelligence

83%
Savings Score

Savings Performance

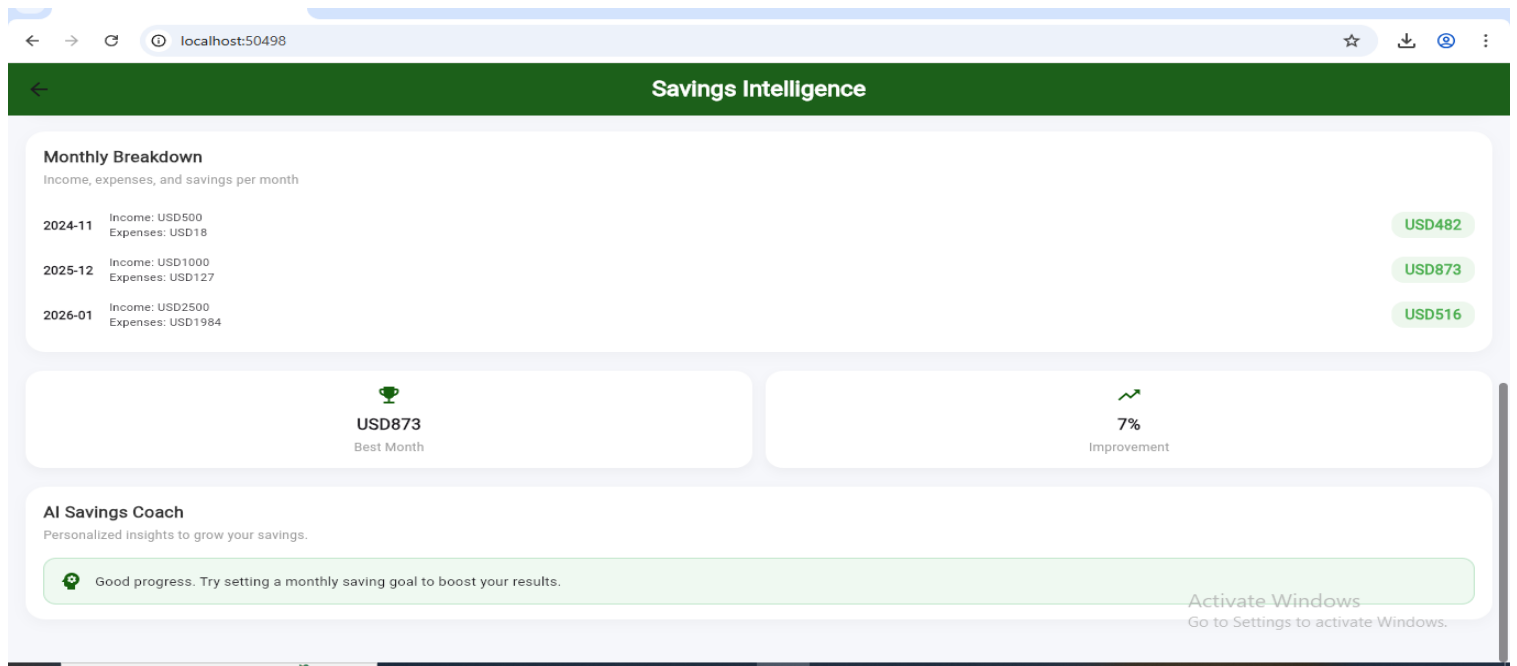
✓ Saving Score AI Savings Coach
Average USD624 per month

Monthly Savings

Track how your savings evolved over time.

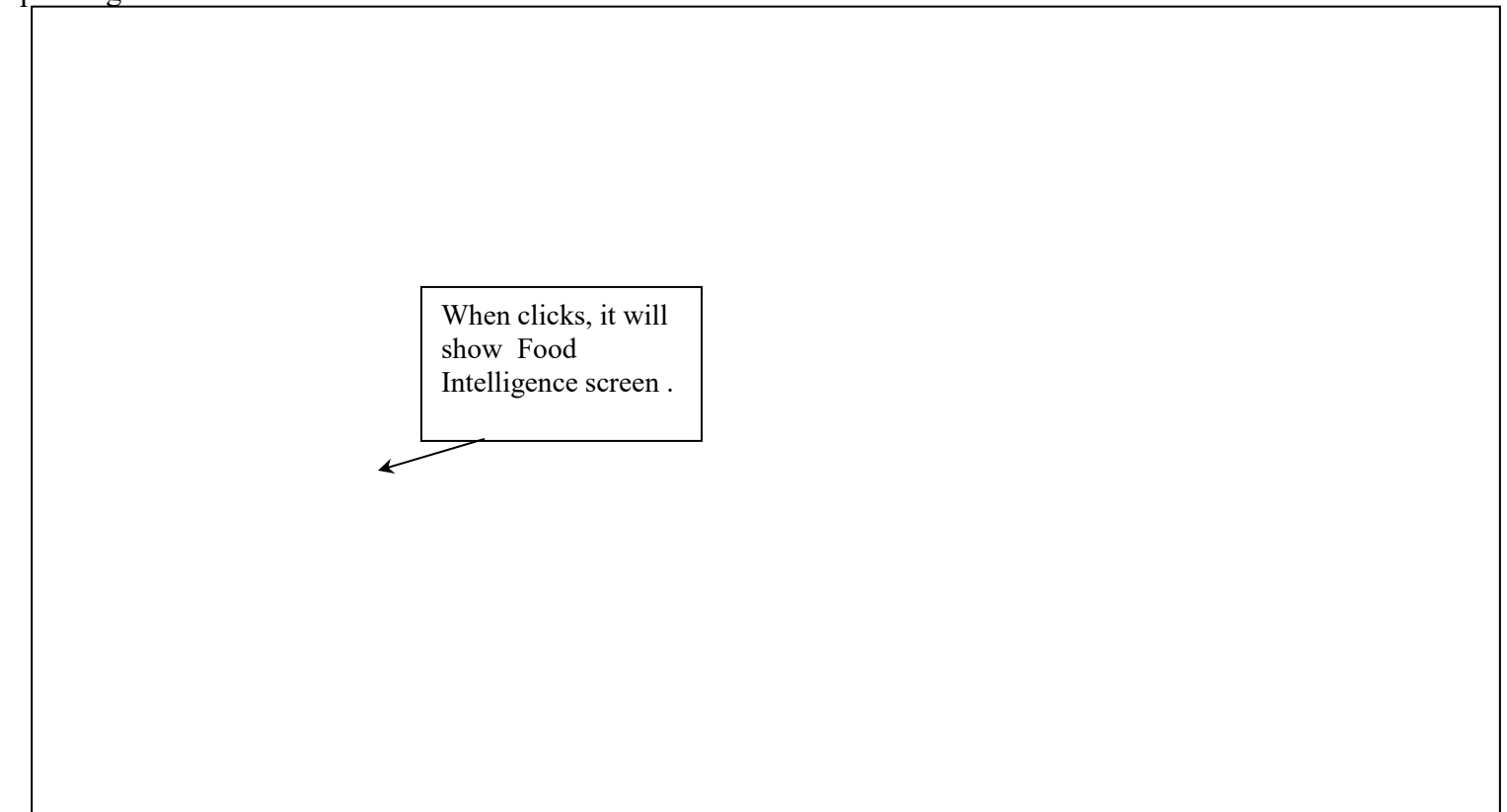


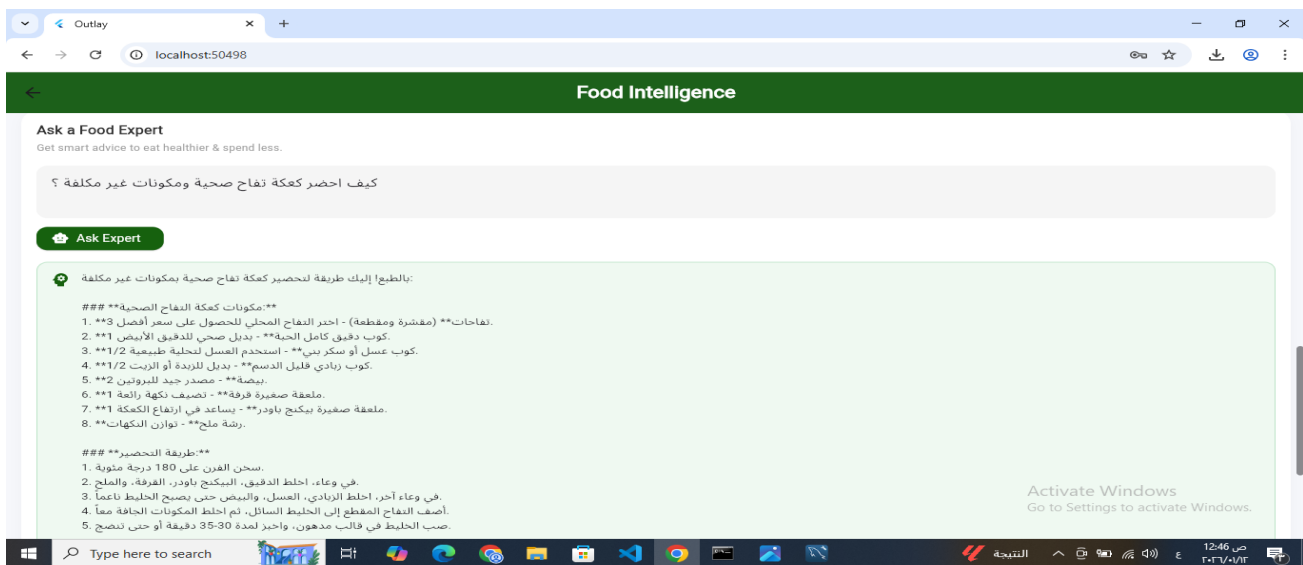
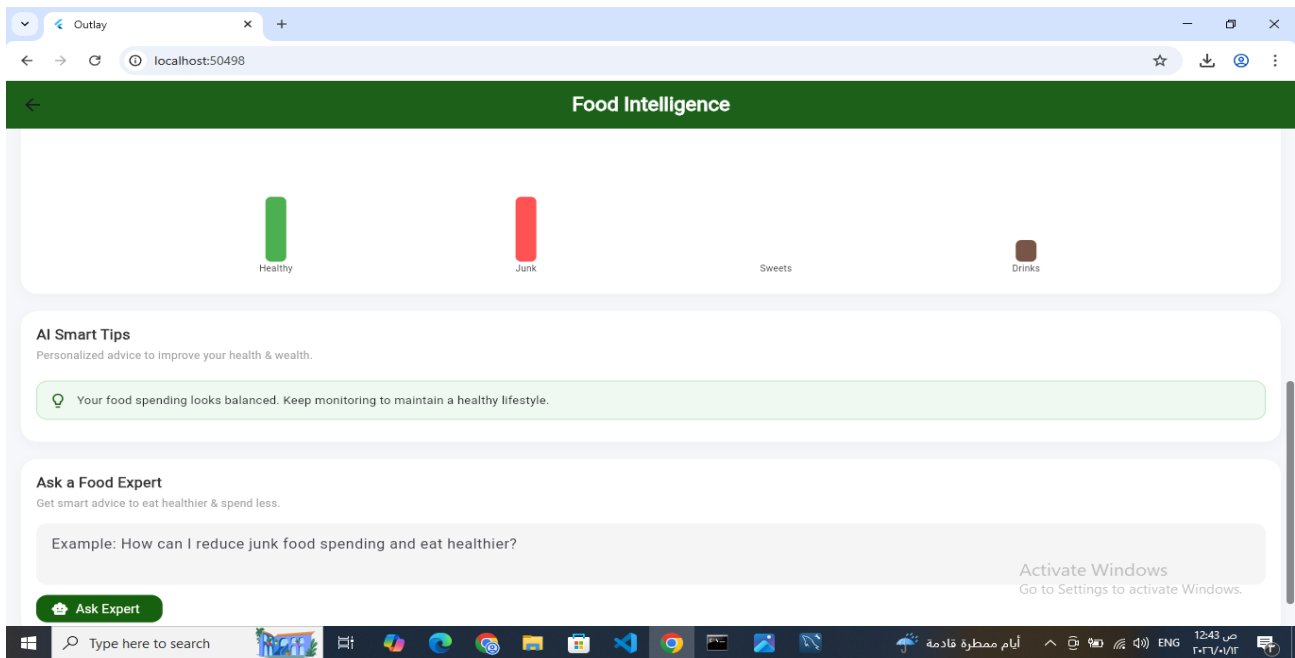
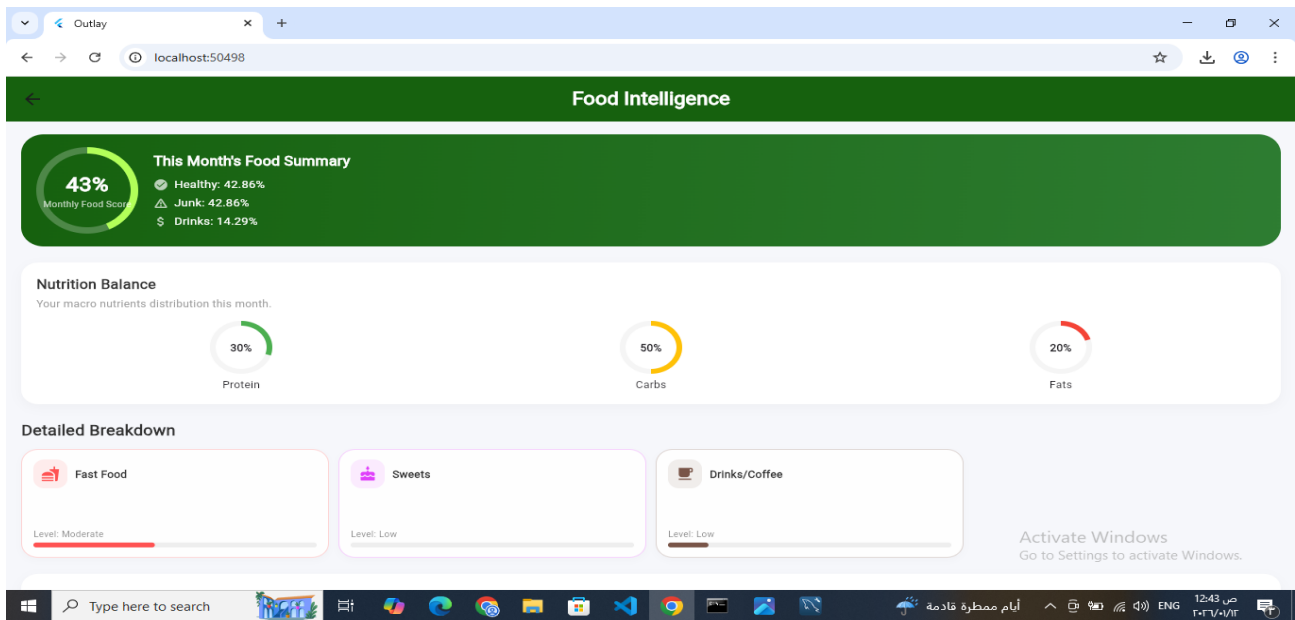
Activate Windows
Go to Settings to activate Windows.



Food Intelligence Screen

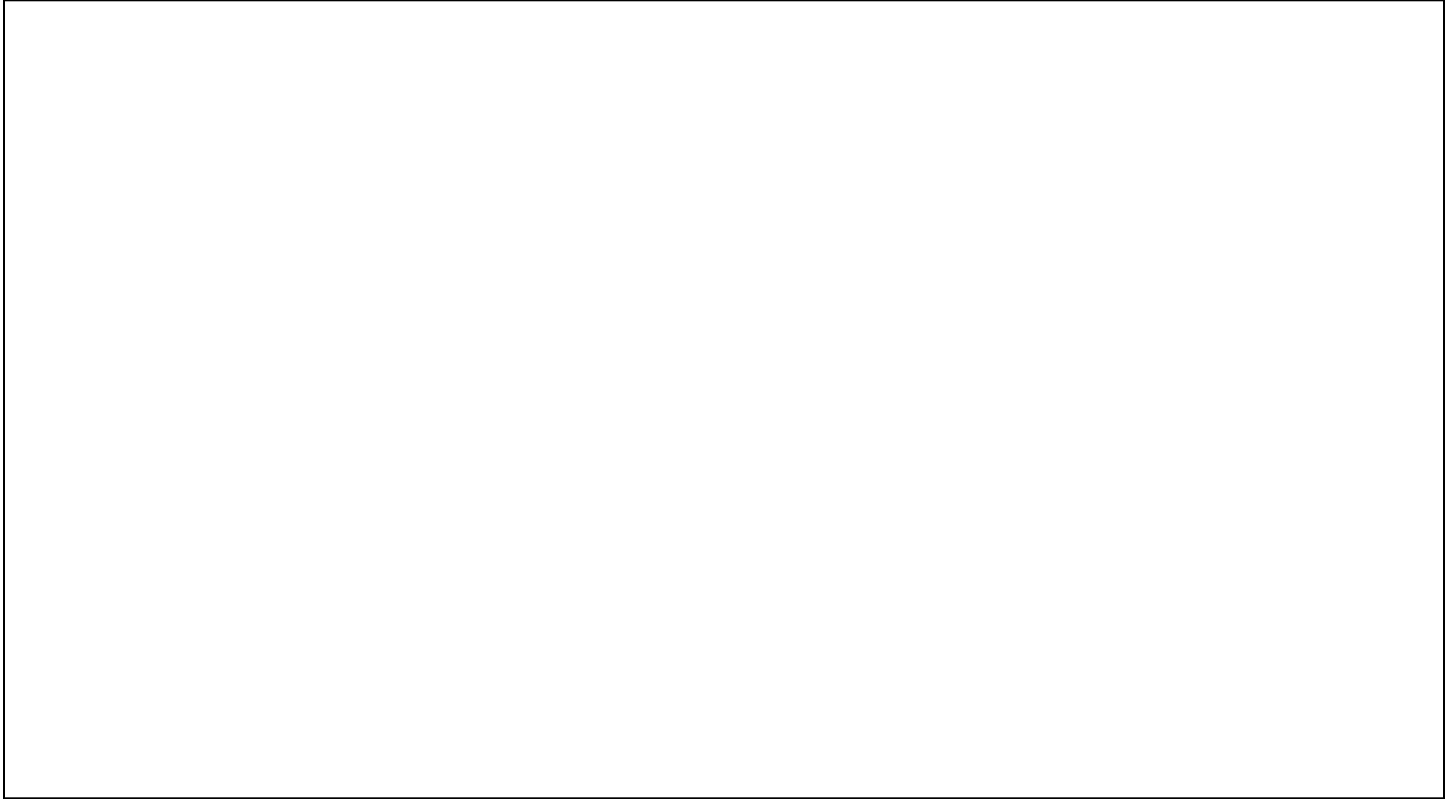
This page analyzes the user's monthly food expenses using AI-driven classification. It visualizes the distribution of healthy food, junk food, sweets, and drinks through interactive charts. The page also evaluates nutritional balance by estimating macronutrients such as protein, carbohydrates, and fats. Additionally, it provides smart AI recommendations and allows users to ask a food expert for personalized health and spending advice.

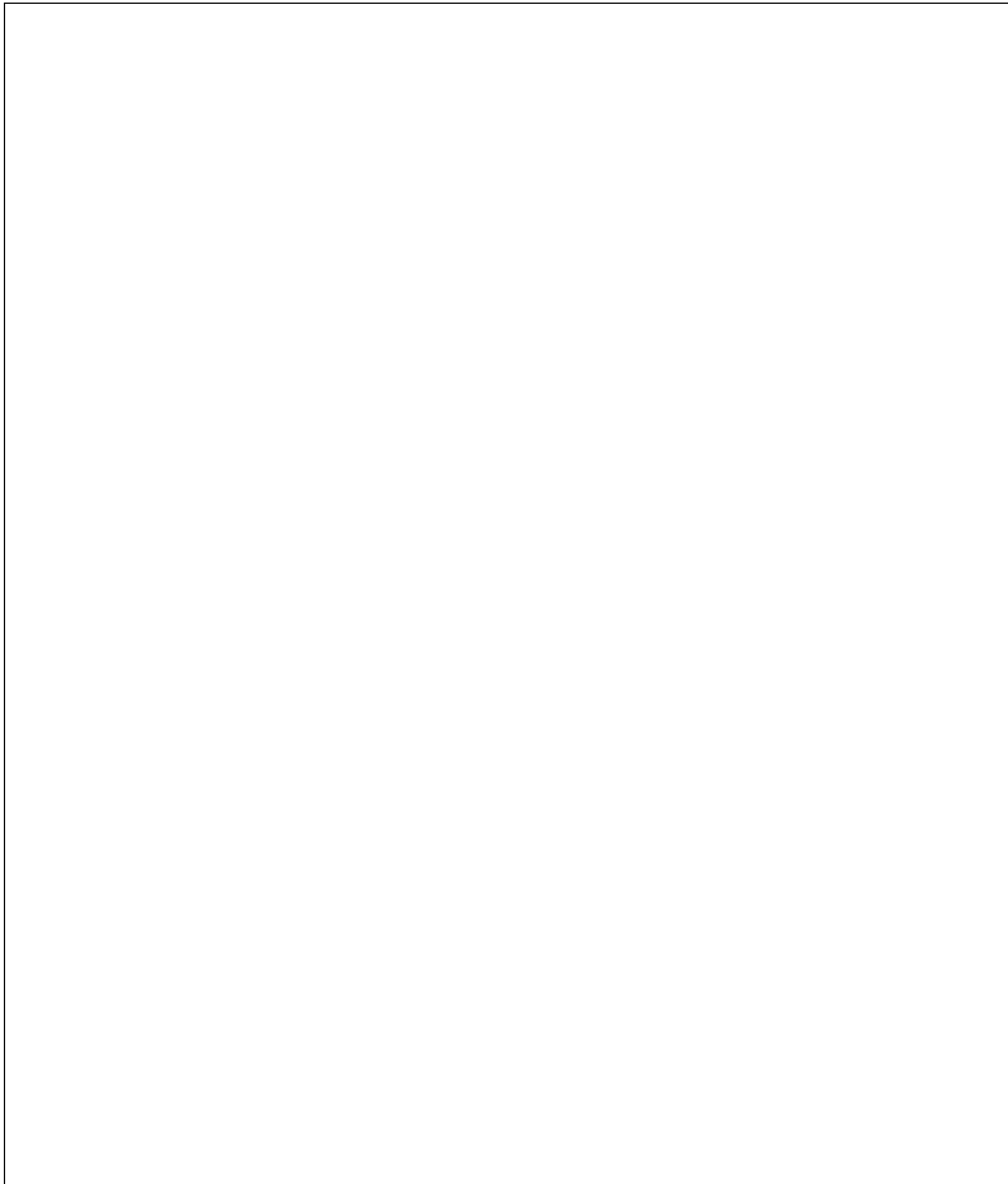




Settings Page

This page allows users to manage their account preferences and personal information in a centralized interface. Users can update their profile details, change their password, select the application language, and choose their preferred currency. Profile images are supported and can be uploaded or removed, with all changes synchronized with the backend server. The page also includes secure logout functionality and an admin dashboard shortcut for authorized users. It Support two language (Arabic , English) , and several currency (ILS , USD , EUR , GBP , JPY , AUD , CAD).





Chapter 5: Results and Discussion

5.1 Project Outcomes

The development and implementation of the **Outlay** application resulted in a comprehensive and intelligent personal finance management system that successfully meets the project's defined objectives. The application effectively integrates financial tracking, artificial intelligence, and lifestyle analysis into a unified, user-friendly platform.

Functional Outcomes

Outlay successfully delivers all core financial management functionalities, including income tracking, expense management, savings monitoring, and financial goal planning. Each user is provided with an automatically generated digital wallet upon registration, ensuring immediate usability and accurate balance tracking. All financial transactions are processed and reflected in real time, enabling users to maintain continuous awareness of their financial status.

The application supports both **manual expense entry** and **AI-based expense extraction** through receipt scanning. Using OCR and AI analysis, Outlay accurately identifies expense items, amounts, and categories, significantly reducing the time and effort required for manual data entry. This dual approach enhances flexibility and improves user engagement.

Technical Performance Outcomes

The hybrid architecture combining **Flutter**, **Node.js**, **Firebase**, and **MySQL** demonstrated reliable and stable performance during testing. The backend efficiently handled simultaneous operations such as expense logging, wallet updates, and AI-driven analysis without noticeable latency. Real-time synchronization between the frontend and backend ensured data consistency across sessions and devices.

Cross-platform deployment proved successful, with consistent behavior and interface design across mobile and web platforms. The Flutter framework enabled smooth navigation, responsive layouts, and reliable performance while maintaining a single shared codebase.

User Experience Outcomes

User interaction with Outlay showed clear improvements in financial awareness and usability. The intuitive interface design allows users to navigate between wallets, budgets, goals, and analytics screens with minimal learning effort. Visual elements such as charts, summaries, and progress indicators effectively communicate financial insights, making complex financial data easier to understand.

Smart notifications, including inactivity reminders, encouraged consistent usage and reduced the likelihood of users abandoning the application. Multi-language and multi-currency support further enhanced accessibility and inclusivity, allowing a wider range of users to benefit from the system.

AI and Lifestyle Analysis Outcomes

One of the most significant outcomes of the Outlay project is the successful integration of **artificial intelligence** into personal finance management. The application not only analyzes financial transactions but also evaluates **food-related expenses** to provide health-oriented insights. By classifying food purchases into healthy and unhealthy categories and estimating nutritional patterns, Outlay introduces a novel connection between financial behavior and lifestyle awareness.

AI-generated recommendations and interactive expert features provide users with personalized advice, supporting healthier spending habits and long-term financial planning.

Overall Project Impact

Overall, the Outlay application achieved its intended purpose of delivering an intelligent, efficient, and user-centered financial management solution. The project demonstrates that combining expense tracking with AI-driven analysis and health insights can significantly enhance user awareness, financial discipline, and decision-making. These outcomes confirm the feasibility and value of Outlay as a modern personal finance and lifestyle management platform.

5.1 Feature Implementation Success

The Outlay application successfully implements a wide range of features designed to enhance personal financial management through automation, intelligence, and user-centered design. Each feature was developed, tested, and integrated to ensure reliability, usability, and real-time performance.

Expense and Income Management

Outlay effectively implements a complete expense and income management system. Users can add income entries that are immediately reflected in the wallet balance, ensuring accurate financial tracking. Expense recording supports both manual entry and AI-assisted input, with automatic balance validation to prevent overspending beyond available funds.

Expenses are categorized into predefined groups, allowing users to analyze their spending behavior across different areas. All financial data is securely stored and synchronized with the backend, ensuring persistence and consistency across sessions.

AI-Based Receipt Analysis

One of the most successful features of Outlay is the **AI-based receipt scanning system**. By integrating OCR and AI processing, the application can extract item names, prices, total amounts, and expense categories from uploaded or captured receipts. This significantly reduces user effort and improves accuracy in expense logging.

Extracted data can be reviewed and edited by the user before being saved, ensuring both automation and user control. Testing results showed high accuracy in text recognition for standard receipts, demonstrating the effectiveness of AI integration in real-world usage scenarios.

Budget and Goal Management

Outlay implements flexible budgeting functionality, offering both manual and AI-assisted budgeting approaches. Users can define spending limits, monitor budget usage, and receive insights into their financial behavior over time.

The Goals Manager feature allows users to create financial goals with defined target amounts and track progress through installment-based contributions. Funds can be added directly from the wallet, with real-time updates to both goal progress and wallet balance. This feature encourages disciplined saving and long-term financial planning.

Financial and Health Insights

A distinctive achievement of Outlay is the successful implementation of financial and lifestyle analytics. The application analyzes spending patterns to generate visual reports and summaries, including daily, monthly, and yearly insights.

In addition, food-related expenses are analyzed to provide health-oriented insights. The system classifies purchases into healthy and unhealthy categories and presents nutritional balance indicators. This feature extends the value of financial tracking by linking spending behavior with lifestyle and health awareness.

Notifications and User Engagement

Outlay includes an intelligent notification system designed to improve user engagement and consistency. Inactivity reminders are triggered after a defined period of non-usage, prompting users to return and log their expenses.

Security and Accessibility Features

The application implements secure authentication using Google OAuth, ensuring safe and convenient access. User settings allow profile management, language selection, and currency preferences, supporting a personalized user experience.

Multi-language and multi-currency support were successfully implemented, making Outlay accessible to users from different regions and financial backgrounds.

Feature Integration Summary

Overall, all implemented features function cohesively within the Outlay ecosystem. The seamless integration between financial tracking, AI analysis, goal management, and health insights demonstrates the robustness of the system design. Feature testing confirms that Outlay meets its functional requirements and provides a reliable, intelligent, and engaging personal finance management experience.

5.2 Market Validation and User Adoption

The Outlay application was evaluated in terms of its market relevance, usability, and potential for user adoption. The results indicate that the application addresses real and widely experienced challenges in personal finance management, particularly among students, young professionals, and individuals seeking better control over their expenses and savings.

Market Need Alignment

Personal finance management is a growing concern due to rising living costs, increased digital transactions, and the complexity of daily spending. Many users lack effective tools that combine simplicity with intelligent insights. Outlay aligns strongly with current market needs by offering an integrated solution that combines expense tracking, savings management, and AI-driven analysis in a single platform.

Unlike traditional expense tracking applications that focus solely on financial data entry, Outlay introduces automation through receipt scanning and adds lifestyle and health-oriented insights. This differentiation increases its attractiveness in a competitive market and enhances its perceived value.

Target User Groups

The primary target users of Outlay include:

- University students who need to manage limited budgets and track daily expenses
- Young professionals seeking structured financial planning and savings tools
- Individuals interested in improving both financial discipline and lifestyle awareness

The application's simple interface, automated expense extraction, and visual reporting are specifically designed to reduce complexity and encourage consistent use among these user groups.

User Engagement and Adoption Indicators

The architecture and feature design of Outlay support high adoption readiness. Cross-platform availability on mobile and web devices increases accessibility, while multi-language and multi-currency support enhances usability for a broader audience.

Smart notification mechanisms, such as inactivity reminders, are designed to encourage continuous engagement without requiring complex user intervention. These features position Outlay as a practical solution that can be easily adopted by new users.

Competitive Advantage

From a market perspective, Outlay differentiates itself by integrating financial management with lifestyle and health awareness. The inclusion of AI-driven food analysis and personalized insights provides added value compared to traditional budgeting applications that focus solely on numerical financial data.

Additionally, the use of modern technologies such as Flutter, Firebase, and AI APIs positions Outlay as a technically competitive and future-ready application.

Adoption Potential

Based on its feature set and alignment with current market demands, Outlay demonstrates strong potential for user adoption if deployed at scale. The system architecture allows for future enhancements such as banking integrations, advanced analytics, and personalized financial coaching, further increasing its long-term market viability.

Overall, this analysis indicates that Outlay is well-positioned to meet real user needs and has promising adoption potential within the personal finance application domain.

5.3 Innovation Contributions

The Outlay project introduces several innovative contributions to the domain of personal finance management by integrating financial tracking, artificial intelligence, and lifestyle awareness into a single unified application. These contributions distinguish Outlay from traditional expense management systems and highlight its academic and practical value.

Integration of Financial and Lifestyle Analysis

One of the key innovations of Outlay lies in combining personal finance management with lifestyle and health-related insights. Unlike conventional expense tracking applications that focus solely on numerical financial data, Outlay extends analysis to food-related expenses and spending behavior. By classifying food purchases and providing health-oriented insights, the application introduces a novel approach that links financial decisions with personal well-being.

This integration encourages users to consider not only how much they spend, but also how their spending choices affect their lifestyle and health.

AI-Driven Expense Automation

Outlay introduces intelligent automation through AI-based receipt scanning and analysis. By utilizing OCR and AI models, the system is capable of extracting expense information from receipts, categorizing transactions, and storing them automatically. This reduces dependency on manual input and minimizes human error, representing a significant improvement over traditional manual expense tracking methods.

The ability to review and edit AI-extracted data maintains user control while benefiting from automation, achieving a balanced and practical AI implementation.

Hybrid System Architecture

From a technical perspective, Outlay contributes an effective hybrid architecture that combines a traditional backend (Node.js and MySQL) with cloud-based services (Firebase). This architectural approach supports scalability, real-time data synchronization, and secure authentication while maintaining structured data management.

The use of Flutter for cross-platform development further enhances this innovation by enabling a single codebase to serve mobile and web platforms with consistent performance and user experience.

Goal-Oriented Financial Management

Another innovative aspect of Outlay is its structured approach to financial goal management. By integrating goal creation, installment-based saving, and real-time progress tracking directly with the user's wallet, the application promotes disciplined financial behavior. This feature transforms abstract saving intentions into measurable and trackable actions.

Intelligent Notifications and Engagement Design

Outlay incorporates intelligent notification mechanisms designed to support consistent financial tracking habits. Inactivity reminders and contextual prompts encourage regular engagement without overwhelming the user. This thoughtful engagement design represents an innovation in promoting long-term usability and financial awareness.

Academic and Practical Contribution

From an academic perspective, Outlay demonstrates how artificial intelligence can be practically applied to personal finance systems in a way that is user-centered and ethically responsible. The project serves as a reference model for integrating AI, financial analytics, and lifestyle insights within a single application.

Overall, the innovative contributions of Outlay lie in its holistic approach to personal finance management, combining automation, intelligence, and lifestyle awareness to deliver a modern and forward-looking solution.

Chapter 6: Conclusions and Recommendations

6.1 Conclusions

This project presented the design and development of **Outlay**, an intelligent personal finance management application that integrates expense tracking, artificial intelligence, and lifestyle awareness into a single unified platform. The primary objective of the project was to provide users with a modern tool that simplifies financial management while promoting responsible spending, saving discipline, and healthier lifestyle choices.

The project successfully achieved its core objectives by implementing a comprehensive set of features, including income and expense tracking, automated wallet management, AI-based receipt analysis, budgeting tools, goal-oriented saving, and financial and health insights. The integration of artificial intelligence enhanced the system's ability to automate data entry, analyze spending patterns, and provide meaningful insights beyond traditional expense tracking.

From a technical perspective, the selected technology stack—Flutter for cross-platform development, Node.js for backend services, Firebase for authentication and real-time support, and MySQL for structured data storage—proved suitable for building a scalable, maintainable, and responsive application. The hybrid architecture enabled clear separation of concerns while supporting future expansion and integration with additional services.

Outlay also demonstrates the importance of user-centered design in financial applications. By providing an intuitive interface, visual analytics, and smart notifications, the application is designed to encourage consistent use and improve financial awareness. The inclusion of multi-language and multi-currency support further enhances accessibility and usability.

Overall, the project confirms that combining personal finance management with AI-driven analysis and lifestyle insights is both feasible and valuable. Outlay represents a meaningful

contribution to the field of intelligent financial applications and serves as a strong foundation for further development and research.

6.2 Recommendations for Future Development

Although Outlay successfully meets its current objectives, several enhancements can be considered for future development to increase functionality, intelligence, and real-world applicability.

Advanced AI Capabilities

Future versions of Outlay could incorporate more advanced AI models to provide predictive financial insights, such as forecasting monthly expenses, predicting saving trends, and detecting unusual spending behaviour. Enhanced natural language interaction could also allow users to query their financial data through conversational interfaces.

Banking and Financial Service Integration

Integrating Outlay with banking APIs and digital payment platforms would allow automatic transaction synchronization, reducing manual input further and increasing data accuracy. This integration could significantly enhance real-world usability and adoption.

Enhanced Health and Lifestyle Analysis

The health-related features could be expanded by integrating external nutritional databases or wearable device data. This would enable more accurate health insights and personalized recommendations that reflect both spending behaviour and physical activity.

Data Analytics and Reporting

Future development may include more advanced analytical dashboards, customizable reports, and export options. These features would support users who require detailed financial summaries for personal planning or professional purposes.

Security and Privacy Enhancements

As financial data is highly sensitive, future work should focus on advanced encryption mechanisms, detailed privacy controls, and compliance with international data protection regulations to further strengthen user trust.

6.3 Strategic Recommendations

From a strategic perspective, several considerations can support the long-term success and scalability of Outlay.

Gradual Market Expansion

Outlay should initially focus on a clearly defined user segment, such as students and young professionals, before expanding to broader audiences. This approach allows feature refinement based on focused use cases.

Modular Feature Growth

Maintaining a modular system design will allow new features to be added without affecting system stability. This strategy supports continuous improvement and adaptability to emerging technologies.

Educational and Financial Literacy Focus

Positioning Outlay as both a financial management tool and a financial literacy assistant can increase its value. Providing educational tips, insights, and explanations alongside analytics can help users develop long-term financial skills.

Research and Academic Extension

From an academic standpoint, Outlay can serve as a foundation for future research in AI-driven financial systems, human–computer interaction, and behavior-aware applications. Further studies could evaluate user behavior, effectiveness, and long-term impact once deployed in real environments.

Chapter 7: References

1. Flutter Development Team. (2024). *Flutter documentation – Build cross-platform applications*. Google.
Retrieved from <https://flutter.dev>
2. Firebase Development Team. (2024). *Firebase documentation – Authentication, hosting, and cloud services*. Google.
Retrieved from <https://firebase.google.com/docs>
3. Node.js Foundation. (2024). *Node.js documentation – JavaScript runtime*.
Retrieved from <https://nodejs.org/en/docs/>
4. MySQL AB. (2024). *MySQL 8.0 Reference Manual*. Oracle Corporation.
Retrieved from <https://dev.mysql.com/doc/>
5. Google Developers. (2024). *Google ML Kit – Text recognition (OCR) documentation*.
Retrieved from <https://developers.google.com/ml-kit/vision/text-recognition>
6. Google Developers. (2024). *Google Identity Services – OAuth authentication*.
Retrieved from <https://developers.google.com/identity>
7. OpenAI. (2024). *OpenAI API documentation*.
Retrieved from <https://platform.openai.com/docs>
8. Johnson, M. R., & Smith, K. L. (2023). *Artificial intelligence in personal finance applications: Trends and challenges*.
International Journal of Financial Technology, 7(2), 112–128.
9. Martinez, A. B. (2024). *User-centered design principles for mobile financial applications*.
ACM Transactions on Computer-Human Interaction, 31(2), 1–24.
10. Thompson, L. A., Chen, Y., & Roberts, P. (2024). *Real-time data synchronization in distributed mobile applications*.
IEEE Transactions on Software Engineering, 50(1), 89–104.
11. World Health Organization. (2023). *Healthy diet and lifestyle guidelines*.
Retrieved from <https://www.who.int>
12. ThemeForest. (2024). *Website templates and themes for web and mobile applications*.
Retrieved from <https://themeforest.net>
13. ColorHunt. (n.d.). *Color palettes for designers and creators*. Retrieved from <https://colorhunt.co/>
14. Flaticon. (n.d.). *Free icons and graphic resources*. Retrieved from <https://www.flaticon.com/>