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# Smart Subscription Manager: Application for Managing User Subscriptions

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# Abbreviations

| Abbreviation | Meaning |
|---|---|
| AI | Artificial Intelligence |
| ML | Machine Learning |
| NLP | Natural Language Processing |
| LSTM | Long Short-Term Memory |
| API | Application Programming Interface |
| SaaS | Software as a Service |
| FinTech | Financial Technology |
| UI | User Interface |
| UX | User Experience |
| DL | Deep Learning |
| RF | Random Forest |
| NN | Neural Network |
| ios | iPhone Operating System |

# 1. Introduction

In today's fast-paced digital world, individuals increasingly depend on subscription-based platforms such as Netflix, Shahid, Spotify, and educational services. However, managing multiple subscriptions has become a challenge as many users forget renewal dates, continue paying for unused services, or lose track of their overall spending. This results in unnecessary financial waste and reduced awareness of personal budgeting. Therefore, there is a strong need for a smart solution that helps users control and optimize their expenses [1].

Several existing applications attempt to support financial management by tracking user expenses or sending payment reminders. However, most of these tools rely on manual entry and lack intelligent features that analyze user behavior or forecasting capabilities. Research in FinTech and Artificial Intelligence has shown that integrating data analytics with financial systems can significantly enhance decision-making and user control [2].

The proposed project, Smart Subscription Manager, aims to address these gaps by building a mobile-based platform that integrates Artificial Intelligence (AI) and Financial Technology (FinTech) techniques. The system will collect data from users manually and through automatic extraction using the Gmail API. It will apply Natural Language Processing (NLP) to classify subscription categories and use Time Series forecasting (LSTM) models to predict future monthly expenses. Additionally, the application will provide users with personalized recommendations to optimize their spending and cancel unused subscriptions, promoting better financial awareness and control.

## 1.1 Problem Definition

The increasing reliance on subscription-based digital services has introduced a complex, data-driven financial challenge: users accumulate multiple recurring payments across diverse platforms without effective tools to monitor, analyze, and optimize them [1]. This leads not only to unnoticed spending on underutilized services but also to a lack of predictive insight into future expenses and poor alignment between subscription value and actual usage [2].

This project addresses the following core research problem: How can we design an intelligent, AI-driven mobile application capable of automatically extracting, interpreting, and forecasting subscription information —transforming scattered financial data into actionable insights that reduce waste and enhance financial decision-making?

The solution aims to fill this research gap by integrating several advanced components:

-Natural Language Processing (NLP): for semantic extraction and classification of subscription details from email invoices [3].
-Time-series forecasting models (LSTM): to predict future financial commitments [4].
-Usage–cost correlation analysis: to assess subscription value and generate personalized recommendations [5].

Through this approach, the project seeks to answer key research questions such as:
-How effectively can unstructured email data be transformed into structured subscription information using NLP techniques?
-To what degree can predictive models forecast future subscription spending patterns?
-How can usage data be combined with cost data to inform decisions about subscription retention or cancellation?
-What impact can an integrated AI–FinTech solution have on users' financial awareness and decision quality?

Although several budgeting and subscription management applications exist, they remain limited in functionality compared to the intelligent system proposed in this project [7]. Most current solutions depend on manual data entry, offer only basic renewal reminders, and provide minimal analytical capabilities. None of them combine automated data extraction from email invoices, semantic analysis using NLP, usage–cost correlation, predictive expense forecasting, and personalized recommendations within a single unified platform [8]. Because of these limitations, users still lack a comprehensive, intelligent tool that empowers them to make informed decisions about which subscriptions to keep, cancel, or downgrade.

By approaching subscription management as a technical challenge that involves automation, semantic understanding, prediction, and optimization, this project proposes a novel and intelligent solution to a largely underexplored problem in financial technology. The outcome will be a comprehensive, AI-powered system capable of transforming scattered subscription data into meaningful and actionable insights, ultimately helping users reduce financial waste and make smarter, data-driven decisions about their subscriptions [9], [10].

## 1.2 Aims and Objectives

**Aim:** This project aims to develop an intelligent mobile application called Smart Subscription Manager that enables users to manage and analyze their subscriptions effectively using AI and FinTech technologies.

The following objectives will help achieve this aim:

- Integrate financial data using Gmail API to detect recurring and hidden subscriptions, with possible future expansion to Hotmail and Yahoo services.
- Add FinTech features such as budget tracking, spending limits, and renewal reminders.
- Use Screen Time APIs to compare app usage with subscription costs.
- Apply AI/ML algorithms to analyze user behavior and suggest cancellation or renewal.
- Implement Time Series forecasting models (LSTM) to predict future monthly expenses.
- Apply Natural Language Processing (NLP) to classify subscription invoices automatically.
- Provide a ranking system to show the most and least valuable subscriptions.
- Enable smart notifications for payments, limits, and unusual activities.

## 1.3 Project Timeline

The project will follow two main phases based on the CS department graduation project structure. Figure 1 shows the project timeline. The first phase (GP1) includes writing the Introduction, Literature Review, and Requirements Analysis chapters, while the second phase (GP2) covers Design, Implementation, Testing, and Conclusion. Each stage will follow a specific duration and milestone schedule as determined by the department.

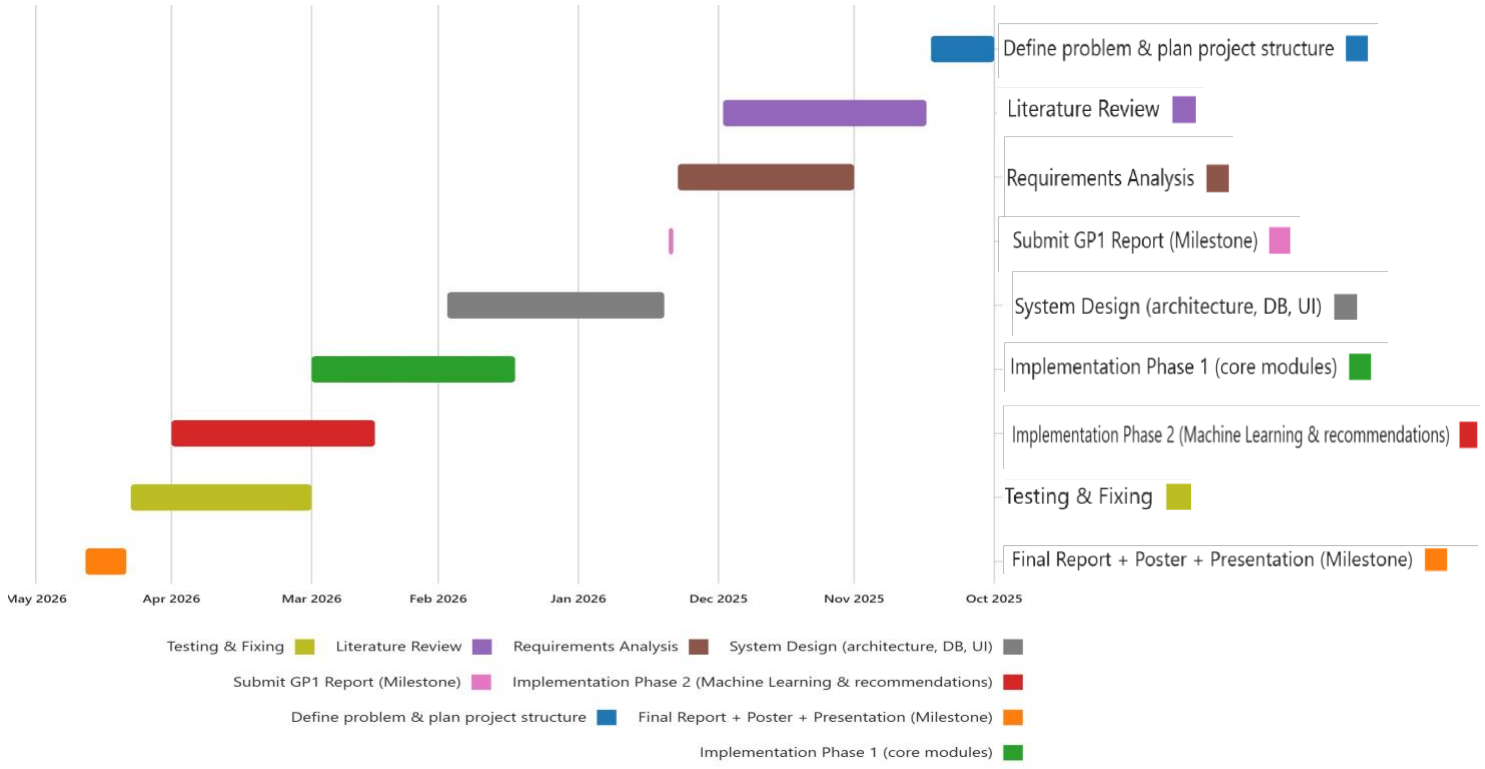


Figure 1: Project implementation timeline

## 1.4 Team Qualification

| | |
|---|---|
| Raseel Aldowayan: | • Experienced in Artificial Intelligence and FinTech applications.<br>• Works on developing the AI model used for expense prediction in the project.<br>• Skilled in analyzing subscription data to improve financial management features. |
| Sara Bedaiwi: | • Interested in system analysis and FinTech solutions.<br>• Skilled in analyzing subscription data and organizing project documentation.<br>• Understanding of software engineering concepts such as quality assurance, and requirement analysis. |
| Alanoud Alyahya: | • Strong analytical, teamwork, and problem-solving skills.<br>• Experienced in software engineering, FinTech, and AI.<br>• Skilled in system analysis and project coordination. |
| Jumanah Alorayyidh: | • Experienced in software engineering,<br>• Experienced in databases and applications.<br>• Experienced in consulting and finance. |

## 1.5 Summary

In this project, we presented the Introduction chapter, which clarified the main problem users face in managing multiple subscriptions that often lead to financial waste. We proposed a solution, Smart Subscription Manager, a mobile application that leverages AI and FinTech technologies to provide intelligent financial insights, automate detection of subscriptions, and forecast future expenses. The following chapters will discuss the theoretical background, system requirements, and the implementation details of the proposed solution.

# 2. Background and Related work

This chapter extends the work presented in Chapter I by positioning the Smart Subscription Manager within the academic and industrial literature. While Chapter I introduced the problem, aims, and the high-level methodology, this chapter narrows the focus to prior studies and systems that address subscription tracking, personal finance management (FinTech), AI-driven invoice parsing and classification (NLP), usage–cost analysis, and time-series expense forecasting (e.g., LSTM). The goal is to synthesize what has been done, organize the evidence into themes relevant to our project, and clarify where our approach advances beyond existing work [3], [4].

## 2.1 Background

The increasing prevalence of subscription-based services has transformed how users consume digital content across multiple sectors, including entertainment, education, cloud computing, and productivity tools. With the widespread adoption of platforms such as Netflix, Spotify, Shahid, and Google Drive, individuals now manage numerous recurring payments simultaneously. While this model offers convenience and continuous access to digital resources, it also introduces financial management challenges. Many users lose track of renewal dates, continue paying for underused services, and lack awareness of their overall spending, resulting in significant financial inefficiency. Understanding and addressing this issue is therefore essential in the interdisciplinary fields of Financial Technology (FinTech), Artificial Intelligence (AI), Machine Learning (ML), Natural Language Processing (NLP), Time-Series Forecasting (LSTM), Mobile Application Development, and Software Engineering [1], [2].

Historically, personal finance management tools have evolved from manual budgeting methods to automated systems capable of tracking expenses through secure bank integrations and APIs. However, these traditional systems remain limited when applied to subscription-based models. Most existing solutions only provide simple expense tracking or reminder notifications without deeper behavioral insights, usage–cost analysis, or predictive forecasting. The rise of FinTech has introduced automation, security, and real-time financial analytics, while advances in AI and ML have enabled intelligent systems that can detect spending patterns and generate proactive recommendations [3]. Despite these developments, current solutions rarely combine these technologies into a single, unified platform that automates, analyzes, and optimizes subscription spending.

This project builds on several foundational technological domains. Financial Technology (FinTech) integrates digital innovation into financial services, enabling real-time monitoring, automation, and data-driven decision-making. Software Engineering provides the systematic approach for designing, developing, and maintaining scalable and reliable systems. Mobile Applications serve as the interactive platform for user engagement, allowing intuitive dashboards and real-time notifications. Within this

architecture, Artificial Intelligence (AI) and Machine Learning (ML) play a key role in learning from user data to improve decision-making accuracy. Natural Language Processing (NLP) enables automatic extraction and classification of subscription details from unstructured text such as email invoices [4], reducing manual effort and improving efficiency. Meanwhile, Long Short-Term Memory (LSTM) neural networks, a subset of time-series forecasting models, predict future spending patterns based on historical behavior and usage trends [5].

By integrating these interdisciplinary technologies, the proposed Smart Subscription Manager bridges the gap between basic expense tracking and intelligent financial decision support. It not only automates subscription management but also enhances user empowerment through predictive analytics and behavior-based insights. This combination of FinTech, AI, ML, NLP, LSTM, and robust Software Engineering contributes to a comprehensive, intelligent solution that helps users make informed financial decisions, minimize waste, and optimize their digital spending efficiently [6], [7].

## 2.2 Related Work

The development of the Smart Subscription Manager required us to learn from multiple academic studies and existing applications that relate to the technologies and features we are planning to implement. Our solution will heavily rely on Artificial Intelligence (AI), Machine Learning (ML), Natural Language Processing (NLP), and time-series forecasting using Long Short-Term Memory (LSTM) to enable users to manage their subscriptions more intelligently. The following works and systems influenced our technical decisions and design of the final prototype.

In Khattak et al. [5] the authors proposed a composite deep learning model for customer churn prediction by analyzing temporal behavioral patterns using Long Short Term Memory (LSTM) networks. Their study demonstrated how LSTM can effectively capture sequential trends in users' behavior and predict future actions such as potential cancellations or reduced engagement.

This research provides valuable insights for our project, as it highlights how time-series forecasting can be used to understand spending behavior and anticipate future expenses. Our system aims to apply similar forecasting logic to identify patterns such as potential overspending or underutilized subscriptions.

In Malik et al. [6] the authors explored the use of Natural Language Processing (NLP) to extract and classify unstructured text from online customer reviews. Their approach successfully identified relevant information and categorized textual content based on context and intent.

This concept is particularly relevant to our proposed system, which plans to utilize NLP techniques for automatically reading and classifying emails and invoices. By doing so,

the system could later identify upcoming renewals and group subscriptions into appropriate categories, reducing manual effort and enhancing automation.

In Chougule et al. [7] the authors proposed a cloud-based system for managing subscription details, billing, and plan upgrades under a unified framework in their paper "Implementation of Subscription Management SaaS-Based System" (IJRASET, 2022). The study primarily focuses on system functionality and database operations. However, its structure serves as an important reference for our project, which aims to expand this concept by incorporating AI-based analytics, NLP for automated invoice extraction, and LSTM forecasting for cost prediction and usage analysis transforming a standard SaaS management model into an intelligent FinTech platform that enables smarter financial decision-making.

In Imani et al. [8] the authors compiled a large-scale review of more than 200 ML-based churn prediction solutions across various industries to identify the most effective algorithms and evaluation strategies. Their insights guide our approach to assessing subscription activity and predicting whether customers are likely to renew, downgrade, or cancel their services using models such as Random Forest, LSTM, and Neural Networks.

In Amari et al. [9] the authors designed a deep learning algorithm to automate invoice validation. Their model extracts structured data from various fields within invoice documents closely aligning with our system's planned functionality of parsing billing details and detecting hidden or forgotten subscriptions retrieved from email receipts.

**Existing similar tools:** In **Rocket Money** [10] the developers introduced a leading subscription management application that connects to users' banking accounts to identify recurring payments and help them cancel unwanted subscriptions. Despite its strong financial tracking capabilities, the application lacks AI-driven prediction and behavioral analytics. Our proposed system builds on this idea by integrating intelligent forecasting and usage based behavioral insights.

In **StayFree** [11] the application tracks screen time and app usage statistics using system APIs. Although it is not a financial management tool, StayFree directly inspired one of our key features linking app usage with subscription costs. Our proposed system adopts a similar behavioral analysis concept but extends it to identify underused or low value subscriptions using financial and AI insights.

## 2.3 Summary

In summary, we show in table 1 the comparison between the reviewed research papers and applications, highlighting their contributions and how they relate to our system.

**Table 1: compression between our system criteria and existing approaches**

| Reference | Main Focus / Method Used | Key Contribution | Limitations / Gap | How It Supports Our System |
|---|---|---|---|---|
| In Khattak et al. [5]. | Used LSTM models to identify user behavior patterns and predict future activity. | Provided insight into temporal spending patterns and forecasting approaches. | Focused on churn prediction, not financial subscription data. | Inspired our use of LSTM to forecast future expenses and detect underutilized subscriptions. |
| In Malik et al. [6]. | Applied NLP to extract and categorize text from unstructured data. | Showed how ML and NLP can automate document understanding. | Did not address financial or subscription-based data. | Guided our invoice and email classification for automated subscription detection. |
| In Chouque et al. [7]. | Developed a SaaS-based cloud system for managing subscriptions and billing. | Demonstrated system architecture for centralized subscription management. | Lacked AI, NLP, or predictive analytics. | Formed the foundation for our intelligent FinTech system that integrates AI and LSTM forecasting. |
| In Imani et al. [8]. | Compared over 200 ML models for churn analysis across industries. | Identified best-performing ML techniques for behavioral prediction. | Focused only on customer retention, not subscription finance. | Helped us choose ML models (LSTM, RF, NN) for subscription renewal prediction. |
| In Amari et al. [9]. | Used DL to automate invoice validation and data extraction. | Demonstrated high accuracy in structured data recognition. | Limited to enterprise billing systems. | Inspired our NLP-based invoice reader to detect hidden or recurring payments. |
| In Rocket Money [10]. | FinTech app linking to bank accounts to identify recurring payments. | Automated subscription detection and cancellation. | Lacks AI forecasting and behavior analysis. | We enhance it with AI predictions and usage-based analytics. |
| In StayFree [11]. | Screen-time tracking app using Android APIs. | Measured user app usage behavior and time patterns. | Not related to financial or spending analysis. | Provided the concept for linking usage behavior to subscription costs in our system. |

Despite the advancement of subscription and financial tracking systems, existing solutions today are mostly siloed tools which serve specific needs like reminders to pay bills or simple spending analysis.

Our work will addresses this shortcoming and presents a comprehensive, AI-powered system that combines automatic data extraction, behavior analysis and predictive modeling. With this integration the project seeks to deliver impactful financial advice to users that is no longer limited to tracking, but based on proactive decision support characteristics serving as a basis of system requirements defined in chapter 3.

The reviewed literature revealed that current subscription and expense management solutions are often limited to basic features such as manual expense tracking or simple reminder notifications. Most of the existing systems lack intelligent components that automatically extract, classify, and analyze financial data or predict future expenses. Furthermore, few approaches have integrated behavioral usage data with cost information to assess the true value of subscriptions.

# 3. Requirements Analysis and Specification

## 3.1 User Requirements: Functional and Non-Functional

### Functional Requirements:

Table 2 the user functional requirements of the Smart Subscription Manager system. It summarizes each system feature by listing its ID, title, and a brief description of the functionality provided to the user.

**Table 2: User Functional Requirements**

| ID | Requirement Title | Description |
|---|---|---|
| FR-01 | Secure Registration & Login | The system will allow secure user registration and login |
| FR-02 | Email Invoice Extraction (NLP) | The system will extract and classify email invoices using AI (NLP). |
| FR-03 | Manage Subscriptions | The system will allow users to manage subscriptions manually. |
| FR-04 | Spending Summaries | The application will maintain fast performance. |
| FR-05 | Renewal & Spending Alerts | The system will notify users of renewals and unusual spending. |
| FR-06 | Financial Forecasts | The system will generate financial forecasts and insights. |

## Non-Functional Requirements:

Table 3 outlines the user non-functional requirements of the Smart Subscription Manager system, describing system-level qualities such as usability, notifications, privacy, performance, and multi-platform support. These requirements define the expected system behavior and overall user experience.

**Table 3: User Non-Functional Requirements**

| ID | Requirement Title | Description |
|---|---|---|
| NFR-01 | Usability | The interface will be simple, intuitive, and responsive. |
| NFR-02 | Notifications | Notifications will be clear and customizable. |
| NFR-03 | Data Privacy | The system will ensure data privacy and confidentiality |
| NFR-04 | Performance | The application will maintain fast performance. |
| NFR-05 | Multi-Platform Support | The design will support Android and iOS devices. |

## 3.2 System Requirements: Functional and Non-Functional

### Functional requirements

This table lists all system functionalities including the requirement ID, title, and a detailed description of each feature.

Table 4: Functional Requirements of the Smart Subscription Manager system

| ID | Requirement Title | Description |
|---|---|---|
| FR-01 | Add Subscription Manually | The system shall allow the user to manually add a subscription by entering the service name, cost, renewal date, and optional category. |
| FR-02 | View Subscription Dashboard | The system shall display all subscriptions in a dashboard with details such as cost, category, and renewal date, including search and sorting features. |
| FR-03 | Set Budget and Renewal Alerts | The system shall allow the user to configure a monthly budget and specify the number of days before renewal to receive alerts. |
| FR-04 | View Recommendations | The system shall display personalized subscription recommendations based on the system's internal analysis. |
| FR-05 | Extract Emails (Gmail API) | The system shall retrieve invoice emails from Gmail using the Gmail API with appropriate authentication and filtering mechanisms. |
| FR-06 | Parse Invoice (NLP) | The system shall extract structured data from invoice emails using NLP techniques, including service name, amount, plan, and renewal date. |
| FR-07 | Retrieve Usage Data (Screen Time API) | The system shall obtain application usage data from the Screen Time API for subscription value assessment. |
| FR-08 | Classify Subscription | The system shall classify each subscription into a predefined category using machine-learning models. |
| FR-09 | Analyze Usage vs Cost | The system shall compute a value score for each subscription by comparing its usage with its cost. |
| FR-10 | Send Renewal Alerts | The system shall automatically send renewal alerts to the user based on the renewal date and the user's configured alert settings. |

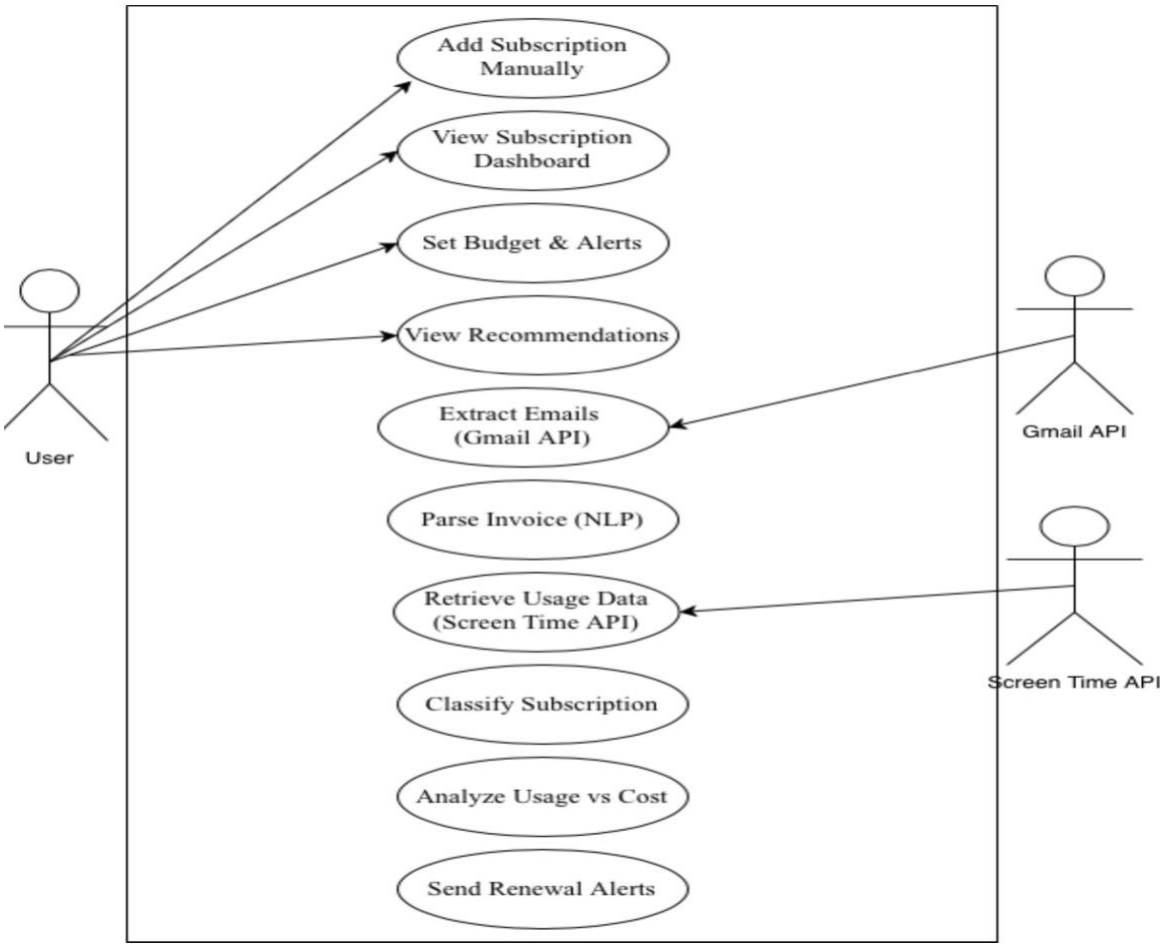


Figure 2 :Use-case Diagram

Table 5: Use Case Descriptions

| | | | |
|---|---|---|---|
| UC1 – Add Subscription Manually | Actor: User<br>Goal: Add a subscription that was not detected automatically.<br>Preconditions: User is authenticated.<br>Postconditions: Subscription is stored and appears in the dashboard.<br>Main Flow:<br>1. User opens “Add Subscription”.<br>2. User enters service details.<br>3. System validates and saves.<br>Exceptions:<br>- Invalid input: system shows error message. | UC2 – View Subscription Dashboard | Actor: User<br>Goal: View all subscriptions with details.<br>Preconditions: Subscriptions exist.<br>Postconditions: Dashboard displayed.<br>Main Flow:<br>1. User opens the dashboard.<br>2. System loads subscription list.<br>3. User may filter or search.<br>Exceptions:<br>- Data load failure: retry displayed. |
| UC3 – Set Budget & Alerts | Actor: User<br>Goal: Configure monthly budget and alert settings.<br>Preconditions: User is authenticated.<br>Postconditions: Settings saved.<br>Main Flow:<br>1. User opens settings.<br>2. Enters budget and alert days.<br>3. Saves settings.<br>Exceptions:<br>- Invalid numbers: the system warns user. | UC4 – View Recommendations | Actor: User<br>Goal: View personalized subscription recommendations.<br>Preconditions: System processed cost and usage data.<br>Postconditions: Recommendations displayed.<br>Main Flow:<br>1. User opens recommendations page.<br>2. System displays list with reasons.<br>Exceptions:<br>- No recommendations: empty state. |
| UC5 – Extract Emails (Gmail API) | Actor: Gmail API<br>Goal: Provide invoice emails to the system.<br>Preconditions: Valid OAuth consent.<br>Postconditions: Raw email data stored.<br>Main Flow:<br>1. System requests filtered emails.<br>2. Gmail API returns email content.<br>3. System stores raw data.<br>Exceptions:<br>- Token expired: re-authentication required. | UC6 – Parse Subscription Invoices (NLP) | Actor: System<br>Goal: Extract structured fields from invoices.<br>Preconditions: Raw emails available.<br>Postconditions: Structured records stored.<br>Main Flow:<br>1. System applies NLP models.<br>2. Extracts amount, plan, service name, dates.<br>3. Saves structured data.<br>Exceptions:<br>- Unparsable content: flagged for review. |
| UC7 – Retrieve Usage Data (Screen Time API) | Actor: Screen Time API<br>Goal: Provide usage duration.<br>Preconditions: Permission granted.<br>Postconditions: Usage data saved.<br>Main Flow:<br>1. System requests usage.<br>2. API returns duration per app.<br>3. System stores results.<br>Exceptions:<br>- Permission revoked: request fails. | UC8 – Classify Subscription | Actor: System<br>Goal: Assign subscription category.<br>Preconditions: Basic data available.<br>Postconditions: Category stored.<br>Main Flow:<br>1. System runs classification model.<br>2. Stores assigned category.<br>Exceptions:<br>- Low confidence: set as “Uncategorized”. |
| UC9 – Analyze Usage vs Cost | Actor: System<br>Goal: Compute value score.<br>Preconditions: Usage and cost available.<br>Postconditions: Value KPIs stored.<br>Main Flow:<br>1. System merges usage and cost.<br>2. Calculates KPIs and score.<br>3. Saves results.<br>Exceptions:<br>- Missing usag: skip analysis. | UC10 – Send Renewal Alerts | Actor: System<br>Goal: Notify user before renewal date.<br>Preconditions: Valid dates and settings.<br>Postconditions: Notification logged.<br>Main Flow:<br>1. Scheduler checks upcoming renewals.<br>2. System sends alert.<br>3. Logs status.<br>Exceptions:<br>- Failed delivery: retry. |

**Non-Functional requirements**

**a. Performance**

- The system should process invoices quickly and provide fast results.
- AI models should give accurate classifications and forecasts.

**b. Availability**

- The system should be available at all times.
- It must support both Android and iOS devices.

**c. Ease of Use**

- The interface should be simple and easy to navigate.
- Dashboards and notifications must be clear and user-friendly.

**d. Reliability**

- Extracted data must be accurate and consistent.
- The system should handle errors smoothly without losing data.

**e. Scalability**

- The system should allow adding more email services in the future.
- It must support growing numbers of users and data.

**f. Maintainability**

- The code should be modular and easy to update.
- AI and FinTech components should be upgradeable independently.

# 4. System Design

## 4.1 Flowchart Diagram

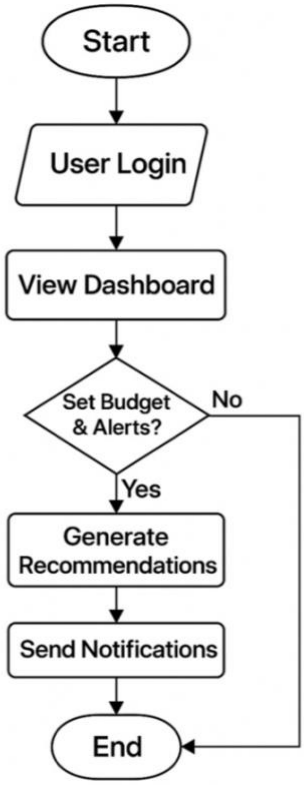


Figure 3: Flowchart – Smart Subscription Manager Workflow

The flowchart illustrates the main workflow in the Smart Subscription Manager. It begins with the user logging into the application, followed by viewing the dashboard. The system then checks whether the user has configured a budget and alerts. If not, the process ends. If configured, the system generates personalized recommendations and sends notifications to the user before completing the process.

## 4.2 Sequence Diagram

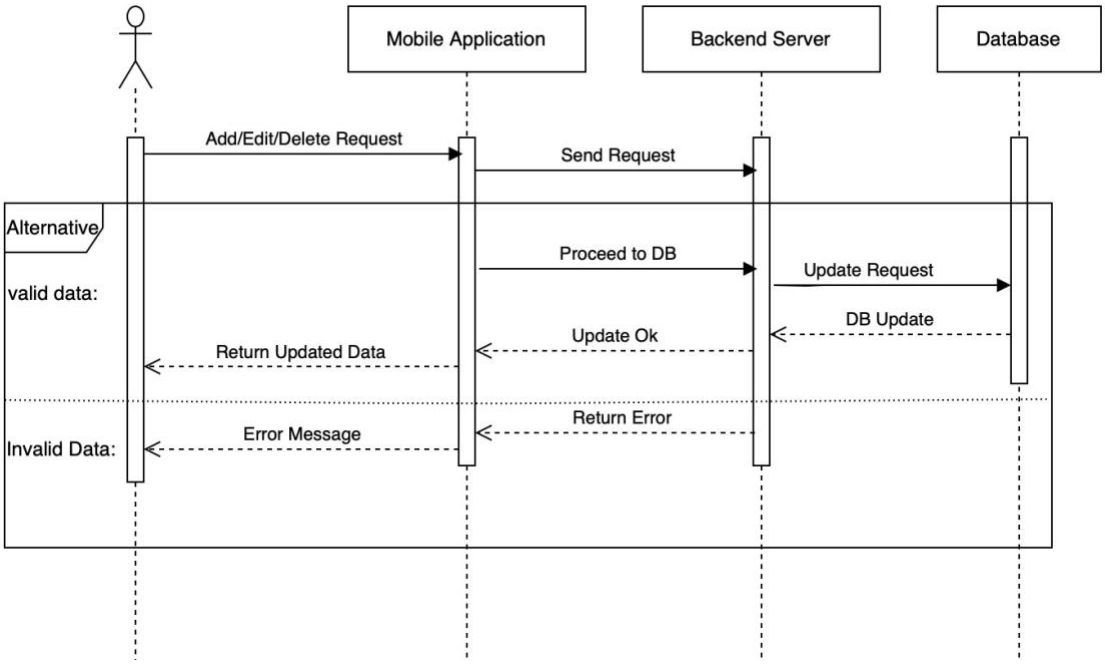


Figure 4: Sequence Diagram – Manual Subscription Management

The sequence diagram shows the steps of executing the process of manual subscription management in Smart Subscription Manager. It starts from the user sending Add/Edit/Delete request through the Mobile Application, then the Backend Server verifies the data. If the data is valid, the server updates the Database and returns the updated subscription list to the user; otherwise, it sends an error message to the Mobile Application without updating the Database.

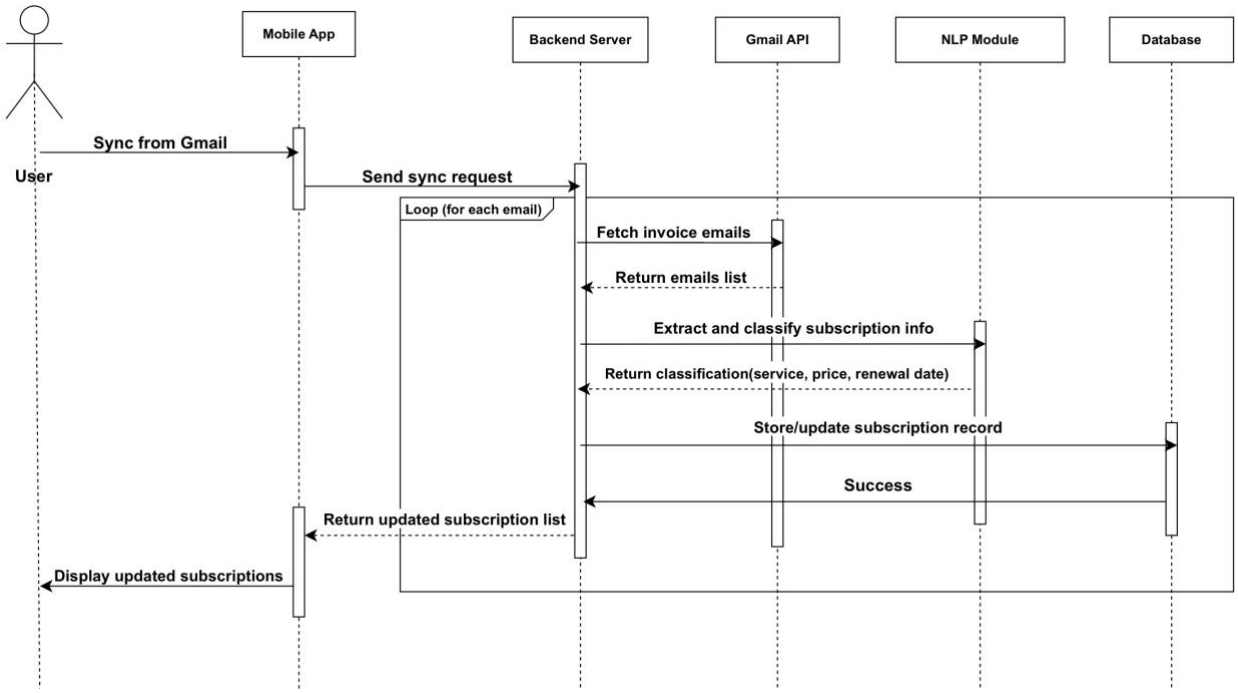


Figure 5:Sequence Diagram – Gmail Invoice Import and NLP Classification

This sequence diagram shows how the system imports subscription invoices from Gmail and classifies them using NLP. The user presses the “Sync from Gmail” button in the mobile app. The app sends a sync request to the backend server, which calls the Gmail API to fetch invoice emails. For each email, the backend sends the content to the NLP module to extract and classify subscription information (service name, category, price, renewal date). The processed data is stored in the database, and the updated subscription list is returned to the app.

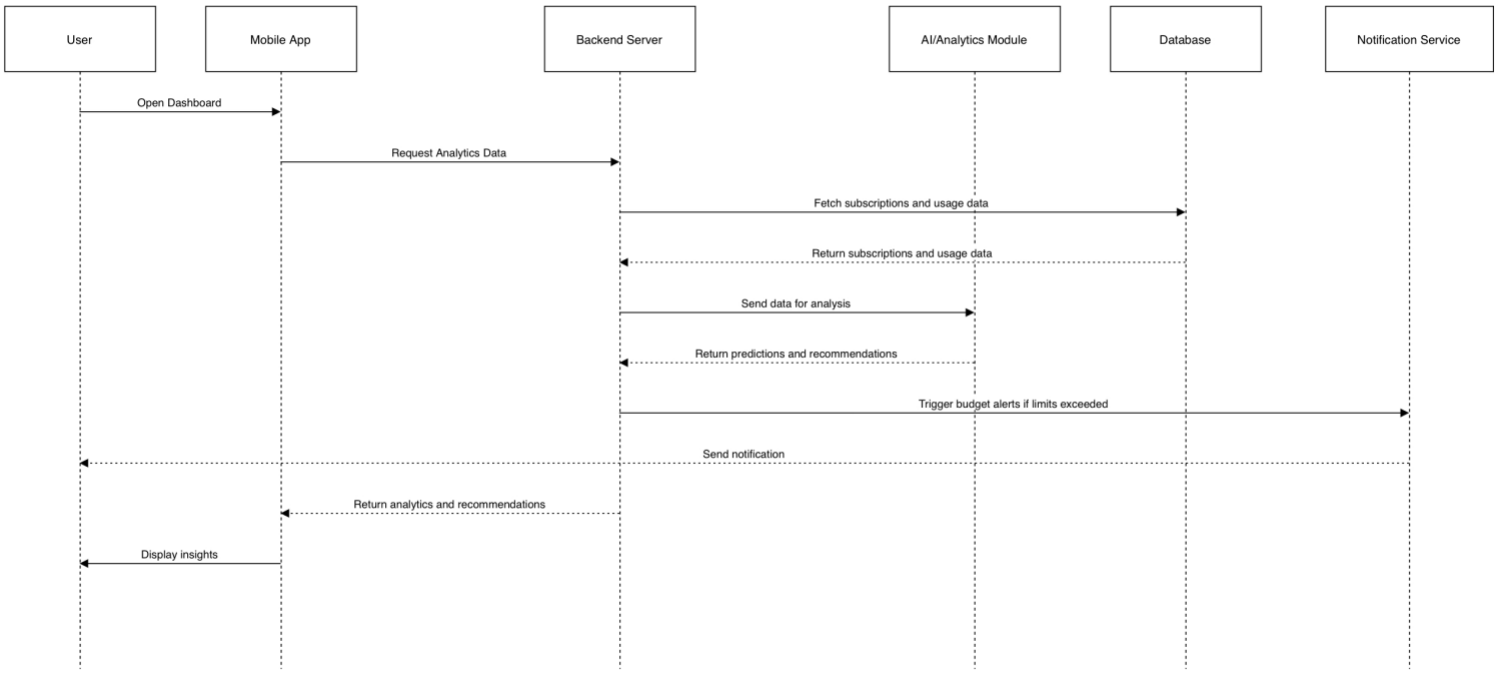


Figure 6:Sequence Diagram – Analytics Processing and Budget Alerts

This sequence diagram shows how the system processes analytics data.
When the user opens the dashboard, the mobile app requests analytics from the backend server. The server retrieves existing subscription and usage data from the database, sends it to the AI/Analytics module for prediction and recommendations, and triggers budget alerts when limits are exceeded. The results are sent back to the mobile app for display, and notifications are sent through the notification service.

## 4.3 Class Diagram

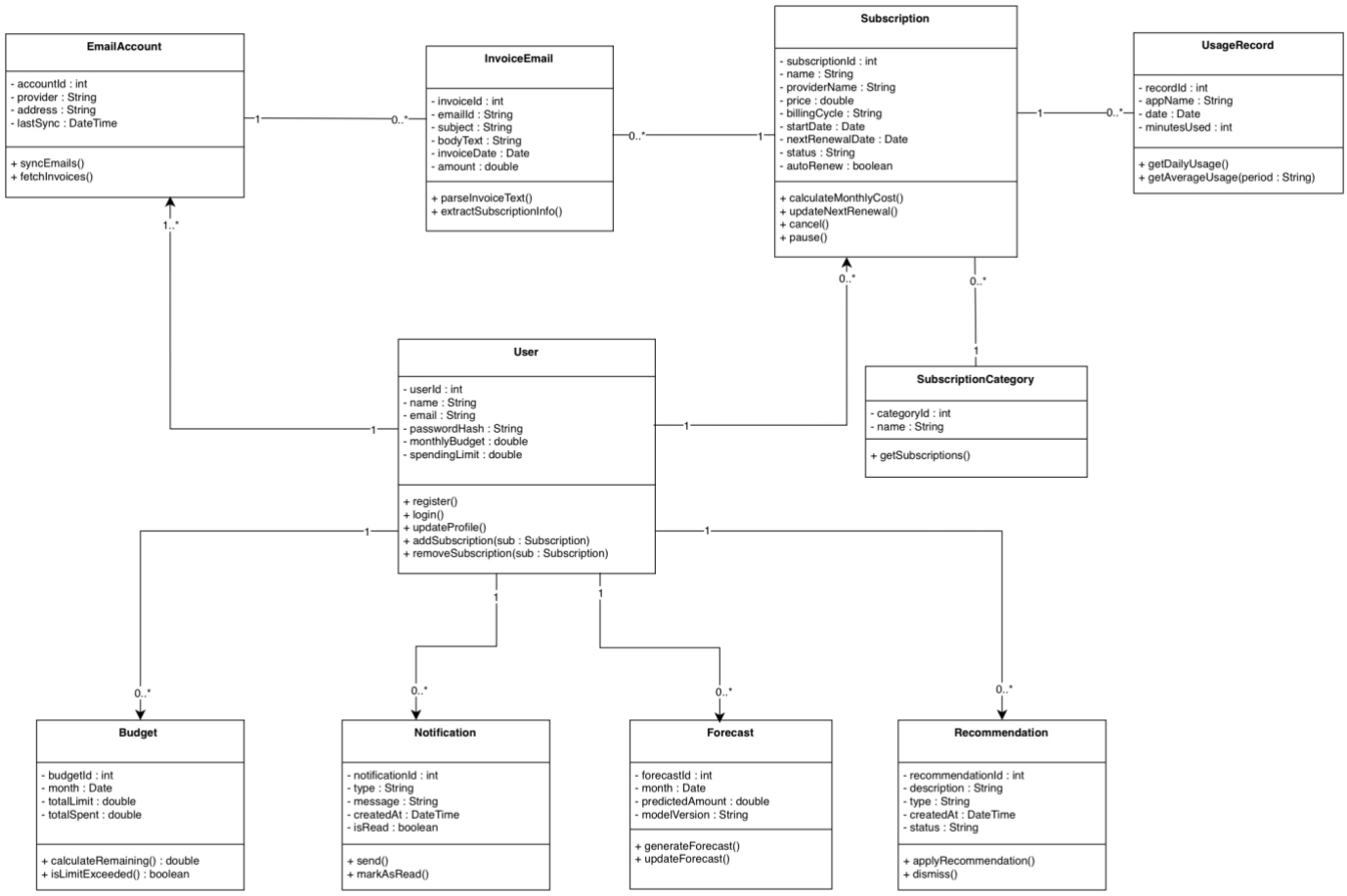


Figure 7: Class Diagram – Smart Subscription Manager System

This class diagram illustrates the core classes of the Smart Subscription Manager, including User, Subscription, InvoiceEmail, UsageRecord, Budget, Forecast, Notification, and Recommendation. It shows attributes, methods, and relationships between system components.

# 5. Conclusion and Future Work

In this first phase of the project (GP1), we established the foundations of the Smart Subscription Manager mobile application by clearly defining the subscription-management problem, reviewing related research, and specifying how AI, NLP, and FinTech techniques can be combined to deliver a smarter financial solution. We completed the Introduction, Background & Related Work, and Requirements Analysis chapters, and identified the system's functional and non-functional requirements, use cases, and core modules. In addition, we developed the initial system design elements, including the flowchart, sequence diagrams, and class diagram, which provide a clear understanding of the system's intended structure and behavior.

Building on this groundwork, the second phase (GP2) will focus on implementing the full system as described in GP1. This includes completing the detailed design, developing both the mobile interface and backend services, integrating the Gmail API for invoice retrieval, applying NLP models for automated extraction and classification, and building the LSTM forecasting model for expense prediction. GP2 will also involve implementing the usage–cost analysis, generating personalized recommendations, performing comprehensive testing, and delivering the final working prototype of the Smart Subscription Manager along with full documentation.

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