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1. Introduction

1.1. Purpose of the Document

This document serves the purpose of providing a clear definition of both the **formal** and **non-formal** requirements concerning the project. We will begin by offering a concise overview of the application's functionalities.

Furthermore, the central portion of this document is dedicated to system models, with a particular focus on UML (Unified Modeling Language). UML is a modeling language that establishes a standardized notation for the elements that constitute a software system.

In the subsequent sections, we will delve into the comprehensive details of **functional** and **non-functional** requirements, as well as their measurement and specification.

1.2. System Functionality

The project's primary objective is to design and develop an Android application, FinanceFlow, accessible to all users with an Internet connection. FinanceFlow serves as an educational platform, guiding users through the intricacies of investing in cryptocurrencies and stocks. Key features include assistance from chatbots and a predictive model, leveraging reinforcement learning to enhance accuracy continually.

Upon registration, each user is endowed with a standard allocation of fictitious funds, allowing them the freedom to invest as they see fit. While users are welcome to pursue their investment strategies independently, the platform encourages gradual learning. To facilitate this, users have access to a curated selection of news articles related to their investments or other relevant information.

The platform also provides intuitive charts illustrating the performance of stocks and cryptocurrencies. These charts offer an overview of each user's fictitious account balance, simplifying the tracking of their investments.

A pivotal aspect of the project is the reinforcement learning-based predictive model. This model learns and improves its accuracy over time, ensuring that users receive increasingly precise predictions as they engage with the platform. This forward-looking approach empowers users with a valuable tool for making informed investment decisions.

To promote financial literacy, the platform offers extensive learning resources, including FAQs, chatbot support, and curated news. This comprehensive approach ensures that users gain a solid foundation in trading principles, allowing them to navigate the complex world of finance with confidence.

Furthermore, FinanceFlow is designed with a user-friendly interface, ensuring that users of all backgrounds can comfortably engage with the platform. The inclusive approach aims to welcome individuals at all levels of expertise, from beginners to seasoned traders.



In addition, in the event that a user depletes their allocated funds, they will be directed to the "Help" page. Here, the AI will engage the user with quizzes designed to enhance their understanding of how stocks work. For each correct answer, users will receive rewards, providing them with an opportunity to replenish their funds and resume their investment activities.

The project's commitment to providing relevant, accurate, and accessible financial information contributes to a more informed society, combating misinformation and empowering users to make sound financial decisions. By implementing these innovative features and focusing on continuous learning, "FinanceFlow" is poised to revolutionize financial education and investment practices.



2. Glossary

Functionalities: The set of operations that can be executed within the app, representing the app's capabilities.

UML (Unified Modeling Language): A standardized modeling language used to visualize the design of a system, often through diagrams.

Use Case Model: A representation in UML that showcases the different functionalities provided by the system.

Collaboration Model: A model that describes how different parts of the system work together and how users engage with the system and each other.

Reinforcement Learning: A machine learning method where a model learns by getting feedback on its actions and improves over time.

Functional Requirements: Descriptions of services the system should offer.

Non-functional Requirements: Constraints or characteristics that the system should adhere to, which are not directly related to functional behavior.

Product Requirements: Requirements related to how the product itself should behave.

Requirements Metrics: Quantifiable measures used to evaluate the system's properties and features.

Requirements Specification: Detailed description of the system's functional requirements.

Requirements Traceability Matrix (RTM): A tool that maps and tracks every requirement through its development lifecycle.

Level System and Medals: A gamified system where users progress through levels and earn medals.

Community Forum: A space within the app for users to interact and share knowledge.

Scenario Simulations: Simulated investment situations based on real past market events.

Weekly/Monthly Challenges: Timed trading challenges where users compete against each other.

Microservice Architecture: A method of developing software systems where each component runs as a small service, often with its own database.

Flutter: A framework used to develop applications for both Android and Apple devices from a single codebase.



3. System Models

3.1. Use Case Model

The Use Case Model, represented in UML (Unified Modeling Language), serves to depict the various functionalities provided by the "FinanceFlow" system. This visual representation simplifies the understanding of system interactions. We've divided the diagram into two parts for enhanced clarity, utilizing the scenario feature to define sequences of actions that describe specific interactions between actors and the system. Below each scenario, you'll find a table, each containing a description of individual functionalities.

Each table encompasses the following information:

Use Case Name	A unique identifier for the use case.
Scope	A brief description of the use case, including its purpose and boundaries.
Actors	The users or systems that interact with the system to achieve the use case goal.
Preconditions	The conditions that must be true before the use case can begin.
Triggers	The events that initiate the use case.
Description	A detailed description of the steps involved in the use case, including the interactions between the actors and the system.
Alternatives	The different paths that can be taken through the use case, depending on the user's choices or system conditions.
Postconditions	The conditions that must be true after the use case has successfully completed.
Open Questions	Any issues left unresolved at the end of the use case.

Use Case Name	User Registration
Scope	Allow users to create an account on the FinanceFlow platform.
Actors	User
Preconditions	None
Triggers	User clicks on the "Register" button.
Description	Users enter their personal information (name, email address, password) and create an account.
Alternatives	None



Postconditions	If the credentials are valid, the account is created and the user can log into the app, otherwise the account is not created and the user can't access FinanceFlow app
Open Questions	None

Use Case Name	Email Verification
Scope	Verify the user's email address.
Actors	User
Preconditions	The user has registered for an account.
Triggers	The user receives an email with a verification link.
Description	The user clicks on the verification link in the email.
Alternatives	The user's email address is verified.
Postconditions	User account is created
Open Questions	None

Use Case Name	User Login
Scope	Allow users to log in to their FinanceFlow account.
Actors	User
Preconditions	The user has registered for an account.
Triggers	User clicks on the "Login" button and enters their email address and password.
Description	The system authenticates the user's credentials and logs them into the platform. The first login gives the User a fixed amount of money.
Alternatives	Users can choose to reset their password if they have forgotten it.
Postconditions	User is logged into the platform.
Open Questions	None

Use Case Name	Select Stock for Investment
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Scope	Allow users to select a stock to invest in.
Actors	User
Preconditions	The user is logged into the platform.
Triggers	User selects a stock.
Description	The system displays the stock's current price, chart and Buy/Sell buttons.
Alternatives	None
Postconditions	User confirms the investment and the system purchases the stock on their behalf.
Open Questions	User's fictitious account balance is updated to reflect the new investment.

Use Case Name	View Stock Chart Or Account Balance Chart
Scope	Allow users to view a stock's price chart or his personal account balance chart.
Actors	User
Preconditions	The user has selected a stock or his account balance.
Triggers	User clicks on the stocks name or on the account balance preview
Description	The system displays a chart of the stock's price history or the chart of the account balance. Users can zoom in and out of the chart and view different time periods.
Alternatives	None
Postconditions	User has seen and navigate through the stock chart or account balance chart
Open Questions	None

Use Case Name	Buy Stock
Scope	Allow users to buy a stock.
Actors	User
Preconditions	The user has selected a stock and viewed its chart and the user needs to have enough money to make the transaction.
Triggers	User clicks on the "Buy" button.



Description	The system displays a confirmation screen, showing the stock's current price and the amount the user wants to invest.
Alternatives	None
Postconditions	User confirms the purchase and the system purchases the stock. User's fictitious account balance is updated to reflect the new investment.
Open Questions	None

Use Case Name	Sell Stock
Scope	Allow users to sell a stock.
Actors	User
Preconditions	The user owns the stock they want to sell.
Triggers	User clicks on the "Sell" button.
Description	The system displays a confirmation screen, showing the stock's current price and the amount the user wants to sell.
Alternatives	None
Postconditions	User confirms the sale and the system sells the stock. User's fictitious account balance is updated to reflect the sale.
Open Questions	None

Use Case Name	View Account Balance
Scope	Allow users to view their fictitious account balance.
Actors	User
Preconditions	The user is logged into the platform.
Triggers	User clicks on the "Account Balance" graph.
Description	The system displays the user's current account balance graph and the current amount on the account.
Alternatives	Users can view the history of their transactions and their investment performance.



Postconditions	None
Open Questions	None

Use Case Name	Read News
Scope	Allow users to read news articles related to their investments and other relevant news.
Actors	User
Preconditions	The user is logged into the platform.
Triggers	Users click on the "News" they want to read.
Description	The system opens the link associated with that news.
Alternatives	The article is opened on the platform.
Postconditions	User read the article selected
Open Questions	None

Use Case Name	Ask Chatbot Question
Scope	Allow users to ask questions to the chatbot and receive answers.
Actors	User
Preconditions	The user is logged into the platform.
Triggers	User clicks on the "Chatbot" button and enters their question.
Description	The chatbot processes the question and provides an answer. The more the User interacts with the AI Chatbot, the more he will be rewarded.
Alternatives	Users can continue the conversation with the chatbot to ask more questions or get clarification.
Postconditions	None
Open Questions	None

Use Case Name	Button to stocks page from Account Balance
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Scope	Allow users to navigate to the Stocks page from Account balance
Actors	User
Preconditions	The user is in the Account Balance section.
Triggers	User clicks on the "Buy More" button.
Description	The system navigates the user to the Stocks page.
Alternatives	Users can also navigate to the Stocks page by selecting it from the bottom navigation bar.
Postconditions	User is on the Stocks page.
Open Questions	None

Use Case Name	Button to Profile page from Feed, News and Stock Page
Scope	Allow users to navigate to their Profile page from the Feed, News and Stock pages.
Actors	User
Preconditions	The user is on the Feed, News or Stock page.
Triggers	User clicks on the top-right "Profile" icon.
Description	The system navigates the user to their Profile page.
Alternatives	Users can also navigate to their Profile page by selecting it from the bottom navigation bar.
Postconditions	User is on their Profile page.
Open Questions	None

Use Case Name	Search Stock Button
Scope	Allow users to search for stocks on the Stock page.
Actors	User
Preconditions	The user is on the Stock page.



Triggers	User clicks on the "Search Stock" search bar.
Description	User enters the name of the stock they want to search for and clicks on the "Search" button.
Alternatives	Users can navigate through the AI suggested stocks.
Postconditions	The system displays a list of stocks that match the user's search query.
Open Questions	None

Use Case Name	Read a FAQ
Scope	Allow users to read a FAQ.
Actors	User
Preconditions	The user is on the Help page.
Triggers	User clicks on a FAQ.
Description	The system displays the FAQ's full text.
Alternatives	Users can scroll through the FAQ to read it.
Postconditions	User has read the FAQ.
Open Questions	None

Use Case Name	Click on "display all FAQs"
Scope	Allow users to view all FAQs on the Help page.
Actors	User
Preconditions	The user is on the Help page.
Triggers	User clicks on the "display all FAQs" button.
Description	The system displays a list of all FAQs.
Alternatives	Users can browse through the list of FAQs to find the one they are interested in.
Postconditions	User is viewing a list of all FAQs.
Open Questions	None



Use Case Name	Start a new conversation with AI
Scope	Allow users to start a new conversation with the AI assistant.
Actors	User
Preconditions	The user is on the "Help" page.
Triggers	User clicks on "Start a new conversation with AI".
Description	The system opens a new chat window.
Alternatives	Users can type in their question or request and the AI assistant will respond.
Postconditions	User is engaged in a conversation with the AI assistant.
Open Questions	None

Use Case Name	View/Change user profile photo
Scope	Allow users to view and change their profile photo from the Profile page.
Actors	User
Preconditions	The user is on the Profile page.
Triggers	User clicks on the "Change Photo" button.
Description	The system displays a file selection dialog box.
Alternatives	User selects a new profile photo and clicks on the "Open" button.
Postconditions	The system uploads the new profile photo and updates the user's profile.
Open Questions	User's profile photo is updated.

Use Case Name	Display personal informations
Scope	Allow users to view their personal information on the Profile page.
Actors	User
Preconditions	The user is on the Profile page.
Triggers	User clicks on the "Personal information" button.
Description	The system displays the user's personal information, such as their name, email



	address, date of birth, and phone number.
Alternatives	None
Postconditions	User is viewing their personal information on the Profile page.
Open Questions	None

Use Case Name	Change personal informations
Scope	Allow users to change their personal information on the Profile page.
Actors	User
Preconditions	The user is in the Personal information section.
Triggers	User clicks on the "Edit" button next to the personal information they want to change.
Description	The system displays an editing field for the selected personal information.
Alternatives	User enters the new value for the personal information and clicks on the "Save" button.
Postconditions	The system updates the user's personal information.
Open Questions	User's personal information is updated.

Use Case Name	Display the about us page
Scope	Allow users to navigate to the About Us page from the Profile page.
Actors	User
Preconditions	The user is on the Profile page.
Triggers	User clicks on the "About Us" button.
Description	The system navigates the user to the About Us page.
Alternatives	None
Postconditions	User is on the About Us page.
Open Questions	None



Use Case Name	Display the user guide
Scope	Allow users to navigate to the User Guide page from the Profile page.
Actors	User
Preconditions	The user is on the Profile page.
Triggers	User clicks on the "User Guide" button.
Description	The system navigates the user to the User Guide page.
Alternatives	None
Postconditions	User is on the User Guide page.
Open Questions	None

Use Case Name	Click on a pre-existing conversation with AI
Scope	Allow users to resume a previous conversation with the AI assistant.
Actors	User
Preconditions	The user is on the "Help" page.
Triggers	User clicks on a pre-existing conversation.
Description	The system opens the conversation window and displays the previous messages.
Alternatives	Users can continue the conversation with the AI assistant.
Postconditions	User is engaged in a conversation with the AI assistant.
Open Questions	None

Use Case Name	Click on a category news button that lists all the news of that category
Scope	Allow users to navigate to a page that lists all the news articles for a specific category.
Actors	User
Preconditions	The user is on the News page.
Triggers	User clicks on a category news button.



Description	The system navigates the user to a page that lists all the news articles for that category.
Alternatives	Users can browse through the list of news articles and select one to read.
Postconditions	User is viewing a list of news articles of a specific category.
Open Questions	None

Use Case Name	User out of money
Scope	Allow users who are out of money to take a quiz to learn more about stocks.
Actors	User, AI Assistant
Preconditions	User is out of money.
Triggers	User goes out of money.
Description	The "Help" page becomes the only page accessible. Here the AI will display a quiz to help the user understand how stocks.
Alternatives	None
Postconditions	The user has an amount of money proportional to the correct answers given.
Open Questions	None

3.2. Collaboration Model

In the context of "FinanceFlow," our collaboration model is integral to providing users with a well-rounded educational experience and enabling a sense of community within the application. While "FinanceFlow" primarily focuses on empowering users with financial knowledge, the collaboration model is designed to foster a collaborative environment, albeit in a different manner compared to conventional social features like chats or comments. Key aspects of our collaboration model include:

1. User-Centric Engagement:

- **FinanceFlow** emphasizes a user-centric approach, where each user's journey is a solitary yet enriched experience. Users can explore and invest in cryptocurrencies and stocks independently, allowing them the freedom to develop their strategies.

2. Gradual Learning and Knowledge Sharing:



- The platform encourages gradual learning by providing access to a curated selection of news articles and educational resources. While users do not directly interact with each other, they indirectly share knowledge through the platform's educational content.

3. User Data and Predictive Model:

- The collaborative aspect of "FinanceFlow" is reflected in the reinforcement learning-based predictive model. This model leverages collective user data to continuously enhance its accuracy. Users, in their individual interactions with the app, contribute to the collective intelligence that informs the model's predictions.

Our collaboration model is focused on ensuring that the collective actions of users contribute to the overall improvement of the platform's predictive capabilities. While there are no direct user-to-user interactions such as chats or data libraries, the collaborative element is embedded in the way the predictive model learns and evolves over time based on the collective behavior of all users.



4. Functional and Non-functional Requirements

As for the requirements, they can be divided into two categories: **functional** requirements and **non-functional** requirements. The former are concerned with describing the services that the system offers, while the latter will have the purpose of providing strong constraints on the services, particularly if they are not complied with they could compromise the functionality of the system, rendering it effectively unusable.

Both requirements will be specified in the following sections.

4.1. Functional Requirements

Functional requirements outline the main functions and features that the application must provide to meet the users' needs and achieve the intended goal. These requirements are:

- **Services** offered by the app: The app aims to provide users with the ability to invest in various assets, with advice based on analysis and predictions about market trends.
- App **behavior** under given conditions: For example, how the app provides feedback to users through a chatbot, how it handles authentication, and how it responds to specific interactions such as buying and selling.
- **Results** provided by the app based on specific inputs: This could refer to how the app provides predictions on market trends or presents relevant financial news based on user preferences or actions.

In the following chapter, we will explore each of these functional requirements in detail, ensuring that the app meets user expectations and provides an optimal user experience.

Every requirement will be described in a table structured as follows:

ID	Unique identifier for each functional requirement. It follows the format <FR-XX> where FR stands for Functional Requirement and XX is a 2 digit progressive number
Use case	The use case in the UML diagram to which we are referencing
Definition	Section in which the function of the system will be specified by defining the type of inputs and outputs, including the behavior that correlates the two.
Reason	The reason why the requirement has been chosen
Influences	Specifies the what needs to happen in order for the service provided by the requirement to work
Priority	Describes the priority it should have so as to enable the adherence to timelines without hindering the proper completion of the project.



In addition, columns will be colored based on the requirement priority (**high**, **medium**, **low**)

Here's the list of functional requirements:

ID	FR-01
Use case	User Registration
Definition	The system should give the option of creating a new account for a user who is using the application for the first time. Mandatory entry of a valid email address, phone number, first and last name will be required.
Reason	Every user that wants to use the app must have an account, otherwise the system can't let him access the app.
Influences	The user must have an account in order to use the services offered by the app
Priority	High

ID	FR-02
Use case	Email verification
Definition	The system prompts the user to verify the account via a verification link sent by email.
Reason	Ensure the user creating the account really has access to the email account.
Influences	Without confirming email address the account can't be created and the person can't access the app
Priority	High

ID	FR-03
Use case	User login
Definition	The system needs to allow the user to access the app to use the services.
Reason	If the login wasn't allowed, the user wouldn't be able to login and therefore use the app
Influences	An account for that user must exist to perform the login action
Priority	High



ID	FR-04
Use case	Select stock for investment
Definition	Enables users to browse, search, and select specific stocks they are interested in investing.
Reason	To give users the flexibility to choose their investment options and make informed decisions based on their preferences and market research.
Influences	The user's investment strategy, diversification of the user's portfolio, and potential return on investment.
Priority	High

ID	FR-05
Use case	View stock chart or account balance chart
Definition	Provides users with graphical representations of stock performance over time or the progression of their account balance.
Reason	Visual aids help users understand market trends and the health of their investments, allowing for better investment decisions.
Influences	The user's understanding of market trends, investment decisions, and overall financial planning.
Priority	High

ID	FR-06
Use case	Buy a stock
Definition	Enables users to purchase stocks they have selected, specifying the number of shares and confirming the transaction.
Reason	To facilitate the primary purpose of the application, which is to invest in stocks. Purchasing is a core functionality.
Influences	The user's investment portfolio, potential return on investment, and the overall market dynamics (as buying impacts stock demand).
Priority	High



ID	FR-07
Use case	Sell stock
Definition	Allows users to sell stocks from their portfolio, specifying the number of shares and confirming the transaction.
Reason	To provide users with the flexibility to liquidate their investments based on market conditions, personal financial needs, or investment strategies.
Influences	The liquidity of the user's portfolio, potential for realized gains or losses, and the overall market dynamics (as selling impacts stock supply).
Priority	High

ID	FR-08
Use case	View account balance
Definition	Enables users to view the current balance of their account, reflecting the value of their holdings and any cash reserves.
Reason	To keep users informed about their financial standing and the value of their investments, which can guide future investment decisions.
Influences	Users' understanding of their financial health, investment decisions, and potential further deposits or withdrawals.
Priority	High

ID	FR-09
Use case	Read news
Definition	To keep users informed about market dynamics, company updates, and global economic trends that can influence investment decisions.
Reason	To keep users informed about market dynamics, company updates, and global economic trends that can influence investment decisions.
Influences	Users' understanding of the market, investment strategies, and individual stock choices based on current events.
Priority	Medium



ID	FR-10
Use case	Ask chatbot questions
Definition	Allows users to interact with an AI-powered chatbot to ask questions, seek advice, or get clarity on app functionalities.
Reason	To offer real-time support and guidance, enhancing user experience and confidence in using the app.
Influences	User satisfaction, understanding of app functionalities, and potentially investment decisions based on the advice received.
Priority	High

ID	FR-11
Use case	Button to stock page from account balance
Definition	Allows users to navigate directly to the stock page from their account balance view with a dedicated button.
Reason	To provide users with a streamlined experience, making it easier to switch between checking their balance and viewing stock details.
Influences	User navigation experience, potential for increased stock viewing and transaction activities due to ease of access.
Priority	Low

ID	FR-12
Use case	Button to profile page from feeds, news, stock page
Definition	Enables users to swiftly navigate to their profile page from various sections of the app, such as the Feed, News, or Stock Page, via a dedicated button.
Reason	To ensure consistent navigation and allow users to quickly access their profile settings or information from different parts of the app.
Influences	User navigation experience, accessibility to personal profile settings and details.
Priority	Medium

ID	FR-13
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Use case	Search stock button
Definition	Provides users with a button that initiates a stock search functionality, allowing them to find specific stocks by name, ticker, or other criteria.
Reason	To allow users to quickly locate and access information on specific stocks without browsing through extensive lists.
Influences	Efficiency of user experience, potential for increased stock viewing, and transaction activities due to ease of finding stocks.
Priority	Medium

ID	FR-14
Use case	Read a FAQ
Definition	Enables users to select and view answers to frequently asked questions about the app's functionalities, investment strategies, or other relevant topics.
Reason	To provide users with immediate answers to common queries, reducing the need for contacting support and enhancing self-service capabilities.
Influences	User understanding of the platform, reduced support requests, and increased user confidence in using the app.
Priority	Medium

ID	FR-15
Use case	Click on "display all FAQs"
Definition	Provides users with a button to view the entirety of the FAQ section, displaying all questions and answers in a comprehensive list or grid.
Reason	To offer users an overview of all available FAQs, ensuring they don't miss out on any crucial information.
Influences	User experience in the FAQ section, potential for reduced support requests, and improved user understanding.
Priority	Low

ID	FR-16
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Use case	Start a new conversation with AI
Definition	Allows users to initiate a new interaction or conversation thread with the AI-powered chatbot.
Reason	To provide users with real-time support, advice, or information by interacting with the AI chatbot.
Influences	User experience in seeking support or advice, potential for improved decision-making based on AI guidance.
Priority	High

ID	FR-17
Use case	View/change user profile picture
Definition	Provides users the capability to view their current profile picture and offers an option to change or update it.
Reason	To allow users to personalize their profile and enhance their identity within the platform.
Influences	User personalization experience, recognition of user's identity in community features or interactions.
Priority	Low

ID	FR-18
Use case	Display personal information
Definition	Shows users a detailed view of their stored personal information, such as name, email, date of birth, etc
Reason	To provide transparency about what personal data is stored and allow users to review their details.
Influences	User's confidence in data management, clarity on personal data, potential needs for updates or corrections.
Priority	Medium

ID	FR-19
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Use case	Change personal information
Definition	Allows users to modify or update specific pieces of their personal information.
Reason	To ensure that users can keep their details up-to-date, correcting any inaccuracies or making adjustments as needed.
Influences	Accuracy of user data, user's confidence in managing their information, and potential effects on personalized features or recommendations.
Priority	Medium

ID	FR-20
Use case	Display the "About Us" page
Definition	Offers users a dedicated page or section that provides information about the platform, its mission, team, history, and other relevant details.
Reason	To build trust and provide transparency about the platform's origins, goals, and the team behind it.
Influences	User's understanding of the platform, trust in the service, and potential engagement or loyalty.
Priority	Low

ID	FR-21
Use case	Display the user guide
Definition	Provides users with access to a comprehensive guide detailing how to use the platform, its features, and best practices.
Reason	To assist users in navigating and utilizing the platform effectively, especially those new to the application.
Influences	User onboarding experience, understanding of platform functionalities, and overall user satisfaction and efficiency.
Priority	Medium

ID	FR-22
Use case	Click on a pre-existing conversation with AI



Definition	Allows users to reopen and continue a previous interaction or conversation thread with the AI-powered chatbot.
Reason	To enable users to revisit past interactions, retrieve past advice or answers, and maintain a history of their queries.
Influences	User experience in seeking continuous support, potential for improved decision-making based on past AI guidance, and ease of reference.
Priority	Medium

ID	FR-23
Use case	Click on a category news button that lists all the news of that category
Definition	Provides users the option to view news articles or updates specifically categorized under a chosen topic or category.
Reason	To allow users to streamline their news consumption based on their interests or the relevance of specific financial categories.
Influences	User's information consumption experience, potential for more informed investment decisions based on category-specific news, and overall engagement with the platform's content.
Priority	Medium

ID	FR-24
Use case	User out of money
Definition	Detects when a user's account balance is insufficient for a desired transaction (like buying a stock) by preventing the transaction and presenting the option to take quizzes.
Reason	The user's fictitious money balance is zero
Influences	The user's fictitious money balance is added money, depending on the quizzes results
Priority	High



4.2. Non-functional Requirements

Non-functional requirements concern the behavior properties of the system; they can be critical because they could make the system useless if they are not met. They are written in a way that they can be easily verified because they must be quantified.

They are specified below with a division between product, process and external.

Every non functional requirement will be described in a table structured as follows:

ID	Unique identifier for each functional requirement. It follows the format < NFR-XX > where NFR stands for Non Functional Requirement and XX is a 2 digit progressive number.
RF	Specifies the referred functional requirement.
Definition	Description of the requirement.
Reason	The reason why the requirement has been chosen.
Influences	Specifies what the requirement triggers.
Priority	Describes the priority it should have so as to enable the adherence to timelines without hindering the proper completion of the project.

In addition, columns will be colored based on the requirement priority (**high**, **medium**, **low**)

Here's the list of non functional requirements:

ID	NFR-01
FR	–
Definition	Users should receive timely notifications for system maintenance or downtimes.
Reason	To keep users informed about any interruptions and maintain trust.
Influences	User satisfaction, trust, and planning around system downtimes.
Priority	Medium

4.2.1. Product Requirements

Product requirements specify how the product should behave in terms of usability, efficiency (performance and space), reliability, and portability.

The following tables describe the requirements regarding reliability, i.e., the ability to meet the technical specifications for operation over time:



ID	NFR-02
FR	–
Definition	Provides users with access to a comprehensive guide detailing how to use the platform, its features, and best practices.
Reason	Assist users in navigating and utilizing the platform effectively, especially those new to the application.
Influences	User onboarding experience, understanding of platform functionalities, and overall user satisfaction.
Priority	Medium

ID	NFR-03
FR	FR-22
Definition	Allows users to reopen and continue a previous interaction or conversation thread with the AI-powered chatbot.
Reason	Enable users to revisit past interactions, retrieve past advice or answers, and maintain a history of their queries.
Influences	User experience in seeking continuous support and ease of reference.
Priority	Medium

ID	NFR-04
FR	FR-09
Definition	Provides users the option to view news articles or updates specifically categorized under a chosen topic or category.
Reason	Allow users to streamline their news consumption based on their interests or the relevance of specific financial categories.
Influences	User's information consumption experience and overall engagement with the platform's content.
Priority	Medium



ID	NFR-05
FR	–
Definition	The application should have a response time of less than 2 seconds for 95% of its operations.
Reason	To ensure a smooth and efficient user experience without noticeable delays.
Influences	User satisfaction, usability of the platform.
Priority	High

ID	NFR-06
FR	–
Definition	The system should support at least 1,000 concurrent users.
Reason	To ensure scalability and handle peak user loads.
Influences	System performance, scalability, user experience during peak times.
Priority	High

ID	NFR-07
FR	–
Definition	All features should be thoroughly documented in the user guide.
Reason	To provide users with resources to understand and utilize all platform functionalities.
Influences	User understanding, reduced need for support, improved user experience.
Priority	Medium

ID	NFR-08
FR	–
Definition	The application should adhere to accessibility standards, ensuring it's usable by people with disabilities
Reason	To ensure inclusivity and meet regulatory standards for digital accessibility.



Influences	User inclusivity, regulatory compliance, broader user base.
Priority	High

ID	NFR-09
FR	–
Definition	The user interface should be intuitive and require minimal training for a new user to get started.
Reason	To ensure ease of use and reduce the learning curve for new users.
Influences	User onboarding experience, user satisfaction, reduction in support queries.
Priority	Medium

4.2.2. Process Requirements

Process requirements address deliveries, implementation and standards.

ID	NFR-10
FR	–
Definition	Regular backups of user data and transaction histories should be taken every month..
Reason	To prevent data loss and ensure data recovery in case of any failures.
Influences	Data integrity, user trust, operational continuity.
Priority	High

4.2.3. External Requirements

External requirements are related to interoperability and ethical and legal requirements (privacy and security).

They also arise from factors external to the system and its development process

ID	NFR-11
FR	–
Definition	All personal data should be encrypted both in transit and at rest.



Reason	To maintain user data privacy and meet security standards.
Influences	Data security, user trust, regulatory compliance.
Priority	High



5. Requirements Metrics

The Requirements Matrix serves as a beacon, guiding the development process and ensuring alignment with our core objectives. By defining properties integral to each feature and associating them with quantifiable metrics, we pave the path for systematic evaluation and refinement. This chapter elucidates these properties and their corresponding metrics, providing a clear blueprint for stakeholders to gauge the project's progress and outcomes.

5.1. Properties and Metrics

The table below represents a comprehensive list of properties derived from the project's objectives, each associated with specific metrics that allow for evaluation and monitoring.

Property	Metric
AI-driven Financial Advice	<ul style="list-style-type: none">- Accuracy of advice (%)- Response time (seconds)- Data sources integrated- User feedback rating
User-centric News Platform	<ul style="list-style-type: none">- User engagement rate (%)- News update frequency- Relevance accuracy (%)- User customization options
Portfolio Simulation	<ul style="list-style-type: none">- Simulation accuracy (%)- Historical data range (years)- Projection range (years)- Scenario flexibility
Financial Chatbot	<ul style="list-style-type: none">- User satisfaction rate (%)- Query resolution time (seconds)- Topics covered- User interaction frequency

5.2. Properties Description

The second table delves deeper into each property, exploring its sub RNF (Reliability, Non-functionality, Flexibility) and the corresponding metrics.

Property	RNF	Metric
AI-driven Financial Advice	Reliability	<ul style="list-style-type: none">- Consistency of advice across users (%)- Error rate (%)
	Non-functionality	<ul style="list-style-type: none">- System uptime (%)- Latency in fetching real-time data



	Flexibility	<ul style="list-style-type: none"> - Ease of integrating new data sources - Adaptability to market changes
User-centric News Platform	Reliability	<ul style="list-style-type: none"> - News accuracy (%) - System uptime (%)
	Non-functionality	<ul style="list-style-type: none"> - Average loading time (seconds) - Notification delay (seconds)
	Flexibility	<ul style="list-style-type: none"> - Customizability of news feed - Support for multiple news sources
Portfolio Simulation	Reliability	<ul style="list-style-type: none"> - Historical data accuracy (%) - Consistency in simulation results (%)
	Non-functionality	<ul style="list-style-type: none"> - Speed of simulation (seconds) - Data refresh rate
	Flexibility	<ul style="list-style-type: none"> - Ability to add new simulation scenarios - Support for multiple financial instruments
Financial Chatbot	Reliability	<ul style="list-style-type: none"> - Consistency of answers (%) - Accuracy in answering (%)
	Non-functionality	<ul style="list-style-type: none"> - Multi-platform support - Chatbot response time (seconds)
	Flexibility	<ul style="list-style-type: none"> - Ease of updating knowledge base - Multilingual support



6. Requirements Specification

The requirements specification contains the precise and detailed description of the functional requirements of the system. Human language is put aside to favor the use of a more technical language to impose uniformity on the specification.

Each requirement will follow the format specified in the table below:

ID	A unique identifier for the requirement.
RF	The requirement type.
Specifics	A detailed description of the requirement.
Pre-condition	The conditions that must be met before the requirement can be fulfilled.
Post-Condition	The conditions that must be met after the requirement has been fulfilled.
Side effects	Any unintended or unexpected consequences of the requirement.

ID	RS-01
RF	FR-01
Specifics	The application at his first start allows the user to create an account.
Pre-condition	The application should be correctly downloaded from the Google Play Store.
Post-Condition	User's data will be elaborated to create an account. The confirmation email is sent.
Side effects	None

ID	RS-02
RF	FR-03
Specifics	The system allows the user to access the app to use the services.
Pre-condition	The user has a valid account and is logged in.
Post-Condition	The user can use all the features and services of the app.
Side effects	None



ID	RS-03
RF	FR-03
Specifics	The system allows the user to access the app to use the services.
Pre-condition	The user has a valid account and is logged in.
Post-Condition	The user can use all the features and services of the app.
Side effects	None

ID	RS-04
RF	FR-04
Specifics	Enables users to browse, search, and select specific stocks they are interested in investing.
Pre-condition	The user is logged in and has a valid account.
Post-Condition	The user selects a stock to invest in.
Side effects	The system displays the stock's information and allows the user to invest.

ID	RS-05
RF	FR-05
Specifics	Provides users with graphical representations of stock performance over time or the progression of their account balance.
Pre-condition	The user is logged in and has a valid account.
Post-Condition	The user selects a stock or their account balance and views the corresponding chart.
Side effects	None



ID	RS-06
RF	FR-06
Specifics	Enables users to purchase stocks they have selected, specifying the number of shares and confirming the transaction.
Pre-condition	The user is logged in, has a valid account, and has sufficient funds to purchase the desired quantity of shares.
Post-Condition	The user confirms the purchase and the shares are added to their portfolio.
Side effects	The user's account balance is updated to reflect the purchase.

ID	RS-07
RF	FR-07
Specifics	Allows users to sell stocks from their portfolio, specifying the number of shares and confirming the transaction.
Pre-condition	The user is logged in, has a valid account, and owns the desired quantity of shares.
Post-Condition	The user confirms the sale and the shares are removed from their portfolio.
Side effects	The user's account balance is updated to reflect the sale.

ID	RS-08
RF	FR-08
Specifics	Enables users to view the current balance of their account, reflecting the value of their holdings and any cash reserves.
Pre-condition	The user is logged in and has a valid account.
Post-Condition	The user selects to view their account balance and the system displays it.
Side effects	None

ID	RS-09
RF	FR-09
Specifics	To keep users informed about market dynamics, company updates, and global economic trends that can influence investment decisions.



Pre-condition	The user is logged in and has a valid account.
Post-Condition	The user selects to view news and the system displays a list of articles.
Side effects	The user may read the articles to stay informed about the market and make more informed investment decisions.

ID	RS-10
RF	FR-10
Specifics	Allows users to interact with an AI-powered chatbot to ask questions, seek advice, or get clarity on app functionalities.
Pre-condition	The user is logged in and has a valid account.
Post-Condition	The user types in a question or query and the chatbot responds.
Side effects	The user may receive answers, advice, or guidance on how to use the app.

ID	RS-11
RF	FR-11
Specifics	Allows users to navigate directly to the stock page from their account balance view with a dedicated button.
Pre-condition	The user is logged in and viewing their account balance.
Post-Condition	The user clicks on the button to navigate to the stock page.
Side effects	The user is taken to the stock page where they can view and search for stocks.

ID	RS-12
RF	FR-12
Specifics	Enables users to swiftly navigate to their profile page from various sections of the app, such as the Feed, News, or Stock Page, via a dedicated button.
Pre-condition	The user is logged in and viewing any page in the app.
Post-Condition	The user clicks on the button to navigate to their profile page.
Side effects	The user is taken to their profile page where they can view and edit their personal settings and information.



ID	RS-13
RF	FR-13
Specifics	Provides users with a button that initiates a stock search functionality, allowing them to find specific stocks by name, ticker, or other criteria.
Pre-condition	The user is logged in and viewing any page in the app.
Post-Condition	The user clicks on the button to search for a stock.
Side effects	The user is able to enter search criteria and view a list of matching stocks.

ID	RS-14
RF	FR-14
Specifics	Enables users to select and view answers to frequently asked questions about the app's functionalities, investment strategies, or other relevant topics.
Pre-condition	The user is logged in and viewing any page in the app.
Post-Condition	The user clicks on a FAQ to view the answer.
Side effects	The user is able to read the answer to their question.

ID	RS-15
RF	FR-15
Specifics	Provides users with a button to view the entirety of the FAQ section, displaying all questions and answers in a comprehensive list or grid.
Pre-condition	The user is logged in and viewing the FAQ section.
Post-Condition	The user clicks on the button to display all FAQs.
Side effects	The user is able to view a list or grid of all FAQs.

ID	RS-16
RF	FR-16
Specifics	Allows users to initiate a new interaction or conversation thread with the



	AI-powered chatbot.
Pre-condition	The user is logged in and has a valid account.
Post-Condition	The user clicks on a button to start a new conversation with the AI chatbot.
Side effects	A new conversation window opens, allowing the user to interact with the AI chatbot.

ID	RS-17
RF	FR-17
Specifics	Provides users the capability to view their current profile picture and offers an option to change or update it.
Pre-condition	The user is logged in and has a valid account.
Post-Condition	The user clicks on their profile picture or selects the option to change their profile picture.
Side effects	The user is able to view their current profile picture and upload a new one.

ID	RS-18
RF	FR-18
Specifics	Display personal information
Pre-condition	The user is logged in and has an account.
Post-Condition	The user's personal information is displayed in a clear and concise manner.
Side effects	None

ID	RS-19
RF	FR-19
Specifics	Change personal information
Pre-condition	The user is logged in and has an account.
Post-Condition	The user's personal information is updated successfully.
Side effects	None



ID	RS-20
RF	FR-20
Specifics	Display the "About Us" page
Pre-condition	The user is logged in and has an account.
Post-Condition	The "About Us" page is displayed in a clear and concise manner.
Side effects	None

ID	RS-21
RF	FR-21
Specifics	Display the user guide
Pre-condition	The user is logged in and has an account.
Post-Condition	The user guide is displayed in a clear and concise manner.
Side effects	None

ID	RS-22
RF	FR-22
Specifics	Click on a pre-existing conversation with AI
Pre-condition	The user is logged in and has interacted with the AI-powered chatbot in the past.
Post-Condition	The previous conversation thread is reopened and displayed.
Side effects	None

ID	RS-23
RF	FR-23
Specifics	Click on a category news button that lists all the news of that category
Pre-condition	The user is logged in and has an account.
Post-Condition	A list of news articles categorized under the selected topic or category is displayed.



Side effects	None
ID	RS-24
RF	FR-24
Specifics	User out of money
Pre-condition	The user's fictitious money balance is zero.
Post-Condition	The user is presented with the option to take quizzes and learn with AI to receive rewards and restart investing.
Side effects	The user's fictitious money balance may be reset, depending on the quiz results.



7. Requirements Traceability Matrix

The Requirements Traceability Matrix is a crucial tool in software engineering and project management that ensures every specified requirement for a system can be traced from its origin through its development lifecycle. Essentially, the Requirements Traceability Matrix provides a visual representation of the relationship between requirements, ensuring that no requirement is overlooked and that all are duly implemented and validated.

This matrix offers several benefits:

- **Comprehensive Overview:** At a glance, stakeholders can understand which requirements have been addressed and which are pending.
- **Change Management:** The matrix aids in handling changes to requirements, ensuring that any change's ripple effects are well understood.
- **Verification and Validation:** RTM ensures that all requirements are verifiable and have corresponding validation tests, ensuring product quality.
- **Accountability and Transparency:** It provides a clear lineage for each requirement, ensuring that every requirement is justified, sourced, and tracked. In the subsequent sections, the matrix will detail each requirement's relationships, giving a holistic view of the project's status and its alignment with initial objectives.

FR-	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
FR-01	X	X	X																					
FR-02		X	X																					
FR-03			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
FR-04				X		X																		
FR-05					X																			
FR-06						X																		X
FR-07							X																	
FR-08								X																
FR-09									X														X	
FR-10										X														



FR-11										X										
FR-12										X					X	X	X		X	
FR-13										X										
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FR-24																				X
NFR-01																				
NFR-02																				
NFR-03																		X		
NFR-04								X												
NFR-05																				
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NFR-07																				
NFR-08																				
NFR-09																				



NFR-10																						
NFR-11																						



8. System Evolution

As the digital landscape continually evolves, so too must our applications adapt and grow to meet emerging demands and harness new technological advancements. This chapter delves into the prospective enhancements and modifications envisaged for **FinanceFlow** in its future iterations. While the current system provides a robust foundation for users to explore the world of trading and finance, there's always room for further refinement and expansion.

Within this chapter, you'll find a curated list of potential enhancements and features. These proposals are grounded in both user feedback and a forward-looking perspective on how trading and financial education might evolve in the coming years. From gamified elements like a level system and medals to fostering a vibrant community through forums, the ideas presented here serve as a roadmap for **FinanceFlow's** continued growth and evolution.

Understanding that technology and user needs are ever-changing, this chapter underscores our commitment to continuous improvement and our aspiration to consistently offer an unparalleled user experience.

- **Level system and medals:**

- **Description:** Users progress through various levels as they become more active and informed on the platform. Each level could have a set of objectives or missions, such as completing a certain number of quizzes, reading a specified amount of articles, or achieving a particular return on their virtual investments. Upon reaching certain milestones, users are awarded medals of different materials (bronze, silver, gold) based on the difficulty of the achievement.
- **Benefits:** This gamified system encourages users to continue learning and to remain active on the platform. It also provides a sense of accomplishment and visual recognition through medals, further incentivizing user engagement.
- **Implementation:** In addition to designing the leveling system, notifications and badges could be introduced to acknowledge user achievements. A dashboard might also display earned medals, progress, and upcoming goals.

- **Community forum:**

- **Description:** A space within the app where users can interact with one another. They can share advice, ask questions, discuss investment strategies, or share educational resources.
- **Benefits:** Promotes collaborative learning and builds a community of users helping one another. It can also help keep users engaged and active within the app.
- **Implementation:** In addition to creating a forum, features like upvote/downvote, post or comment reporting, and the ability to follow specific users or topics could be introduced.

- **Scenario simulations:**

- **Description:** Users can test their investment strategies in scenarios based on real past market events. For example, how they would have handled the 2008 financial crisis or the exponential rise of cryptocurrencies in 2017.



- **Benefits:** Offers users a safe environment to learn from history and understand how certain events impact markets.
- **Implementation:** It would involve developing scenarios based on historical data, allowing users to "invest" according to that data, and then seeing the outcomes of their decisions.
- **Weekly/monthly challenges:**
 - **Description:** Trading challenges where users can compete in specific scenarios or with certain constraints to see who achieves the best returns.
 - **Benefits:** These challenges can help users stay active and engaged, while testing and refining their investment skills in a competitive yet friendly environment.
 - **Implementation:** Develop scenarios or themes for challenges, have a leaderboard for users, and reward challenge winners with badges or other virtual incentives.

By incorporating these features, **FinanceFlow** can not only be educational but also engaging and fun for its users.



9. Appendices

9.1. Database Requirements

The backend will be developed using a microservice architecture. Thus, each component will own an isolated database, with only the information required by each service.

A brief summary of each microservice and the corresponding databases:

- **Authentication service:** Will be required to store user related information, such as credentials, subscription plans, and permissions.
- **Chatbot service:** Will be required to store past conversations. A user will be able to access past-conversations and continue from any point.
- **News service:** Will only hold information in memory as a short lived cache. No database will be required for this service. The only interactions needed from this service are API calls to major news outlets.
- **Forecasting service:** Will be required to store time-series data of each ticker. With such a huge amount of different tickers, and incredibly high granularity, the only option to efficiently make predictions on such data (e.g. training machine learning models on it), will require a custom storage system developed just for this purpose.

Other services might be developed in the future to enhance the experience of the application, but will all follow a similar pattern. Each service will only store its relevant information using the most appropriate database for the job.

9.2. Device Requirements

The user facing application will be written using Flutter, a framework to develop platform agnostic applications. Thus, both Android and Apple devices will be supported.

The Android application will require a minimum Android version of 5.0 and between 40MB and 50MB of storage space. Additional space of up to 100MB will be required for local storage and caches.

The IOS application will require a minimum version of IOS 11 or later, with a similar footprint in terms of storage size.

Networking and possible biometrics information will be required to interact with the service and authenticate using either fingerprints or Face ID.



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