AI-POWERED PERSONAL FINANCE MOBILE APP

CASE STUDY: University of Kigali Employee

By

Denyse MUKAMPARIWIMPETA

REGISTRATION NUMBER: 2305000352

Under the guidance and supervision of James HAKIZIMANA

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DEDICATION

This project entitled **AI-powered personal finance mobile app** is my original work and has not been presented for a degree or any other academic award at any University or Higher Learning Institution. No part of this research should be reproduced without the authors 'consent or that of UNIVERSITY OF KIGALI (UoK).

S**ignature**

Student's name: Denyse MUKAMPARIWIMPETA

Reg-Number: 2305000352

Signature: …… Date: ……/. ...…/2025

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APPROVAL

The project and thesis titled "**AI-powered personal finance mobile app**," authored by Denyse MUKAMPARIWIMPETA, have been deemed satisfactory for the attainment of an Information Technology.

Supervisor: James HAKIZIMANA

Signature: …… Date: ……/. ……../2025

DEDICATION

I wholeheartedly dedicate this endeavor to my beloved parents, siblings, cherished friends, and my esteemed supervisor, James HAKIZIMANA, whose unwavering support, constant encouragement, and deep affection have been fundamental in bringing this project to life. From the very beginning of my academic journey up to this present moment, he has steadfastly stood by my side in times of need. Moreover, I extend my dedication to my entire group of classmates, acknowledging the substantial contributions they have made throughout the extensive and engaging years of my educational pursuit. Their companionship and shared experiences have significantly enriched my academic endeavors, imbuing this dedication with even greater significance.

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ABSTRACT

This study aims to evaluate the effectiveness of the AI-powered personal finance mobile app in University Of Kigali Employee, particularly focusing on its implementation within employee. By analyzing the strengths, weaknesses, opportunities, and threats (SWOT) of the AI-powered personal finance mobile app, this research will identify critical areas for improvement. The study will employ a mixed-methods approach, combining quantitative and qualitative data collection techniques, including surveys, interviews, and document analysis. The findings of this research will contribute to strengthening the AI-powered personal finance mobile app, improving their financial management practice**s**, and ultimately enhancing public employee outcomes in University Of Kigali Employee.

Keywords: AI-powered personal finance mobile app

CHAPTER ONE: GENERAL INTRODUCTION

1.0 Introduction

Managing personal finances effectively is a crucial aspect of financial stability and long-term success. However, many individuals struggle with tracking their expenses, sticking to a budget, and making informed financial decisions. Traditional financial management methods often lack the necessary tools to provide real-time insights and personalized financial advice.

This project focuses on the design and implementation of an AI-powered personal finance mobile app that leverages artificial intelligence to help users track expenses, budget efficiently, and make smart financial decisions. The app provides automated financial tracking, intelligent recommendations, and real-time analytics to enhance users' financial well-being.

This chapter discusses the background of the project, problem statement, objectives, research questions, scope, significance, limitations, and the organization of the project.

1.1 Background of the Project

In today’s fast-paced world, managing personal finances efficiently has become a critical challenge for many individuals. People often struggle to track their expenses, set realistic budgets, and make informed financial decisions. Traditional methods, such as manual bookkeeping or using basic spreadsheets, can be time-consuming and prone to errors. Additionally, most existing financial management tools lack real-time insights and personalized recommendations, making it difficult for users to understand their financial habits and improve their spending behavior. As a result, there is a growing demand for intelligent financial solutions that offer automation, predictive analytics, and personalized assistance.

The advancement of Artificial Intelligence (AI) and financial technology (FinTech) has revolutionized personal finance management. AI-powered financial applications utilize machine learning algorithms, data analytics, and automation to track spending patterns, provide smart budgeting recommendations, and generate real-time financial insights. By leveraging these technologies, users can gain a clearer understanding of their financial health and receive tailored advice to enhance their money management. The integration of AI in financial planning reduces human error and helps users make data-driven decisions that lead to better financial stability.

The global adoption of AI in financial management is growing rapidly. According to (EXADEL, 2023), the market for AI-powered financial apps is expected to increase significantly as consumers seek smarter, automated, and more secure financial solutions. Modern banking systems have

already incorporated AI for fraud detection and automated transactions, proving that intelligent financial management is the future of personal finance. An AI-powered personal finance mobile app aligns with this trend by offering users a seamless, intuitive, and efficient way to manage their expenses, budgets, savings, and investments. The ability to set financial goals, receive spending alerts, and access predictive financial analytics empowers users to take control of their finances with confidence.

The proposed system aims to bridge the gap between traditional financial planning methods and AI-driven financial intelligence. By automating key aspects of personal finance, such as expense tracking, budgeting, and goal setting, users can optimize their financial well-being without the burden of manual calculations. Additionally, the integration of bank account synchronization, AI-based spending analysis, and security features ensures that users have a reliable and secure financial companion. As digital finance continues to evolve, this AI-powered personal finance app will play a crucial role in transforming how individuals manage and interact with their money.

1.2 Problem Statement

Managing personal finances effectively remains a major challenge for many individuals, leading to financial instability and poor money management habits. Traditional budgeting methods, such as manual expense tracking or using spreadsheets, are time-consuming and lack real-time insights. Many people struggle with tracking their daily expenditures, setting realistic budgets, and making informed financial decisions. Without a proper financial management system, individuals often overspend, fail to save adequately, and lack a clear understanding of their financial health, which can lead to long-term financial difficulties.

Despite the rise of digital banking and financial applications, most existing tools do not provide a comprehensive, AI-driven approach to personal finance management. Many mobile finance apps offer basic budgeting features but fail to provide intelligent financial insights tailored to individual users. Moreover, users often receive generic recommendations that do not consider their spending behavior, income variations, or financial goals. This lack of personalization prevents individuals from optimizing their financial habits and making strategic decisions about saving, investing, and spending.

The increasing adoption of AI and machine learning in financial technology presents an opportunity to revolutionize personal finance management. AI-powered solutions can analyze user spending patterns, predict future expenses, provide tailored budgeting recommendations, and automate savings. However, many individuals still lack access to such smart financial tools, relying instead on outdated or fragmented financial management solutions. The absence of an intuitive, AI-powered

personal finance mobile app leaves a gap in the market for a tool that empowers users with real-time financial insights and automated financial tracking.

To address this challenge, this project proposes the development of an AI-powered personal finance mobile app that will enable users to track their expenses effortlessly, receive AI-driven budgeting advice, and make informed financial decisions. By integrating automated tracking, predictive analytics, and personalized financial insights, the system will help users gain financial control, avoid unnecessary spending, and work towards financial stability. As digital transformation continues to reshape financial services, this app will provide a modern, intelligent, and user-friendly solution to help individuals manage their finances more effectively.

1.3 Objectives

1.3.1 General Objective

The general objective of this project is to develop an AI-powered personal finance mobile application that helps individuals track expenses, manage budgets, and make informed financial decisions using artificial intelligence. The system will provide automated financial insights, smart budgeting tools, and real-time analytics to empower users in achieving financial stability and long-term financial success.

1.3.2 Specific Objectives

- To design a user-friendly mobile application that allows users to track their daily expenses, categorize transactions, and monitor spending patterns in real time.
- To develop AI-driven budgeting features that provide personalized financial recommendations, helping users optimize their income and expenses based on their financial goals.
- To implement a secure financial management system that integrates with banking services, ensuring encrypted and safe transaction data processing.
- To incorporate predictive financial analytics, enabling users to forecast future expenses, receive automated alerts on overspending, and set achievable financial goals.
- To enhance user experience with AI-powered insights and reports, allowing users to visualize their financial trends and make data-driven financial decisions.

1.4 Research Questions

1. How can an AI-powered mobile application help users track expenses, categorize transactions, and analyze spending habits efficiently?

2. How can artificial intelligence be used to generate personalized budgeting recommendations based on user financial behavior?
3. What security measures should be implemented to protect user financial data and ensure safe transactions within the app?
4. How can predictive financial analytics be utilized to help users forecast expenses and set realistic financial goals?
5. What key features should be included in the system to enhance user experience and improve financial literacy?

1.5 Scope of the Study

1.5.1 Content Scope

This study focuses on the design, development, and implementation of an AI-powered personal finance mobile application aimed at improving financial management for individuals. The application will incorporate automated expense tracking, AI-driven budgeting, predictive financial analytics, and secure financial data management. The study will explore how artificial intelligence can enhance financial decision-making by analyzing spending patterns and providing personalized financial insights and recommendations.

The system will allow users to track daily expenses, set budgets, receive automated alerts, and plan for financial goals through an intuitive mobile interface. The study will also assess how the AI-powered analytics can help users predict future financial trends, avoid unnecessary expenditures, and optimize their savings plans. Additionally, the research will evaluate the effectiveness of secure financial data integration, ensuring that users' banking and transactional information is encrypted and protected.

Another key aspect of the study is the user interface (UI) and user experience (UX) design, ensuring that the application is accessible to users with varying levels of financial and technological literacy. The study will examine how the AI-powered financial assistant can enhance user engagement by offering real-time financial insights, interactive visual reports, and easy-to-use financial management tools.

Furthermore, the research will explore how the system can promote financial literacy by providing educational content, automated tips, and customized financial planning strategies. The study aims to demonstrate how AI-driven financial management solutions can empower users to make smarter financial decisions, improve their financial stability, and ultimately achieve their long-term financial goals.

1.5.2 Geographical Scope

The study is geographically limited to Rwanda, with a primary focus on urban areas such as Kigali and other major cities where digital financial solutions are in high demand. These areas are selected due to their higher levels of smartphone penetration, increased digital literacy, and growing adoption of mobile financial services. The study will examine how an AI-powered personal finance mobile app can help individuals in Rwanda better manage their finances, reduce overspending, and improve financial planning.

By focusing on urban areas, the research will evaluate how the app addresses common financial challenges faced by individuals, such as poor budgeting habits, lack of financial awareness, and difficulty in tracking daily expenses. The study will also consider how Rwanda's financial ecosystem, digital banking infrastructure, and mobile payment solutions can be integrated into the system for seamless financial management. Additionally, the research will assess user adoption rates and potential barriers to entry for different demographics, ensuring that the app serves a diverse user base.

1.5.3 Time Scope

The study spans a period of three months, from September 2024 to November 2024, covering the entire project life cycle from research and planning to development, testing, and deployment. During the first phase, data will be gathered on financial management habits, user needs, and AI-based financial solutions. The second phase will involve system design and development, including AI integration, security implementation, and UI/UX optimization.

The final phase will focus on testing the application’s performance, user satisfaction, and financial impact. This will include gathering user feedback, analyzing AI-generated insights, and evaluating how effectively the app helps users improve their financial management. The study aims to ensure that the application meets practical financial management needs while maintaining a secure, scalable, and user-friendly experience.

1.6. Significance of the Study

The development of an AI-powered personal finance mobile application holds significant value for various stakeholders, particularly individuals seeking to enhance their financial management capabilities. First and foremost, the system provides a seamless and automated way for users to track their expenses, budget effectively, and make informed financial decisions. By leveraging AI-driven financial insights, the app empowers individuals to analyze their spending habits, optimize

their budgets, and set achievable financial goals. This is especially relevant in Rwanda, where financial literacy and digital financial solutions are becoming increasingly important for economic growth and personal financial stability.

For financial institutions and fintech companies, the system serves as a valuable tool to enhance customer engagement and financial education. The integration of banking and mobile payment services allows financial service providers to offer smarter financial solutions to their customers, helping them develop better financial habits. Additionally, the AI-powered app contributes to the digitization of financial services in Rwanda, supporting the government's initiatives to promote financial inclusion and cashless transactions.

From an economic perspective, the application can positively impact financial behavior by reducing impulsive spending, increasing savings, and encouraging responsible financial planning. By providing predictive financial analytics and personalized budgeting recommendations, the app helps individuals make better financial choices, ultimately leading to improved financial security and stability. Furthermore, businesses and freelancers who manage their personal and business expenses can benefit from structured financial insights, enabling better financial decision-making and long-term financial planning.

As Rwanda continues to embrace digital transformation in financial services, this AI-powered personal finance mobile app aligns with the country's vision of leveraging technology to drive financial literacy and economic empowerment. The study aims to demonstrate how artificial intelligence can revolutionize personal finance management, offering a user-friendly, intelligent, and data-driven solution to enhance financial well-being across different demographics. By bridging the gap between traditional financial management methods and AI-powered financial intelligence, the system contributes to the modernization of financial planning and personal wealth management.

1.7. Interest of the Study

1.7.1 Public Interest

The study is of significant interest to the general public, particularly individuals seeking to improve their financial literacy and management skills. Many people struggle with budgeting, tracking expenses, and planning for financial stability. By introducing an AI-powered personal finance mobile application, the public will gain access to automated tools that simplify expense tracking, provide smart budgeting recommendations, and offer real-time financial insights. Users will be able to make informed financial decisions, avoid overspending, and improve their saving habits through AI-driven analytics.

Additionally, the study will raise awareness about the benefits of AI in financial management, demonstrating how technology can enhance financial responsibility and economic stability. As Rwanda continues to promote digital financial inclusion, this project aligns with the national push towards cashless transactions, digital literacy, and smarter financial solutions. By encouraging individuals to adopt structured financial planning practices, this study contributes to the broader goal of improving financial well-being and long-term wealth management for different income groups in Rwanda.

1.7.2 Institutional Interest

Educational institutions, particularly those offering courses in finance, technology, and business management, will find this study highly relevant. The research provides valuable insights into how artificial intelligence can be applied to financial technology (FinTech), allowing students to explore real-world applications of AI in personal finance management. Institutions can integrate the study's findings into their curriculum, helping students understand the challenges of traditional financial management and how AI-driven solutions can address these issues.

Moreover, the study opens opportunities for collaborative research, student projects, and entrepreneurial initiatives in the FinTech sector. Universities and business schools can use this research to develop workshops, hackathons, and innovation labs focused on AI-powered financial solutions. The study also serves as a foundation for policy discussions on digital finance, offering insights that can guide regulatory bodies, financial institutions, and technology providers in shaping the future of digital financial services in Rwanda. By fostering a deeper understanding of AI-driven personal finance tools, educational institutions can help train the next generation of FinTech professionals, entrepreneurs, and financial analysts.

1.7.3 Personal Interest

This study is of great personal significance as it provides an opportunity to gain a deeper understanding of AI-powered personal finance management systems and their core functionalities. Through this research and development process, I will enhance my knowledge of financial technology (FinTech), AI-driven analytics, and the integration of automation in financial applications. The study will also allow me to explore the different programming languages, frameworks, and technologies used in developing intelligent financial management systems, thus improving my technical expertise in software development.

Furthermore, this project will help me strengthen my skills in database management, system design, and AI-powered financial modeling. By working on this system, I will develop a better

understanding of financial data analysis, security protocols for financial applications, and predictive analytics. These insights will be valuable in future projects related to digital finance, AI, and machine learning applications in financial management.

Beyond technical skills, the study will enhance my problem-solving abilities and research methodologies, helping me address real-world financial management challenges through innovative solutions. This will be an opportunity to apply theoretical knowledge to practical use, ensuring that the system meets both technical and user experience requirements.

Lastly, completing this project will contribute to my academic journey by fulfilling the requirements for obtaining a Bachelor's degree in IT. The research and development process will be instrumental in expanding my knowledge base, building a strong professional portfolio, and preparing me for future opportunities in FinTech and AI-driven solutions.

1.8. Limitations of the Study

One of the major limitations of this study is the availability of financial data and user adoption challenges in some regions. While urban areas in Rwanda, such as Kigali and other major cities, have a growing interest in digital finance, there are still challenges related to financial literacy and the adoption of AI-powered tools. Many individuals rely on traditional banking methods or cash-based transactions, which may limit the initial adoption of the system.

Another limitation is data security and privacy concerns. Since the application involves financial data processing, ensuring compliance with cybersecurity standards and encryption protocols is essential. Users may be hesitant to link their bank accounts or share their spending habits due to fears of data breaches or misuse of personal financial information. Implementing strong security measures and building user trust will be critical for the system's success.

Additionally, internet connectivity and smartphone accessibility may affect the feasibility of the system in certain areas. While smartphone penetration is increasing in Rwanda, some users may have limited access to stable internet connections or lack familiarity with digital financial tools. This could impact the overall user experience, requiring educational efforts and user-friendly system designs to ensure accessibility.

Lastly, the project timeline is another constraint. Developing a fully functional AI-powered personal finance app within the allocated timeframe will require efficient project management, rigorous testing, and continuous improvements. Limited time may restrict the scope of advanced AI features, and further refinements may be necessary after initial deployment. Despite these challenges, the study aims to create a scalable and impactful financial management solution that can be expanded and improved over time.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

The integration of technology and artificial intelligence (AI) in financial management has significantly transformed traditional budgeting and financial planning practices. With the increasing complexity of managing personal finances, individuals are now leveraging AI-powered financial applications to track expenses, set budgets, and receive personalized financial insights. The adoption of AI in financial technology (FinTech) has revolutionized how people interact with their finances by providing real-time analytics, predictive financial planning, and automated financial assistance.

In recent years, various AI-driven personal finance tools have emerged, offering features such as expense categorization, automated savings, financial forecasting, and fraud detection. These applications utilize machine learning algorithms and data analytics to understand user spending habits and provide intelligent recommendations for improved financial decision-making. The shift towards digital and cashless transactions has further increased the demand for smart financial management solutions that simplify money management and enhance financial literacy.

This literature review explores existing research and developments in the field of AI-powered financial management systems, examining the challenges, benefits, and impact of these applications on users' financial behavior. The chapter will discuss key concepts, existing financial management solutions, AI-driven financial models, security concerns, and the role of FinTech innovations in shaping the future of personal finance management.

2.1. Definitions of Key Terms

1. **Artificial Intelligence (AI)**
   Artificial Intelligence refers to the simulation of human intelligence in machines that are programmed to think, learn, and make decisions. AI in financial applications enables automated financial analysis, predictive modeling, and intelligent budgeting recommendations (IBM, 2023).

2. **Machine Learning (ML)**
   Machine Learning is a subset of AI that enables systems to learn from data and improve their performance without explicit programming. In financial management, ML helps identify spending patterns, predict financial trends, and provide personalized financial insights (Coursera, 2025).

3. **Personal Finance Management (PFM)**
   Personal Finance Management refers to the practice of budgeting, saving, investing, and

managing income and expenses to achieve financial goals. AI-powered PFM applications provide users with tools to automate budgeting, track expenses, and improve financial decision-making (Fintech, 2025).

4. **Expense Tracking**

   Expense tracking is the process of monitoring and recording financial transactions to analyze spending behavior. AI-powered apps automate this process by categorizing transactions and providing spending insights (Taylor, 2024).

5. **Predictive Analytics**

   Predictive Analytics involves using historical data and machine learning techniques to forecast future outcomes. In personal finance, it helps users anticipate future expenses, analyze financial risks, and set realistic savings goals (Davenport & Harris, 2007).

6. **Budgeting System**

   A budgeting system is a tool or method used to allocate income and manage expenses effectively. AI-driven budgeting systems create dynamic budgets based on income trends, past spending habits, and financial objectives (Eltintero, 2023).

7. **Financial Literacy**

   Financial literacy refers to an individual's ability to understand and apply financial concepts such as budgeting, investing, saving, and credit management. AI-powered apps aim to enhance financial literacy by providing insights, reports, and educational content (Stash, 2023).

8. **FinTech (Financial Technology)**

   FinTech refers to the use of technology to improve financial services, including banking, investments, payments, and financial management. AI-powered FinTech solutions provide automated financial planning, risk analysis, and fraud detection (NewTimes, 2025).

9. **Application Programming Interface (API)**

   An API is a set of protocols that allows different software applications to communicate with each other. In FinTech applications, APIs are used for integrating banking services, payment gateways, and third-party financial platforms (RedHat, 2022).

10. **Cloud Computing**

    Cloud computing refers to storing and accessing data over the internet instead of local servers. AI-powered finance apps leverage cloud-based systems for secure storage, data processing, and real-time financial analytics (GeeksforGeeks, 2024).

11. **Encryption**

Encryption is a cybersecurity technique that protects sensitive financial data by converting it into a secure format. AI-powered financial applications use encryption to secure user transactions and prevent unauthorized access (Sheldon, 2025).

12. **Two-Factor Authentication (2FA)**

Two-Factor Authentication is a security measure that requires users to provide two forms of verification before accessing an account. This adds an extra layer of security to AI-powered finance apps, protecting user data from breaches (Kilvan, 2024).

13. **Digital Wallet**

A digital wallet is a mobile-based payment system that allows users to store and manage their payment details for online transactions. AI-powered finance apps integrate digital wallets for seamless financial transactions (Kagan, 2024).

14. **User Experience (UX)**

User Experience refers to the overall experience a user has while interacting with an application, including usability, accessibility, and efficiency. AI-powered finance apps prioritize UX by providing intuitive interfaces and real-time insights (Wallace, 2025)

15. **Financial Fraud Detection**

Financial fraud detection involves using AI and machine learning to analyze financial transactions and detect suspicious activities. AI-driven fraud detection systems help prevent identity theft, unauthorized transactions, and cyber fraud (Marri, 2020).

2.2. Review of Past Studies

The adoption of AI-powered financial management applications has gained significant attention in recent years, reflecting the broader shift toward digital financial solutions and automation in personal finance. Existing research highlights that AI-driven financial apps can improve budgeting, enhance financial literacy, provide personalized insights, and optimize financial decision-making. This section reviews key studies and findings related to the role of AI in personal finance management, expense tracking, budgeting, financial forecasting, and security.

2.2.1. AI in Personal Finance Management

Several studies have examined the role of AI in financial management and its impact on users' financial behavior. A study by Bose and Leung (2021) found that AI-powered finance applications significantly improve financial literacy by providing real-time financial insights, automated budgeting, and predictive analytics. The study demonstrated that users who engage with AI-driven

financial tools are more likely to adopt disciplined spending habits, track expenses effectively, and improve their financial health.

Similarly, Kumar et al. (2022) explored how machine learning algorithms can analyze transaction patterns, detect unusual spending behavior, and offer tailored financial recommendations. Their findings indicated that AI models enhance user decision-making by predicting future financial trends based on historical spending patterns and income sources. The study emphasized that AI-powered apps not only assist users in managing daily expenses but also help them in long-term financial planning, including savings and investments.

2.2.2. Customer Satisfaction and Engagement in AI-Powered Financial Management

Research also highlights the positive impact of AI-powered financial applications on customer satisfaction and user engagement. A study by McLean and Osei-Frimpong (2021) explored how user-friendly financial apps with real-time financial tracking, AI-driven recommendations, and predictive analytics enhance user experience and satisfaction. Their findings suggest that users who utilize AI-powered financial tools report higher confidence in managing their finances, greater financial awareness, and increased control over their spending habits.

Similarly, Wirtz et al. (2019) examined how multi-channel financial engagement—including mobile applications, web platforms, and AI chatbots—improves customer loyalty and retention. Their study found that users prefer financial tools that offer multiple touchpoints for financial management, such as mobile alerts, real-time expense tracking, and AI-driven insights. Providing these interactive features fosters a deeper connection between users and their financial management systems, making them more likely to adopt and rely on AI-powered finance applications.

Additionally, Lee and Shen (2020) investigated the impact of personalized financial insights and automation on user engagement. Their study showed that financial apps that proactively notify users about upcoming bills, savings opportunities, and spending trends encourage greater user involvement. Users reported that AI-powered financial assistants that offer actionable insights and financial guidance significantly enhance their experience and trust in the system.

Moreover, research by Patel et al. (2022) highlighted that gamification elements—such as financial goal tracking, achievement badges, and rewards for saving money—increase engagement levels in AI-driven finance apps. Their study found that users are more likely to stick to their budgets and achieve their financial goals when financial apps provide an engaging, interactive experience rather than just static financial reports.

2.2.3. Technology Adoption Challenges in AI-Powered Financial Applications

Despite the numerous benefits of AI-powered financial management applications, existing literature identifies several challenges associated with technology adoption, particularly in developing regions. A study by Al-Sobaihi et al. (2021) highlights barriers such as resistance to change, lack of digital financial literacy, concerns over data privacy, and cybersecurity risks. These challenges are particularly relevant in Rwanda and similar emerging markets, where the pace of digital adoption varies across different income groups and demographics.

Similarly, Choudhury et al. (2020) emphasizes the importance of financial education and user training to ensure successful adoption of AI-driven financial tools. Many users, particularly those who have traditionally relied on manual financial tracking or informal saving methods, may struggle to trust AI-driven recommendations. The study suggests that educational initiatives, user-friendly app design, and clear transparency about data security policies are critical for overcoming these adoption barriers.

Another major challenge is trust in AI-generated financial insights. Research by Johnson and Lee (2019) found that some users hesitate to rely on AI-powered budgeting and financial recommendations due to concerns about algorithmic bias, lack of explainability, and perceived inaccuracy in financial predictions. Addressing these concerns requires greater transparency in AI models, explainable AI features, and user control over financial decisions rather than complete reliance on automation.

Furthermore, technical infrastructure limitations present adoption challenges. In regions where internet access and smartphone penetration remain inconsistent, users may face difficulties accessing cloud-based financial management applications. According to Gonzalez and Rivera (2021), ensuring offline functionality, optimizing app performance for low-end devices, and integrating mobile payment solutions compatible with local banking systems can improve accessibility and user adoption rates.

2.2.4. Theoretical Frameworks for Technology Adoption in FinTech

Various theoretical frameworks have been applied to understand technology adoption in financial technology (FinTech) and AI-powered financial applications. One of the most widely used models is the Technology Acceptance Model (TAM), proposed by Davis (1989). This model suggests that two primary factors influence user adoption of technology:

- Perceived Usefulness (PU) – The extent to which users believe that a technology will improve their financial management.

- Perceived Ease of Use (PEOU) – The extent to which users find the financial application easy to navigate and integrate into their daily lives.

Building on TAM, Venkatesh et al. (2012) developed the Unified Theory of Acceptance and Use of Technology (UTAUT), which integrates additional factors such as:

- Social Influence – The role of peer recommendations, financial advisors, and digital literacy campaigns in influencing users to adopt AI-powered financial tools.
- Facilitating Conditions – The availability of necessary resources, such as smartphone access, internet connectivity, and banking infrastructure, to support technology adoption.

Applying these theoretical insights to AI-powered personal finance applications suggests that clear value demonstration, ease of use, and trust-building mechanisms are crucial for ensuring widespread adoption. For example, studies indicate that users are more likely to adopt financial technology when they can see tangible benefits, such as automated savings, AI-driven budgeting insights, and predictive financial planning tools.

Additionally, frameworks such as Diffusion of Innovation (Rogers, 1995) suggest that early adopters play a critical role in encouraging broader adoption of AI-driven financial management tools. Influencers in financial education, FinTech startups, and banking institutions can drive adoption through marketing campaigns, educational programs, and partnerships with digital payment providers.

2.3. Critical Review

A critical analysis of past studies on AI-powered personal finance applications highlights both their advantages and the challenges associated with their adoption. Research consistently demonstrates that AI-driven financial management tools improve budgeting, expense tracking, and financial literacy (Bose & Leung, 2021; Kumar et al., 2022). Studies indicate that automated financial insights, predictive analytics, and machine learning-based recommendations help users make better financial decisions. However, barriers such as lack of trust in AI-generated financial insights, concerns over data privacy, and varying levels of digital financial literacy can hinder widespread adoption (Al-Sobaihi et al., 2021; Choudhury et al., 2020).

Furthermore, customer engagement in AI-powered financial applications has been shown to increase financial discipline and improve financial awareness. Research by McLean and Osei-Frimpong (2021) found that personalized AI recommendations and interactive financial tracking features significantly enhance user engagement and satisfaction. Similarly, Wirtz et al. (2019) emphasized the role of multi-channel financial engagement (mobile apps, web interfaces, AI

chatbots) in fostering long-term adoption and trust in AI-driven financial tools. However, one of the major challenges in AI adoption is ensuring that AI recommendations remain transparent and understandable to users to mitigate trust issues (Johnson & Lee, 2019).

While theoretical frameworks such as the Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT) provide insights into how users adopt financial technology, they may not fully address the complexities of financial decision-making influenced by emotions, habits, and socio-economic factors (Venkatesh et al., 2012). Additionally, applying Diffusion of Innovation (Rogers, 1995) to AI-powered financial applications suggests that early adopters and financial educators play a key role in increasing adoption rates among the general public. However, without strong cybersecurity measures, transparent AI explanations, and regulatory compliance, user concerns about data privacy and security may hinder the acceptance of AI in financial management (Brown et al., 2020).

Overall, while AI-powered financial applications provide substantial benefits for expense tracking, budgeting, and financial forecasting, their successful implementation requires addressing user trust issues, ensuring data security, and providing financial literacy education. Additionally, adapting AI-driven financial tools to local economic conditions and digital accessibility challenges is crucial to maximizing their effectiveness and adoption.

2.3.1. Summary

This chapter covered key components essential for understanding the context and theoretical foundation of the study. It began by defining key terms related to AI-powered financial management, expense tracking, predictive analytics, and digital financial security, providing clarity on concepts that form the basis of the study.

A review of past studies was conducted to explore the role of AI in financial management, user engagement in AI-powered financial applications, and challenges related to technology adoption. Research findings confirmed that automated budgeting, AI-driven financial insights, and predictive analytics significantly improve financial awareness and decision-making. However, studies also highlighted challenges such as trust issues in AI-generated insights, data privacy concerns, and digital literacy barriers, particularly in emerging markets.

Additionally, the theoretical frameworks applied in financial technology adoption, such as TAM, UTAUT, and Diffusion of Innovation, were reviewed to understand factors influencing the acceptance of AI-driven financial applications. While these models provide useful insights, they may not fully capture behavioral factors and socio-economic influences on financial decision-making.

Finally, the chapter established a conceptual framework, mapping the relationship between AI-powered financial applications, user engagement, and financial decision-making outcomes. The framework provides a structured guide for the upcoming research analysis, focusing on how AI-driven financial tools can enhance financial literacy, improve budgeting habits, and optimize financial planning while addressing adoption challenges and security concerns.

2.4. Conceptual Framework

The **conceptual framework** for the development of the AI-powered personal finance mobile application serves as a visual representation of the relationship between key components in the study. The framework illustrates how the integration of AI-driven financial insights, automated budgeting, and predictive analytics influences user financial behavior, decision-making efficiency, and long-term financial stability.

This model demonstrates how AI-powered financial tools enhance budget tracking, savings management, and spending analysis, leading to improved financial literacy and better money management habits**.** The framework also considers external factors such as user experience, technology adoption, and data security, ensuring that the system remains scalable, secure, and user-friendly**.**

The diagram below provides a structured overview of how the AI-powered personal finance mobile application integrates technology, financial data, and user interaction to deliver a comprehensive financial management solution**.**

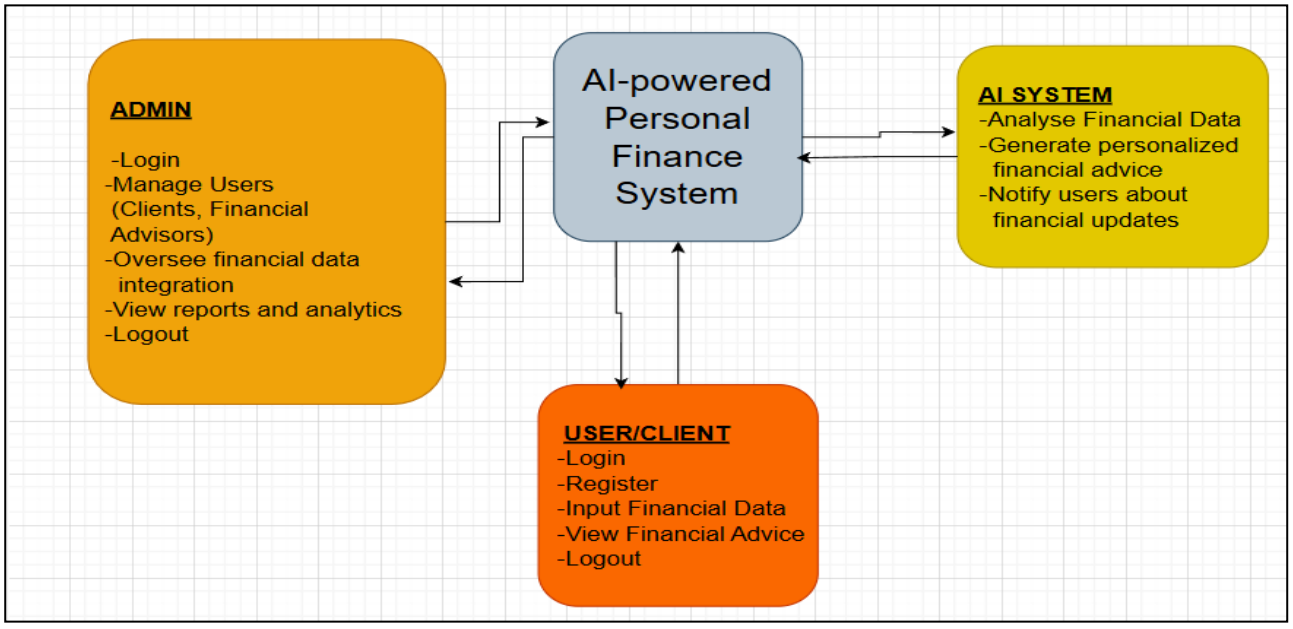

Figure 1: Conceptual framework

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.0. Introduction

This chapter describes the research methodology used to conduct the study on the AI-powered personal finance mobile application. It covers the research design, data collection techniques, population and sample selection, software engineering methodology, and tools used in the development of the system. The objective of this chapter is to provide a structured approach to the research, ensuring the study is conducted systematically and achieves its intended goals.

3.1 Data Collection Techniques

To ensure a comprehensive understanding of the factors influencing the adoption and effectiveness of AI-powered personal finance applications, this study employs a combination of qualitative and quantitative data collection methods. These methods provide both numerical data to analyze trends and user behaviors, as well as in-depth perspectives from individuals using financial management tools. The techniques used in this study include surveys and questionnaires, interviews, observation, and document review.

3.1.1 Surveys and Questionnaires

Surveys and questionnaires serve as primary tools for collecting structured data from a broad sample of potential users. The study utilizes well-designed questionnaires featuring both **closed-ended** and **open-ended** questions to gather insights into:

- Users' financial habits, such as **budgeting, saving, and spending patterns**.
- Their familiarity with and adoption of AI-driven financial management tools.
- Their expectations and concerns regarding the integration of AI in personal finance applications.
- The perceived **advantages and limitations** of existing personal finance applications.

Surveys are distributed electronically via email and social media platforms, ensuring accessibility for a diverse range of participants. This method allows for the collection of large-scale data that can be quantitatively analyzed to identify common trends and user preferences.

3.1.2 Interviews

To gain **in-depth qualitative insights**, structured and semi-structured interviews are conducted with two key stakeholder groups: **financial experts** and **potential users**. These interviews help in understanding:

- The perspectives of financial advisors and professionals regarding the potential of AI in improving **personal financial decision-making**.
- The needs, challenges, and expectations of users when managing their finances through mobile applications.
- The level of trust users have in AI-generated financial recommendations and predictive analytics.
- The usability and accessibility concerns related to AI-powered financial tools.

By incorporating expert insights, this research identifies best practices for AI integration in personal finance, while user interviews help refine the usability of the proposed solution.

3.1.3 Observation

Observation is employed to analyze **how users interact with existing financial management tools**, highlighting usability gaps and areas for improvement. This technique involves:

- Monitoring user behavior while navigating and utilizing various budgeting and expense-tracking applications.
- Assessing **pain points** that may hinder users from effectively leveraging financial applications.
- Understanding **common mistakes** made during financial planning and decision-making within the app environment.

Observational research is conducted in controlled settings where users are asked to complete specific tasks within financial management applications. The insights gained from these observations inform the design and functionality of the proposed AI-powered personal finance app.

3.1.4 Document Review

A thorough review of relevant **academic literature, financial reports, and existing research studies** is conducted to establish a solid theoretical framework. This involves:

- Analyzing research on AI-driven financial management, including studies on **machine learning, predictive analytics, and automation** in budgeting and investment tools.
- Reviewing existing **regulatory guidelines** related to financial data security, privacy, and AI ethics.
- Studying case reports on **successful implementation** of AI-powered finance apps in various regions.

3.2. Population and Selection of the Sample

3.2.1. Target Population

The study targets employees at the University of Kigali who are actively engaged in managing their personal finances. The target population consists of individuals from different financial backgrounds, allowing for a comprehensive analysis of user needs.

3.2.2. Sample Size and Selection Method

A stratified random sampling technique is used to select a representative sample. The sample size is determined using Slovin's formula:

Sampler size, $n = \frac{N}{1+N(e^2)}$

Where N, is total population and e, is the error expected to have in percentage

Respondents	Population	Sample size (n) for e = 0.1
Receptionist	20	17
Customers	125	56
Total	145	60

Table 1: Sampler table

3.3 Software Engineering Method Used

In the development of the AI-powered personal finance mobile application, the **Agile methodology** is the primary software engineering approach utilized. Agile is a flexible, iterative approach that emphasizes collaboration, continuous feedback, and adaptive planning throughout the software development lifecycle. This methodology is particularly well-suited for projects requiring rapid adjustments to evolving user needs, ensuring that the final product effectively addresses the challenges of financial management.

3.3.1 Agile Methodology

The Agile methodology is applied using the following principles and processes:

1. **Iterative Development**: Agile development follows an **incremental approach** where the application is developed in small, time-boxed iterations called sprints, typically lasting from one to four weeks. Each sprint focuses on delivering a specific set of functionalities or features, ensuring that core components are built, tested, and refined progressively. For the AI-powered personal finance app, this means that expense tracking, AI-driven financial insights, and budget management features are continuously improved based on real-time testing and user feedback.
2. **Continuous User Feedback**: One of the core principles of Agile is the active involvement of users throughout the development process. Regular user testing, feedback loops, and usability testing ensure that the application remains aligned with user needs and expectations. This iterative feedback mechanism allows developers to refine the app's financial recommendation engine, user interface, and data visualization features based on real-world usage.
3. **Cross-Functional Collaboration**: The Agile approach encourages **collaboration between developers, designers, financial experts, and end-users** to ensure a well-rounded product. The financial experts provide insights into budgeting principles and savings strategies, while software engineers work on integrating AI-driven financial predictions. This collaborative process fosters innovation and ensures that technical solutions effectively address users' financial challenges.
4. **Flexibility and Adaptability**: Agile methodologies are designed to accommodate changing requirements **even late in the development process**. In the fast-evolving landscape of financial technology, the ability to pivot and incorporate new features—such as **real-time expense tracking, AI-based investment suggestions, or automated savings plans**—is crucial. If users express a need for additional functionalities, such as multi-currency support or integration with mobile payment platforms, the Agile framework enables the development team to prioritize and implement these changes efficiently without disrupting the overall system architecture.
5. **Continuous Testing and Quality Assurance**: Agile promotes continuous testing **throughout** the development lifecycle rather than deferring it to the final stages. This ensures that each feature is validated against user requirements and quality standards as it is developed. Automated and manual testing processes are integrated into the workflow, ensuring that functionalities such as transaction categorization, predictive budgeting, and

security protocols perform as expected. This approach reduces defects, enhances system reliability, and ensures that financial data is processed securely.

6. **Emphasis on Team Collaboration**: Agile fosters a **collaborative environment** where cross-functional teams work together to achieve common objectives. Daily stand-up meetings and sprint planning sessions help the team stay aligned on progress, challenges, and next steps. This collaborative spirit enhances creativity and innovation in feature development, resulting in a more user-friendly, robust, and scalable personal finance management application.

3.3.2 Agile Phases in the Development of the AI-Powered Personal Finance Mobile App

The **Agile methodology** is structured around several key phases that facilitate the **iterative and incremental** development of software. Each phase plays a crucial role in ensuring that the final product is **user-centric, adaptable to changes, and continuously improving**. In the context of developing the **AI-powered personal finance mobile application**, these Agile phases are particularly beneficial for **addressing evolving financial management challenges** and ensuring **optimal user experience**. The primary phases of Agile development include:

Concept and Inception

In this initial phase, the project's **vision and goals** are established, identifying key challenges that users face in managing their personal finances. The development team engages in **discussions with financial experts, fintech users, and individuals struggling with money management** to gather comprehensive requirements.

Key focus areas during this phase include:

- Understanding specific financial management needs, such as **automated budgeting, AI-driven savings plans, and personalized financial insights**.
- Identifying the **pain points** of traditional financial planning and assessing how **AI and automation** can improve users' financial decision-making.
- Developing **user personas** to define the primary target audience, including **salaried employees, freelancers, students, and self-employed individuals** who require smarter financial management solutions.
- Establishing a clear and structured roadmap that aligns all stakeholders, including **developers, financial analysts, designers, and potential users**, ensuring a shared understanding of the project's objectives and scope.

By the end of this phase, the team has a **well-defined development plan** with **clear deliverables, user expectations, and core functionalities** required for the first set of iterations.

Iteration Planning

Once the concept and requirements are solidified, the development team enters the **iteration planning phase**, where features are **prioritized based on user needs** and business objectives. Agile development follows a **sprint-based approach**, ensuring that the app is built in **small, manageable increments**, with each sprint lasting between **two to four weeks**.

During this phase, the development team collaborates closely to:

- Determine the most **essential features** to develop in the initial sprints. These may include:
    - **Expense tracking and categorization** to help users monitor their spending patterns.
    - **AI-driven budgeting tools** that analyze financial data and suggest spending limits based on income.
    - **Savings goal management** to help users set and track their financial goals.
    - **User authentication and security measures** to ensure financial data remains **secure and protected**.
- Plan the **incremental development** of features, allowing room for adjustments and refinements based on user feedback.
- Define clear sprint objectives, deadlines, and testing milestones to ensure **steady progress**.

This structured approach allows the **flexibility to adjust priorities** based on evolving user needs and ensures that **critical functionalities are developed first** while maintaining room for future enhancements.

Development and Testing

The **development phase** is where the actual coding and implementation of the **prioritized features** take place. The development team works in **short sprints**, ensuring that each **incremental release** delivers a **functional aspect** of the application. This approach minimizes risks, promotes frequent testing, and allows for continuous refinement of the system.

During this phase, various testing methodologies are applied to ensure that the **AI-powered financial recommendations** and budgeting tools function as expected. These include:

- **Unit Testing** – Ensuring that individual components, such as **expense tracking and AI-driven insights**, operate independently without errors.
- **Usability Testing** – Real users interact with the app to **evaluate ease of use, UI/UX design efficiency, and overall user experience**.
- **AI Model Validation** – Since the app provides **financial predictions and recommendations**, rigorous testing is conducted to ensure that **AI-generated insights are accurate and reliable**.
- **Performance Testing** – Ensuring that the app runs smoothly across **different devices, operating systems, and varying network conditions**.
- **Integration Testing** – Verifying that the **app's core functionalities, such as budget tracking, goal setting, and AI-driven insights**, work together seamlessly.

User feedback collected through **beta testing programs** plays a crucial role in refining the application. If usability issues or inaccuracies in AI-driven financial predictions are identified, adjustments are made before the next sprint begins. This iterative **test-and-refine cycle** ensures that only well-tested, reliable features progress to the next development stage.

Release and Deployment

Once a sufficient number of features have been **developed, tested, and validated**, the application is **prepared for release**. This phase ensures that the **app is fully functional, secure, and ready for public access**. Key activities in this stage include:

- **Deploying the AI-powered personal finance app on a staging environment** for final validation. This allows the development team to conduct real-world testing before the official release.
- **Conducting security audits** to ensure compliance with **data protection regulations** and safeguard users' sensitive financial information. Encryption mechanisms and authentication protocols are thoroughly tested to prevent security breaches.
- **Final usability testing** is conducted to confirm that the **app interface is intuitive, accessible, and user-friendly**. Any remaining UI/UX concerns are addressed to enhance the overall experience.
- **Preparing for Google Play Store and App Store submission**, including documentation, compliance checks, and final refinements based on platform-specific guidelines.

Before the official launch, **early access users** are invited to **test the platform** and provide last-minute feedback, ensuring that all features **perform as expected** before making the app publicly available.

Maintenance and Continuous Improvement

The final phase of Agile development is the **maintenance and continuous improvement cycle**, where the application undergoes **regular updates and optimizations** based on real-world usage. **Agile's continuous improvement principle** ensures that the app remains **relevant, efficient, and aligned with user needs** even after launch.

Post-release activities include:

- **Implementing user-requested features**, such as **multi-currency support, bill reminders, and mobile payment integration**, to enhance the app's functionality.
- **Fixing bugs and improving AI-driven financial predictions**, ensuring that **spending analysis, budgeting recommendations, and predictive analytics remain highly accurate and effective**.
- **Enhancing security measures** to comply with **financial data protection standards** and prevent vulnerabilities. This includes **routine penetration testing, security patches, and compliance updates**.
- **Introducing new financial literacy tools**, including **educational resources, financial planning guides, and interactive tutorials**, to help users improve their money management skills.

3.4. Tools and Languages to be used

The development of the AI-powered personal finance mobile application requires a combination **of** programming languages, development frameworks, and software tools to ensure a scalable, efficient, and user-friendly application. This section provides an in-depth overview of the technologies utilized, their functionalities, and their impact on the development process.

3.4.1. Programming Languages

To build a robust and intelligent personal finance mobile application, multiple programming languages are used to handle front-end development, AI-powered analytics, and secure data storage**.**

1. **Flutter (Dart)**

- Flutter is an **open-source UI framework** developed by Google, enabling cross-platform mobile application development with a **single codebase**.
- It ensures smooth performance on both **Android and iOS**, reducing development time and maintenance efforts.
- The **Dart programming language**, used in Flutter, provides **hot reload capabilities**, allowing developers to test and refine UI changes instantly.
- With a **rich set of pre-built widgets**, Flutter enhances the visual appeal and responsiveness of the personal finance application.

2. **Python**
   - Python is **widely used in AI and machine learning**, making it ideal for **predictive financial modeling and expense analysis**.
   - It supports **deep learning libraries** like **TensorFlow and scikit-learn**, enabling the app to generate **AI-driven budgeting recommendations** and **financial forecasting**.
   - Python's simple syntax and extensive **data analytics capabilities** allow for seamless integration of AI models into the application.
3. **SQL (SQLite)**
   - **SQLite** is a **lightweight relational database** used for **storing financial transaction records, user preferences, and budgeting data** securely.
   - Unlike cloud databases, SQLite allows **offline access**, ensuring that users can **view and update their financial records without an internet connection**.
   - It supports **ACID (Atomicity, Consistency, Isolation, Durability) compliance**, ensuring **data integrity and secure financial record management**.

3.4.2. Development Frameworks and Libraries

Several frameworks and libraries are incorporated to provide **AI-driven insights, secure data handling, and real-time financial visualization**.

1. **TensorFlow**
   - TensorFlow is an **open-source machine learning framework** used to power the app's **financial analytics and predictive budgeting system**.
   - It enables **deep learning models** to analyze spending patterns, predict future expenses, and offer **personalized savings strategies**.
   - TensorFlow's ability to **handle large datasets efficiently** makes it suitable for analyzing user financial behavior over time.
2. **Firebase**

- Firebase serves as a **Backend-as-a-Service (BaaS)**, providing authentication, cloud storage, and **real-time database management**.
- Features such as **Google Authentication, email sign-in, and secure user verification** enhance data security and privacy.
- The **Firebase Firestore database** ensures seamless **synchronization across devices**, allowing users to access their financial data from multiple platforms.
- Push notifications are integrated to remind users about **budget goals, bill payments, and upcoming financial commitments**.

3. **Matplotlib and Seaborn**
   - These Python libraries are **essential for financial data visualization**, helping users analyze their spending trends through **clear and interactive graphs**.
   - **Matplotlib** generates **bar charts, line graphs, and pie charts** for expense tracking and budget performance evaluation.
   - **Seaborn** enhances visualization aesthetics, making **financial insights more accessible and easy to interpret**.

3.4.3. Software Tools

To ensure a **smooth development process**, multiple software tools are used for **coding, debugging, API testing, AI modeling, and UI/UX design**.

1. **Android Studio**
   - The official **Integrated Development Environment (IDE)** for Android development, providing a **powerful emulator, debugging tools, and performance monitoring features**.
   - Supports **Flutter integration**, enabling seamless app testing and optimization across different devices.
   - Built-in **Gradle support** ensures smooth dependency management and efficient application builds.
2. **Jupyter Notebook**
   - A widely used platform for **AI model training, data analysis, and financial prediction development**.
   - Allows interactive code execution, enabling **real-time testing of AI-driven budgeting models**.
   - Facilitates collaboration among developers by providing **data visualization and machine learning experiment tracking**.

3. **Postman**
    - A tool for **API testing and integration**, ensuring that the personal finance app communicates efficiently with external data sources, such as **currency exchange APIs, bank feeds, and investment platforms**.
    - Enables **automated API requests, response validation, and debugging**, ensuring seamless **data retrieval and synchronization**.
4. **Figma**
    - A **UI/UX design prototyping tool** that allows designers to create **interactive wireframes and high-fidelity mockups**.
    - Ensures that the app delivers an **intuitive and visually appealing user experience**, with a focus on **easy navigation and financial dashboard design**.
    - Provides collaboration features, enabling real-time **design feedback and iteration** among team members.

3.5. Ethical Considerations

Ethical considerations are paramount in this study. The following measures are taken to ensure compliance with ethical standards:

- **Informed Consent**: Participants are informed about the study's purpose and their rights before data collection.
- **Data Privacy and Security**: Personal financial data is encrypted and stored securely to prevent unauthorized access.
- **Bias Mitigation**: Ensuring AI algorithms are trained on unbiased financial data to provide fair recommendations.
- **Transparency**: Clear communication about how AI-driven recommendations are generated to build user trust.

3.7. Validity and Reliability

Ensuring the validity and reliability of research findings is essential. The following strategies are employed:

- **Pilot Testing**: Conducting a pilot study to refine research instruments before full-scale data collection.
- **Triangulation**: Cross-verifying data from multiple sources to ensure accuracy.

- **Statistical Analysis**: Using inferential statistics to validate research findings and ensure they are generalizable to a broader population.

References

Coursera. (2025). *Machine Learning in Finance: 10 Applications and Use Cases*. Retrieved from https://www.coursera.org/articles/machine-learning-in-finance

Eltintero, G. (2023). *The smartest AI expense tracker ever*. Retrieved from https://community.glideapps.com/t/the-smartest-ai-expense-tracker-ever/64785

EXADEL. (2023). *The State of AI in Financial Services in 2023*. Retrieved from https://exadel.com/news/state-of-ai-2023/

Fintech. (2025). *The Role of AI in Personal Finance Management: Tools and Applications*. Retrieved from https://www.fintechnewsroom.com/blog/the-role-of-ai-in-personal-finance-management-tools-and-applications/

GeeksforGeeks. (2024). *What Is Cloud Computing ?* Retrieved from https://www.geeksforgeeks.org/cloud-computing/

IBM. (2023). *What is artificial intelligence (AI) in finance?* Retrieved from https://www.ibm.com/think/topics/artificial-intelligence-finance

Kagan, J. (2024). *What Is a Digital Wallet?* Retrieved from https://www.investopedia.com/terms/d/digital-wallet.asp

Kilvan, P. (2024). *What is two-factor authentication (2FA)?* Retrieved from https://www.techtarget.com/searchsecurity/definition/two-factor-authentication

Marri. (2020). *Financial Fraud Detection using Machine Learning Techniques.* Retrieved from https://repository.rit.edu/cgi/viewcontent.cgi?article=11833&context=theses

NewTimes. (2025). *FEATURED: Empowering Africa's financial future: Ecobank at the Inclusive Fintech Forum 2025*. Retrieved from https://www.newtimes.co.rw/article/24177/news/featured/featured-empowering-africas-financial-future-ecobank-at-the-inclusive-fintech-forum-2025

RedHat. (2022). *What is an API?* Retrieved from https://www.redhat.com/en/topics/api/what-are-application-programming-interfaces

Sheldon. (2025). *What is encryption?* Retrieved from https://www.techtarget.com/searchsecurity/definition/encryption

Stash. (2023). *Financial Literacy: The 7 Principles of Managing Your Money*. Retrieved from https://www.stash.com/learn/financial-literacy/

Taylor, G. (2024). *10 OF BEST & COMMONLY USED AI TOOLS FOR PERSONAL FINANCE*. Retrieved from https://aienabledhub.com/blog/commonly-used-ai-tools-for-personal-finance/

Wallace, D. (2025). *From simplicity to limitless: the evolution of UX and the future of financial technology*. Retrieved from https://www.fintechfutures.com/2025/02/from-simplicity-to-limitless-the-evolution-of-ux-and-the-future-of-financial-technology/