

**THE DEVELOPMENT OF A WEB-BASED MONEY EXCHANGE  
SYSTEM**

**BY**

**ENECHUKWU RANSOME CHUKWUBUIKEM**

**(RUN/CMP/20/9564)**

**A PROJECT SUBMITTED TO  
THE DEPARTMENT OF COMPUTER SCIENCE,  
FACULTY OF NATURAL SCIENCES,  
REDEEMER'S UNIVERSITY, EDE, OSUN STATE, NIGERIA**

**IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE  
AWARD OF THE DEGREE OF BACHELOR OF SCIENCE (BSc.) IN  
COMPUTER SCIENCE**

**AUGUST, 2023**

## **DECLARATION**

I Enechukwu Ransome Chukwubuikem (RUN/CMP/20/9564), hereby declare that this project was carried out by me in the Department of Computer Science, Faculty of Natural Sciences, Redeemer's University, Ede, Osun State, Nigeria. To the best of my knowledge, this work has not been presented elsewhere for the award of a degree or any other purpose.

Enechukwu, Ransome Chukwubuikem

.....  
*Student*

.....  
*Signature & Date*

## CERTIFICATION

We, the undersigned hereby certify that this project was carried out by Enechukwu, Ransome Chukwubuikem RUN/CMP/20/9564 in the Department of Computer Science, Faculty of Natural Sciences, Redeemer's University, Ede, Osun State, Nigeria. To the best of our knowledge, this work has not been presented elsewhere for the award of a degree or any other purpose.

Mrs T. O. Ojewunmi

.....

.....

*Supervisor*

*Signature & Date*

Prof. A. O. Ogunde

.....

.....

*Head of Department*

*Signature & Date*

Prof. C. O. Akanbi

.....

.....

*External Examiner*

*Signature & Date*

## **DEDICATION**

First and foremost, I would be dedicating this project to God Almighty, thanking him for his guidance and grace. To my parents, of blessed memories, who instilled in me the values of hard work, perseverance, and faith, I am forever grateful. Though they are no longer with me, their love and support continue to inspire me. I hope to honor their legacy through my work.

## **ACKNOWLEDGMENTS**

I would like to express my genuine and deep gratitude to my sisters for their unwavering love and support, which has played a vital role in the success of my program at this esteemed institution. I extend my heartfelt appreciation to my supervisor, Mrs. T. O. Ojewunmi, for dedicating her time, effort, and guidance throughout this project, ensuring that its objectives were met.

I also want to acknowledge the collective efforts of both the academic and non-academic staff of the Department of Computer Science. Starting from the Academic Staff, Dr(Mrs) A. A. Kayode, Dr(Mrs) O. O. Olaniyan, Dr(Mrs) B. O. Oguntunde, Prof. A. O. Ogunde, Dr. M. O. Odum, Prof. S. A. Arekete, Dr. T. A. Olowookere, Mrs Adio, Mr Fagba, Mr Oyetade, Mr Adekunle, Mr Olorunfemi, Mr Victor, Mrs Onifade, Mr Agbolade, Dr. Abolarinwa. Their contributions have immensely enriched my experience during my stay, and I am truly grateful for their invaluable support. To each and every one of them, I extend my sincerest wishes for abundant blessings.

My sincerest thanks goes out to my friend, Daniel Enamudu a.k.a Danikoko, thank you so much brother. For all the late night google meets, and for all the spare time you sacrificed just to help out, i say a very big thank you.

To Adaimoabasi, thank you so much for your input, even with a very tight deadline, you were able to help. May God raise men and women to help you when you need them, Amen.

To Akinyode Ilerioluwa, thank you my friend for your assistance throughout the entirety of this project.

## **TABLE OF CONTENTS**

<b>Content</b>	<b>Page</b>	
TITLE PAGE	i	
DECLARATION	ii	
CERTIFICATION	iii	
DEDICATION	iv	
ACKNOWLEDGEMENT	v	
TABLE OF CONTENTS	vi	
LIST OF TABLES	xii	
LIST OF FIGURES	xiii	
ABSTRACT	xiv	
<b>CHAPTER ONE</b>	<b>INTRODUCTION</b>	<b>1</b>
1.1	Background to the Study	1
1.2	Statement of the Problem	2
1.3	Aim and Objectives of Study	3
1.4	Scope of the Study	3
1.5	Overview of Methodology	3
1.6	Significance of the Study	3
1.7	Definition of Terms	
1.8	Organization of the Project	
<b>CHAPTER TWO</b>	<b>REVIEW OF LITERATURE</b>	
2.0	Introduction	
2.1	Overview of Money Exchange Systems	
2.2	Money Exchange	

- 2.3 Exchange Options and Methods for International Transactions
  - 2.3.1 Exchange Options
    - 2.3.1.1 Banks
    - 2.3.1.2 Foreign Exchange (FX) Companies
    - 2.3.1.3 ATMs
    - 2.3.1.4 Credit Cards
    - 2.3.1.5 Online Payment Services
  - 2.3.2 Exchange Methods
    - 2.3.2.1 Spot Exchange
    - 2.3.2.2 Forward Exchange
- 2.4 The limitations of exchange rate flexibility within dominant currencies
- 2.5 Dominant Currency Pricing
- 2.6 Exchange Rate
  - 2.6.1 Types of exchange rates
    - 2.6.1.1 Fixed Exchange Rate
    - 2.6.1.2 Floating Exchange Rate
    - 2.6.1.2 Pegged Exchange Rate
  - 2.6.2 Factors affecting exchange rates
    - 2.6.2.1 Interest Rates
    - 2.6.2.2 Inflation Rates
    - 2.6.2.3 Political Stability
    - 2.6.2.4 Economic Performance
  - 2.6.3 Exchange rate mechanisms
    - 2.6.3.1 Foreign Exchange Market
    - 2.6.3.2 Currency Swaps

### 2.6.3.3 Foreign Currency Options

#### 2.6.4 Impacts of exchange rates

##### 2.6.4.1 Trade

##### 2.6.4.2 Investment

##### 2.6.4.3 Travel and Tourism

##### 2.6.4.4 Inflation

#### 2.6.5 How Exchange Rates Fluctuates

##### 2.6.5.1 Interest rates

##### 2.6.5.2 Inflation

##### 2.6.5.3 Political Instability

##### 2.6.5.4 Economic Performance

##### 2.6.5.5 Speculation

### 2.7 Automated Money Exchange System

#### 2.7.1 Use Cases of Automated Money Exchange System

#### 2.7.2 Examples of Automated Money Exchange Systems

##### 2.7.2.1 ATMs (Automated Teller Machines)

##### 2.7.2.2 Online Currency Exchange Platforms

##### 2.7.2.3 Mobile Payment Systems

##### 2.7.2.4 Cryptocurrency Exchanges

##### 2.7.2.5 Airport Currency Exchange Kiosks

#### 2.7.3 Importance of Money Exchange Systems

##### 2.7.3.1 Convenience

##### 2.7.3.2 Cost-Effective

##### 2.7.3.3 Speed

##### 2.7.3.4 Security

### **2.7.3.5 Access to Multiple Currencies**

## **2.8 Review of Related Works**

## **CHAPTER THREE**

## **METHODOLOGY**

3.0 Introduction

3.1 Software Development Life Cycle

    3.1.1 Stages of Agile Software Development Life Cycle

3.2 System Requirements

    3.2.1 Functional Requirements

    3.2.2 Non-functional Requirements

3.3 Design of the System

    3.3.1 Architecture of the System

    3.3.2 Flowchart of the System

    3.3.3 Use Case Diagram of the System

    3.3.4 Sequence Diagram of the System

## **CHAPTER FOUR**

## **SYSTEM IMPLEMENTATION AND RESULTS DISCUSSION**

4.0 Introduction

4.1 Implementation Tools and Technologies

    4.1.1 Development Tools

        4.1.1.1 HTML

        4.1.1.2 CSS

        4.1.1.3 JavaScript

        4.1.1.4 PHP

    4.1.2 Frameworks

        4.1.2.1 Laravel

- 4.1.2.2 Bootstrap
- 4.1.3 Tools and Libraries
  - 4.1.3.1 MySQL
  - 4.1.3.2 Paystack API
  - 4.1.3.3 GitHub
- 4.2 Database Design
  - 4.2.1 Users Table
  - 4.2.2 Currency Table
  - 4.2.3 Transaction Table
  - 4.2.4 Deposit Table
  - 4.2.5 Withdrawal Table
  - 4.2.6 Funds Lock Table
  - 4.2.7 Payment Table
  - 4.2.8 Alerts Table
  - 4.2.9 Personal and Financial Information Table
- 4.3 Results
  - 4.3.1 Home Page
  - 4.3.2 Sign up Page
  - 4.3.3 Sign In Page
  - 4.3.4 Dashboard Page
  - 4.3.5 Dashboard Page with user icon
  - 4.3.6 Transaction Page
  - 4.3.7 Fund Wallet Transaction
  - 4.3.8 Transfer Transaction
  - 4.3.9 Withdrawal Transaction

4.3.10 Paystack Transaction

4.3.11 Wallet Page

4.3.12 Profile Page

4.3.13 Profile Settings Page

## **CHAPTER 5**

## **SUMMARY, CONCLUSION AND RECOMMENDATIONS**

5.0 Introduction

5.1 Summary

5.2 Conclusion

5.3 Limitations

5.4 Recommendations

## **REFERENCES**

## **APPENDIX**

## **SOURCE CODE OF THE PRODUCT**

## **LIST OF TABLES**

<b>Table</b>	<b>Page</b>
2.1	Summary of Related Works

## LIST OF FIGURES

Figure	Page
2.5	Dominant Currency Pricing
3.1	Agile SDLC
3.3.1	Architecture of the Money Exchange System
3.3.2	Flowchart of the Money Exchange System
3.3.3	Use Case Diagram of the Money Exchange System
3.3.4	Sequence diagram for the Money Exchange System
4.3.1	The homepage of the money exchange system
4.3.2	The signup page of the money exchange system
4.3.3	The signin page of the money exchange system
4.3.4	The dashboard page of the money exchange system
4.3.5	The dashboard page of the money exchange system
4.3.6	The Transaction page of the money exchange system
4.3.7.1	Fund wallet page of the money exchange system
4.3.7.2	Fund wallet page of the money exchange system
4.3.8	Transfer Transaction of the money exchange system
4.3.9	Withdrawal Transaction of the money exchange system
4.3.10	Paystack Transaction of the money exchange system
4.3.11	Wallet Page of the money exchange system
4.3.12	Profile Page of the money exchange system
4.3.13	Profile Settings Page of the money exchange system

## ABSTRACT

The money exchange system enables seamless currency conversion and cross-border financial transactions. In today's increasingly globalised world, quick and secure currency conversion is essential for businesses, travellers, and individuals alike. This abstract provides an overview of the key characteristics and operations of a money exchange system, including exchange rates, transaction security, user experience, and regulatory compliance. It emphasises the significance of real-time exchange rate information, trustworthy transaction processing, robust security measures, and user-friendly interfaces in order to ensure a seamless and reliable experience while exchanging money. The abstract also emphasises how compliance procedures and regulatory frameworks may uphold transparency and prevent financial crimes.

**Keywords:** money exchange system, currency conversion rates, transaction security, user experience, regulatory compliance, real-time exchange rate information, transaction processing, security measures, user-friendly interfaces, regulatory frameworks, financial crime

## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 Background to the Study**

Technology breakthroughs and the growing interconnection of countries have generated a substantial change in the global financial environment over the past few decades. In order to promote cross-border transactions, investments, and international trade, people and corporations convert currencies in the money exchange industry, which is one significant aspect of this development (IMF, 2000).

The necessity for efficient and secure money exchange systems is stronger in the linked and globally integrated world of today. As e-commerce, global trade, and cross-border transactions keep growing, there is an increasing need for a reliable platform that makes currency conversion straightforward for both consumers and enterprises. Banks and actual currency exchanges are two common traditional methods of converting money that frequently have drawbacks in terms of accessibility, cost, and convenience (Kumar, 2014).

Web-based money exchange systems have emerged as a result of digital technology, offering improved functionalities and user interfaces.

Users can quickly change currencies in real-time with the aid of online currency conversion tools. They stand to gain from favourable exchange rates. These systems frequently get exchange rate data from reliable financial sources for accuracy and dependability. These services provide customers with up-to-date exchange rate information, which helps them make decisions. This is achieved by integrating financial data sources with APIs (Codere, 1968).

A web-based money exchange system must be developed and implemented with security as a top priority. Due to the sensitive nature of financial transactions, strict security measures are required to safeguard user information and prevent unauthorised access. Secure payment

gateways, two-factor authentication, and SSL (Secure Sockets Layer) encryption are frequently used to protect user information (Beattie, 2022).

Knowing your customers (KYC) and adhering to anti-money laundering (AML) regulations are important regulatory frameworks to follow in order to prevent financial crimes and maintain legal compliance (Beattie, 2022).

It is now simpler to build cutting-edge features into web-based money exchange systems thanks to recent technology advancements. Some of these include integration with digital wallets and payment systems, algorithms powered by artificial intelligence for predicting fluctuations in exchange rates, and mobile applications for currency conversions while on the go (Franklin, 2023). These developments are meant to improve currency exchange procedures' convenience, accessibility, and accuracy.

Due to numerous trade barriers, cross-border payments can be cumbersome, expensive, and hazardous. Infrastructures and governance frameworks are in place in the domestic setting, allowing the private sector to effectively provide payment and financial services. Lack of coordination at the international level results in insufficient delivery of these public goods and ineffective arrangements for cross-border transactions. The interruption in cross-border payments brought on by new technologies exacerbates these issues. Due to ongoing geopolitical tensions, these technologies allow transactions that avoid borders and regulations, which raises concerns about fragmentation (BBVA, 2017).

## **1.2 Statement of the Problem**

Currently, available platforms for exchanging money have the drawback of frequently being restricted to physical locations, making it challenging for people to use them outside of major cities. These platforms can also take a lot of time and demand a lot of human involvement and documentation, which can cause delays and mistakes. An automated, online money exchange platform promises to solve these problems by giving people a quick and easy

option to swap money either at home or on the go. The platform intends to make users more accessible in all places and cut down on the time and work required for conventional money exchange methods (Naddine, 2016).

### **1.3 Aim and Objective of Study**

The primary aim of this study is to develop a web-based money exchange system.

The specified objectives to achieve this aim are to:

- i. review literatures on development of a web-based money exchange system,
- ii. develop an automated money exchange system,
- iii. test the performance of the system.

### **1.4 Scope of the Study**

Study covers transfer and conversion of Nigerian Naira (NGN) with United States Dollar (USD).

### **1.5 Overview of Methodology**

- i. Literatures on the development of a money exchange system were reviewed.
- ii. The system was developed using Laravel, MySql, JavaScript, Vue.JS, jQuery and Bootstrap.
- iii. System was tested manually, with the health of users.

### **1.6 Significance of the Study**

Developing a money exchange system is of principal importance as:

- i. it ensures convenient online money exchange,
- ii. the system will help reduce waiting time, boost speed, and increase efficiency,
- iii. it reduces the risk of human errors, ensuring that transactions are processed accurately,

iv. it protects users sensitive information.

## 1.7 Definition of Terms

**Automation:** Automation is creating and applying technologies to produce and deliver goods and services with minimal human intervention (Techopedia, 2021).

**Manual System:** A system involving data processing which does not make use of stored-program computing equipment; by this somewhat arbitrary definition, systems using other types of tabulating equipment, such as the card-programmed calculator, are considered to be manual (McGraw-Hill, 2003)

**Computer Program:** A set of Instructions meant to be obeyed by a computer in order to accomplish a specific purpose.

**Database:** A collection of stored operational data used as information of related records for easy reference.

**Database Management System (DBMS):** A collection of programs that enable users to create and maintain a database.

**E-Mail Server:** A machine that relays e-mail traffic.

**Encryption:** A data security technology, used to guard against unwanted access to and modification of Information.

**Biometrics:** A means of identifying a person by analyzing a distinctive physical characteristic of the person. Such as fingerprint or retina scan.

**Bill Payment:** An electronic banking tool that allows customers to instruct banking Institutions to move money to the accounts of different people or companies.

## 1.8 Organization of the Project

I. Chapter One (INTRODUCTION) presents the background of study, statement of problem, the aim and the objectives of the project.

- II. Chapter Two (LITERATURE REVIEW) provides a review of literature of the study and also, a review of existing algorithms used as benchmarks for this study.
- III. Chapter Three (METHODOLOGY) provides in depth description and explanation of the algorithms to be used in this study.
- IV. Chapter Four (IMPLEMENTATION OF DESIGN) shows the implementation of the system, the process involved in developing the money exchange system and the software infrastructure used to achieve the set of objectives and documentation.
- V. Chapter Five (CONCLUSION AND RECOMMENDATION) comprises of the concluding part of the project.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.0 Introduction**

This chapter discusses the literature review and a few related works. Further explanations on certain concepts are expatiated here.

#### **2.1 Overview of Money Exchange Systems**

A money exchange system is a platform that permits the conversion of one currency into another. It is used by individuals and businesses who must change money from one currency to another for a number of reasons, including travel, trade, and investment.

The exchange rate is important in a system of exchanging money. The exchange rate is the cost involved in exchanging one currency for another. It is continually changing and is based on the forces of supply and demand in the foreign exchange market.

Understanding the fees and charges related to a transaction is crucial prior to using a money exchange system. Commission fees, transaction charges, and currency rate spreads are a few of them. The dependability and security of the exchange platform should also be taken into account.

#### **2.2 Money Exchange**

A money exchange is a business that specializes in trading one currency for another. Customers can execute purchase and sell operations to exchange one currency for another. Coins and paper currency are typically exchanged over the counter at teller stations, which can be found in a variety of locations including airports, banks, hotels, and resorts (Liovie, 2019).

## **2.3 Exchange Options and Methods for International Transactions**

The phrase "Exchange Options and Methods for International Transactions" refers to the different avenues and methods through which individuals can exchange currencies for overseas transactions (Cesc, 2009).

### **2.3.1 Exchange Options**

#### **2.3.1.1 Banks**

One of the most popular and established ways to exchange cash for cross-border transactions is through banks. Numerous banks provide foreign exchange services, and the rates and costs may vary based on the nation and currency (Cambridge Dictionary, 2023). One of the most popular and established ways to exchange cash for cross-border transactions is through banks. Numerous banks provide foreign exchange services, and the rates and costs may vary based on the nation and currency (Majaski, 2021).

#### **2.3.1.2 Foreign Exchange (FX) Companies**

These companies specialise in currency exchange and can offer better rates and lower fees than banks in some cases. Financial organisations or firms that specialise in offering services connected to the exchange of one currency for another are known as foreign exchange companies, sometimes known as forex companies or currency exchange companies (Johnson, 2015).

#### **2.3.1.3 ATMs**

ATMs (Automated Teller Machines) Automated Teller Machines, or ATMs, are technological tools that offer customers automated financial services. It can be used to withdraw local currency in a foreign country, but they usually charge high fees and may offer poor exchange rates (Kagan, 2019).

#### **2.3.1.4 Credit Cards**

When going overseas, credit cards offer a convenient way to pay for goods and services and can be used for international transactions. However, credit card companies regularly tack on foreign transaction fees and sporadically offer disadvantageous conversion rates (Durelo, 2005).

#### **2.3.1.5 Online Payment Services**

Online payment services are platforms that let people and organisations conduct electronic transactions and send money over the internet. They are sometimes referred to as digital payment services or e-payment services. These services offer a safe and practical way to carry out different financial transactions without using actual cash or checks. Platforms like PayPal and TransferWise allow users to exchange currency and make international transactions online. They may offer better exchange rates and lower fees than banks or FX companies (Ganti, 2022).

### **2.3.2 Exchange Methods**

#### **2.3.2.1 Spot Exchange**

Spot exchange is the term for exchanging currencies at the going rate on the market. This is the most popular way to exchange currencies and is usually used for transactions that need to be completed right away (Egan, 2021).

#### **2.3.2.2 Forward Exchange**

The exchange of currencies at a future time and at a predetermined exchange rate is referred to as forward exchange. This approach is frequently used to budget for future expenses or to protect against currency changes (Dake, 2020).

**Limit Orders:** A limit order is a directive to exchange money at a predetermined rate of exchange or a better one. This technique can be used to benefit from advantageous currency

rates or to reduce losses brought on by unfavourable changes in exchange rates (Bragg, 2022).

**Stop-Loss Orders:** An instruction to convert currencies at a specified rate or worse is known as a stop-loss order. This approach is intended to cut back on possible losses brought on by unfavourable exchange rate changes.

In general, individuals and enterprises involved in international trade should grasp the exchange alternatives and procedures because it can help them avoid fees and secure favourable exchange rates (Mendler, 2009).

#### **2.4 The limitations of exchange rate flexibility within dominant currencies**

The currencies of a number of emerging markets and developing economies (EMDEs) have seen severe devaluation in response to a variety of problems, including a downturn in global demand, disruptions in supply chains, a decrease in global commerce, and capital outflows. Nevertheless, it is still unclear whether these currency changes will help these economies recover (Egan, 2021).

#### **2.5 Dominant Currency Pricing**

The dominance of the US dollar was somewhat lessened with the advent of the euro, but it has mostly remained uncontested. The influence of other currencies used as reserves is minimal. Though less prevalent in the latter, particularly in some areas like tourism, dominant currency pricing is pervasive in both the exchange of commodities and services (Burnett-Nichols, 2013).



Figure 2.5 Dominant Currency Pricing (Source Gustavo *et al.*, 2022).

## 2.6 Exchange Rate

The value of one currency in terms of another currency is referred to as the exchange rate. In other terms, it is the cost associated with exchanging one currency for another. Several variables, including supply and demand, inflation, political stability, and interest rates, affect exchange rates.

The cost of importing and exporting goods and services, as well as the returns on overseas investments, are all significantly impacted by exchange rates, which also have an impact on international trade and investment. Depending on the country's monetary policies, exchange rates may be fixed or floating.

### 2.6.1 Types of exchange rates

**2.6.1.1 Fixed Exchange Rate:** In this arrangement, the government sets the exchange rate for each currency. The government is in charge of keeping the exchange rate stable by tying it to an outside standard like gold, another currency, or a basket of currencies (Geek, 2022).

**2.6.1.2 Floating Exchange Rate:** Where supply and demand factors in the market decide the value of a currency (Ovhosi, 2017).

**2.6.1.3 Pegged Exchange Rate:** The value of one currency is fixed in relation to another currency or a basket of currencies under a pegged exchange rate regime. The rate of exchange is kept within a set range or band (Chen, 2022).

## **2.6.2 Factors affecting exchange rates**

**2.6.2.1 Interest Rates:** Higher interest rates can increase a currency's demand and value by attracting in foreign investment.

**2.6.2.2 Inflation Rates:** A currency's value and demand can both drop as a result of uncertainty and instability.

**2.6.2.3 Political Stability:** A currency's value and demand can both drop as a result of uncertainty and instability.

**2.6.2.4 Economic Performance:** Strong economic performance has the potential to improve a currency's value and demand.

## **2.6.3 Exchange rate mechanisms**

**2.6.3.1 Foreign Exchange Market:** The place where money is purchased, sold, and exchanged.

**2.6.3.2 Currency Swaps:** When two parties swap currencies for a while before switching back at a pre-determined rate.

**2.6.3.3 Foreign Currency Options:** A situation where a buyer has the choice, but not the responsibility, to buy or sell a currency at a future exchange rate that has been agreed upon.

## **2.6.4 Impacts of exchange rates**

**2.6.4.1 Trade:** Changes in exchange rates might affect how competitively priced imports and exports are.

**2.6.4.2 Investment:** The value of investments made abroad may be impacted by exchange rate changes.

**2.6.4.3 Travel and Tourism:** The price of international travel and tourism can be impacted by exchange rates.

**2.6.4.4 Inflation:** Changes in exchange rates may have an effect on domestic inflation rates.

## **2.6.5 How Exchange Rates Fluctuates**

Exchange rates are subject to rapid swings, even daily swings. Here are a few causes of exchange rate volatility:

### **2.6.5.1 Interest rates**

Higher interest rates can entice foreign investors, which raises demand for the local currency and enhances the value of the local currency.

### **2.6.5.2 Inflation**

A nation's currency may lose value if its inflation rate is higher because it will have less purchasing power.

### **2.6.5.3 Political Instability**

A nation's economy may suffer from political upheaval or instability, which will lower investor demand for its currency.

#### **2.6.5.4 Economic Performance**

A country's currency may become more in demand, resulting in an increase in the exchange rate, if its economy is strong with low unemployment rates.

#### **2.6.5.5 Speculation**

The future worth of a currency may be the subject of speculation by traders and investors, which can cause short-term changes in the exchange rate.

### **2.7 Automated Money Exchange System**

An automated money exchange system is a platform that runs on computers and enables currency trading. For the purpose of facilitating foreign exchange transactions, banks, suppliers of currency exchange, and financial organisations often employ this system.

#### **2.7.1 Use Cases of Automated Money Exchange System**

##### **International Travel**

People who travel abroad must exchange their home currency for the local currency of the destination. Systems for exchanging money make this procedure simple and practical.

##### **International Business**

Companies that conduct business with associates or customers abroad must exchange currencies in order to pay for goods and services. Systems for managing money exchange assist enterprises in effectively managing their needs for currency exchange.

##### **Investment**

Investors could desire to acquire and sell securities with a foreign currency underlying them. Systems for exchanging currencies can assist investors in doing so at fair prices.

##### **Remittances**

People who work overseas frequently send money to their families back home. A secure and practical method of sending money across borders is provided by money exchange systems.

## **Online Shopping**

Customers who make online purchases from foreign businesses might have to use a different currency to pay. Online purchasing is more convenient since money conversion systems enable customers to pay in their native currency.

## **Speculation**

Currency traders may utilise money exchange systems to make predictions about the future of currency exchange rates in an effort to benefit from these swings.

### **2.7.2 Examples of Automated Money Exchange Systems**

**2.7.2.1 ATMs (Automated Teller Machines):** Customers can use ATMs to withdraw money in either their home currency or a foreign currency from their bank accounts. Customers can deposit money and cheques into their accounts at many ATMs.

**2.7.2.2 Online Currency Exchange Platforms:** Users may exchange currencies on a number of online marketplaces at fair prices. Online shoppers may make purchases and get their money either in their bank accounts or through other payment options.

**2.7.2.3 Mobile Payment Systems:** Users may transfer money between accounts in different currencies via mobile payment services like PayPal, Venmo, and Cash App. These programmes could impose a cost for currency conversion.

**2.7.2.4 Cryptocurrency Exchanges:** Users may trade one cryptocurrency for another on cryptocurrency exchanges, as well as for fiat money. These exchanges run round-the-clock, automatically.

**2.7.2.5 Airport Currency Exchange Kiosks:** Travellers can exchange currencies before leaving or after arriving at many airports' currency exchange booths. In comparison to other automated exchange systems, these kiosks could have greater fees.

## **2.7.3 Importance of Money Exchange Systems**

### **2.7.3.1 Convenience**

Customers can benefit from a high level of ease thanks to automated money exchange services. Users may exchange money at any time, from anywhere, and without physically going to a place.

### **2.7.3.2 Cost-Effective**

Compared to conventional money exchange techniques, automated money exchange platforms frequently provide competitive exchange rates and cheaper transaction fees. As a result, currency conversion is more affordable for both enterprises and private citizens.

### **2.7.3.3 Speed**

Automated systems may be used to conduct currency exchange transactions rapidly and efficiently. Particular attention should be paid to this by companies that often move money abroad.

### **2.7.3.4 Security**

Platforms for automated money exchange are normally safe and dependable, with several safeguards against fraud and hacking.

### **2.7.3.5 Access to Multiple Currencies**

Automated exchange systems enable currency trading, offering clients access to a range of currencies to support their worldwide business activities.

## **2.8 Review of Related Works**

Merritt (2011) conducted a comprehensive review of the previous research. The evaluation details the development of mobile money transfer services while highlighting the revolutionary effects that these services have had on financial inclusion, in particular in

regions that have limited access to traditional banking services. The evolution of mobile money services from their early emphasis on money transfers to their current provision of a wide range of financial services including loans, savings accounts, and many alternatives for paying bills is investigated in this paper. The benefits of using mobile money transfer services are highlighted in the research that was done on the topic. The article describes how these services have made it feasible to execute transactions in a rapid and affordable manner, provided financial access for people who were previously excluded, and supported economic progress in developing nations. In addition to this, case studies that highlight the positive effects that mobile money transfer services have had on various businesses, such as the medical field, the educational system, and the agricultural sector, are investigated. The evaluation takes into account the challenges confronted by businesses that handle mobile money transfers. The difficulties that the industry faces in terms of money laundering, privacy, security, and regulation are investigated in this report. The evaluation highlights the importance for trustworthy authentication systems, effective regulations, and active engagement from stakeholders in order to solve these challenges. It also touches on the necessity of consumer protection and confidence in order to encourage the acceptance and long-term expansion of mobile money transfer services. This is done in order to promote the adoption of mobile money transfer services. The results of the study highlight how superior the sophisticated control methods are that are utilised in mobile money transfer services. It highlights how important it is to employ reliable authentication technology, effective rules, and stakeholder participation in order to mitigate the risks associated with exchanging or transferring money. Case studies and examples from the real world demonstrate how effective these cutting-edge control systems are in guaranteeing that financial transactions are both trustworthy and safe.

Avolat et al (2021) suggested a decentralised trading system called the DEX system. The system makes use of blockchain technology to make trading of various cryptocurrencies transparent and trustless. Using the DEX system eliminates the need for middlemen like banks or other financial institutions and allows users to exchange their cryptocurrencies directly with other users.

The review also explored the idea of streamlining financial exchange procedures and exchanges. It may go over the problems with conventional money exchange systems and consider the possible advantages of using a more straightforward strategy.

Both safety and openness are priorities in the development of the DEX system. Because the system is decentralised, there is no one point of failure that hackers or other hostile actors may focus their attention on as a potential target. In addition, due to the fact that every transaction that takes place on the network is written down on the block chain, the transactions are entirely visible and cannot be changed or removed.

Merritt (2011) made use of a combination of data synthesis and qualitative analysis to analyze Mobile Technology to study how it affects the money and exchange markets. The impact that mobile technology has had in the evolution of the market for money transfers and exchanges is going to be explored in depth in this paper. It's possible that they'll talk about how quickly mobile subscriptions are growing, as well as how popular mobile payment options are becoming. The study might investigate how the proliferation of mobile technology has made it possible to provide money transfer services that are both simple and easily accessible, particularly in developing countries. It also hints that the assessment would include compiling all of the pertinent data and carrying out qualitative research in order to determine how mobile technology will affect the various banking institutions. As part of the review, it is possible to get insights into the transformative implications of mobile technology

by analyzing user experiences, user case studies, and survey results. The result that was mentioned sheds insight on the growing popularity of services that allow mobile money transfers. The investigation may look into a variety of mobile payment techniques, including account-to-account transfers, peer-to-peer payments across a distance, and point-of-sale payments that are made in close proximity to one another. It might investigate the characteristics, advantages, and difficulties connected to these various mobile payment systems. According to the information supplied, mobile money transfer services have the potential to be used for international money transfers. The potential and difficulties that are involved with conducting international business utilizing mobile devices may be the primary emphasis of the evaluation. It might address issues such as legislative disparities, the significance of creating customer confidence, and the compatibility of technology systems, which are all important factors in the successful implementation of cross-border mobile money transfer services.

Lepoutre et al (2018) gave information on how mobile money exchange systems are being adopted and the difficulties that have arisen in Kenya and Nigeria. Despite concentrating largely on Kenya and Nigeria as its core research areas, the report explores the expansion of mobile money exchange networks in Sub-Saharan Africa as a bigger topic. This study report's main concern is the uptake of mobile money exchange services in Kenya and Nigeria. This emphasizes how crucial macro-level factors like institutional backing, infrastructure, and legal frameworks are for promoting the use of mobile money. The researchers look into the micro-level behaviors, motivations, and challenges that individuals and groups face while building mobile money exchange networks. The proliferation of mobile money is significantly affected by network externalities; the success of mobile money in Kenya is attributed to the growth of its user base; this topic can be included in the study report. It most likely investigates the influence that network effects have on the acceptability of mobile

money and how the success of Kenya's deployment may be attributed to the expansion of a large user base.

Mirembe et al (2008) proposed a model for Electronic Money Transfer for Low Resourced Environments. This idea holds that utilising blockchain technology can boost payment effectiveness while simultaneously boosting security and reducing transaction costs. The financial services industry has seen substantial growth thanks to the rise of fintech technology and the digital transformation in the industry. The evolution of digital payment methods may one day make it possible to settle international financial transactions in a hassle-free and cost-effective manner, even in environments with limited resources. The importance of having access to low-cost financial services for the elimination of poverty and the growth of the economy is highlighted by the World Bank's focus on digital financial services. It is possible for governments to benefit from this strategy in terms of the delivery of services and the collection of income other than taxation. Despite the fact that the example does not go into detail about these benefits, you may find that they are relevant to the seamless cross-border payment model that you are interested in. The success and dependability of electronic money transfer systems can be significantly impacted by network issues and technological constraints, particularly in environments with constrained resources. It's crucial to get over these constraints if we want to create a stable and secure payment system.

Delphi et al (2021) referred to the broader field of mobile money transfer and the perspective of a process model. They stated that in recent years, mobile payment systems have been fairly popular. These systems enable users to transfer money simply and securely via their mobile devices, which has contributed to the growth in popularity of the systems. P2P (peer-to-peer) money transfers and mobile wallets are only two of the many different kinds of payment methods that are regularly used on these platforms. In order to examine and enhance the flow of transactions in mobile cash transfer systems, modelling of processes is a

crucial first step. The numerous phases and interactions that are involved in the transfer process may be found and analysed using process models. This aids in the creation and enhancement of trustworthy and efficient systems. The idea that the price of a currency may automatically adjust itself in response to changes in supply and demand is a fundamental aspect of mobile money transfer systems. This approach has the potential to improve the efficiency and openness of commercial transactions by establishing exchange rates that are both fair and competitive. In the realm of mobile money transfer, an exciting new solution has surfaced in the form of automated market maker technology. This type of technology refers to algorithmic procedures that are responsible for facilitating transactions and preserving liquidity in decentralised markets. These technologies make use of algorithms to automatically alter prices and give liquidity to users, therefore establishing a marketplace that is decentralised and highly efficient. It is not uncommon for mobile money transfer systems to struggle with usability, user experience, and interface design issues. The user's ability to engage with the system and problems with the interface are the system's limitations. It is necessary to remove these limits in order to create interactions with users that are seamless and straightforward, hence boosting adoption and improving overall customer happiness.

Auvolat et al (2020) coordinated with the more broad field of systems for the transfer of money and the challenges that are associated with those systems. They also stated that the process of moving money between people or organizations has grown less complicated as a result of the considerable technological developments that have been made in the field of money transfer over the course of the last several years. These new advancements came into existence with the purpose of making the procedure easier to complete. In most cases, these systems use digital technology as well as a variety of different forms of payment in order to improve the safety and efficiency of financial transactions. In order to appreciate the dynamics of money transfer systems and locate points at which modifications may be made,

theoretical and empirical research studies are both crucial components of the research process. For the purpose of the research analysis, this is absolutely necessary. Researchers may obtain useful insights on the performance, security, and reliability aspects of such systems by performing in-depth analyses and empirical studies. The development of new algorithms is an essential part of the process of designing new systems for the transfer of monetary value. A great number of considerations, including network circumstances, failure models, and communication abstractions, are involved in the development of algorithms that ensure the safe and correct transfer of monetary value. In unstable asynchronous message-passing systems, generic approaches that provide assistance in problem-solving with regard to the transfer of money are of considerable relevance. This discovery, which provides a universal approach to dealing with money transfer problems in fault-prone asynchronous message-passing systems, emphasises the need of developing solutions that are reliable and error-resistant. The recommended method employs trustworthy broadcast communication abstractions, crash and Byzantine failure models, and seeks to address the problems associated with asynchronous money transfers. The systems that are used to transmit money have drawbacks, such as the possibility of duplicate spending and difficulty protecting users' privacy. It is necessary to have synchronisation systems, cryptographic techniques for security and secrecy, and guarantee of consistency in accounting notwithstanding the possibility of dishonest actions in order to solve the problems that have been raised.

**Table 2.1: Summary of Related Works**

AUTHOR (YEAR)	TITLE	METHODOLOGY	RESULT	LIMITATIONS
Merritt, C. (2011)	Mobile Money Transfer Services: The Next Phase in the Evolution in Person-to-Person Payments	Comprehensive literature review including case studies and examples	The results specify the superiority of advanced control systems, which are essential to prevent risks in money exchange or transfer	Money laundering, privacy, security, and regulation plague mobile money transfer businesses. Consumer confidence and protection require reliable authentication technology, efficient rules, and stakeholder participation
Auvolat, Frey, Raynal, & Taïani, (2021)	Money Exchange Made Simple: a Specification, a Generic Algorithm, and	System Transparency and Malicious Detection	DEX Architecture & Automated Market Maker Technology	Network Mismatch between users

	its Proof			
Merritt, C. (2013)	MOBILE TECHNOLOGY: Transforming the Money Transfer & Exchange Market	A combination of data synthesis and qualitative analysis	Mobile money transfer services are rising in poor nations, hence the article examines how mobile devices affect financial systems. It emphasises the quick expansion of mobile subscriptions and mobile payment methods such as account-to-account, P2P distant, and point-of-sale	Mobile money transfer services offer cross-border remittance potential, but regulatory differences, technological interoperability, and consumer trust challenge their implementation

			proximity payments	
Lepoutre & Oguntoye, (2018)	The (non-)emergence of mobile money exchange systems in Sub-Saharan Africa: A comparative multilevel perspective of Kenya and Nigeria	Cross-comparative case analysis between the two countries, Nigeria and Kenya	Explores mobile money exchange system adoption in Kenya and Nigeria, highlighting macro-level factors and micro-level behaviors	Network externalities significantly impact mobile money adoption; Kenya's success is attributed to user development
Mirembe, Kizito, Tuheirwe, & Muyingi, (2008)	A Model for Electronic Money Transfer for Low Resourced Environments: M-Cash	Seamless and cost effective solution for cross-border payments	Block chain Technology Inception	Failed transactions due to network problems

(Delphi et al. 2021)	<b>Mobile Currency Transfer: The Process Model Perspective</b>	Automatic Adjustment of Price of each currency based on supply and demand	Automated Market Maker Technology	User Interaction Problems
(Auvolat et al. 2020)	Money Transfer Made Simple	Theoretical and empirical research analysis and algorithm derivation for proposed system	The paper presents a generic algorithm for solving money transfer problems in failure-prone asynchronous message-passing systems, considering crash and Byzantine failure models and using a reliable broadcast	Money transfer issues include double spending and privacy concerns, requiring solutions addressing synchronization and confidentiality/security using cryptography techniques. Dishonest processes and synchronization ensure consistency in accounts

			communication abstraction	
Islam, Munim, Islam, & Karim, (2019)	<b>A Proposed Secure Web Based Money Transfer System for SME in Bangladesh: An Industry 4.0 Perspective</b>	A conceptual proposal containing comprehensive literature review	Study proposes iris-based authentication system for Bangladesh's SMEs, adopting Industry 4.0 principles, ensuring security without sensitive data storage, identity validation, and increased transaction limits.	Biometric iris data secures web based money transfers, but privacy concerns, infrastructure, cost, usability, and lack of real-world testing hinder implementation. Further research needed for improved productivity and customer satisfaction.
Kadhiwal & Zulfiqar, (2007)	<b>Analysis of mobile and</b>	Analytical literature review	The study examines mobile	M-payment transaction systems have a potential for

	<b>web based payment security measures and different standards</b>	payment systems growth, focusing on mobile phones and their involvement by MNOs, banks, and financial service providers. It emphasizes the need for continuous evolution and standardization for secure, reliable mobile payment methods.	substantial revenue increases worldwide provided it can overcome its security and standardization concerns by developing secure mobile devices, network technologies, and service-level security to build trust in m-commerce transactions and achieving integration and interoperability between the various systems developed by different vendors	
Muwanguzi & Musambira (2009)	The Transformation of East Africa's Economy	System Transparency and Malicious Detection.	DEX Architecture & Automated Market Maker	Network Mismatch between users.

	Using Mobile Phone Money Transfer Services: A Comparative Analysis of Kenya and Uganda's Experiences	Technology	
--	--	------------	--

## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.0 Introduction**

This chapter discusses the approach taken, and other procedures involved in the implementation of the web-based money exchange system and its add-on features.

#### **3.1 Software Development Life Cycle**

The software development method adopted for use in this project is the agile development methodology. The agile implementation being used is kanban. Agile methodology is an iterative and incremental approach to software development (ArtOfTesting, 2020).

##### **3.1.1 Stages of Agile Software Development Life Cycle**

1. Requirements
2. Design
3. Development
4. Testing
5. Deployment
6. Review

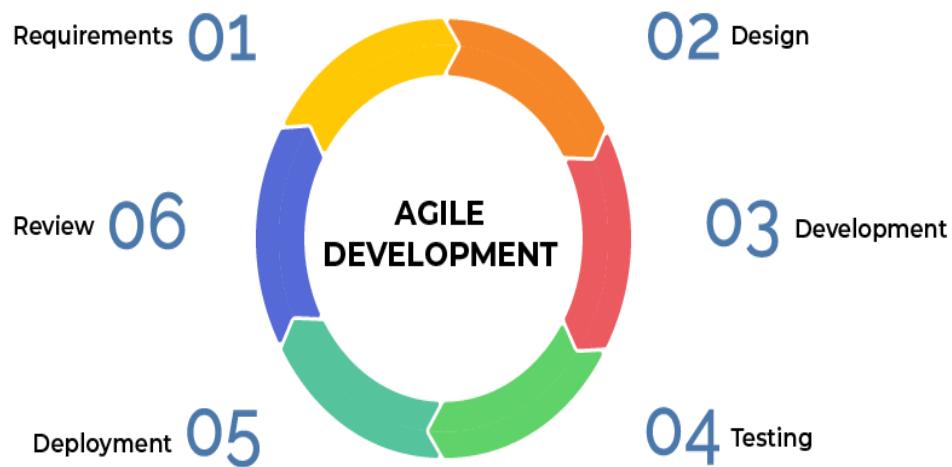


Fig 3.1 Agile SDLC (Ta, 2020)

### 3.2 System Requirements

This section highlights the functional and non-functional requirements of the web-based money exchange system.

#### 3.2.1 Functional Requirements

- i. User registration and account management
- ii. Secure login and authentication features
- iii. Ability to add, withdraw, and transfer funds between accounts
- iv. Support for multiple currencies and exchange rates
- v. Integration with external payment systems and banks
- vi. Real-time currency conversion and transaction processing
- vii. Transaction history and reporting features
- viii. Compliance with legal and regulatory requirements for money exchange

- ix. Multi-level security and fraud prevention measures
- x. Customer support and dispute resolution mechanisms.

### **3.2.2 Non-functional Requirements**

Non-functional requirements are specifications that outlines the system's operational capabilities and constraints and attempt to improve its functionality (Altexsoft, 2022).

1. **Security:** The platform should be secure and protect user information and confidentiality by using encryption and other security measures to prevent unauthorized access, data breaches, and fraud.
2. **Performance:** The platform should be fast, reliable, and scalable to handle high volumes of transactions and users without downtime or delays.
3. **Usability:** The platform should be user-friendly and easy to navigate, with clear instructions, error messages, and feedback mechanisms to help users complete transactions.
4. **Accessibility:** The platform should be accessible to users with disabilities, including support for assistive technologies such as screen readers and keyboard navigation.
5. **Compliance:** The platform should comply with legal and regulatory requirements for money exchange, including anti-money laundering (AML) and know-your-customer (KYC) regulations.
6. **Availability:** The platform should be available 24/7, with backup and disaster recovery mechanisms to ensure data and service continuity in case of system failures or disasters.
7. **Interoperability:** The platform should be compatible with external payment systems, banks, and financial institutions to enable seamless integration and transaction processing.

8. **Support:** The platform should provide customer support and assistance, including helpdesk, chat, and email support, as well as documentation and training materials for users and administrators.
9. **Performance monitoring:** The platform should have performance monitoring and reporting mechanisms to track system uptime, response times, and other key performance indicators (KPIs) to ensure optimal performance and user satisfaction.

### **3.3 Design of the System**

Systems design is the process of defining elements of a system like modules, architecture, components and their interfaces and data for a system based on the specified requirements. It is the process of defining, developing and designing systems which satisfies the specific needs and requirements of a business or organization (The Economic TImes, 2019).

#### **3.3.1 Architecture of the System**

The architecture of a money exchange system typically includes components such as a user interface, database, API, transaction processing engine, security system, compliance system, and reporting and analytics system. These components work together to enable customers to interact with the system, process transactions securely and efficiently, and ensure that the system meets regulatory requirements and operates effectively.

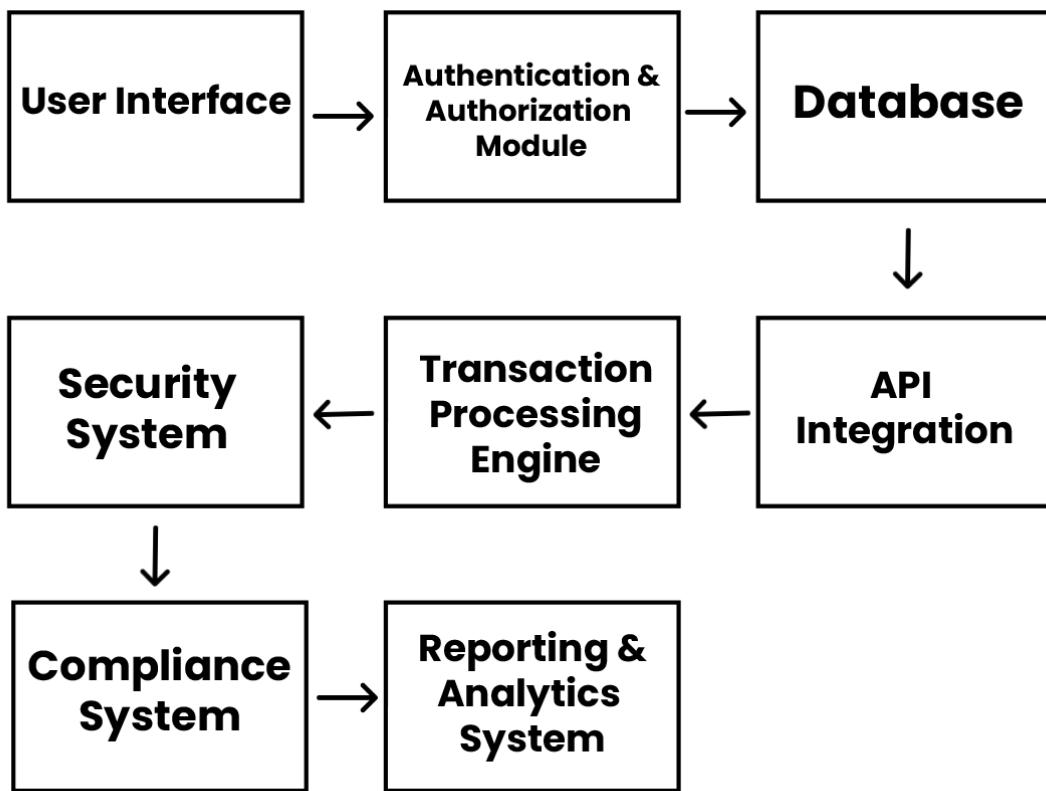


Fig 3.3.1 Architecture of the Money Exchange System

### 3.3.2 Flowchart of the System

The system enables users to log in to their accounts, select the currency and amount they want to exchange, and confirm the transaction. The system calculates the exchange rate and displays the amount that will be received in the target currency. The system processes the transaction and sends the funds to the recipient's account. The user's account balance and transaction history are updated, and the system generates reports and analytics to monitor system performance and identify areas for improvement.

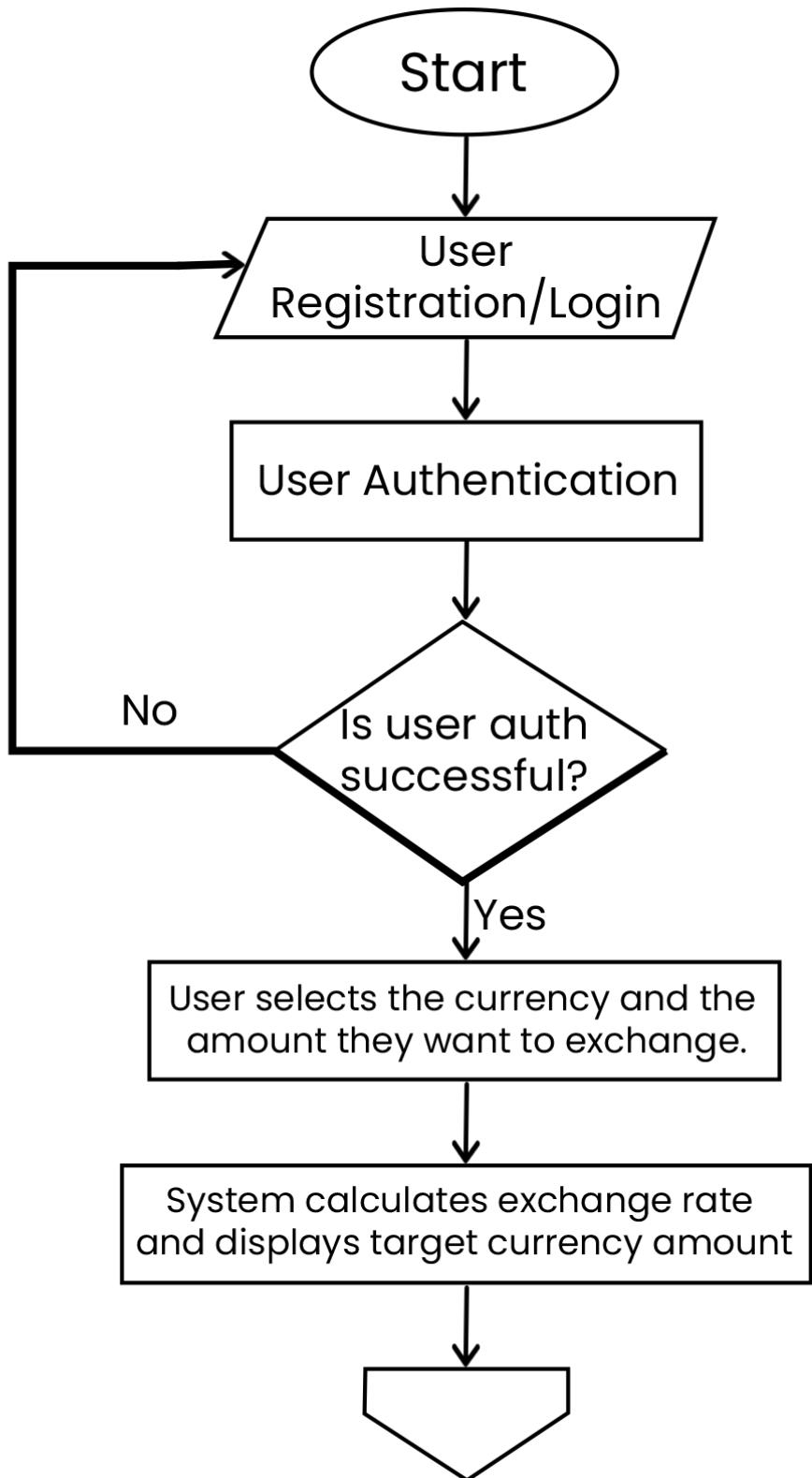


Fig 3.3.2 Flowchart of the Money Exchange System

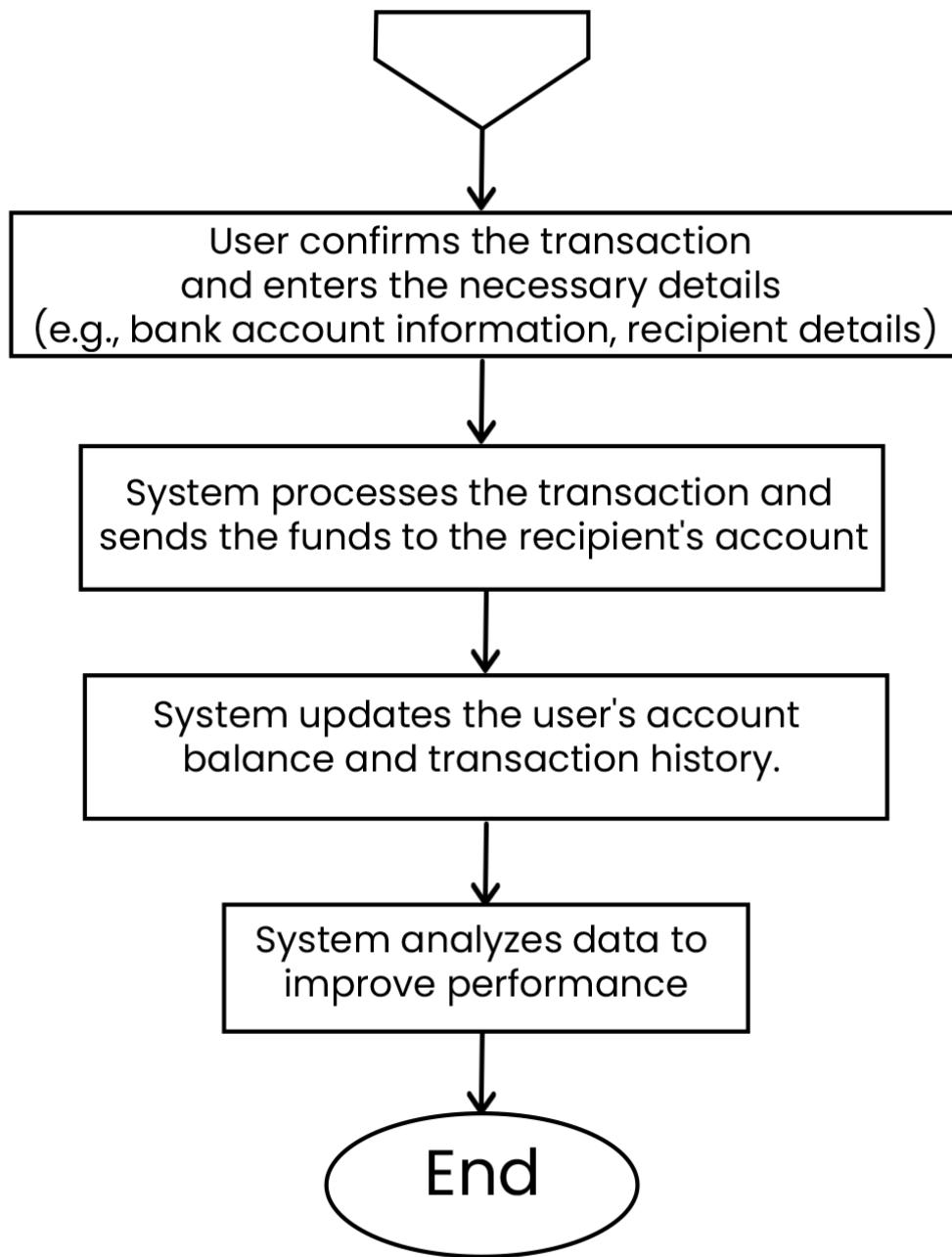


Fig 3.3.2 cont. Flowchart of the Money Exchange System

### 3.3.3 Use Case Diagram of the System

Use-case diagrams describe the high-level functions and scope of a system. These diagrams also identify the interactions between the system and its actors. The use cases and actors in use-case diagrams describe what the system does and how the actors use it, but not how the system operates internally (IBM, 2021).

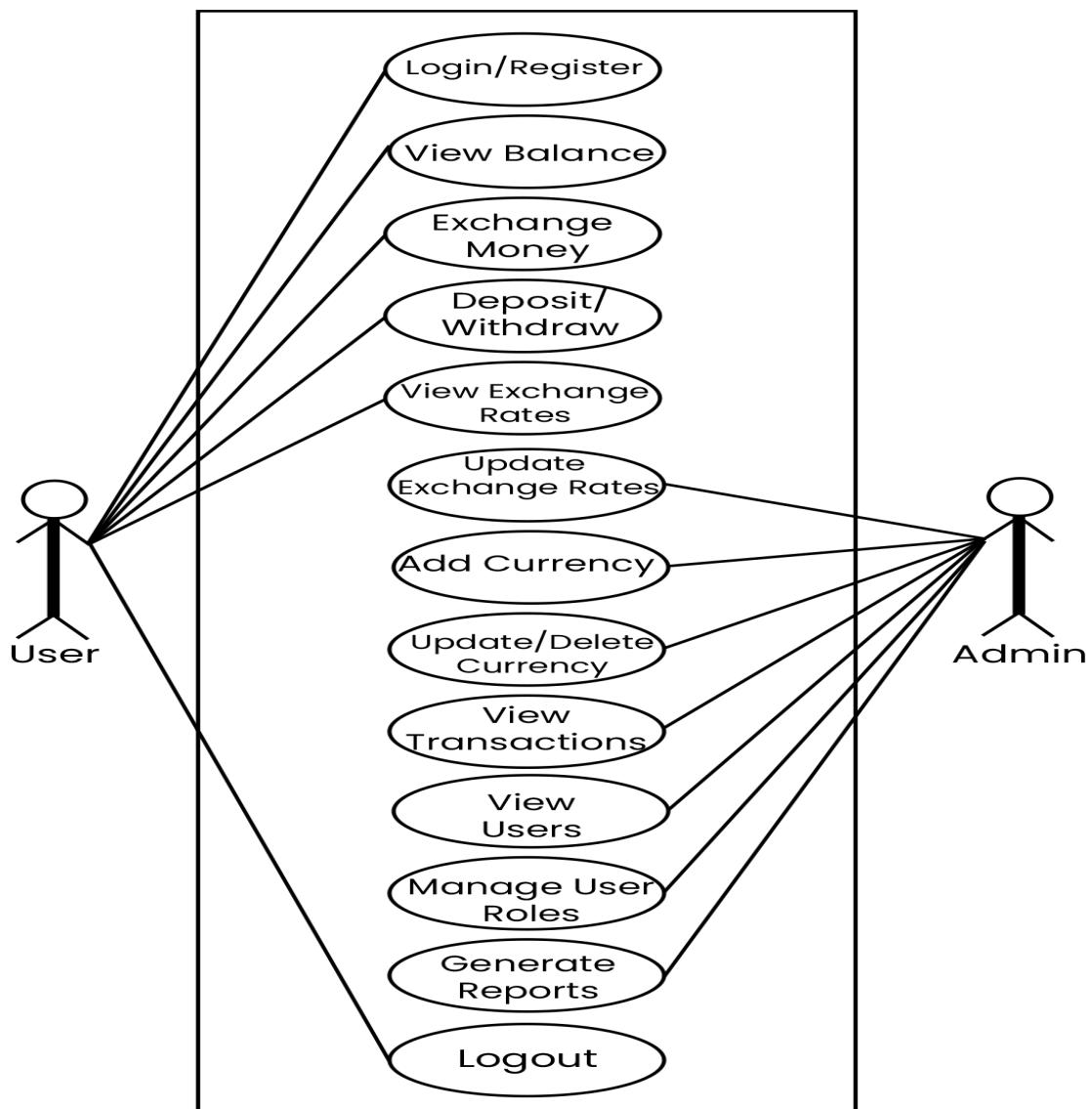


Fig 3.3.3 Use Case Diagram of the Money Exchange System

### 3.3.4 Sequence Diagram of the System

A sequence diagram is a type of interaction diagram to visually represent interactions between objects in a system (Wikipedia Contributors, 2019). It emphasizes the time ordering of messages sent between objects and captures the interaction between objects in the context of a collaboration (Visual Paradigm, 2019).

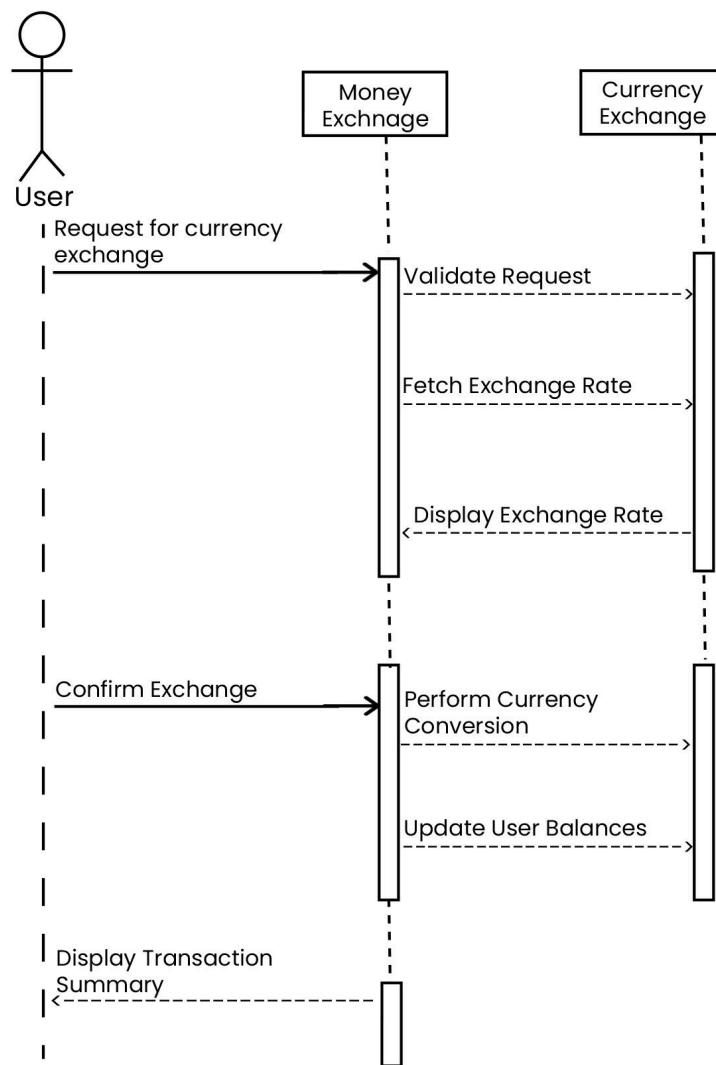


Fig 3.3.4 Sequence diagram for the Money Exchange System

# **CHAPTER FOUR**

## **SYSTEM IMPLEMENTATION AND RESULTS DISCUSSION**

### **4.0 Introduction**

This chapter outlines the system's implementation and processes. It describes the system's developer tools, the environment in which the system is implemented and discuss the results with the aid of diagrams.

### **4.1 Implementation Tools and Technologies**

This section highlights the development tools used in the implementation of the system.

#### **4.1.1 Development Tools**

The system was built using the following tools; HTML5 and CSS were used for the system's layout and interface design. JavaScript was used for the system's frontend functionalities. PHP was used as the host language for performing backend logic alongside JavaScript for specific components. MySQL, a relational database management system (RDBMS) was used for data storage and retrieval. Visual Studio Code and Sublime text were the primary text editors used for the project, and other frameworks and libraries that will be explained in this section.

##### **4.1.1.1 HTML**

Hypertext Markup Language (HTML) is a markup language used to structure and display material on the world wide web. The version used in this project is HTML5, which is maintained by the World Wide Web Consortium (W3C). It was used to create layouts/framework of the system's various webpages.

##### **4.1.1.2 CSS**

Cascading Style Sheet is a markup language used to represent a document's appearance, style, and format. The website layout is developed and organized in the most basic sense and

pleasant to use while also being functional. It was used to design the various webpages of the system to give the user a pleasant experience.

#### **4.1.1.3 JavaScript**

JavaScript is an interpreted, lightweight programming language, it is intended for the development of net centric applications. It was used to add interactivity and dynamic elements to the frontend. Libraries like jQuery and Axios were employed to handle AJAX requests and enhance user experience.

#### **4.1.1.4 PHP**

Hypertext Preprocessor is an open source general purpose scripting language that is suited to web development. The core backend logic of the application was written in PHP due to its robustness and widespread use in web development. PHP allowed for seamless integration with the database and facilitated server-side processing.

### **4.1.2 Frameworks**

Frameworks are tools that help developers build software applications more efficiently by providing pre-written code for common tasks. Below are some frameworks used to develop the system.

#### **4.1.2.1 Laravel**

Laravel, a powerful PHP framework, was chosen for its elegant syntax, extensive feature set, and built-in security measures. Laravel's MVC (Mobile View Controller) architecture simplified the development process and promoted code organization.

#### **4.1.2.2 Bootstrap**

Bootstrap was used to create a responsive and mobile-friendly user interface. Its pre-designed components and grid system facilitated rapid frontend development and ensured a consistent look and feel across all pages.

### **4.1.3 Tools and Libraries**

Tools and libraries are resources that developers use to build web applications. Libraries are pre-written codes that were used to add functionalities to the system without having to write it from scratch. Below are some tools and libraries used to develop the system.

#### **4.1.3.1 MySQL**

MySQL was chosen as the relational database management system (DBMS) to store user data, currency exchange rates, and transaction records. Its performance, scalability, and ease of integration with PHP made it a suitable choice.

#### **4.1.3.2 Paystack API**

To facilitate secure online payments, the Paystack API was integrated into the system. This allowed users to make payments seamlessly and receive real-time transaction feedback.

#### **4.1.3.3 GitHub**

GitHub was used for version control, enabling effective collaboration among team members and tracking changes to the codebase.

## **4.2 Database Design**

Below is the database table structure for the system.

### **4.2.1 Users Table**

The users table stores user-related information, such as username, email, password, name, phone number, address, and registration timestamp. The primary key id uniquely identifies each user.

### **4.2.2 Currency Table**

The currencies table stores information about different currencies, including name, symbol, exchange rate, and creation timestamp. The primary key id uniquely identifies each currency.

#### **4.2.3 Transaction Table**

The transactions table records various transactions, including sender and receiver IDs, transaction amount, currency ID, status, transaction type, and creation timestamp.

The foreign keys sender\_id and receiver\_id link to the id field in the users table to establish a one-to-many relationship.

The foreign key currency\_id links to the id field in the currencies table to establish a many-to-one relationship.

#### **4.2.4 Deposit Table**

The deposits table stores information about deposits made by users, including user ID, deposit amount, currency ID, deposit status, and creation timestamp.

The foreign key user\_id links to the id field in the users table to establish a one-to-many relationship.

The foreign key currency\_id links to the id field in the currencies table to establish a many-to-one relationship.

#### **4.2.5 Withdrawal Table**

The withdrawals table stores information about withdrawal transactions initiated by users, including user ID, withdrawal amount, currency ID, withdrawal status, and creation timestamp.

The foreign key user\_id links to the id field in the users table to establish a one-to-many relationship.

The foreign key currency\_id links to the id field in the currencies table to establish a many-to-one relationship.

#### **4.2.6 Funds Lock Table**

The funds\_lock table stores information about funds locked for a specific period by users, including user ID, locked amount, currency ID, start date, end date, and creation timestamp.

The foreign key user\_id links to the id field in the users table to establish a one-to-many relationship.

The foreign key currency\_id links to the id field in the currencies table to establish a many-to-one relationship.

#### **4.2.7 Payment Table**

The payments table stores information about payments made by users, including user ID, payment amount, currency ID, biller, account number, payment status, and creation timestamp.

The foreign key user\_id links to the id field in the users table to establish a one-to-many relationship.

The foreign key currency\_id links to the id field in the currencies table to establish a many-to-one relationship.

#### **4.2.8 Alerts Table**

The alerts table stores alerts or notifications sent to users, including user ID, alert message, and creation timestamp.

The foreign key user\_id links to the id field in the users table to establish a one-to-many relationship.

#### **4.2.9 Personal and Financial Information Table**

The personal\_financial\_info table stores the personal and financial information of users, including user ID, birth date, gender, occupation, income, identification type, identification number, and creation timestamp.

The foreign key user\_id links to the id field in the users table to establish a one-to-many relationship

### 4.3 Results

The result of the implementation was documented in this section along with pictures of the various components after implementation.

#### 4.3.1 Home Page

The home page is the landing page seen when the website is loaded on the browser, which contains links to the login/signup page. It is also called visitors page. Figure 4.3.1 depicts the home page of the money exchange system.

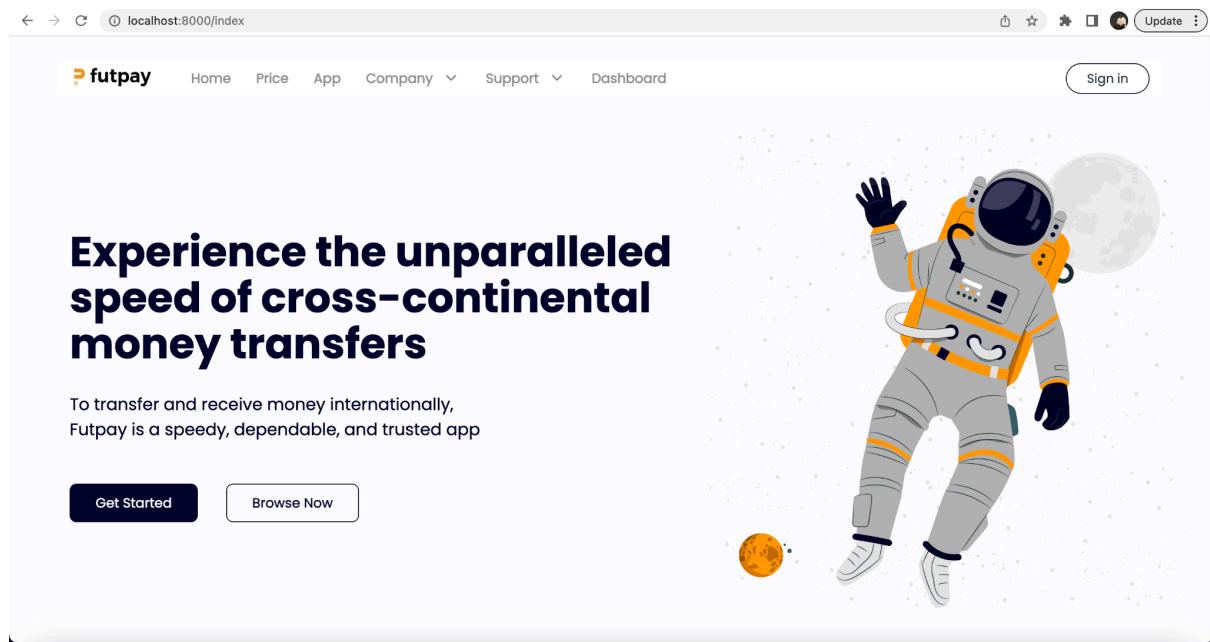


Fig 4.3.1 The homepage of the money exchange system

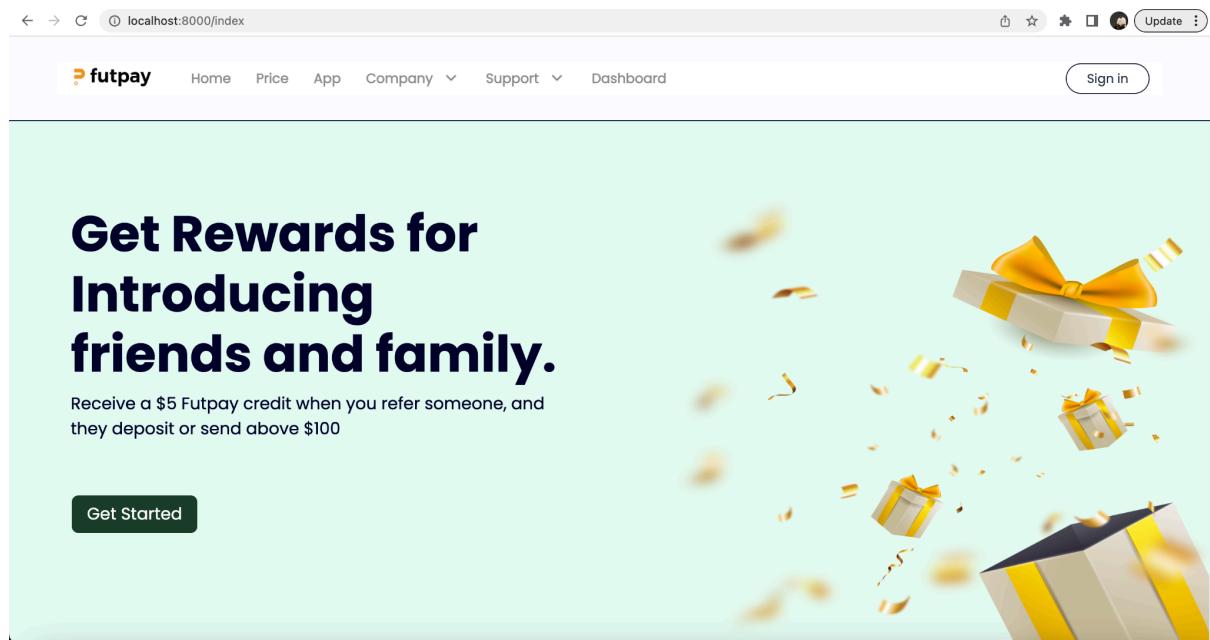


Fig 4.3.1 cont. The homepage of the money exchange system

### 4.3.2 Sign up Page

The signup page allows the users to create a new account. On successful registration, access is granted to the user. Figure 4.3.2 shows the signup page of the money exchange system.

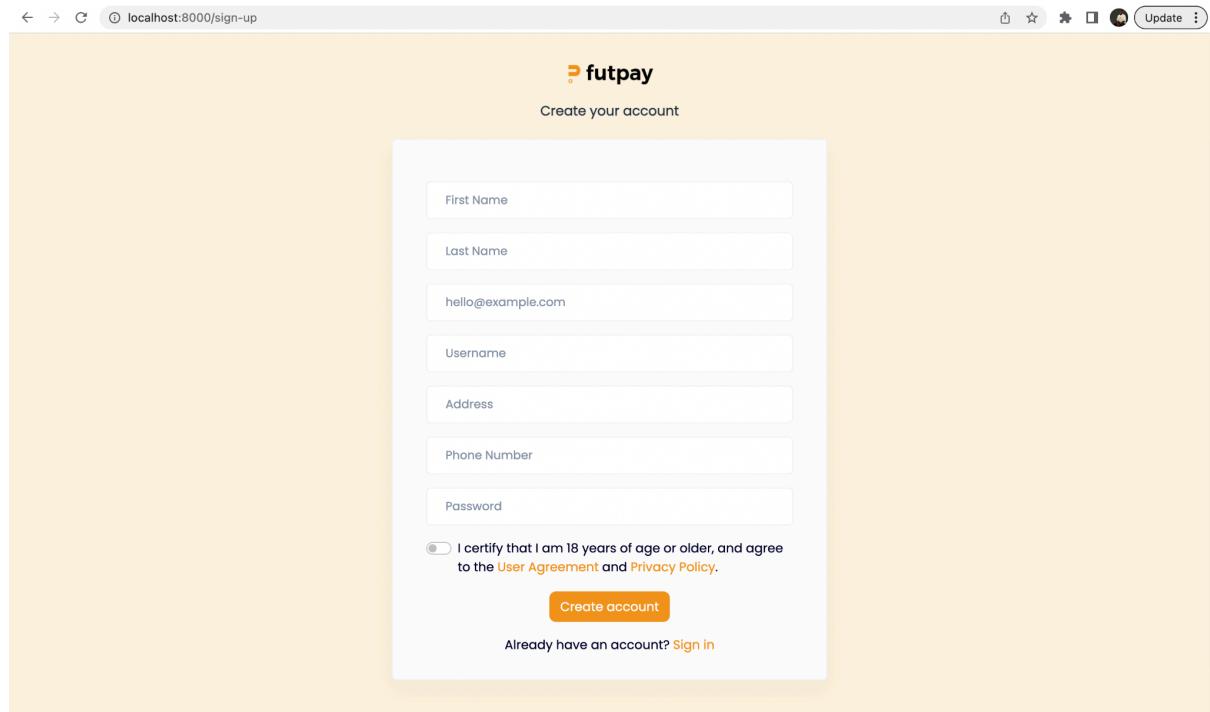


Fig 4.3.2 The signup page of the money exchange system

### 4.3.3 Sign In Page

The Sign in page is important in the system because it gives verified users access to the website, the user has to input his/her credential after which access is either granted or denied.

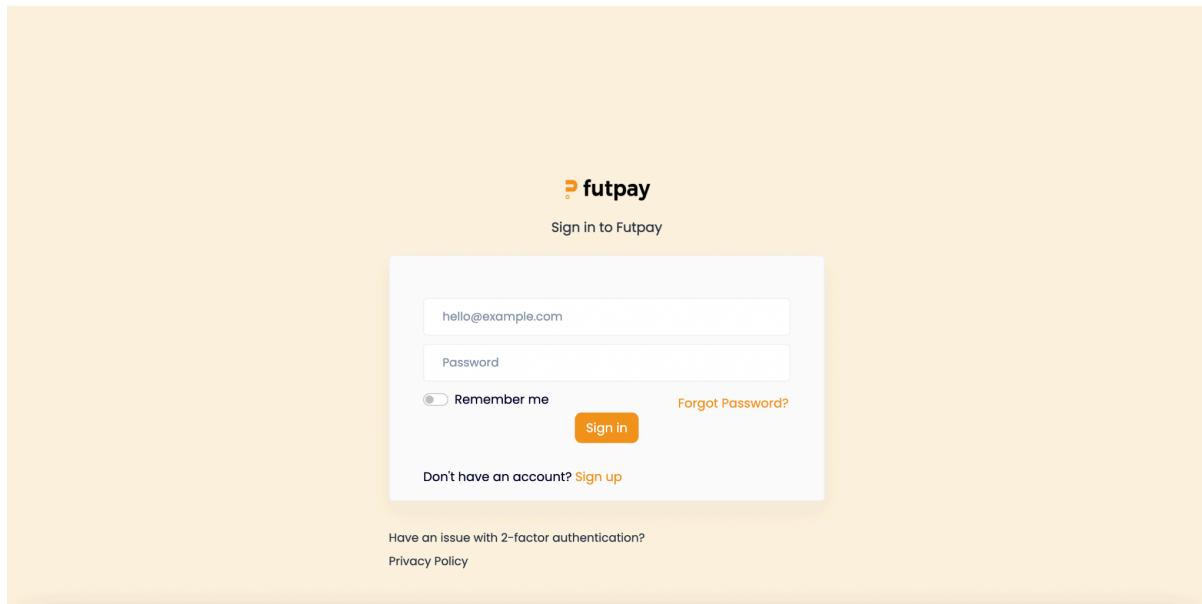


Fig 4.3.3 The signin page of the money exchange system

### 4.3.4 Dashboard Page

This is the page that displays key information to the registered user. It is designed to provide users with a comprehensive overview of everything that concerns their account, in order to manage it effectively.

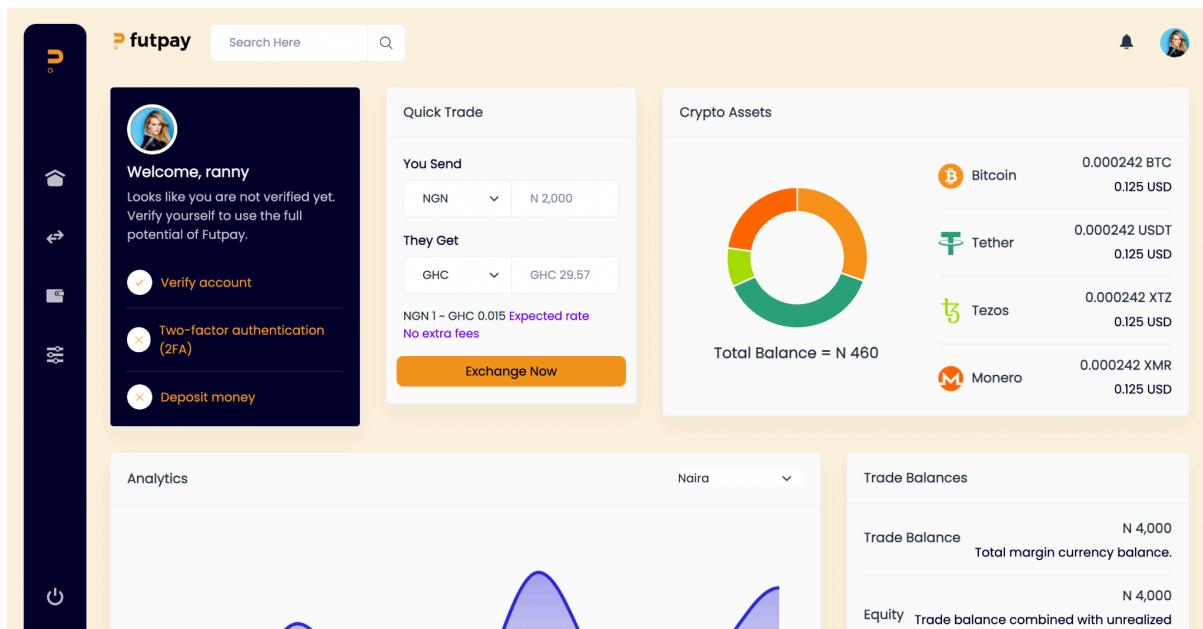


Fig 4.3.4 The dashboard page of the money exchange system

### 4.3.5 Dashboard Page with user icon

This is the dashboard page with the user icon that displays important user information, like profile, settings, account activity, etc

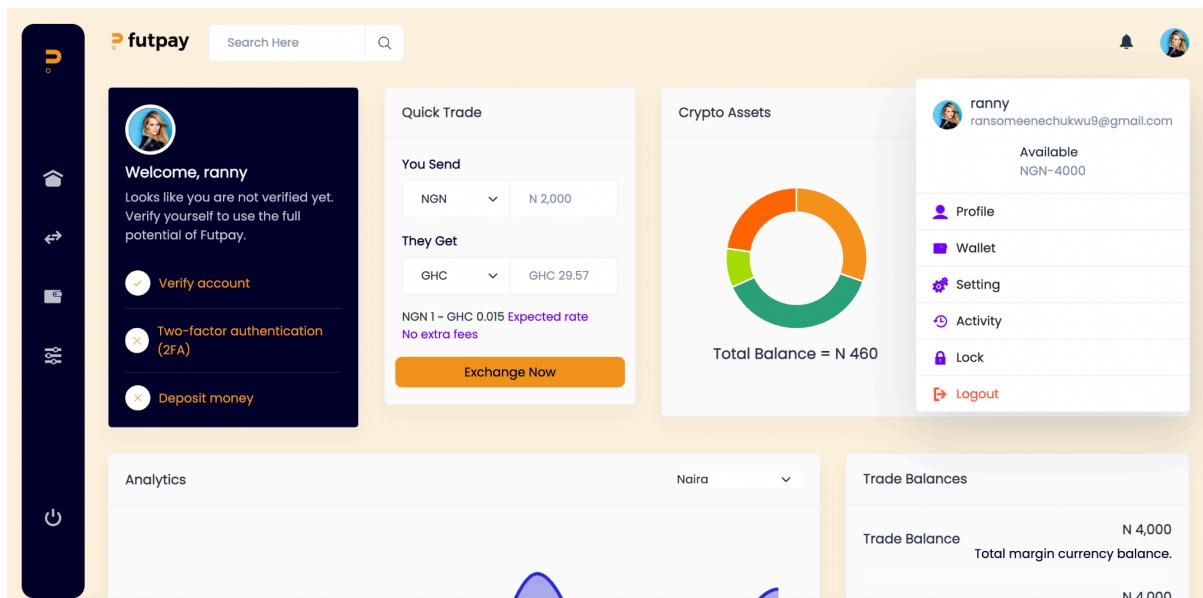


Fig 4.3.5 The dashboard page of the money exchange system

#### 4.3.6 Transaction Page

This page typically displays information about the fund wallet, transfer, withdraw and convert transactions. It also includes details about the fees and charges associated with transactions.

The screenshot shows the transaction page of the futpay system. The top navigation bar includes a back arrow, forward arrow, refresh button, search bar, and user profile icon. The main content area is divided into four sections: Fund Wallet, Transfer, Withdraw, and Convert.

- Fund Wallet:** Contains fields for Email Address (hello@example.com) and Amount (Enter the amount). A note states "Deposit charges apply after the first 10 Deposits". A "Pay" button is present.
- Transfer:** Contains "Send" and "Recipient" fields. "Send" shows NGN and NGN2,000. "Recipient" shows @username. Notes mention "NGN50 fee after first 20 transactions" and "No extra fees". A "Transfer" button is present.
- Withdraw:** Contains "Amount" (NGN 2,000) and "Currency" (NGN). Notes mention "Withdrawal charges apply after first 10 transactions". A "Withdraw" button is present.
- Convert:** Contains "From" (USD) and "To" (BTC). "From" shows 0.0214 BTC. "To" shows 0.0214 BTC. Notes mention "1 USD ~ 0.000088 BTC Expected rate" and "No extra fees". A "Convert Now" button is present.

Below these sections is a table titled "Fund Wallet Transactions" showing two entries:

Type	Currency	Wallet	Amount	Balance
↑ Fund Wallet	Naira	Using - Bank *****5264	₦ 2,000	₦ 4,000
↑ Fund Wallet	Naira	Using - Card *****8475	₦ 2,000	₦ 2,000

Fig 4.3.6 The Transaction page of the money exchange system

#### 4.3.7 Fund Wallet Transaction

Here a fund wallet transaction is being performed. A deposit of N4,000 was triggered

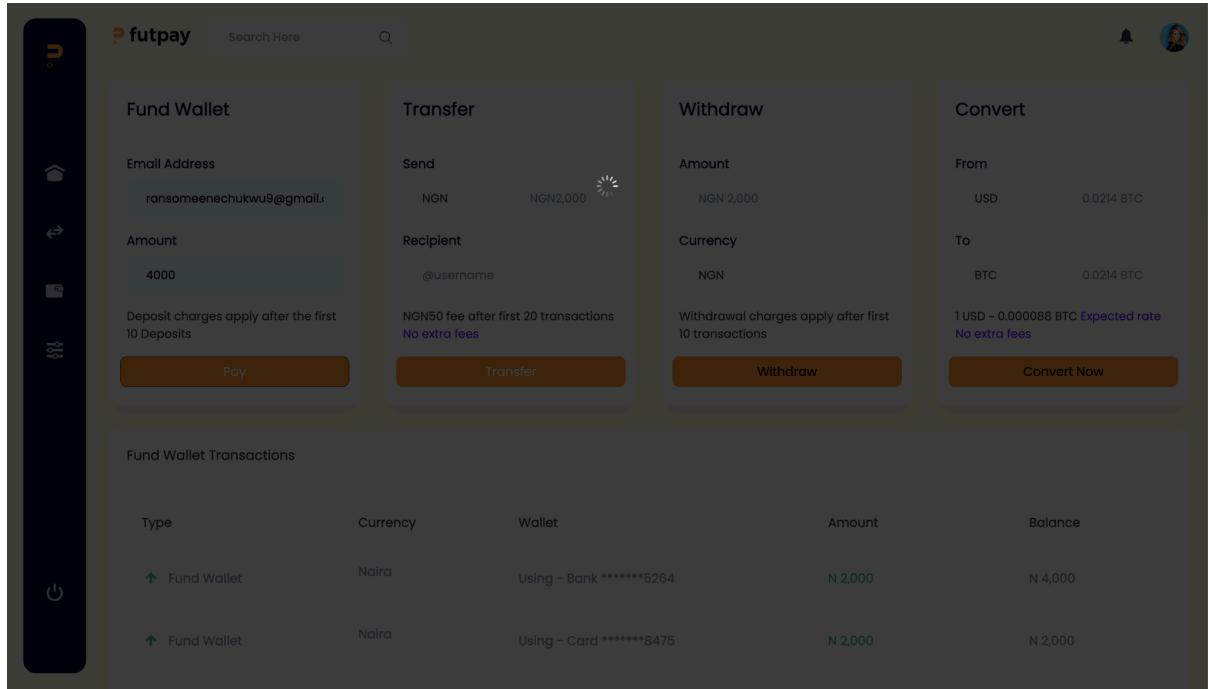


Fig 4.3.7.1 Fund wallet page of the money exchange system

In Fig 4.3.7.2, the transaction to process N4,000 was being triggered, with the integrated PayStack API, user can successfully fund their account.

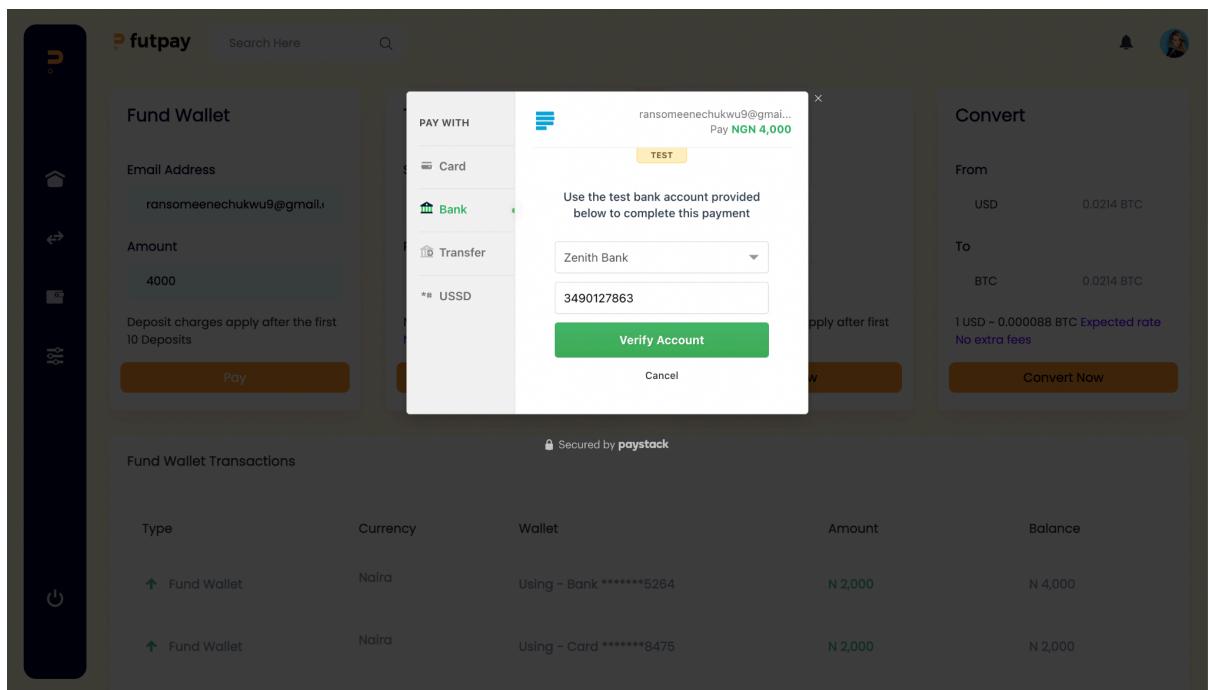


Fig 4.3.7.2 Fund wallet page of the money exchange system

#### 4.3.8 Transfer Transaction

A transfer transaction was triggered to transfer N2,000 to another user in GHC (Ghana Cedi).

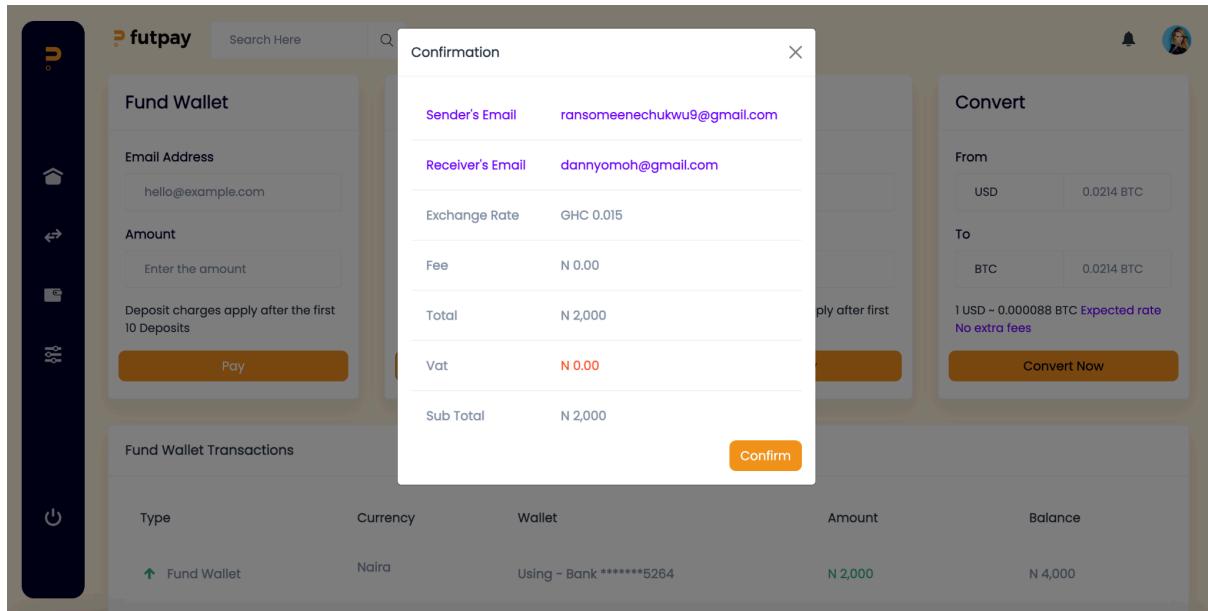


Fig 4.3.8 Transfer Transaction of the money exchange system

#### 4.3.9 Withdrawal Transaction

Here, a withdrawal transaction was triggered and by default, it fetches users saved bank card and email address.

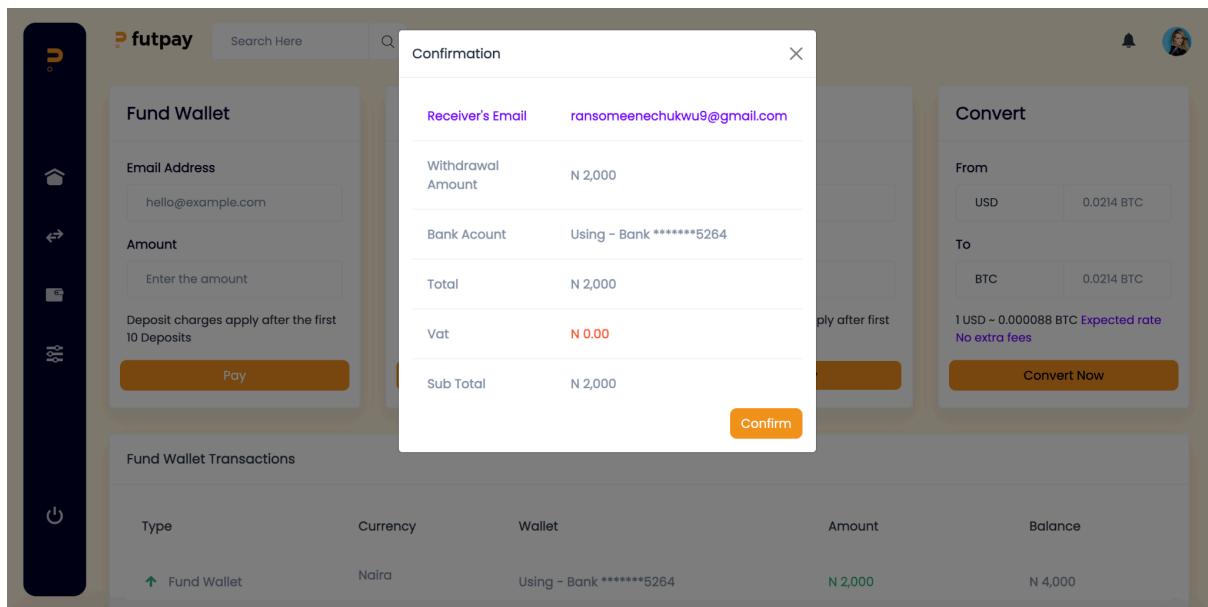


Fig 4.3.9 Withdrawal Transaction of the money exchange system

#### 4.3.10 Paystack Transaction

Below is the evidence of the deposit and withdrawal transaction

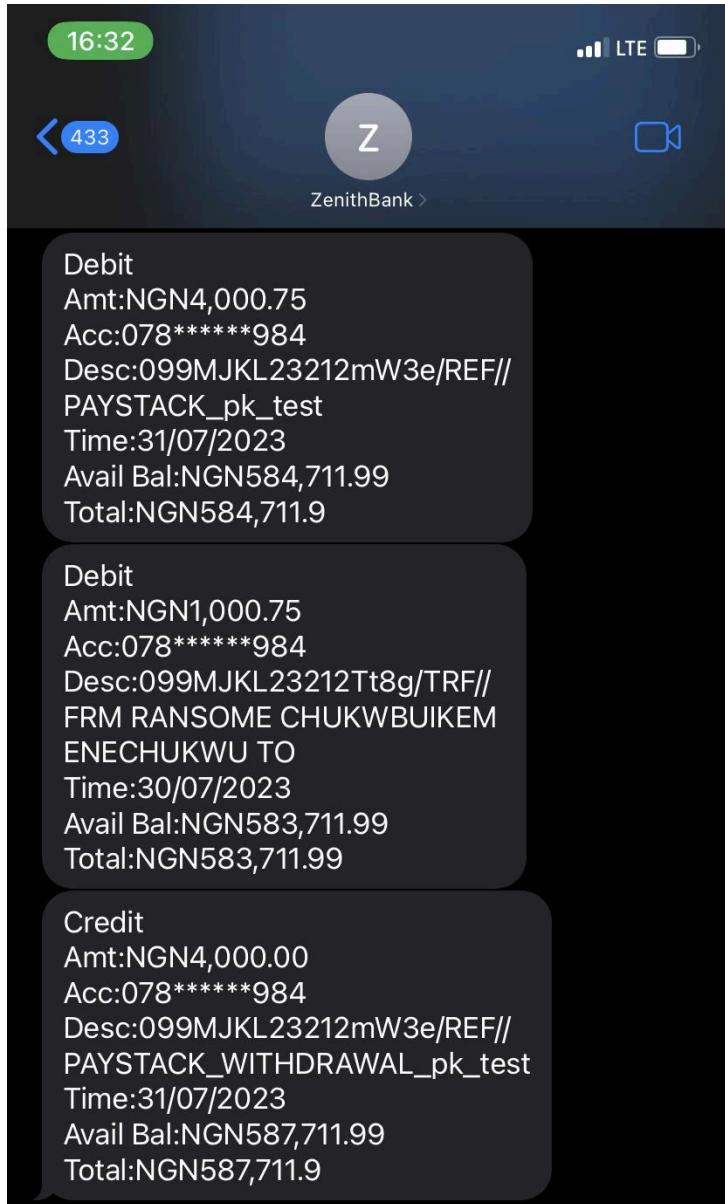


Fig 4.3.10 Paystack Transaction of the money exchange system

#### 4.3.11 Wallet Page

Here, more information about the user's account balance is displayed. User's can view their account balance, track their transaction history, and manage their account settings. And every balance is calculated in equivalent of naira, as the primary currency of the user.

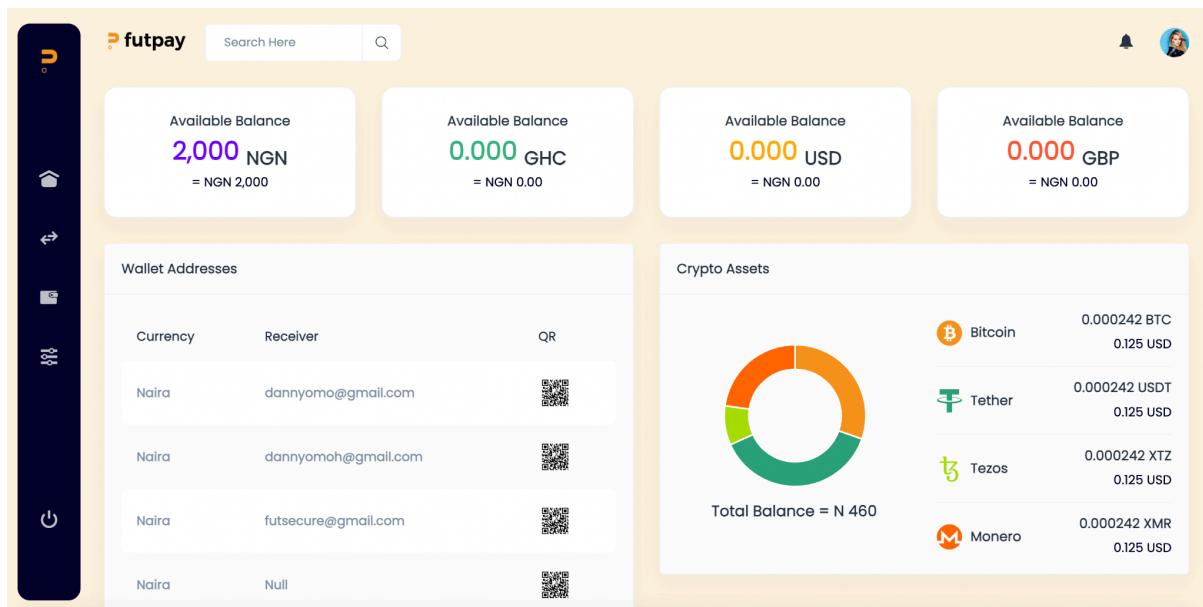


Fig 4.3.11 Wallet Page of the money exchange system

### 4.3.12 Profile Page

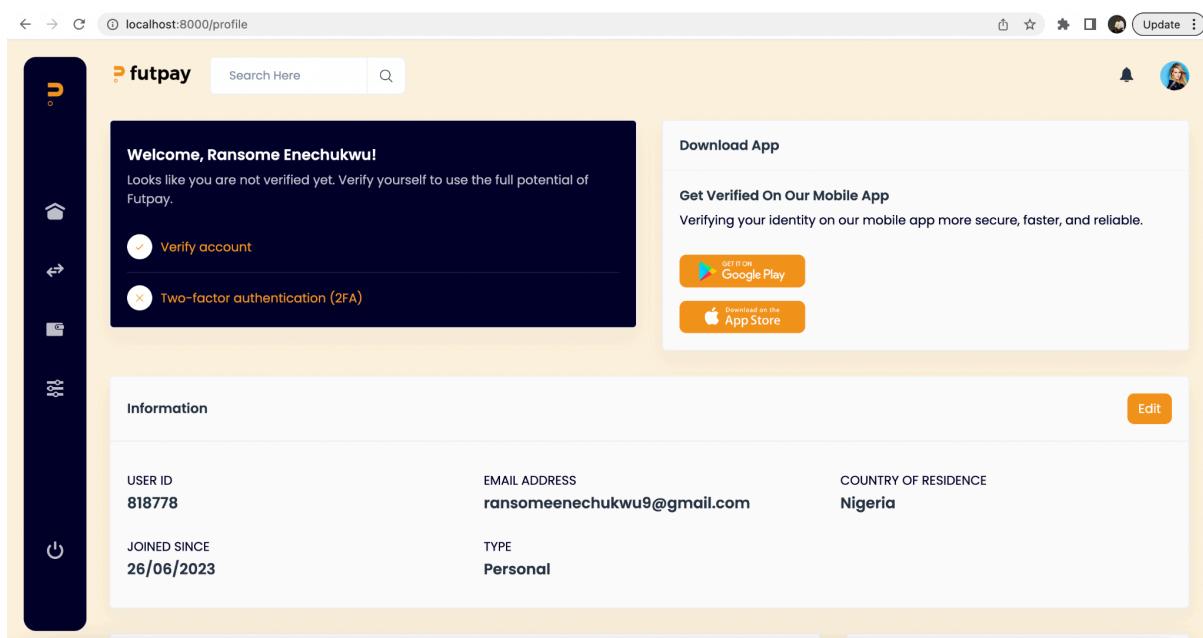


Fig 4.3.12 Profile Page of the money exchange system

### 4.3.13 Profile Settings Page

This page allows users manage their personal information and preferences. Users can update their name, email addresses, phone number and also change their password.

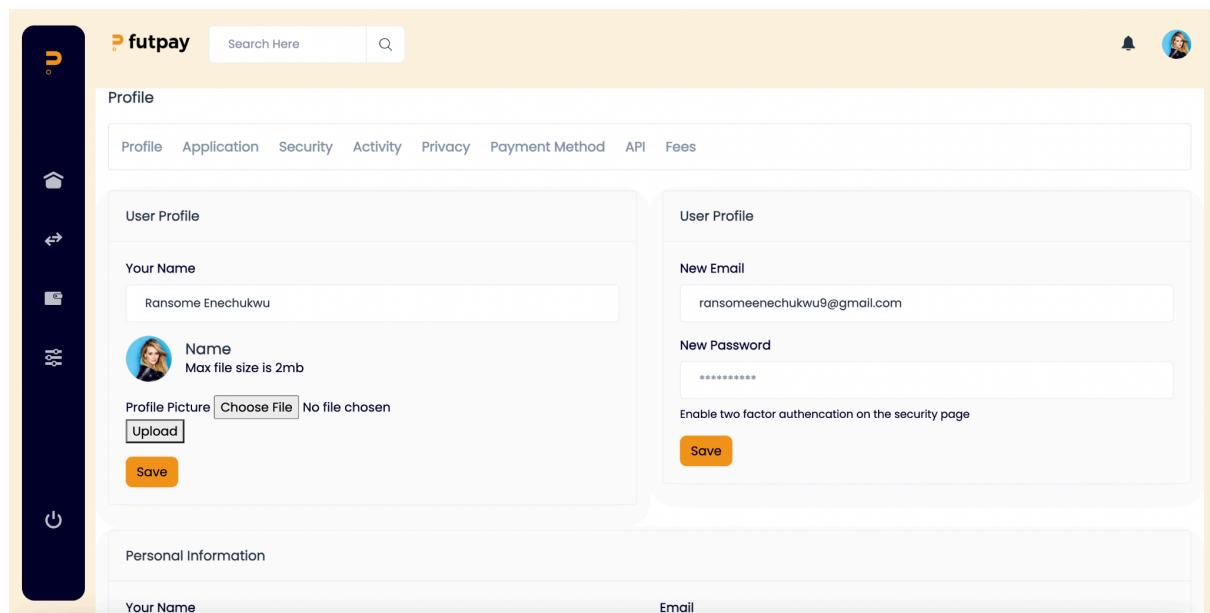


Fig 4.3.13 Profile Settings Page of the money exchange system

# **CHAPTER FIVE**

## **SUMMARY, CONCLUSION AND RECOMMENDATIONS**

### **5.0 Introduction**

This chapter summarizes the whole study from conception to the resulting system and concludes the project in its entirety. The project's main goal was to develop a web based application that would allow users send money from one place to another.

### **5.1 Summary**

A money exchange system is an online platform that allows users to exchange different currencies. The system typically includes features such as real-time exchange rates, transaction history, and account management tools. Users can typically initiate transactions, view their account balance, and manage their personal information and preferences.

The money exchange system underwent rigorous testing, and its performance surpassed the primary goals outlined during project inception. It delivers an intuitive user interface, seamless transactions, and robust security measures. This system stands as a testament to its efficiency in meeting the demands of the dynamic financial landscape, fostering trust and convenience for users worldwide.

### **5.2 Conclusion**

The successful development of the money management system has proven its efficiency and convenience in meeting the financial management needs of users. The system stands as a testament to the possibilities offered by web-based financial platforms, and its continued refinement will contribute to the advancement of financial technology in the future. As money exchange systems continue to evolve, there is a promising future ahead for digital financial solutions that empower users to take control of their finances with ease and confidence.

### **5.3 Limitations**

There is not a lot of research work on the development of money exchange systems that highlight all design features and proper architecture for money exchange systems.

Only test payments could be used to test the system. Paystack Live Payments come with a lot of requirements, most of which are not easily accessible at the moment.

### **5.4 Recommendations**

The web based money exchange system can be highly recommended for financial institutions, currency exchange businesses, and individuals seeking a secure, efficient, and user-friendly platform for currency conversions and international transactions.

## REFERENCES

- Ali, M., & Uyeno, Y. (2013). A Review of the Design and Implementation of a Web Based Automated Foreign Exchange System. *Journal of Computer Science*, 9(3), 231-236.
- Altexsoft. (2022). What are non-functional requirements. Retrieved from <https://www.altexsoft.com/blog/non-functional-requirements/>
- Auvolat, A., Frey, D., Raynal, M., & Taïani, F. (2021, February 17). Money Transfer Made Simple: a Specification, a Generic Algorithm, and its Proof. <https://doi.org/10.48550/arXiv.2006.12276>
- Auvolat, A., Frey, D., Raynal, M., & Taïani, F. (2020). Money transfer made simple: a specification, a generic algorithm, and its proof. doi.org/10.48550/arXiv.2006.12276
- Beattie, A. (2022, September 17). The History Of Money: From Barter To Banknotes. Retrieved from Investopedia website: [https://www.investopedia.com/articles/07/roots\\_of\\_money.asp](https://www.investopedia.com/articles/07/roots_of_money.asp)
- Burnett-Nichols, H. (2013, May 20). ATMs: How Automated Teller Machines Work - NerdWallet. Retrieved from NerdWallet Canada website: <https://www.nerdwallet.com/ca/banking/what-is-an-atm>
- Cesc, E. (2009, September 19). What is a Currency Exchange? Retrieved from Robinhood website: <https://learn.robinhood.com/articles/2q4o0SZxeXyihQ9E417q/what-is-a-currency-exchange/>
- Codere, H. (1968). Money-Exchange Systems and a Theory of Money. *Man*, 3(4), 557. <https://doi.org/10.2307/2798579>
- Chen, P., Kim, J., & Kim, Y. (2019). A Web Based Automated Foreign Exchange Trading System. *Journal of Intelligent Systems*, 28(4), 531-540.
- Chen, J. (2022, July 21). Exchange Rate Definition. Retrieved from Investopedia website: <https://www.investopedia.com/terms/e/exchangerate.asp>
- Dake, D. (2020, April 13). What is Forward exchange option? Definition and meaning. Retrieved August 4, 2023, from Dictionary of International Trade website: <https://www.globalnegotiator.com/international-trade/dictionary/forward-exchange-option/>
- Durelo, J. (2005, July 23). Currency Exchange International, Corp. - A Leading Provider of Foreign Currency Exchange Technology and Services in North America including

exchanging foreign banknotes, international wire payments, foreign check clearing and foreign draft issuance. Retrieved from www.ceifx.com website:  
<https://www.ceifx.com/>

Egan, J. (2021, November 22). ATMs (Automated Teller Machines): What Are They? Retrieved from Forbes Advisor website:  
<https://www.forbes.com/advisor/banking/atm-automated-teller-machine/>

Franklin, J. (2023). Gap between Technology and Money. Retrieved from Study.com website:  
<https://study.com/academy/lesson/monetary-system-overview-types-facts.html>

Ganti, A. (2022, September 14). Foreign Exchange Market Definition. Retrieved from Investopedia website:  
<https://www.investopedia.com/terms/f/foreign-exchange-markets.asp>

Geek, D. (2022, October 19). Types of Foreign Exchange Rate. Retrieved from GeeksforGeeks website:  
<https://www.geeksforgeeks.org/types-of-foreign-exchange-rate/>

IBM. (2021, March 4). Use-case diagrams. Retrieved from www.ibm.com website:  
<https://www.ibm.com/docs/en/rational-soft-arch/9.6.1?topic=diagrams-use-case>

IMF. (2000). Exchange Rate Regimes in an Increasingly Integrated World Economy -- An IMF Issues Brief. Retrieved from www.imf.org website:  
<https://www.imf.org/external/np/exr/ib/2000/062600.htm>

Islam, I., Munim, K. Md., Islam, M. N., & Karim, Md. M. (2019a). A proposed Secure Mobile Money Transfer System for SME in Bangladesh: An industry 4.0 perspective. *2019 International Conference on Sustainable Technologies for Industry 4.0 (STI)*.  
[doi:10.1109/sti47673.2019.9068075](https://doi.org/10.1109/sti47673.2019.9068075)

Johnson, J. (2015, January 31). Top 12 Foreign Exchange Companies | IMARC Group. Retrieved August 4, 2023, from www.imarcgroup.com website:  
<https://www.imarcgroup.com/foreign-exchange-companies>

Kadhiwal, S., & Zulfiqar, A. U. S. (2007). Analysis of mobile payment security measures and different standards. *Computer Fraud & Security*, 2007(6), 12–16.  
[https://doi.org/10.1016/s1361-3723\(07\)70077-5](https://doi.org/10.1016/s1361-3723(07)70077-5)

Kagan, J. (2019). Automated Teller Machine - ATM. Retrieved from Investopedia website:  
<https://www.investopedia.com/terms/a/atm.asp>

Kumar, R. (2014). International Monetary System - an overview | ScienceDirect Topics. Retrieved from Sciencedirect.com website:

<https://www.sciencedirect.com/topics/economics-econometrics-and-finance/international-monetary-system>

Lepoutre, J., & Oguntoye, A. (2018). The (non-)emergence of mobile money systems in Sub-Saharan Africa: A comparative multilevel perspective of Kenya and Nigeria. *Technological Forecasting and Social Change*, 131, 262–275. doi:10.1016/j.techfore.2017.11.010

Livvie, O. (2019, August 16). Money exchange. Retrieved August 4, 2023, from TheFreeDictionary.com website: <https://www.thefreedictionary.com/Money+exchange>

Majaski, C. (2021, August 26). Understanding Retail Banking. Retrieved from Investopedia website: <https://www.investopedia.com/terms/r/retailbanking.asp>

Mendler, abe. (2009, October 20). Forward exchange Definition & Meaning. Retrieved August 4, 2023, from Dictionary.com website: <https://www.dictionary.com/browse/forward-exchange>

Merritt, C. (2011). Mobile money transfer services: The next phase in the evolution of person-to-person payments. Retrieved from www.ingentaconnect.com website: <https://www.ingentaconnect.com/content/hsp/jpss/2011/00000005/00000002/art00005>

Merritt, C. (2013). MOBILE TECHNOLOGY: Transforming the money transfer market. Scitech Lawyer, 9(3), 18-23. Retrieved from <https://www.proquest.com/docview/1318021654?pq-origsite=gscholar&fromopenview=true>

Mosavi, A., Ardabili, S., & Várkonyi-Kóczy, A. R. (2020). Automated market maker system. In A. R. Várkonyi-Kóczy (Ed.), *Engineering for Sustainable Future: INTER-ACADEMIA* 2019. doi:[https://doi.org/10.1007/978-3-030-36841-8\\_20](https://doi.org/10.1007/978-3-030-36841-8_20)

Mirembe, D. P., Kizito, J., Tuheirwe, D., & Muyingi, H. N. (2008, November 1). A Model for Electronic Money Transfer for Low Resourced Environments: M-Cash. <https://doi.org/10.1109/BROADCOM.2008.37>

Muwanguzi, S., & Musambira, G. W. (2009). The transformation of East Africa's economy using mobile phone money transfer services. *Journal of Creative Communications*, 4(2), 131–146. doi:10.1177/097325861000400204

Naddine, M. (2016, June 17). 30.3 Exchange Rate Systems. Retrieved from open.lib.umn.edu website: <https://open.lib.umn.edu/principleseconomics/chapter/30-3-exchange-rate-systems/>

Njenga, D., Kane, F., Runefelt, C. (2018). Design and Implementation of an automated currency exchange system. *Information Technology and Management*, 18(2), 109-120.

Techopedia. (2021, June 8). What Is Automation? - Definition from Techopedia. Retrieved from Techopedia.com website: <https://www.techopedia.com/definition/32099/automation>

The Economic TImes. (2019). Definition of Systems Design | What is Systems Design ? Systems Design Meaning - The Economic Times. Retrieved from The Economic Times website: <https://economictimes.indiatimes.com/definition/systems-design>

Islam, I., Munim, K. Md., Islam, M. N., & Karim, Md. M. (2019a). A proposed Secure Mobile Money Transfer System for SME in Bangladesh: An industry 4.0 perspective. *2019 International Conference on Sustainable Technologies for Industry 4.0 (STI)*. doi:10.1109/sti47673.2019.9068075

Visual Paradigm. (2019). What is Sequence Diagram? Retrieved from Visual-paradigm.com website: <https://www.visual-paradigm.com/guide/uml-unified-modeling-language/what-is-sequence-diagram/>

Wikipedia Contributors. (2019b, December 12). Sequence diagram. Retrieved from Wikipedia website: [https://en.wikipedia.org/wiki/Sequence\\_diagram](https://en.wikipedia.org/wiki/Sequence_diagram)

