**THE CATHOLIC UNIVERSITY OF EASTERN AFRICA**

**FACULTY OF SCIENCE**

**DEPARTMENT OF COMPUTER AND INFORMATION SCIENCE**

**WEB BASED ECONOMY MANAGEMENT SYSTEM**

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**A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILMENT OF REQUIREMENTD FOR THE .NET FRAMEWORK.**

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**DECLARATION**

I declare that this is my original work and has never been submitted to any institution for the award of Certificate, Diploma or Degree.

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This project has been submitted for project purpose with approval of supervisor

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Date……………………………………………………………….

**DEDICATION**

I dedicate this project to my mother Isabella Mukhebi for giving me the support and opportunity to attain my university degree despite the hard economic times.

**ACKNOWLEDGMENT**

I would like to thank the Almighty God for giving me the breath and providing finances to support my education. I would like to thank him for strength and knowledge to help me successfully do the project.

I would also like to thank my beloved mother Isabella Mukhebi who despite the hard economic challenges was able to pay for my tuition and upkeep throughout my stay in school.

I give special thanks to Mr. Edward Kioko for tireless effort and supervision to see me go through this important project.

To my classmates whom we learnt together during my study period I say thank you so much. May the almighty God bless you abundantly.

**ABSTRACT**

*Covid virus continues to kill many people every day throughout the world. This can be linked to the fact that it is almost impossible to completely do away with human to human contact. Money is the most exchanged commodity between people and can be a good agent in the spread of the virus. There lacks a means to transact between people globally across the web and the available ones have limitations like geographical limitations and also hard to flip money to and from the web, making the process tiresome and takes a long time. Banking services are also yet to reach most parts of the world, as a result denying many people a chance to access the benefits of banking like easy loan application and earning an interest rate on savings. The aim of this project is to develop a web based economy management system to provide an easy way for people to exchange funds without contact, to provide remote banking to every global citizen and to fill the gaps left by current mobile money and banking services. The proposed system is based on three components: A database, a backend programmed in C# and an xhtml user interface. The database is centralized, the backend provides a method for communication between the interface and the database, and a user interface where the user can interact with the system.*

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**ACRONYMS**

SQL Structured Query Language

DBMS Database Management System

IDE Integrated Development Environment

ERD Entity Relationship Diagram

DFD Data Flow Diagram

**DEFINITION OF TERMS**

AGENT A special user who is responsible for updating other users account balance through withdrawals and deposits

DATABASE A collection of information in an organized manner.

USERS The people who interact with the system.

ERROR A defect in the program

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**CHAPTER ONE**

* 1. **Motivation and background**

Technology continues to shape every aspect of human life. The rate of change is so fast that most people barely notice it. Today in Kenya, Mpesa continues to fulfill a need that not long ago was a night mare to those involved in the business.

A recent video by the marketing manager at Safaricom said that mpesa started off as a method of the working population in cities to send money upcountry. In the beginning, sending money from Nairobi to rural Kenya was done by passenger buses which also offered courier services. This posed a major risk to money transfer given it was physical and also risks to the people involved during the handling of the money when huge amounts were involved.

The major need mpesa solved was ability to share money with loved ones without having to be in contact.

Soon with the growth of the company, they launched mpesa business which allowed businesses to receive money from clients and pay for supplies.

After 10 years of business, the Kenyan economy is still majorly dependent on paper currency.

Mpesa has slowly transitioned from a way to exchange money into a mobile wallet running on the STK. Today, most people use mpesa as a storage of value. In that they can upload money onto mpesa and withdraw it on a rainy day.

It even has a feature called mshwari which allows its users to open a savings account and get access to credit facilities. Mpesa is a brand of Safaricom which is a telecommunications company.

Taking a look into banking industry, they are managed by the central bank and their typical activities include:

* Opening of a personal and/or business account.
* Filling of personal, professional and legal documents
* Cash deposit
* Cash withdrawal
* Interbank transfer
* Providing loan services
* Salary

Money is a store of value. The books of history date batter trade as the first form of commerce. This involved exchange of goods for goods. A major fault with this type of trade is how to measure the volume of products equating to the offer presented.

Due to the limitations of batter trade, precious metals like gold and silver were adopted as a standard of exchange in that the potato farmer could equate a given number of potatoes to a gold same to the tailor and regardless of how much potatoes the farmer has, the only way to get the cloths was to exchange the potatoes he had to a standard (gold) then use it to purchase cloths from the tailor.

This form of trade also came in handy in that the Taylor might not need the potatoes but the farmer still wants the cloths. It allowed exchange of resources without putting the other party at a disadvantage.

However, all the gold and silver in the world was too little to handle the global commerce hence the United States under the leadership of John Kennedy decided to back the US dollar (A paper standard) as a legal form of tender. With gold under it’s wing because they had the largest amount of gold reserve. Other countries would then back their currency to the US dollar so as to maintain a stable global economy.

* 1. **Problem statement**

Even with the advancement in technology, there are still many people across the globe who do not have access to banking services. This has denied them the benefits of banking such as security for funds, easy access to loans and ability to earn an interest on savings.

Covid virus continues to spread fast and needs to be controlled. There lacks a way for people to efficiently exchange money without contact. The available services such as the use of ATM cards still puts people at risk of contracting the virus.

The cost of setting up a bank is still very high and requires a lot of documentation before one can start running banking services.

* 1. **Aim of research**

To come up with a web based system that will be able to handle exchange of finances between people and businesses and help come up with a paperless economy.

* 1. **Objectives of the research**

Without a powerful, effective economy management system, the Covid virus will continue to spread uncontrollably, marginalized areas of the world will not get access to banking services and loans will still be problem to those who cannot get the service.

At the end of this project, the following objectives will have been achieved.

* Review current systems to know its features and functionalities. This helps in understanding the pros and cons of the current system and to know how to best solve the available gaps.
* Analyze the current system to understand how its functionalities are implemented.
* Identify methodologies for carrying out the research.
* Come up with the requirements of the proposed system. This includes the requirements that will counter the faults of the current system.
* Design and implement the proposed system.
* Test the system in accordance with the requirements.
  1. **Justification of the research**

In 2020, the global fintech industry recorded a growth rate of 7.2% which is 2.1% higher than the growth rate recorded in 2019. Every other year, new crypto currencies continue to pop contributing to high volatility in the financial markets.

Even with the advancement in technology, many people in the globe still do not have access to banking services and are denied the benefits like quick access to credible loans to boost their businesses and earning interest rates on savings.

The Covid virus continues to spread fast and needs to be controlled. This can be done by limiting human contact including exchange of money between persons.

The proposed system will provide a banking service for people in marginalized areas giving them the benefits of banking services. It will also provide a way for people to exchange money between each other and businesses without the need for contact.

From the factors given it is no doubt there needs to be a system that counters the challenges in the current financial services in the country and the world as a whole.

* 1. **Scope of the research**

Information systems and technology as a whole has been used to improve processes, methods of storage and systems as a whole. This proposed system follows this by providing the following services.

* To provide a paperless economy for global trade
* To provide remote banking services to every global citizen.
* To provide secure anonymous inter-person money transfer
* To help reduce the spread of Covid 19
* To fill the gap left by current banking and mobile money services in Kenya.
  1. **Research organization**

The research is organized in chapters. Chapter one discusses the introduction to the research topic. Chapter two covers the research methodology, which addresses the methodologies for data collection, system analysis, system design, system implementation, system testing and system deployment. Chapter three covers the related systems, reviews, emerging trends and the research gap in the research area. Chapter four takes care of system analysis which describes current systems, requirement analysis, feasibility study and its conclusions. Chapter five covers the system design which describes the proposed system, its weaknesses and strengths, conceptual architecture and input/output of the proposed system. Chapter six covers implementation and testing, development of a testing plan, evaluation plan and showing system screenshots. In chapter seven, it covers conclusions and recommendations, findings and problems encountered in the research.

**CHAPTER TWO: RESEARCH METHODOLOGY**

**2.1 INTRODUCTION**

This section covers specific procedures and techniques used to identify select, process and analyze information about the economy management system. This also describes the stages of research, data collection process and data analysis process. Different methods were used including questionnaires, observation and interviews.

**2.2 METHODOLOGY FOR LITERATURE REVIEW**

The literature will be reviewed under the following themes:

* Economy management methods
* Impacts of mobile money in the banking industry
* Trends in online commerce management systems
* Problems and issues surrounding online banking
* Reasons for doing business on the internet.

The analyst will have to go through books, journals, articles and through online search on topics related to the above themes. Journals, books and articles will be gotten from The Catholic University Learning Resource Centre and also from the internet. The source documents that are going to be used will be from the year 1995 to present.

**2.3 METHODOLOGY FOR REQUIREMENT SPECIFICATION**

**2.3.1 Data Collection**

In this study, three data collection techniques will be used including: questionnaires, interviews and observation. The goal will be to get different and diverse feedback from the different stakeholders including staff in banking industry, users of mobile money and internet banking and business owners in order to have a holistic view of the research.

**2.3.1.1 Questionnaires**

Three different questionnaires will be used each targeting different audiences: staff in the banking industry, users of mobile money and internet banking and business owners. The questionnaire will be shared through social media and by physical means through few agents around Nairobi. The questionnaires will be given to both Citizens and Non-Citizens in Kenya aged 18 years and above. The questions in the questionnaires will be brief and will not take a respondent more than 10 minutes. This is important so that the respondents do not tire from many questions.

The questionnaires will then be collected for analysis. These questionnaires will be available for a period of two weeks so that we can get a lot of input and opinions. Advantages of questionnaires are: It will allow for large amounts of data to be collected from a large number of people in a short period of time. It is also cost effective. It can also be analyzed scientifically and objectively much better than other forms of research and finally the questionnaires will be easy to quantify by the researcher.

The disadvantages of questionnaires on the other hand are: Respondents may not be 100% truthful with their answer with reasons including: social desirability bias and attempting to protect privacy. Also when using questionnaires, there are chances that some questions may be left unanswered. This may affect the depth of the research. The respondents may also not understand certain questions and may have different interpretations of the questions. This miscommunication can lead to skewed results.

The samples of the questionnaires used can be found in the appendix.

**2.3.1.2 Interviews**

Interviews will be used to collect data from business owners in Nairobi County. The goal is to discover the issues that they come across when dealing with digital transactions while customers are paying for goods. Interviews will be carried out in supermarkets and commercial outlets where different staff in different departments will be interviewed. The interviews will only last for 10 to 15 minutes. Two interviewers will be needed in order to interview at least 20 staff members in a day. The interviews will only be carried out in one day.

The advantages of using interviews are: Interviews have a better response rate than mailed questions and the people who cannot read or write can answer back. With interviews, it is also easier to capture the verbal and non-verbal cues including body language and enthusiasm. This is key in order to get a better understanding on different topics. Oral interviews are also flexible in the manner that the interviewer can open more perspectives to the topic and also give additional information.

The disadvantages of interviews include: Interviewing may limit sample size if the size of interviewing staff is limited. Conducting interview studies can also be costly as well as very consuming. Interview studies also provide less anonymity which is a big concern for many respondents; this may hinder us from getting very honest respondents.

The sample interview can be found in the appendix.

**2.4 METHODOLOGY FOR SYSTEM ANALYSIS**

The methodology will provide a description of the system analysis and its component pieces and how they interact and work together to accomplish the systems main goal. This description will use tools such as data flow diagrams, flow charts, context diagrams, case diagrams and sequence flow diagrams.

Data flow diagrams will be used to show how the data will be processed by the system, this is inputs and outputs. The main focus of data flow is showing the flow of information.

Flow charts will also be used to show the sequence of steps and decisions used to perform various system processes.

Case diagrams will be used to describe various actions the system will be executing with the end users of the system.

The context diagrams will be used to generalize the function of the system with relation to external entities.

Sequence diagrams will be used to describe how and in what order group of objects in the system work together.

**2.5 METHODOLOGY FOR SYSTEM DESIGN**

System design is the process of defining the elements of a system such as the architecture, modules and components, the different interfaces of those components and the data that goes through that system.

System design will mainly focus on the general outlook of the system, the user interface; that is what the users see and use in order to interact with the system.

**2.6 METHODOLOGY FOR SYSTEM IMPLEMENTATION**

**2.6.1 Front End**

This is the user interface that the user will be using to interact with the system. The following languages and frameworks will be used.

1. XML - This is a computer language devised to allow website and application user interface creation. It will be used to design the website elements such as navigation bars, footers, headers, input elements and buttons.
2. CSS – Is a style sheet language used to format the layout of web pages so that they look beautiful and appealing to the eye. In the proposed system, CSS3 will be used to make the website look attractive and elements to look well-arranged such as images.

**2.6.2 Back end**

The backend is composed of the parts that the user of the site can’t actually see. It is composed of processes, programs or scripts that a user cannot see. These scripts run every time that a page is accessed. The following languages will be used to implement the backend:

1. C# - C# is a widely used open source general-purpose scripting language that is especially suited for web development using the .Net framework. C# will be used to do the processing and to connect the XML to the SQL database.
2. SQL Server – It is a Microsoft-backed open source relational database management system (RDBMS) based on Structured Query Language (SQL). SQL Server is also capable of replicating data and partitioning tables for better performance and durability. It also has stored procedures and views which is a great advantage when it comes to data retrieval in the database.

**2.7 METHODOLOGY FOR SYSTEM TESTING**

System testing is an integral part of system development. This is key because it helps us to know whether a system has met the requirements set forth in the beginning of the system development process. Unit testing, integration testing, system testing and acceptance testing are the testing methodologies that will be used in the proposed system.

Unit testing involves testing of individual components of the system. The purpose is to validate that each unit of the software code performs as expected. A unit may be an individual function, method, procedure, module or object. Individual objects/functions/classes can be tested to see whether they are functioning as they are required to. This testing methodology can be done while the system is still in development stage. When it is done, it can help to reduce the costs involved. It is in the light of the above advantage that this testing methodology will be carried by the system developers while they are coding.

Integration testing is a testing methodology that involves testing how software modules are integrated logically and tested as a group. Integration testing focuses on checking data communication amongst the modules. Integration testing is very key since it will help software developers to identify the defects in the interaction between these software modules when they are integrated. It will be carried out by testers and software developers in the later stages of system development.

System testing is another methodology where the completed system is tested as a whole. In this methodology, the system will be tested to evaluate end to end system specifications. System testing will be done by professional testing agents on the completed software product before it is introduced to the market.

The final methodology is acceptance testing that is carried out to ensure that the system has met the user’s requirements. It will be carried out by the actual end users of the system once the system is fully developed.

**2.8 METHODOLOGY FOR SYSTEM DEPLOYMENT**

The main goal of system deployment is to make the new system available to end users in an organized fashion; with coordinated training, documentation and support procedures as needed. System deployment will be deployed in parallel. This will give the users time to get used to the system easily.

The methods of system deployment of the proposed system will involve project managers, developers, testers and the end user. Initial and ongoing project planning will ensure a smooth transition from development into production. It will involve system monitoring; reporting any problems that may arise and training end users on how to use the system. When the reported problems are solved, the transition to the proposed system begins and the client can finally sign off.

**2.9 CHAPTER SUMMARY**

In this chapter, we have highlighted on the methodologies for data collection and the analysis of the data, methodologies for system analysis and design testing and the methodology for system deployment.

**CHAPTER THREE: REVIEW OF RELATED WORK**

**3.1 INTRODUCTION**

This chapter reviews the literature relevant for the definition of The Economy Management System. It examines several texts in order to establish the fundamentals of economy management and digital banking.

**3.2 HISTORY OF RESEARCH**

Money is a store of value. This argument goes back to the origin of the paper currency and trade. The books of history date batter trade as the first form of commerce. This involved exchange of goods for goods. A major fault with this type of trade is how to measure the volume of products equating to the offer presented. E.g*. A potato farmer would like to get cloths from a tailor who also needs some potatoes. Measuring a volume of potatoes to equate to a piece of cloth was dependent to the parties involved. This often resulted in unfair trade,*

Due to the limitations of batter trade, precious metals like gold and silver were adopted as a standard of exchange in that the potato farmer could equate a given number of potatoes to a gold same to the tailor and regardless of how much potatoes the farmer has, the only way to get the cloths was to exchange the potatoes he had to a standard (gold) then use it to purchase cloths from the tailor.

This form of trade also came in handy in that the Taylor might not need the potatoes but the farmer still wants the cloths. It allowed exchange of resources without putting the other party at a disadvantage.

However, all the gold and silver in the world was too little to handle the global commerce hence the United States under the leadership of President John Kennedy decided to back the US dollar (A paper standard) as a legal form of tender. With gold under its wing because they had the largest amount of gold reserve. Other countries would then back their currency to the US dollar so as to maintain a stable global economy.

A bank is a company that a citizen of a country decides to store money in with the assurance that when they come to ask for it they will be given.

After the introduction of gold standard, some people would have so much money that they did not know what to do with it. This posed a major risk to them. There were also people who would run out of gold and still needed to take care of themselves. e.g. a farmer only harvests once a year. During the other time of the year, he is busy tilling his land yet he still had some needs to take care of. So he would go to those with much gold and ask for some in that when he gets his harvest, he would pay back. The people with much money lying around found an opportunity to lend those with less and intern get a little profit from it.

Soon the business became big that they would sometimes run out of gold to give to those with less. So they decided to ask others with much gold to come in and take part in the business and in-turn get a small commission out of it.

As business continued to grow, the relationship between bank owners and investors grew to people with little connection hence a need for a common understanding in that if an investor comes in and gives his money, when he comes to ask for it regardless of the person in the office, he would still get his money. So they came up with something called a Memorandum of Understanding (MOU), which was a piece of document that showed how much the bank owners owed the investors. Soon many banks opened up and each had their own MOU. This posed a major limitation when an investor in one region wanted to get access to his money and he was in another region, where his bank is not available and his MOU is not recognized.

The need for a common MOU between banks led to the founding of the Central bank which was tied to the national government. The central bank came up with their standard MOU and agreed that every bank in the country would use the common MOU as a form of legal tender. Every country soon set up its own central bank and created their own legal tender for use within the country then backed it up with the US dollar which was backed up by gold.

For the bank to stay in business, it takes money from the investors and invests this money into loans where it gets a profit from with the promise that when the investor comes to ask for his money, he is readily offered.

As the number of investors and borrowers increased, the banks started to allow exchange of money between its people allowing employers and businesses to transact easily, efficiently and securely.

Banking over the years has evolved and now people mostly use digital form of money to transact and do business. The need for paper currency has also greatly reduced and new forms of money like bit coin which are based on the block chain technology have come up and are promising to completely revolutionize commerce.

**3.3 REVIEW OF RELATED SYSTEMS**

In this section, we will review current Economy management systems and digital banking systems. We will notice that there will be common features in the systems.

**3.3.1 PayPal**

PayPal is an online money management system that uses an email address as the primary identification for its users. It gives its users an ability to send money to each other efficiently and fast across the web. It also provides commerce services to businesses allowing them to receive payments and pay for goods and services efficiently. It also offers security to its users providing a means to ask for a refund in cases of fraud. PayPal also gives loans to businesses using their services with a clean track record. The services from PayPal can be accessed from the website <www.paypal.com>

**3.3.2 Bit Coin**

Bitcoin is a digital currency based on the block chain technology. Bitcoin was founded in 2010 by Santoshi Nakamoto whose aim was to develop a secure method for people to transact while preserving their anonymity. Bitcoin was added to the stock market and has had high volatility making it a good product to trade in the financial market. This has led to its wide spread acceptance and businesses are slowly accepting it as a form of payment. Bitcoin can be stored in several crypto wallets available online at a cost. The original Bitcoin website is <www.bitcoin.org>

**3.3.3 KCB online banking**

KCB is a banking institution in Kenya. It was founded in 1993. It has been providing banking services to the Kenyan population and has kept up to date with technology. Now KCB offers a web terminal where users can view their account balances, send money to other bank accounts and pay for goods and services directly from the web interface. The web terminal can be accesses through the link <onlinebanking.kcbhroup.com> The site provides an efficient way for the bank users to access and use their funds.

**3.3.4 Mpesa mobile money**

Mpesa is the leading mobile money company in East Africa. It has been operational for twenty two years. It offers a flexible way for its customers to withdraw and deposit money into the system.

The Mpesa system provides a way for people to send money to each other, deposit and withdraw cash from various agents across the country, buy airtime, get loans and save and also to pay for goods and services in shops and supermarkets.

Mpesa is offered in a mobile application and through the sim toolkit.

**3.4 EMERGING TRENDS AND PATTERNS IN RESEARCH AREA**

There are various trends that are impacting economy management and digital banking. These trends are geared towards transition to a paperless economy and attracting people to the thought of technology backed commerce. Below are the trends that are currently impacting economy management.

Block chain technology: This is a technology that guarantees security for online transactions. It involves a legal contract that is replicated across a wide number of computers making it hard for a hacker to interfere with without being detected. This technology has been used to develop digital currency like bitcoin and Etherium which are increasingly being recognized and accepted by people and businesses across the world as a form of payment.

Personalization: This is a technology that is implemented by the use of Artificial Intelligence and makes customers or website visitors to get personalized product recommendations. AI works by using data to learn about the users and providing knowledge to be used to recommend different products to different users based on the analysis.

Use of APIs is also another major trend in economy management. Financial institutions like banks and middle men like visa and master card used APIs to extend their services to end users. Web developers use these APIs to integrate the payment systems to commercial applications allowing customers to pay for goods and services without the need to change websites.

**3.5 RESEARCH GAP FILLED BY RESEARCH**

Information technology tools have been used to increase efficiency by automating processes, managing and processing information. The proposed system will use these information technology tools so as to fill the gap in economy management by doing the following: Providing an easy to use banking systems for anyone around the globe with access to the internet, providing a seamless method for people to do commerce online securely across the globe, to provide a common digital currency that can be used to purchase goods globally without the need for middle men like banks, to provide loans and saving interests to people who use the system regularly and finally to provide anonymity in online transactions and help get rid of paper currency.

**3.6 CHAPTER SUMMARY**

In this chapter, we have reviewed the history of commerce and economy management. We have also reviewed current related systems to our research and finally talked about the gap that our research project fills. This chapter’s main goal was to help us to understand our research area so as to develop a system that meets current standards in terms of functionality and fills the gap in the research area.