-

JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF INFORMATICS AND INNOVATIVE SYSTEMS
DEPARTMENT OF COMPUTER SCIENCE & SOFTWARE ENGINEERING

A project Proposal Submitted to the School of Informatics and Innovative Systems at Jaramogi Odinga Odinga University of Science and Technology

DIGITAL VOUCHERS

By

KIPLAGAT KELVIN MUTAI

AND

MUNG'ATIA FRED MUTHURI

A Project report submitted to the board of undergraduate studies in partial fulfillment of the requirement for the Award of a bachelor degree of science in computer security and forensics of Jaramogi Oginga Odinga university of science and technology

MARCH 2020

DECLARATION AND APPROVAL

Student

I, the undersigned declare that this research project is our original work and that it has not been presented in any other university or institution for academic credit.

Signature …….

Date…….

KIPLAGAT KELVIN MUTAI

I132/0644/2016S

I, MUNG'ATIA, FRED MUTHURI declare that this report is sorely mine, based on my system in conception, and has never been presented before by neither any other author nor I or under any other discipline.

Signature …….

Date…….

MUTHURI FRED MUNG'ATIA

I132/0655/2016S

UNIVERSITY SUPERVISOR'S APPROVAL

This research project report has been submitted for examination with my approval as university supervisor.

Signature…….

Date…….

DEDICATION

KIPLAGAT, KELVIN MUTAI

I132/0644/2016S

I dedicate the entire work carried here in to my Mum Mrs. Emily sang for their inspiration all through my course. I would like to appreciate all my lecturers who instilled in me lifelong values and the desire for education. Finally, I would like to appreciate all of you who have contributed to my success and have not been mentioned above, remember that all your efforts are highly appreciated and you will never be forgotten for your stake in my life, God bless you all.

MUNG'ATIA, FRED MUTHURI

I132/0655/2016s

I would like to dedicate this entire work to lovely family and their unseizing support all through my course. Also, I take this opportunity to thank my lecturers for believing in me and instilling a role of focus, determination and self-motivation in my education. Finally, I would like to appreciate my colleague for his support and cooperation through the entire process, not forgetting all of who have contributed to my success and have not been mention here.

ACKNOWLEDGEMENT

We would like to acknowledge God Almighty for the strength, sound mind and provision during the period of study. Special thanks to our supervisor Dr. Raburu and other pannelists for their immense support, guidance and patience, and without their constructive criticism and advice this work would not have been complete. We also register our gratitude to our parents and siblings for their continuous encouragement during this journey, my university Administration (Jaramogi University) for providing an enabling environment for us to complete the course and access the labs during weekends and at night. Thank you to all my friends who contributed to the completion of this academic document both directly and indirectly. They provided me with logistical and moral support that gave us every reason to work harder and ensure that this study becomes a success.

To all of you, God bless and increase you immensely.

Table of Contents

List of Tables

List of Figures

ABBREVIATIONS & ACRONYMS

API: application programming interface

DFD: data flow diagrams

SDLC: system development lifecycle

TLC: transport layer security

ABSTRACT

Vouchers have been there since 19th century, but did we think of having them digitalized? I thought of this idea in a special and great approach. A digital voucher would be a commodity of value that would be universally accepted and would allow your loved ones, family, friends and you to shop and pay bills using your banking account without having necessarily account interaction, through our cyber security techniques. A voucher being an entitlement to access services worth less or equal to the set value, means that access value can only be given and one can't escalate their privileges.

These family members, friends, loved ones and yourself can't an access a banking industry due to their age or nationality physically. But you understand that if we lock this group out, we will be failing economically. This project contributes basically to our country's (Kenya)vision 2030 strategic plan by integrating through money flow. It touches lightly on our academic life, technology, through processing of digital vouchers as commodity of value.

In many cases, a good demography lack an opportunity to actively participate in an active economic growth. One of the ways to involve all human in economy is by accepting their mode of payment, now that other money transfer platforms have laid down policies that excludes a certain demography e.g. use of a national identity card, intelligently we have brought them on board. Through the use of blockchain, we can assure security of your commodity value, that is done through our system. Digital vouchers will be able to harmonize worlds' economy and to treat it as one community. The fact that technology came in place to make the world a global village, we still had a certain demography in diaspora due to currency difference.

Digital vouchers is a commodity of value that one have for convenience supply of goods and services. These vouchers will be encrypted block by block to ensure that even a man in the

middle can only get the digest and can never decrypt the hash to a usable code. Since blockchain is bringing security to our doorstep, we ought to embrace it for our own security. Therefore, by the use of blockchain technology, we put this idea to an implementation.

CHAPTER ONE

1.0 INTRODUCTION

Physical money is bulk, enough risk of having it. A parent wouldn't give his/her child enough money for the whole term due to fear for loss. Equally, foreigners, however how much we promise security, they fear attack and loss if they held their money. Digital voucher is a monetary commodity that can undergo termination if one suspects vulnerability like lose.

Technically, digital vouchers are secure due to the use of blockchain technology, where every class is treated separately as a block, and therefore blockchain implemented. All the way from personal details, the value of the voucher, the timestamp, the voucher code, the balance and in any other relevant information in a block that an attacker can use to get any information for attack analysis.

For a quick learning of the system, the bill will be served in the country's value e.g. 1200 Zimbabwean Dollar, then during payment, that value will be translated in DV by the merchant DV system e.g. 40DV that can help the customer very fast to tally, the value of the bill in his/her known currency e.g. 400Ksh. Therefore, the Zimbabweans will accept a digital voucher as 1DV is 30ZWD, and in Kenya 1DV =10Ksh. 10Ksh and 30ZWD has the same value that is harmonized by 1DV which still is the same value.

This type of digital currency can be monitored; therefore, it is a system that would really look into standards as per the world bank's policy, Bankers association, and any other legal and relevant authority in this case.

1.1 BACKGROUND OF THE STUDY

The main reason that APIs matter so much in modern markets is that they allow for faster authenticity especially when payment is put in question. Barriers to change are reduced and more people can contribute to an organization's success. They offer two-fold benefits: the company can create better products while standing out from the competition. Digitalizing of voucher tickets depends much on API key generation with help of a push key. API key in our voucher will be used by client's customers in purchasing good and service using random generation of keys.

1.2 PROBLEM STATEMENT

Any state has its statutes that govern it. In our country Kenya there are rules that govern the rights of having the identification cards and is of more challenging to the people under age of 18yrs and the foreigners also few locals who visit our country more often. By extension a good number of money transactions require a national ID card for transaction support. With digitalization of voucher our system will create an environment where both the foreigner and people under age of 18yrs will be able to purchase goods and services without the need of them having a mobile banking device or a local bank account i.e. for an ATM card.

These two categories of people are victimized and vulnerable. Therefore, I encourage them to have a Digital Voucher account, of which with it, parents, guardians, tourist support companies, friends or even themselves can do an exchange from any bank as long as terms and conditions are adhered to. The basic requirement is when you buy the commodity, the bank through which the transfer is made has the amount worth the Digital Vouchers value. May it be The Bank of Uganda, Mpesa, KCB, Western Union etc.

After buying, an encrypted code is generated reflecting from the value of the voucher. This digital code will be encrypted and should have a single generation. Therefore, you can't regenerate due to its uniqueness.

The following problems are to be solved;

i. People under age of 18yrs will be able to access exclusive services through digital vouchers without having identification cards.
ii. Foreigner who visits our country will be able to purchase and have services offered without much strain of looking for a bank to change their currencies or identification procedures, just use the money in his/her account.
iii. local people with lost identification card are able to interact with our system till while the id card is processed.
iv. We will have a secure and monitored sales routine, especially for the pupils and high school students by parents, the company hosting its tourists is able to approximate for expenditure and have a strategic plan towards tourism industry.

1.3 .0 OBJECTIVES

1.3.1 MAIN OBJECTIVE

We aim to come up with a blockchain system that is secure to engage actively in an economic activity by developing a digital voucher system that bridges different countries for purchase of goods and services, this commodity of value can also be used to measure value and compare different value of parties.

1.3.2 SPECIFIC OBJECTIVES

i) To develop a seamless system that will be universally accepted, and that can integrate with other money transfer platforms to have a common chance in e-commerce in the world wide economy in the cyberspace.

ii)To develop a system that will record items of transactions. This will build an economic statistics' platform that will help a state in narrowing down the upcoming industries that they need to localize to give the world a better, variety of goods and services.

iii) To embrace cyber security and appreciate diversification of economic growth, by ensuring we have a secure economic network, that gives all the stake holders a common, just and equal economic ground.

1.4 JUSTIFICATION AND SIGNIFICANCE OF THE SYSTEM

Upon the completion of design of the system, the various users of the system will benefit from the system in the following ways:

1. Improvement of security since the system ensure that clients are well secured through blockchain and TLS; which is a standard that keeps an internet connection private and checks that the data sent between two systems (a server and a server, or a server and a client) is encrypted and unmodified. rough

2. The system will set free economic actors by eliminating a situation norm that one need to have identification card to access a given service.

1.5 ASSUMPTION

1. The system has the assumption that the system users are literate or semi-literate.

2. All system users have the access to smart phones, tablets, PDA and computer.

3. There is real time money transfer in inter-banks.

1.6 SCOPE OF THE STUDY

Generally, the idea digital voucher cuts across the Merchant Centers or with the API client's endpoint for a single project when creating an API client.

Involves the under 18 youths some locals and foreigner, also the client and the merchant where service will be offered. The system can accommodate more than 70 -90, 000 both clients and merchants.

CHAPTER TWO

2.0 LITERATURE REVIEW

A number of analyses of web services in the industry and, especially, of RESTful APIs, have been presented. They usually focus on characteristics inherent to the API design. This work presents a new research direction by developing a systematic study of RESTful APIs focusing on how providers deal with non-functional properties in plans by establishing limitations, such as rates and quotas. The point out that hardly any of the services claiming to be RESTful is truly RESTful. analyzes a dataset which comprises 45 Web APIs in total, primarily chosen from Programmable Web directory, and provide conclusions about common description forms, output types, usage of API parameters, invocation support, the level of reusability, API granularity and authentication details.

A gift card program is an identical system. Using a gift card is extremely simple. When a customer wants to purchase a gift card in a specified denomination, typically:

- An employee collects payment up front, as in any other transaction
- The employee then selects the gift card program from the POS and swipes a new gift card through the terminal
- The employee keys in the dollar amount on the POS system to processes the payment
- A receipt with the card value is printed, which can then be presented with the card to the customer

When a customer chooses to use their gift card:

- An employee will take the card, as with any other payment type
- The gift card option is selected on the POS interface
- In similar fashion to chip-less credit cards, the gift card is run through the card reader
- The **merchant account processor** takes care of the approvals, and the purchase balance is removed from the card
- A receipt prints to indicate the remaining balance

- If the purchase depletes the full balance of the gift card, an alternate payment method such as a credit card may be required for the remaining transaction balance
- The customer receives his card back, or, if the balance is used in full, the employee may dispose of or recycle the card

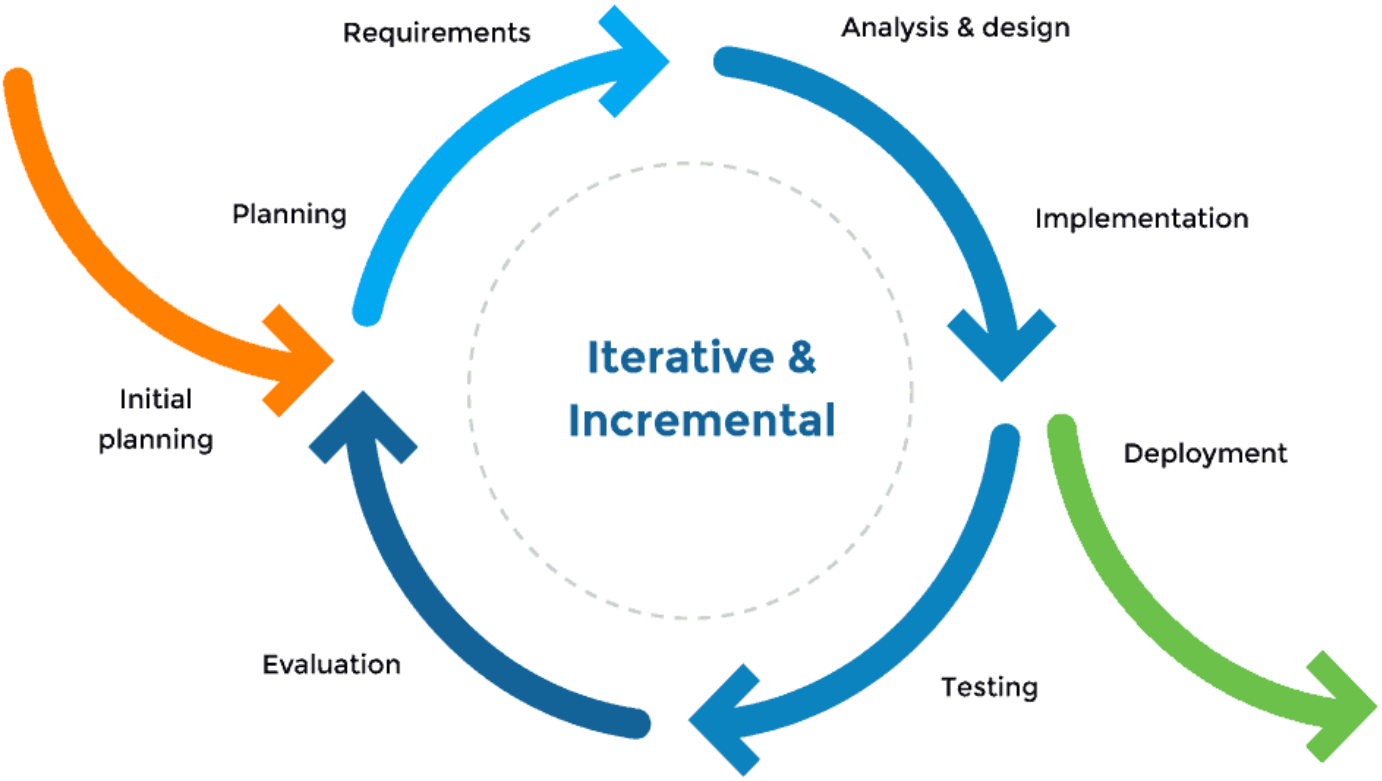
CHAPTER THREE

3.0 METHODOLOGY

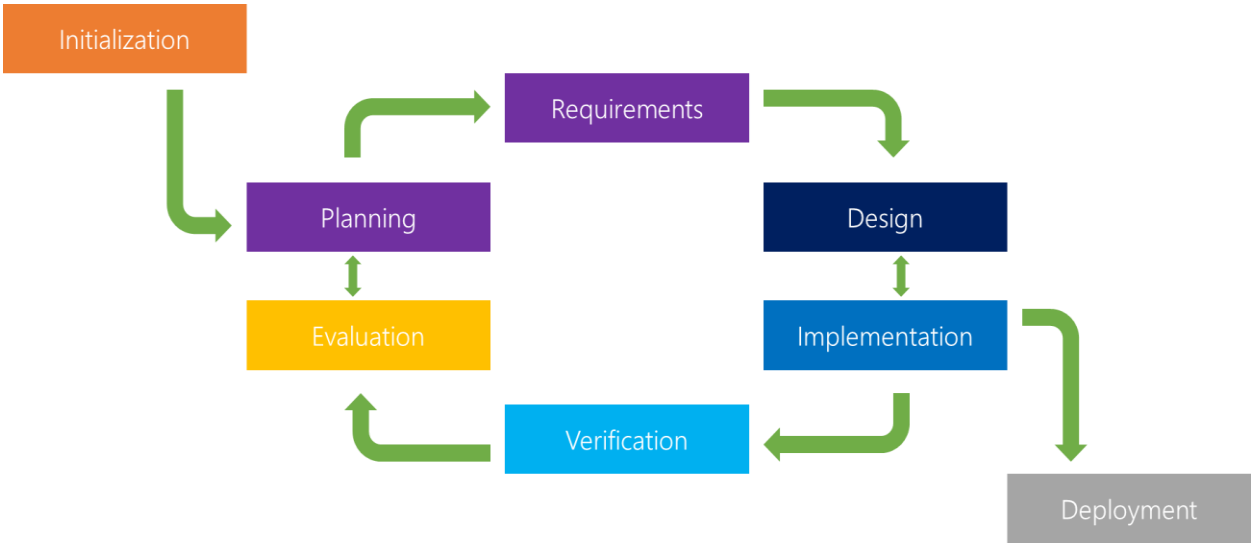
3.1 Iterative Methodology

This methodology focuses on an initial, simplified implementation, which then progressively gains more complexity and a broader feature set until the final system is complete. Incremental alterations are made during the design and implementation of each new iteration.

This model is best thought of as a cyclical process. A handful of stages are repeated over and over (after the initial planning phase) with each completion of the cycle incrementally improving and iterating on the software. This makes enhancements be quickly recognized and implemented throughout each iteration, and hence allowing the next iteration to be at least marginally better than the last.



Iterative Model 1



Iterative Model 2

- **Planning & Requirements**: We chose to use The first step is to go through an initial planning stage to map out the specification documents, establish software or hardware requirements, and generally prepare for the upcoming stages of the cycle.
- **Analysis & Design**: this phase is performed to nail down the appropriate business logic, database models, and the like that will be required at this stage in the project soon after the planning phase. The design phase also occurs here, establishing any technical requirements (languages, data layers, services, etc.) that will be utilized in order to meet the needs of the analysis stage.
- **Implementation**: The actual implementation and coding process can now begin soon after the planning and analysis phases. All planning, specification, and design docs up to this point are coded and implemented into this initial iteration of the project.
- **Testing**: after building iteration has been fully coded and implemented, the next step is to go through a series of testing procedures to point out (identify) and locate any potential bugs or issues that have come up since the last iteration.
- **Evaluation**: Once all prior stages have been completed, it is time for a thorough evaluation of development up to this stage. Everyone is now involved, including clients or other outside parties, to examine where the project is at, where it needs to be, what can or should change, and so on. These are then documented and taken as requirements for the iterative process.

3.2 Advantages of the Iterative Model

- **Inherent Versioning**: Iterative model makes this even easier to version by ensuring that newer iterations are incrementally improved versions of previous iterations. Moreover, in the event that a new iteration fundamentally breaks a system in a catastrophic manner, a previous iteration can quickly and easily be implemented or "rolled back," with minimal losses; a particular boon for post-release maintenance or web applications.
- **Rapid Turnaround**: In the iterative process, each stage can effectively be slimmed down into smaller and smaller time frames; whatever is necessary to suit the needs of the project or organization. While the initial run through of all stages may take some time, each subsequent iteration will be faster and faster, lending itself to that agile moniker so very well, and allowing the life cycle of each new iteration to be trimmed down to a matter of days or even hours in some cases.
- **Suited for Agile Organizations**: The iterative model really starts to shine when it is in the hands of a smaller, more agile team. Particularly when combined with the power of modern version control systems, a full "iteration process" can effectively be performed by a number of individual team members, from planning and design through to implementation and testing, with little to no need for outside feedback or assistance.
- **Easy Adaptability**: The ability to rapidly adapt to the ever-changing needs of both the project or the whims of the client. Even fundamental changes to the underlying code structure or implementations (such as a new database system or service implementation) can typically be made within a minimal time frame and at a reasonable cost, because any detrimental changes can be recognized and reverted within a short time frame back to a previous iteration.

3.3 Disadvantages of the Iterative Model

- **Costly Late-Stage Issues**: in some cases; due to the minimal initial planning before coding and implementation begin, when utilizing an iterative model, it is possible that an unforeseen issue in design or underlying system architecture will arise late into the project. Resolving this could have potentially devastating effects on the time frame and costs of the project as a whole, requiring a great deal of future iterations just to resolve one issue.
- **Increased Pressure on User Engagement**: Unlike other old methodologies, which emphasizes nearly all user/client engagement within the initial stages of the project

during a brief crunch time period, the iterative model often requires user engagement throughout the entirety of the process. This is sometimes an unfortunate obligation, since each new iteration will likely require testing and feedback from users in order to properly evaluate any necessary changes.

- **Feature Creep**: Iterative model requires user feedback throughout the process, this means it also inherently the project may be subject to undesired feature creep, whereby users experience the changes in each iteration, and are inclined to constantly put forth new requests for additional features to be added to future versions.

Error are supposed to be handled well and it takes time to gather and discern the errors that matter most. This feature is used by the User in Digital voucher to login in to the system. They are required to key in the username and the password before they are granted permission to enter the system. The username and the password will be verified and the invalid username and password are not allowed to enter the system. All users are registered by the administrator. The system must only allow the user with valid username and password to enter the system

CHAPTER FOUR

4.0 SYSTEM DEVELOPMENT

REQUIREMENT ANALYSIS

4.1 Introduction

Upon the completion of the Digital voucher there are a number of things that will be expected of it not only by the prospected users but also for the administrator of the system. These will therefore form the requirements of the Digital voucher and will be broadly classified in to the functional requirements and the Non-functional requirements.

4.2 functional requirement

4.2.1 User Login

This feature is used by the User in Digital voucher to login in to the system. They are required to key in the username and the password before they are granted permission to enter the system. The username and the password will be verified and the invalid username and password are not allowed to enter the system. All users are registered by the administrator. The system must only allow the user with valid username and password to enter the system

4.2.2 Register a new user

This feature is used to register the client and merchant to the system to ensure that all details are available and valid. System ensures that the information supplied by the user is of the correct form

4.2.3 client registration

This feature is used by the users who want to purchase good and service. System ensures that the information supplied by the user is of the correct form.

4.2.4 Search

This feature is used by the users to search for exact purchase and other also search for available they can access their voucher

4.3 Functional requirements.

4.3.1 Register a new user

This feature is used to register the client and merchant to the system to ensure that all details are available and valid. System ensures that the information supplied by the user is of the correct form

4.3.2 client registration.

This feature is used by the users who want to purchase good and service. System ensures that the information supplied by the user is of the correct form.

4.3.3 Search

This feature is used by the users to search for exact purchase and other also search for available they can access their voucher.

4.4 Non-functional requirements

4.4.1 Reliability requirements

The Performance rate of the system should remain constant even as the number of concurrent users or data levels increase. Architecture used to build the system should be flexible enough to allow integration with other systems if need be in the future.

4.4.2 Usability requirements

The system should have an attractive, user friendly and interactive graphical user interface and it should be easy to use even with the person with least knowledge of computers.

4.4.3 Security requirements

This system authentication protocol and access control must be highly secured in the login part. Where username identities and passwords are encrypted and hashed using MD5 function. This is because some privileges are only meant for the System Administrator only. Meaning that if the security is compromised, the whole system is compromised. Our Database is also hashed using both MD5 and SHA-1 encryption algorithms functions.

4.4.4 Implementation requirements

In implementing the system, it uses php, html, cascading style sheet as the main programming language and tools. This forms the front-end and the middleware.

At the back-end, MYSQL is used to maintain the information in the database. This is formed by the databases and other data stores.

4.4.5. Portability requirement

The system needs to be portable on all major platforms. This system should not be restricted by any specific technology such as database, web server and operating system.

4.5 Hardware & Software Requirements for a digital voucher.

4.5.1 Hardware requirements

Hardware Computer or a laptop with the following specifications:

1. At least 2GB RAM (Giga Byte Random Access Memory)

This will allow for faster loading of the testing platforms.

2. 2.0 GHZ (Giga Hertz) processor speed

During the testing phase of the codes written, this will facilitate faster processing of the requests by the application as well as speed up responses for the earlier given requests.

3. At least 20GB hard disk capacity

This is to provide the storage space for the application's workspace where the various codes that will be written will reside.

4. External Memory (External Hard disk) approximately 20GB

This is important in the project as it will enable for the process of backup for the purpose of security in case of system crash

5. At least one NIC (network interface card) for connection purposes

4.5.2 Software requirements

1. MYSQL

We used MySQL server on the backend because it provides the ultimate in scalability, sporting the capacity to handle deeply embedded applications with footprint of only 1 MB to running massive data warehouses holding terabytes of information. It also offers exceptional security features that ensure absolute data protection

2. Joomla

We used Joomla because it is open source and because it can be used to build any kind of website, right from the small, simple and personal blog to the large corporate blog.

3. Microsoft office

We used Microsoft office so as it aids in documenting our project and also for scheduling our project by using Microsoft office project.

4. Operating system at least windows 7

This will form the platform that will be used by the system to run.

5. A computer antivirus

This is the software that will help shield the developed files against corruption due to malware and viruses

6. UML

This the software that we used during the design phase in drawing the use cases, activity diagram, entity relationship diagram and others.

7. Apache

We used apache because it is free and it can run on pretty much any OS (Linux, windows and Mac OS)

4.5 Budget of the project

The cost of the project is as follows:

Item Cost CPU	60,000
internet	2,000
DVD cost	100
Printing and photocopying	1000
Miscellaneous	2000
Implementation cost	60,000
Total	126100

Figure 5.0

CHAPTER FIVE

5.0 SYSTEM DESIGN

5.1 Introduction

After the requirements having already been captured and analyzed, the design of the information flow was done here. It is in this phase that the flow charts, dataflow diagrams and entity relationship diagrams were drawn to show flow of information and the activity diagrams were developed to show the connection that will exist between one information and another.

5.2 Diagrams

5.2.1 Use case diagram

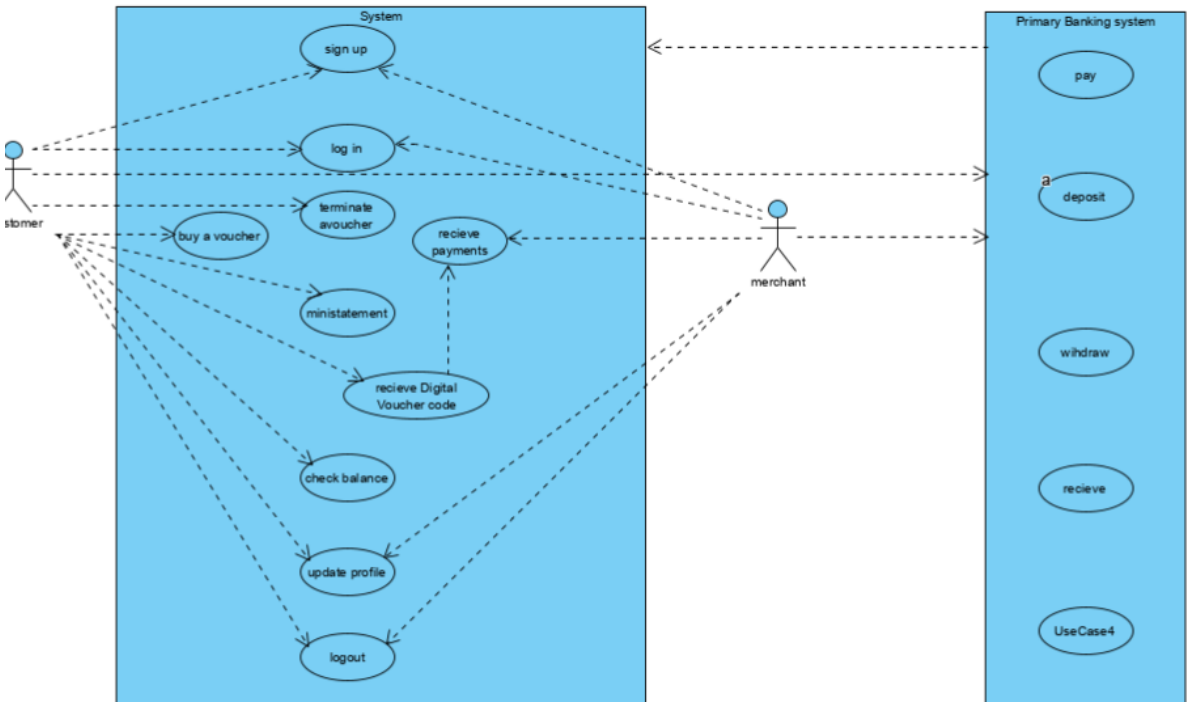


Figure 2 use case diagram

The above diagram explains the functions the administrator, the customer and merchant are supposed to perform

5.2.2 Activity diagram

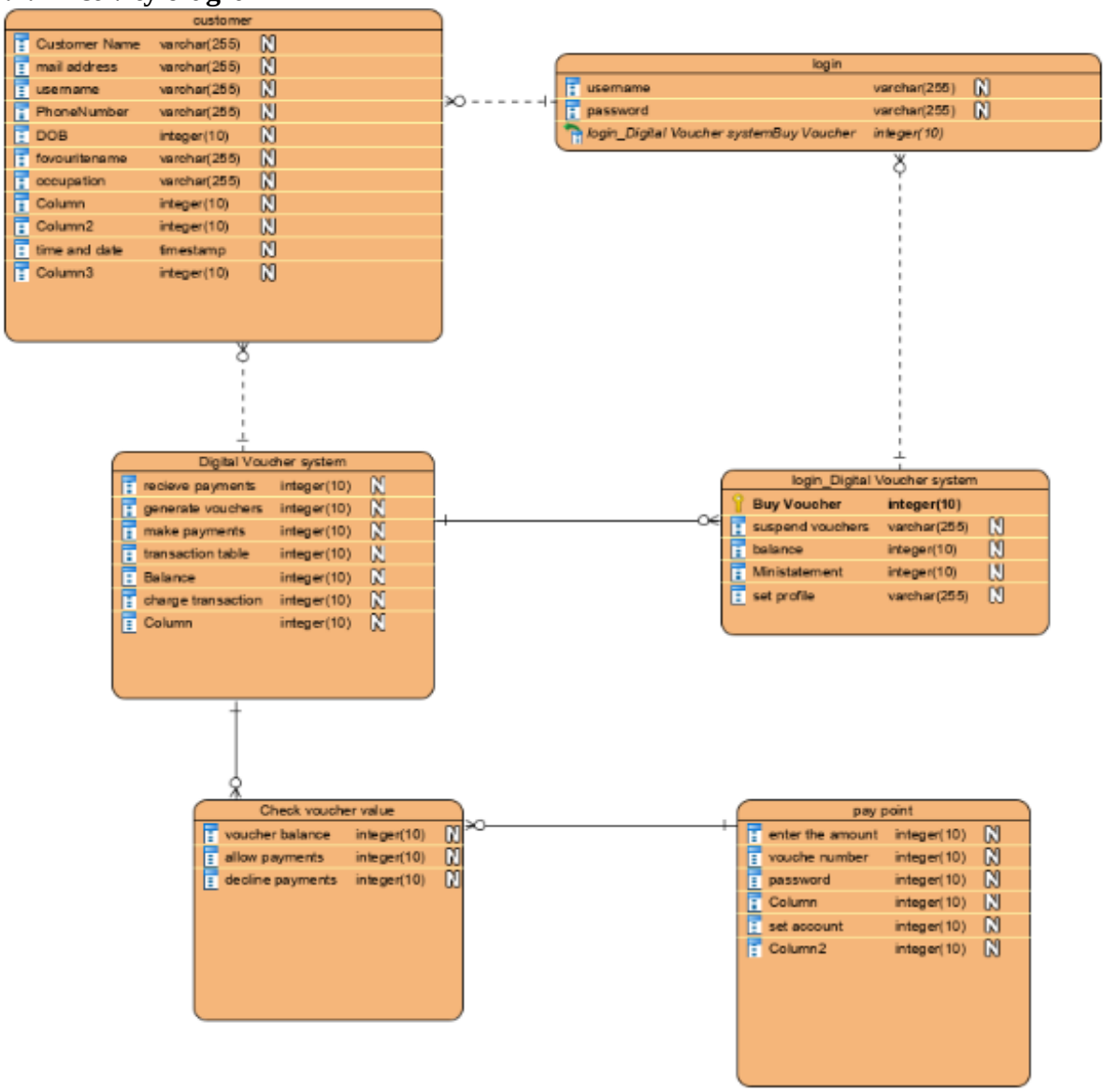


Fig 3. Activity diagram

The above diagram shows all the activities/functions of the administrator though they are combined in one diagram. According to the diagram, administrator should first login to the system. If the username and password are correct, the system allows him to proceed.

5.3 Dataflow diagram

This DFD enable the reader and I to identify specific step to taken to operate the system. With these steps I was also able to determine what and how to undertake different tasks while developing the system.uy7ryt7 8

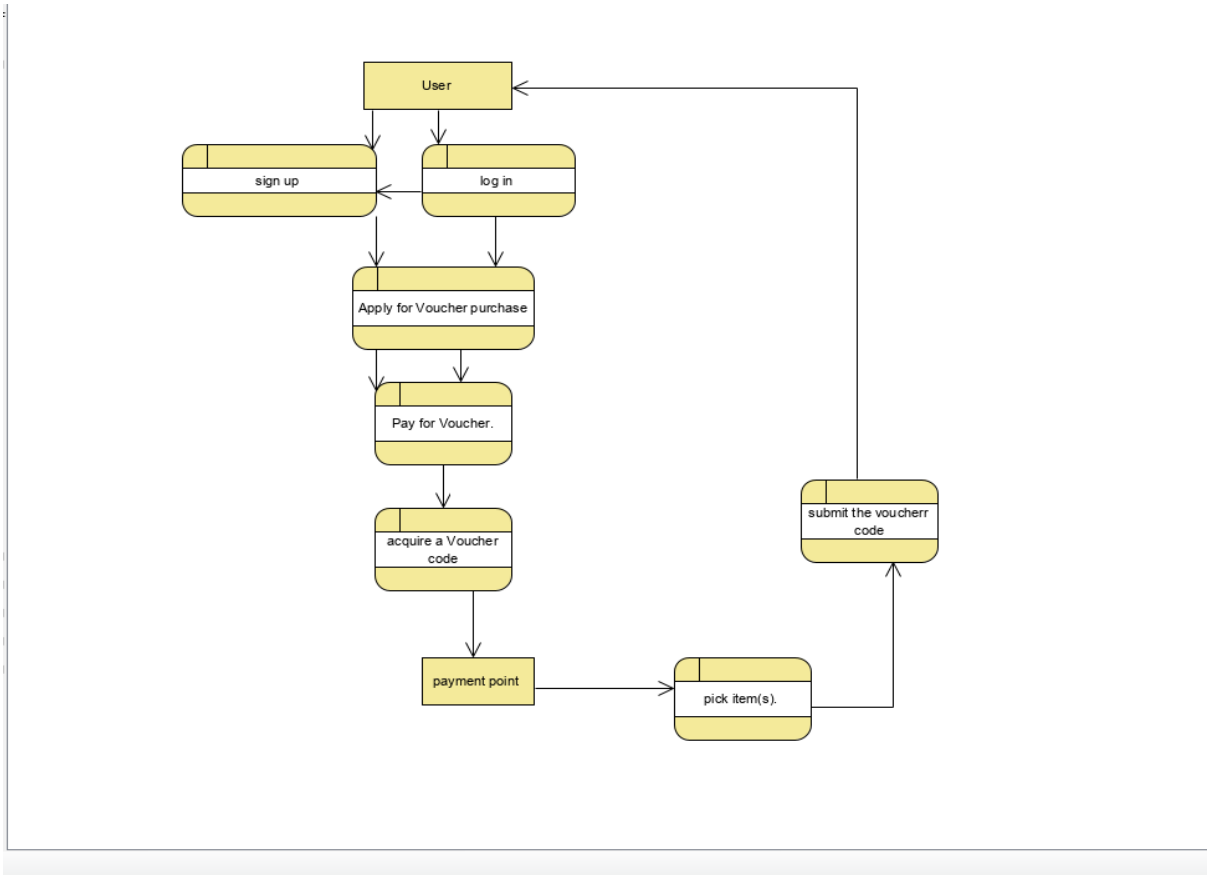


Figure 6 dataflow diagram

CHAPTER SIX

6.0 SYSTEM IMPLEMENTATION

The implementation of this system and testing was done through a local host server. This was done bit by bit after development of each module. The modules included;- signup and login module…dentification, authentication and authorization, transactions module… buying and selling of digital vouchers, statement production, and finally the merchant system that we are not interested in as at now.

Every module was developed with security in mind; therefore, each module is treated as a separate block in the whole system. Agile model methodology enabled us to have an opportunity to test the system right from the start of the development. Agile development methodology is the most enjoyable methodology that we could use. It gave us a chance to enjoy every bit of the development module by developing module that output is there and then. It reduced the non-productivity work. This shows the value of the work also.

6.1 Servers used.

The system was web based and therefore during the development period, we used Apache2 server for testing.

6.2 Reasons for using Apache2

This software has a wide range of products created by the Apache Software Foundation. One such application is called the Apache server. This server is not used to create any website. The purpose of this server is to redirect any network requests, especially HTTP, to other applications.

HTTP is quite large and takes up a lot of memory. So, sometimes other alternatives like light httpd or Nginx are used in case of high traffic. In our case we are using httpd due to its ability to support load. Apache receives incoming requests from TCP (Transmission Control Protocol) ports, and fulfills the requests accordingly and to enable communication between networks. TCP ports help in this communication with IP addresses in the same network.

Advantages of Apache Web server

Its an open source software.

You can add more features and modules.

• It is reliable and performs better.

• It has a very brief installation procedure.

• The changes made on Apache2 are recorded immediately, even without restarting the server.

• Apache can run on almost any operating systems like Windows, Linux etc.

• It is regularly maintained and updated.

• With Apache web server, multiple websites can be run from the same server. In other words, it can create virtual hosts on the same server.

Disadvantages of Apache Web Server

• One of the prominent features of Apache is its ability to modify its configuration. This, however, can cause a serious threat to the security, if not dealt properly though this con doesn't affect us because we uses it as a local host.

Recognizing and disabling unwanted services and modules. Leaving them on could cause serious threats. Apache is a process-based server.

6.3 User manual.

Once you require digital voucher services, you are entitled to registration. After sing up, using the interface fig 1.0 below,

Username; use a name that you can easily remember, but no one else uses it in the system. You should also input a password and confirm it. After the hit on the enter button, the system checks if you have an existing account with us. If so, the system will ask you to log in.

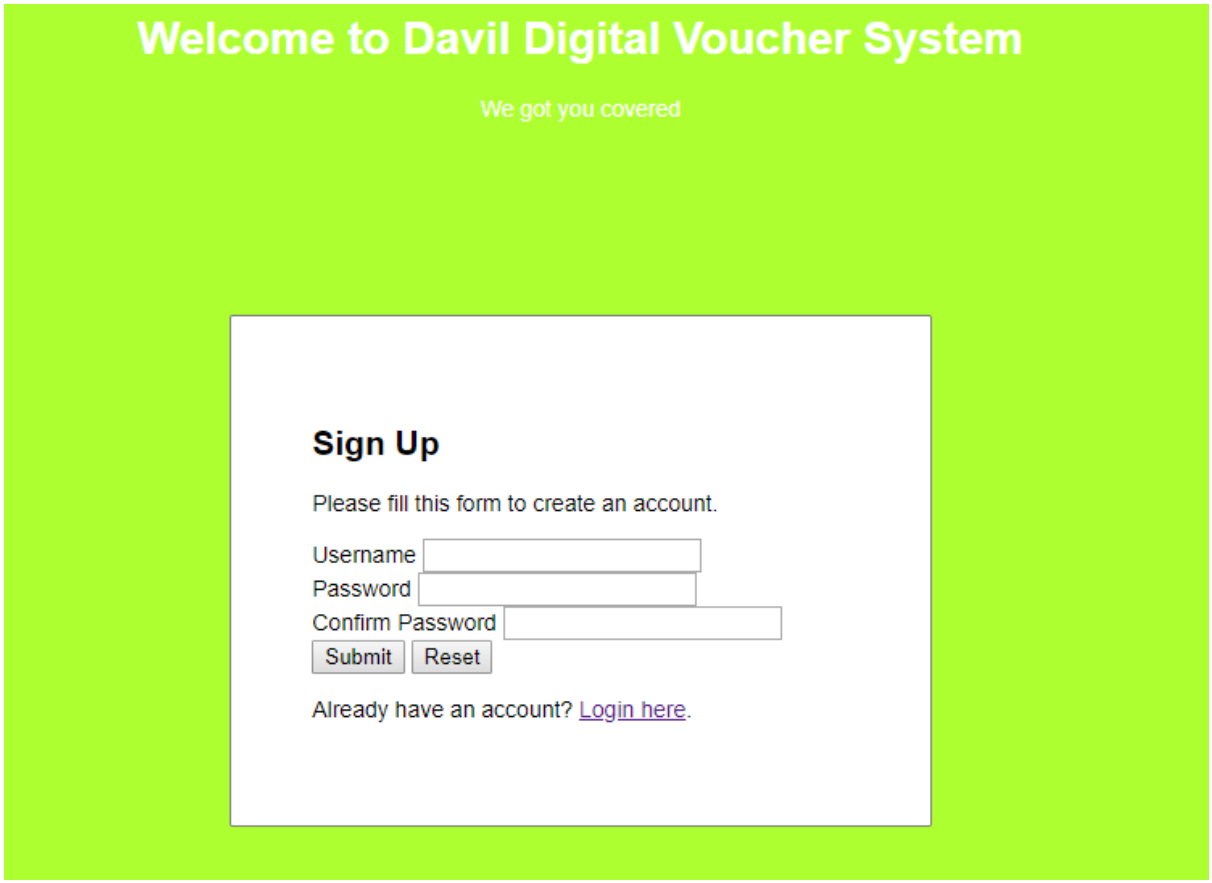

Welcome to Davil Digital Voucher System
We got you covered
Sign Up
Please fill this form to create an account.
Username
Password
Confirm Password
Submit
Reset
Already have an account? Login here.

Fig 1.0

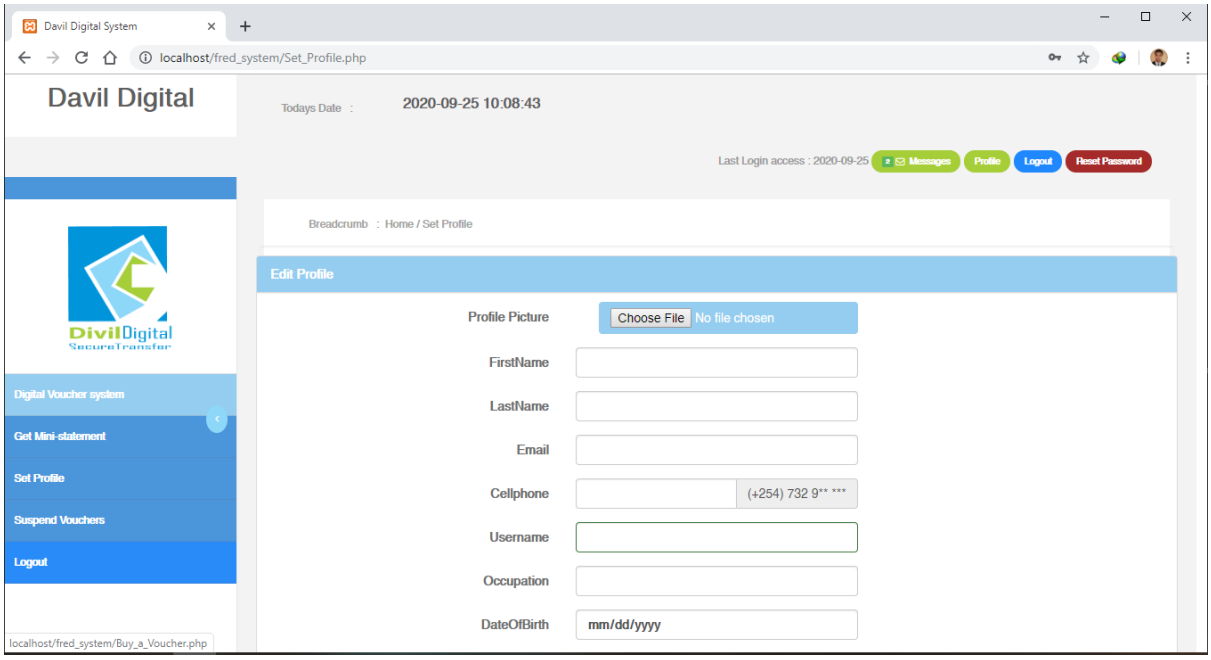

Davil Digital System
localhost/fred_system/Set_Profile.php
Davil Digital
Todays Date :
2020-09-25 10:08:43
Last Login access : 2020-09-25
Messages
Profile
Logout
Reset Password
Breadcrumb : Home / Set Profile
Edit Profile
Profile Picture
Choose File
No file chosen
FirstName
LastName
Email
Cellphone
(+254) 732 9** ***
Username
Occupation
DateOfBirth
mm/dd/yyyy
Digital Voucher system
Get Mini-statement
Set Profile
Suspend Vouchers
Logout
localhost/fred_system/Buy_a_Voucher.php

fig 1.2

The interface above is used to create a profile. One can click a button named “profile” on the top right conner. This profile is used to refer in case one forgets the password, etc. it also it is used to attach an identity to the account.

On fig 1.3, the user interface which the user uses to buy vouchers. By the click on the drop-down button on Digital vouchers. Enter the amount of money you want to purchase, followed by the number of phone number that pays for that transaction. When you click on the button “Process”,

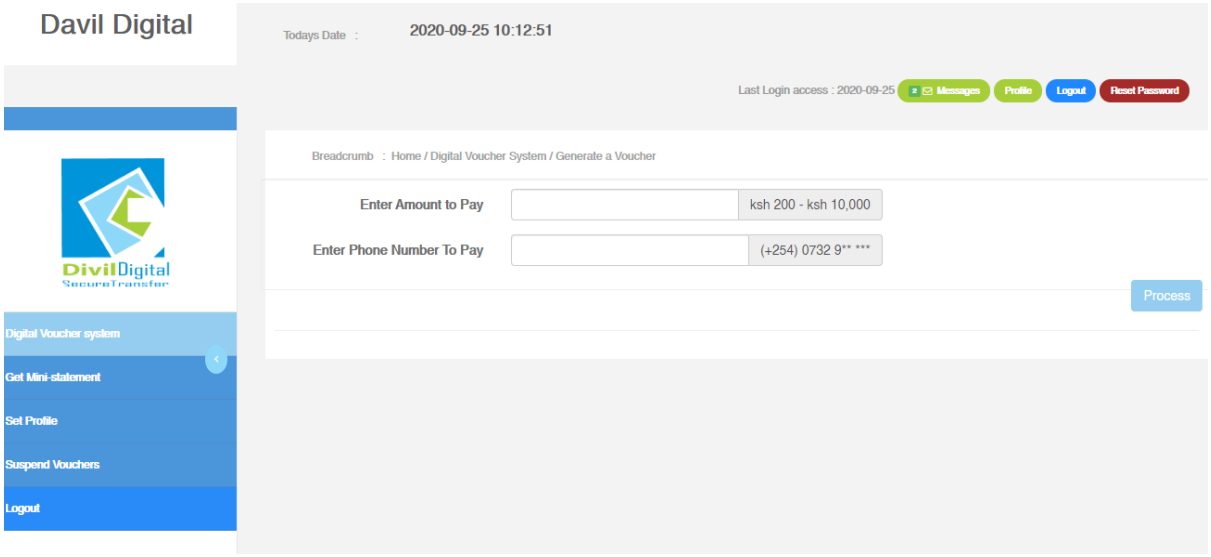


Fig 1.3

On fig 1.4, shows the breakdown of the transaction statement. You can download as a PDF, Excel or Word document. This document will show different transactions you made.

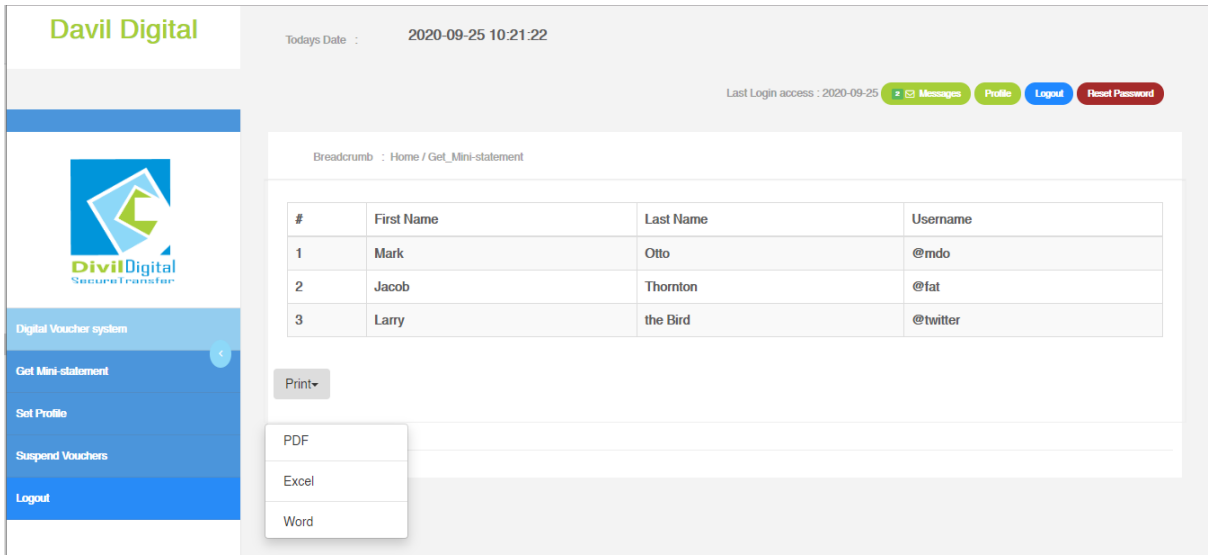


fig 1.4

Its equally important to note that this platform can be used as a money banking platform. You can buy Digital vouchers and use them later when the need arises. Though we have not complied with all the bankers association, we hope and believe that this system will be unavoidable resource in the economy.

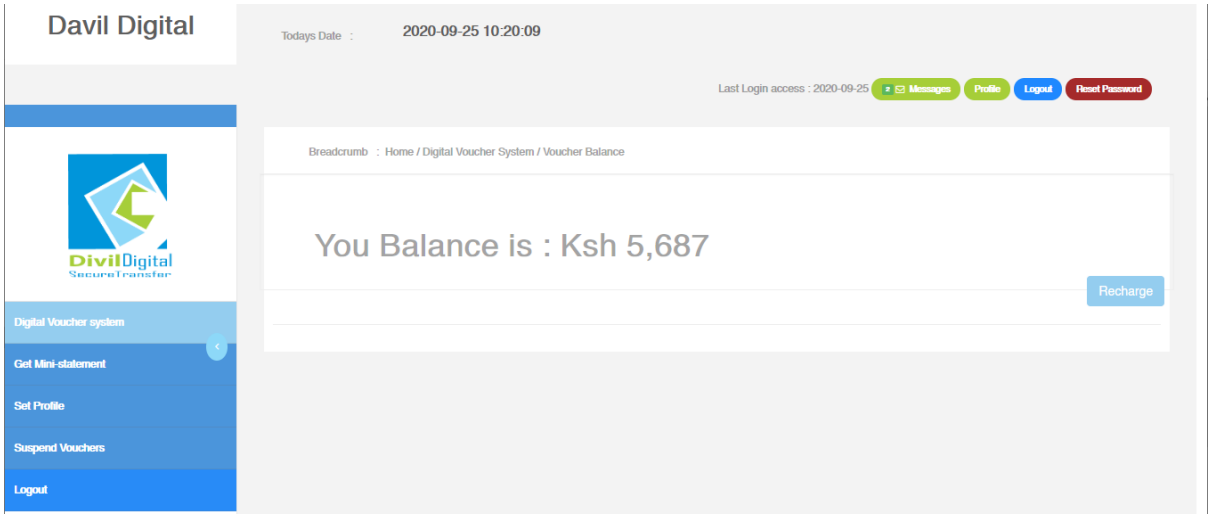


Fig 1.5

The most interesting part is the ability to suspend vouchers. You can have your money back when you need it in any form. You cant lose your money. The vouchers are digital assets which are entitled to an certain person. Transfer, or any other transactionthat takes place here is monitored with Confidentiality, Integrity and Availability in mind.

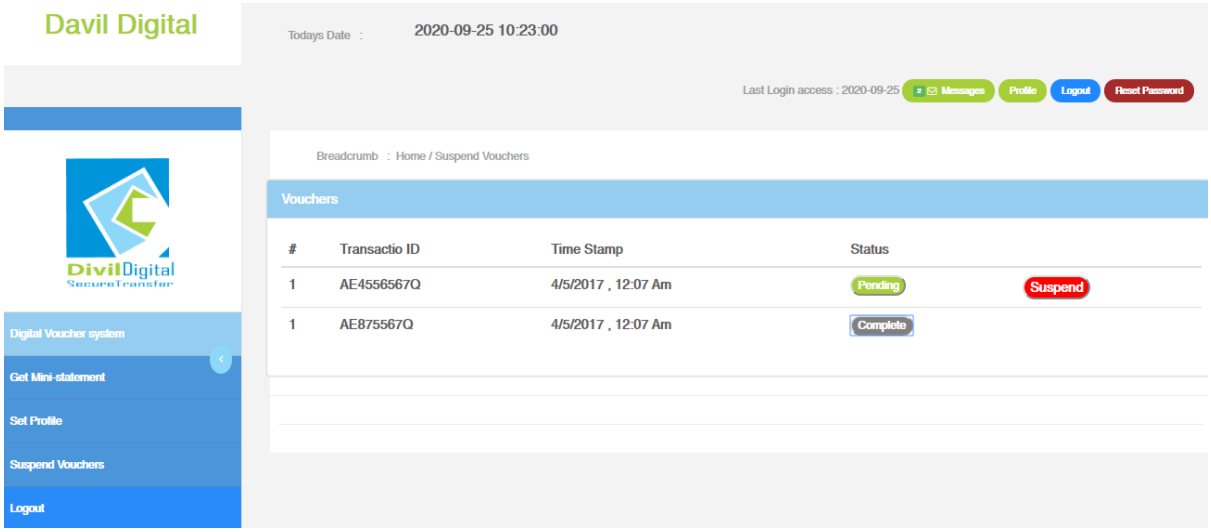


Fig 1.6

CHAPTER SEVEN

7.0 DISCUSSION, RECOMMENDATIONS AND CONCLUSION

7.1 Discussion

In reference to chapter one at the problem statement section, we developed a digital voucher system which addresses the problems statement faced by young Kenyan with no identification cards and also foreigner who are trying to purchase goods and services in our country. The system uses digitalization of voucher which intern will create an environment where both the foreigner and people under age of 18yrs will be able to purchase goods and services without the need of them having a mobile banking device or a local bank account i.e. for an ATM card. The interface allows the admin to login and perform any administrative task as assigned like updating the transaction tables and also monitor the merchant interface. The digital voucher users are allowed to register and login and perform any task as presented to them by the app.

7.2 Recommendations

I recommend that any further improvements of this project be as follows: The scope of the entire system be improved to accommodate more than two user which are the under 18 and the foreigners. The project should also include other marketing industries such as PayPal, money express, mobile banking and atm cards.

7.3 Conclusion

In conclusion, this project has been a very involving task and it has taken much of our attention and efforts to complete it. Assisted by all the individuals who provided any support to us especially our supervisor Dr. Raburu, we undertook this project in reference to the problems stated herein in chapter one being the motivation behind this project and we have addressed them to the best of our knowledge and fulfilled the expectations and requirements of our target audience who are to use this system. We believe that this system will help many of the Kenyans and other countries and regions after the completion of the above-mentioned recommendations in the recommendations section.

REFERENCES

Niccolai, James (2008-04-23), "So What Is an Enterprise Mashup, Anyway?", PC World

Parr, Ben. "The Evolution of the Social Media API". Mashable. Retrieved 26 July 2016.

GET trends/place". developer.twitter.com. Retrieved 2020-04-30.

*Parnas, D.L. (1972). "On the Criteria To Be Used in Decomposing Systems into Modules" (PDF). Communications of the ACM. **15** (12): 1053–1058. doi:10.1145/361598.361623.*

*Garlan, David; Shaw, Mary (January 1994). "An Introduction to Software Architecture"(PDF). Advances in Software Engineering and Knowledge Engineering. **1**. Retrieved 8 August 2016.*

de Ternay, Guerric (Oct 10, 2015). "Business Ecosystem: Creating an Economic Moat". BoostCompanies. Retrieved 2016-02-01.

Boyd, Mark (2014-02-21). "Private, Partner or Public: Which API Strategy Is Best for Business?". ProgrammableWeb. Retrieved 2 August 2016.

Weissbrot, Alison (7 July 2016). "Car Service APIs Are Everywhere, But What's In It For Partner Apps?". AdExchanger.

"Cloudflare API v4 Documentation". cloudflare. 25 February 2020. Retrieved 27 February 2020.

Liew, Zell (17 January 2018). "Car Service APIs Are Everywhere, But What's In It For Partner Apps". Smashing Magazine. Retrieved 27 February 2020.

Jump up to:[a] [b] *Shi, Lin; Zhong, Hao; Xie, Tao; Li, Mingshu (2011). An Empirical Study on Evolution of API Documentation. International Conference on Fundamental Approaches to Software Engineering. Lecture Notes in Computer Science. **6603**. pp. 416–431. doi:10.1007/978-3-642-19811-3_29. ISBN 978-3-642-19810-6. Retrieved 22 July 2016.*

"guava-libraries - Guava: Google Core Libraries for Java 1.6+ - Google Project Hosting". 2014-02-04. Retrieved 2014-02-11.

Oracle. "How and When to Deprecate APIs". Java SE Documentation. Retrieved 2 August 2016.

Mendez, Diego; Baudry, Benoit; Monperrus, Martin (2013). "Empirical evidence of large-scale diversity in API usage of object-oriented software". 2013 IEEE 13th International Working Conference on Source Code Analysis and Manipulation (SCAM). pp. 43–52. arXiv:1307.4062. doi:10.1109/SCAM.2013.6648183. ISBN 978-1-4673-5739-5.

Takanashi, Dean (19 February 2020). "Akamai: Cybercriminals are attacking APIs at financial services firms". .

Dekel, Uri; Herbsleb, James D. (May 2009). "Improving API Documentation Usability with Knowledge Pushing". Institute for Software Research, School of Computer Science. CiteSeerX 10.1.1.446.4214.

Parnin, Chris; Treude, Cristoph (May 2011). "Measuring API Documentation on the Web". Web2SE: 25–30. doi:10.1145/1984701.1984706. ISBN 9781450305952. Retrieved 22 July 2016.

Maalej, Waleed; Robillard, Martin P. (April 2012). "Patterns of Knowledge in API Reference Documentation" (PDF). IEEE Transactions on Software Engineering. Retrieved 22 July 2016.

*Monperrus, Martin; Eichberg, Michael; Tekes, Elif; Mezini, Mira (3 December 2011). "What should developers be aware of? An empirical study on the directives of API documentation". Empirical Software Engineering. **17** (6): 703–737. arXiv:1205.6363. doi:10.1007/s10664-011-9186-4.*

"Annotations". Sun Microsystems. Archived from the original on 2011-09-25. Retrieved 2011-09-30..

Bruch, Marcel; Mezini, Mira; Monperrus, Martin (2010). "Mining subclassing directives to improve framework reuse". 2010 7th IEEE Working Conference on Mining Software Repositories (MSR 2010). pp. 141–150. CiteSeerX 10.1.1.434.15. doi:10.1109/msr.2010.5463347. ISBN 978-1-4244-6802-7.

"Oracle and the End of Programming As We Know It". DrDobbs. 2012-05-01. Retrieved 2012-05-09.

"APIs Can't be Copyrighted Says Judge in Oracle Case". TGDaily. 2012-06-01. Retrieved 2012-12-06.

"Oracle America, Inc. vs. Google Inc" (PDF). Wired. 2012-05-31. Retrieved 2013-09-22.

Rosenblatt, Seth (May 9, 2014). "Court sides with Oracle over Android in Java patent appeal". CNET. Retrieved 2014-05-10.

"Google beats Oracle—Android makes "fair use" of Java APIs". Ars Technica. 2016-05-26. Retrieved 2016-07-28.

Decker, Susan (March 27, 2018). "Oracle Wins Revival of Billion-Dollar Case Against Google". Bloomberg Businessweek. Retrieved March 27, 2018.

Lee, Timothy (January 25, 2019). "Google asks Supreme Court to overrule disastrous ruling on API copyrights". Ars Technica. Retrieved February 8, 2019.