

**DEVELOPING AN ONLINE SCHOOL FEES PAYMENT SYSTEM BASED ON
CLOUD COMPUTING WITH AUTHENTICATION SCHEME: A CASE STUDY OF
NOBO COLLEGE OF PHARMACY IN TANZANIA**

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System

BY

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DECLARATION

I do hereby declare that this research dissertation is my original work and has never been presented to any academic institution for any award.

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Name of Candidate

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Signature

Date.....

APPROVAL SHEET

We confirm that this dissertation entitled **“School Fees Payment System Based on Cloud Computing With Authentication Scheme: A Case Study of Nobo College of Pharmacy in Tanzania”** was carried out by the candidate Fredy F. Byabato with registration number MIS/18559/602/DT.

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Date: _____

DEDICATION

I dedicate this research dissertation to my parents and the whole family.

ACKNOWLEDGEMENTS

I thank the Almighty God for the gift of life, protection, comfort, support and provision which is overwhelming; without him, I would not have completed this research dissertation. I would like to acknowledge my supervisor, Dr. Mboni Kibelloh whose assistance helped me achieve this research dissertation. I appreciate the guidance from the Internal Examiner Dr. Rugemalira G. Igangas. Thank you so much.

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ABBREVIATIONS

A.P.I	-	Application Programming Interface
A.T.M	-	Automated Teller Machine
CATs	-	Continuous Assessment Test
CRDB	-	Cooperative Rural Development Bank
D.R.E	-	Direct Recording Electronic
D.S.A	-	Denial of Service Attack
E.P.S	-	Electronic Payment System
E-Banking	-	Electronic Banking
EBPP	-	Electronic bill presentment and payment
EFT	-	Electronic Fund Transfer
EOS	-	End of Semester Examinations
FE	-	Final Examinations
G.U.I	-	Graphical User Interface
I.B.P.G	-	Internet Banking Payment Gateway
I.O.S	-	Inter-Organizational Information System
NBC	-	National Bank of Commerce
NMB	-	National Microfinance Bank
O.F.P.S	-	Online Fees Payment System
O.P.S	-	Online Payment System
O.S	-	Online system
P.H.P	-	Hypertext Preprocessor
P.I.N	-	Personal Identity Number
PC	-	Personal Computer
S.Q.L	-	Structured Query Language
TBP	-	Tanzania Postal Bank
UE	-	University Examinations

ABSTRACT

This study is a case study in developing a School Fees Payment System Based on Cloud Computing with an Authentication Scheme for Nobo College of Pharmacy in Tanzania. The main objective of the study was to develop an effective online fees payment system that is secure and reliable which can advance the quality of service and disseminate results of student's payments and information as well as provide data storage in the cloud based on the size and capacity needed. The study describes the workflow, requirements and methods that the researcher adopted. For the purpose of this study, a descriptive cross sectional research design was adopted. The research instruments used were questionnaires and interviews and data collected were analyzed using SPSS version 20 and the waterfall process model was used to guide system development. Findings have indicated that the main method of fee payment at Nobo College was through the bank and 72 (83.7%) of respondents agreed that they use banks to pay school fees and only 14 (16.3%) of respondents disagreed. The study also found out that one of the major challenges of fees payment at Nobo College was payers experiencing long queues in the banks which caused stress and this was represented by a high overall mean score of 3.7907 and standard deviation of 1.42347; and other challenges include forgery and fraud on payment of fees to the bank and this was reflected by a high overall mean score of 3.6047 and standard deviation of 1.28593. Also, the study found that there was a challenge of too much paperwork as a result of bank deposits which promotes bureaucracy both in the banks and at the college and this was represented by a high overall mean score of 3.6279 and standard deviation of 1.35513. Objective three of the study concluded that the development of a system was possible because according to the test of the developed system it was found that it was effective and can only be accessed by authorized people this implies that there is a high level of security in the system. The findings have indicated that the online system of the payment of school fees was efficient and simplified tasks of school fees payment due to its ability of time saving, availability and ease to use. The study recommends Nobo College adopt the system because it is efficient, easy to use, convenient, secure, and keeps all the transactions safely to minimize forgery.

CHAPTER ONE

PROBLEM OVERVIEW

1.1 Introduction

The chapter contains the background of the study, problem statement, objectives of the study, research questions, scope, significance of the study and operational definitions of key terms.

1.2 Background of the Study

The education sector is one of the influential sectors in promoting the use of information technology (IT) since it helps to simplify the management of students' records data and as well ease online school fees payment or digital payment and education-related processes. Even though the adoption rate is relatively slow, some countries have led the way in implementing IT in education facilitating education processes and data management across departments and institutions. The adoption has been emphasized by internal and external forces that include the increment in population size, increased demand for the technology in the education sector and the necessity to have a complete online school fees payment system at one point whereby the data storage will be safe and reliable through the cloud and can be computed for the power system without direct contact to the local server that is managed and controlled by the local user. This means that the cloud eliminates the need for users to be physically in the same location as the hardware that stores their data. The cloud makes it easy, giving users access to information whenever and wherever they need it. The one important requirement that is needed to have is an internet connection to facilitate access to the cloud. When a user demand to access a certain document stored in the cloud he/she must first establish an internet connection. The main advantage is a user can gain access to that very document or information from wherever he/she applying any device that can get connected to the internet. These devices would be laptops, tablets, desktops and smart phones (Lewis, 2010).

In developed countries like the USA, they have realized that electronic payments are cheaper methods of payment than paper-based. According to Turban, King, Mckay, Marshall, Lee &

Vielhand (2008), the use of paper checks declined from 85% in 1979 to 59% in 2008 and at the same time electronic payment grew from 15% to 41% in the same period and the trend is increasing globally nowadays. Almost all of the payments are done electronically; there is no need for carrying wallets for any payments to be transacted. The platform is much more secure for every user to perform any transaction online in the most reliable and faster way. Many colleges in the USA have been using online platforms for collecting their fees (Turban, King, Mckay, Marshall, Lee & Vielhand 2008).

Asia is leading the race in encouraging its population to become a completely cashless society, partly due to electronic payments or online payments in Asia. Pasini (2020). Consumers in China in particular are solely using e-payments in their everyday purchases. In some countries like Bangladesh, this situation is quite different where cash use is very high and check and other paper-based payment instrument use has been minimal.

In developing countries like Nigeria online payments have been put into their consideration the reason that many stakeholders have emphasized the use of an online payment system for school fees. Though the waking-up call is still minimal because paperwork is still taking a higher party and hassle through the bank locations still exists. According to Alawiye-Adams (2013), a cashless economy is on the rise and many societies today are switching from a physical cash system to non-physical cash modes of payment which are used to settle all types of transactions in both private and public sectors of the economy (Alawiye-Adams, 2013).

In East African countries such as Kenya, Uganda and Tanzania online school fees payment is still minimal adaption. Many colleges and universities still use a traditional method for the collection of school fees. Whereby someone has to physically visit the bank location and do all sorts of paperwork to complete the payment process. This has caused much delay in the services required by customers due to its availability and sometimes being not reliable.

In Tanzania electronic payment of fees is still based on physically going to the bank and paying fees. This comes with a lot of challenges such as long queues and also vulnerable to be robbed by thieves on the way to the bank. This results in long queues during the opening of the semesters both in the bank areas and in the college's finance department; time wastage during the queuing and the whole process of making the payment; and low revenue collected

by the institution due to the reason that sometimes students sit for examinations without paying school fees.

The current system also faces a delay for the universities and institutions in the process of collecting debts because many students usually pay their school fees at the last minute. That is to say, depositing school fees can be done in one week or even lesser than that before the examinations begin. Hence, many institutions and universities usually face hard times in terms of collecting revenue, because their success is largely dependent on the revenue cycle from their student fees.

Moreover, the current system faces delays for the students, parents, guardians and sponsors whereby the payment of fees cannot be done on weekends or on public holidays because during such days banks are closed. In a scenario, where some students are from outside the country and need to pay fees, they have to travel with their liquid cash and come to pay direct to the bank. This can cause students to end up with debts and it can be a painful task for the institutions and universities to deal with these problems day in and day out, and the payment cycles often get disturbed due to bad debts.

1.3 Problem Statement

Nobo faces challenges in school fee collection, tracking of student's fee status and incurs high operational costs at the finance department when it comes to students payments. Generally, at Nobo College of Pharmacy, all school fees payment activities are conducted directly to the bank environment or any other local bank agents for National Microfinance Bank (NMB). At times many students, parents and guardians fail to beat the deadline regarding paying school fees due to various factors which are very reasonable, understandable and unavoidable. These further results in students missing scheduled mandatory assessments such as college examinations, which can only be administered to students who have cleared their tuition fees.

In Nobo College, this has become a big challenge to the finance office and the whole department at large and the students themselves due to the fact that many students usually have to queue alongside the finance department as they wait for their payment to be approved and secure examination cards. This usually happens during the college's Continuous

Assessment Tests (CATs) and Final Examinations period for every semester. In this case, it has a negative impact on students' performance in their examinations due to the reason that some students enter late in the examinations hall and some of them miss examinations in case they fail to secure examination cards while they have already made payments for their school fees.

An Online School Fees Payment System (OSFPS) will be developed to provide a good and very reasonable solution to all students and other users, since there will be no more hustle and wastage of time during the college's (Continuous Assessment Tests) CATs and End of Semester Examinations (EOS) period in the finance office corridors. Because of this reason, the students will be able to print their Examination Cards directly from the system in case they have cleared a required percentage for each semester's examinations. In this case, the college would be able to collect revenue easily because a student will not be able to sit for examinations unless he/she obtains a card which is generated by the system. In Nobo College a student is required to pay at least 50% of school fees to sit for Continuous Assessment Test 1 (CAT 1), 75% to sit for Continuous Assessment Test 2 (CAT 2) Examinations while 100% for the Final Examinations; the printing button will only be available and be enabled in the system to those who have met the required percentage to sit for examinations.

In this case, there will be no more forgery on examination cards during the Continuous Assessment Tests (CATs) and Final Examinations (FE) period because a bar code scan will be available in every card printed and must be scanned to check for validity in the entrance of the examination room or hall. That is to say, a student will have to present his/her examination card at the entrance of the examination room or hall and an invigilator will scan the card to check for validity for a student to be allowed to enter the room for an examination. The system will handle students' sensitive data property in a reliable, faster and better way, at the same time saving enough time in handling all the payments.

1.4 General Objective of the Study

The main objective of the study was to develop an online school fees payment system based on cloud computing with an authentication scheme for Nobo College of Pharmacy in Tanzania, which is reliable, faster and better.

1.4.1 Specific Objectives

- i. To identify strengths and weaknesses of the existing systems (electronic and non-electronic) used by students for paying college fees at Nobo College of Pharmacy.
- ii. To design an online school fees payment system that will enable students to pay fees and print examination cards in Nobo College of Pharmacy.
- iii. To implement the designed online school fees payment system.

1.4.2 Research Questions

- i. What are the existing systems used by students in paying college fees at Nobo College of Pharmacy?
- ii. What is the online school fees payment system available for students to pay fees and print examination cards in Nobo College of Pharmacy?
- iii. How can the designed online school fees payment system be implemented?

1.5 Scope of the Study

This contains the geographical scope, theoretical scope, content scope and time scope.

1.5.1 Geographical Scope

The study was conducted at Nobo College of Pharmacy in Tanzania situated 600m away from Tabata Segerea Bus Terminal in Dar es Salaam Region, Tanzania. On the other hand, it is the only college which does not utilize the use of technology in most administrative matters such as those related to students' information systems.

1.5.2 Theoretical Scope

The project was basically used for the implementation of information technologies such as web-based, computerized and online systems with data storage in the cloud. The project was developed under four fundamental features; planning, requirement analysis, design and maintenance. This was elaborated clearly on the designing phases of the entire project development and covered the objectives of the research. The study adopted the waterfall model as a sequential software process in the system development because progress is viewed sequentially and steadily flows down.

1.5.3 Content Scope

The content scopes of the study covered the identification of common system problems, collection and assess user requirements data, analysis of data, design, development, implement the proposed online fees payment system for Nobo College of Pharmacy and finally documenting the study and its findings.

1.5.4 Time Scope

The project duration was six months, and during these six months the following activities were worked on; requirement specification, design, development, testing and writing report.

1.6 Significance of the Study

Through the development of this project, the researcher gained skills and knowledge in designing, implementing and testing online systems and the current tools used.

This research will provide a fertile ground for future researchers at KIUT to further this study. Furthermore, researchers can draw on the findings of this research to replicate similar system for KIUT and other universities in Tanzania.

The system would help in reducing the hiring of a lot of IT experts in higher learning institutions hence reducing the cost of paying salaries for many staff especially in the finance department.

The government would use the study as a starting point to improve the services offered by Higher Learning Institutions and hence strengthen the quality of education in the country.

1.7 Operational Definitions of the Key Terms

Transactions

This refers to the exchange of agreement between a buyer and a seller in terms of goods and products or services or financial instruments. Transactions are often recorded, regarding on whether it is an organization or a company that uses accounting rather than liquid cash accounting. Sales transaction often happens between a buyer and seller who are straightforward. It so happens that a seller A sells to B in exchange for a good, product or service and the transaction is completed when the terms are agreed upon (Carol, 2019).

Electronic Banking

Refers to the shift of finances from one account to another through electronic means also known as electronic fund transfer (EFT), which permits someone accessing to the bank accounts and to perform online banking services 24 hours a day, and 7 days a week without major delays. Kauffman (2000) states that electronic transactions lead to easy access to accounts, business and information through networks using the internet. Shan further describes that electronic banking performs transactions that do not require a visit to financial institutions and a person can bank online, bank at home or use mobile banking as well as use virtual banking to conduct his or her transactions.

Internet Banking System

This refers to a system that allows bank clients to access their accounts and general information about bank products and services via a personal computer or other smart devices that illustrate the services and products offered by the bank online. England et al. (2008) argue that the increase in online banking was due to the growth of personal computers for example laptops, tablets and smart phones that have enabled customers to access their accounts and

send money, pay bills, view and check account balances, make mortgage payments and procure financial instruments and certificates of deposit (Egland et al., (2008).

Internet Explosion

This refers to the rapid growth of the internet in the later half of the 1990s, the internet has evolved from a scientific and government research network to a commercial and client market place and this resulted in the creation of entirely new sectors (Chauhan & Sharma, 2014)

Global Economy

Worldwide economic activity between numerous countries that are considered intertwined and thus can affect different countries negatively or positively, that is to say, the way in which economies have been developing to operate together as one system. The global economy has significantly changed in several decades and is based on how it is organized and governed. The changes in the global economy have affected almost everything in life such as the flow of goods and services across borders and also affect how countries grow up or go down in the international system (Steers & Nardon, 2014).

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter the research, location and analysis of the present information associated with the topic of inquiring are determined and quoted. It additionally provides the relationship of the research for the goal of good presentation and critical review of the existing literature. It should be noted that data is rising being accounted as the main resource required to operate the organization like different basic resources, skilled management and organization of knowledge. Data has an influence on the survival of an organization because data is used for planning, and predicting the future of the organization. Regarding the discussion above, the existence of an Online School Fees Payment System (OSFPS) in Nobo College of Pharmacy in Tanzania can improve efficiency, time management and easy decision making to students' needs.

2.2 Theoretical Perspectives

Information Systems can be technologically explained by (Laudon & Laudon 2013) as a part of a combined mechanism operating collectively to gather, retrieve, process, store and distribute information to stimulate the planning, control, coordination and decision making in any company or organization. In other words, an Information System includes data, processes, policies and procedures, protocol, skill sets, hardware, software, among others. These goals are at fulfilling information requirements throughout the whole company or organization to stimulate performance and efficiencies.

2.2.1 Online Payment System (OPS)

Oyewole, El-Maud, Abba and Onuh (2013) define an online payment system as delineated a sort of inter-organization information system (IOS) dedicated to creating money-related transactions among clients and totally various organizations. Oyewole et al. (2013) further argue that an online payment system is a comprehensive term, a representational process that varies scope of delivery through electronic multichannel. This means that online payment

systems operate in such a way that will help the user to complete all the payments without physical contact with paper money in hand. It uses numerous functions and offers associated amplified in exchange for characterizing online payment in literature. Online payment is visible from its abilities as e-banking, m-payment, e-cash, net banking, online banking, e-brokering and e-finance. Online electronic payment systems had also acknowledged capability, a lower level of crimes and resourcefulness in the global payment systems. Kabir, Saidin and Ahmi (2015). This highlights a desire for coordination among various technologies to make an effective system (Vu & Proctor, 2011).

Dennis (2004) characterizes the system of online electronic payments as a kind of monetary commitment that has the clients and also the vendor who enable the use of electronic infrastructures. Brigs and books (2011) noted that online payment is like a relation among associations and those who assist banks and enter houses to conduct financial transactions electronically. In the views of Babatude (2012), online payments are any form of cash transfer through the web and they promote transactions perfectly.

2.2.2 Types of E-payment systems

Kabir, Saidin and Ahmi (2015) explained that there are many electronic payment services that are used globally and they include; e-cash, electronic checks, credit cards and electronic fund transfers. Online payment is divided into two types: internet banking payment Gateway (IBPG) and outsider payment platform. The first is a direct mode of payment and clients conduct payment via e-business which is linked between vendor and purchaser and is connected to the banking framework. Meanwhile, the second one is where by merchants conduct money exchange from the account of the purchaser direct to merchant account (Yang, cheng & Song, 2007).

Yu, Hsi and Kuo (2002) categorized digital payment into four categories such as digital cash, online credit card payment, small payment and electronic cheques and all this is influenced by economic aspect, technology, social aspect, institutions and laws that govern the transactions online. Aigbe & Akpojaro (2014) explained that there are four unique forms of online payment which comprises, Debit Cards, credit cards, smart cards and digital cash. According

to Kim, Tao, Shin and Kim (2010), electronic transactions-based payment systems are based on modes such as electronic transaction (SET), Cyber, Net Bill and virtual holdings.

2.2.3 Security of E-Payment System

Khidzir, Daud, Ismail, Ghani, Affendi, Ibrahim & Hery (2018) described strategies on how data and information can be kept safe and this included; Alteration or unintentional change (integrity), promptly access (availability) to only approved customers on demand, unauthorized access (confidentiality). These safety features are essential for an e-payment system; an insecure EPS will be unable to gain the client's trust which is important to substantiate acceptance. As stated by (Fekadu, 2009) there are security issues with e-banking and e-payment systems since they rely on fundamental ICT platforms which are prone to various economic and business vulnerabilities.

2.2.3.1 The Major Security Demands in EPSs

The following are safe economic exchanges electronically meeting before any transaction is conducted online.

2.2.3.2 Integrity and Authorization

This is characterized by validity, accuracy and completeness of information as per business qualities and needs. This implies that no money is taken from a customer until payment is approved by the client. Additionally, merchants do not settle for any payment while not absolutely certain the permission of the customers is granted, this is alluring customers to keep away from unwanted graft. This implies that there are policies and procedures for identifying, controlling and securing data against unapproved access to or change, while it is in storage or processing. (Kissel, 2006)

2.2.3.3 Confidentiality

This is where by all means the online information of the customer is not disclosed to any other person without approval from him or her. The information and data regarding the transaction

are confined to the merchant and client and the client has to verify payments before any transaction is done and information is kept secret (Dwork, 2018).

2.2.3.4 Availability and reliability

Dwork (2018) notes that in online payment, information and data need to be guaranteed that will be available whenever required and to promote reliability, information need to be frequently communicated as the rate of time and payments needs to be done whenever a need arises.

2.2.3.5 Information security

The growing use of online business has led to increased security threats and it is, therefore, the responsibility of the payment gateway to safeguard all sensitive data and information from frauders and hackers. As a result, payment gateways have increased security protocols, encryption techniques and standards for providing safe and reliable services to the users (O'Raghallaigh, 2017).

2.2.4 Security Mechanisms in Payment Gateways in Cloud Computing

2.2.4.1 Data Encryption

These are security mechanisms applied in payment gateways and used to ensure the protection of information such as credit/debit card details and supplied to the customer from various types of network attackers. The information is often shared between customer and merchants in a very secure method. According to Guynes & Windsor (2011), data encryption is a process that is secure so long as the keys are stored secretly and this maintains unauthorized parties from decrypting the data. According to UKEssys (2018), it is explained that data encryption promotes data integrity since the data modification is done during its transmission in the network and this safeguards the customer's details from being misused, victimized or stolen.

Cloud computing is one of the large platforms that supports data storage at a cheaper cost in exceptional capacity and can be accessible at any time over the web. Encryption is considered the standard or level of technological innovation that IT specialists concur is the source of security. The dangers of data and information security in the cloud are explained in two states:

information that is at rest (or protected and stored in the cloud) and the information is moving (or moving in or out of the cloud). Numerous clouds suppose the utilization of secure web connections like TLS (Transport Layer Security) or (Hypertext Transfer Protocol) HTTP for encoding, to exchange information from the user's terminal to the net application (Bansal, Bhargavan & Lavaud 2013).

2.2.4.2 Data Field Encryption

This refers to an end-to-end coding technique that makes use of industry standard coding for blocking sensitive information to be read at the part of the entry. The decoding key is accessible to approved parties solely, the card details are encrypted by the payment gateway and only read by those individuals who acquire the cryptography key. There, access to the client's details by unauthorized users or parties is declined throughout the data transmission from the payment to the bank (UKEssays, 2018).

Once the information comes to the cloud provider's server, the application supplier for the most part encrypts it to secure the information at rest. In order to keep information secure, the purpose is to separate the encryption key from the encrypted information, for this matter information will not be easy to be tempered with even to the cloud provider themselves because there will be a cryptograph mechanism. For computing service suppliers, there is some issue with the administering encryption keys area. Regularly, encryption keys could be kept on a different server. A backup for all keys should also be stored secretly in a different location in case of a calamity, moreover, encryption keys need to be revived routinely in order to keep and maintain high degree of information security (Lawton, 2016).

It's vital for organizations and companies to create procedures and rules to recognize what data rise to the demand for encryption and the kind of information to be protected safely in plain text Lawton (2016). The user might have a role with the key for obtaining private information without any doubt. Due to the data protection of high level, it makes it hard for the user to just access anyhow, reason being, encryptions standards should be practised in business.

2.2.4.3 Cryptography

This is a technique that uses symmetric cryptography and asymmetric cryptography whereby symmetric cryptography makes the application of the same key for coding and decoding. This method resembles a traditional encryption algorithm that works as a lock and is unlocked with a cryptographic key. Asymmetric cryptography uses coding and decoding with two separate keys whereby there are private and a public key which is applied in decryption for the private key. The clients' sensitive information is encrypted by the payment gateway with a public key that is known and famous to everybody. However, it can be decoded by the bank using the private key of a gateway which is kept secret; the only disadvantage is that the keys have to be updated regularly to keep it secure (Masihuddin, Khan, Mattoo & Olanrewaju 2017).

This can help in the integration of Cloud Computing by the rising number of privacy to the organization. The essential level of security where cryptography can offer cloud computing is the secure storage of information. In other words is a science of storing information safely by converting the raw data into forms which are not readable (Blackburn, Stinson & Upadhyay, 2012).

In today's technology, cryptography is taken as a set of three algorithms. These algorithms are Symmetric-key algorithms, Asymmetric key algorithms and Hashing (Nigoti, Jhuria & Singh, 2013). In Cloud computing the main issues are connected to the problem in data security, backup of data, traffic in the network, storage system file, host security and cryptography only can solve and handle these issues to a large extent.

Encryption technologies such as Secure HTTP, encrypted VPNs, Secure Shell, TLS among others should be used in order to maintain safe and secure communication between the client domain and host domain or from host to control systems. Encryption will assist a lot in preventing such disasters as a man in the middle, spoofed attacks and hijacking of sessions. Cloud computing facilitates customers with a computing infrastructure which can as well give out data storage and run the application task. Cloud data storage stimulates the risk of leakage of information but the very important thing it does not allow access to unauthorized users from owning the data due to the maximum security provided to data storage in the cloud. All

of these problems have been resolved by cryptography so that security, privacy and trust in cloud computing can be ensured.

2.2.4.4 Anonymity

In making the payment the user of the system login to the personal cloud and communicate with the fees application services through an anonymous communication channel. For this case fees application services can be conducted when the user pays encrypted electronic cash. The fees application services use the symmetric key to decrypt the amount paid to obtain electronic cash and notify whether it's genuine before transferring the electronic cash to the bank application service to check for double spending. This makes the user information not identified (Cloud Security Alliance, 2010).

2.2.4.5 Blockchain

Blockchain technology is a form of dispensed architecture which ensures the application of cryptographic signed transactions (Christidis & Michael, 2016). This means that this technology operates in blockwise manner whereby every block is connected to cryptographic systems. The Blockchain process ensures robustness and doesn't cost the operation fees for authorizing the transactions. The hackers find it hard to break thought to the encrypted systems. Hence, the transactions are simpler and open to access.

The blockchain is an important aspect in technological approach especially for many cryptocurrencies with Bitcoin and Ethereum as both are mostly applied ones. The main agenda behind the blockchain is that the longest chain is allowed as the proper one. In other words blockchain can be described in terms of the Bitcoin currency system which includes addresses and the transactions (Andrychowicz, Dziembowski, Malinowski & Mazurek, 2014). This is due to the reason that they are very essential ingredient of the Bitcoin system, the signature with a public secret key pair (pk, sk). In other words Bitcoin is digital cash system where every digital coin is a chain of digital signatures. Each owner communicates with the aid of using virtual digital signing after which transfer the coin relying on hash transactions of current and previous history (Huang, Chen, Wu, Huang & Shen, 2016).

An address is a hash of a public key (pk), technically. For this case public key is applied in presenting an address suppose a user or client has a paired key. The scripts are recorded within the Bitcoin scripting language, therefore the transactions can be performed by a user or client aims to transfer fund from point A to another point in a very convenient and secure way (Andrychowicz, Dziembowski, Malinowski & Mazurek, 2014)

2.2.4.6 Unforgeability

The fee payment system based on cloud computing applies the technology of ID-based Bank application services due to the fact that it makes the use of digital blind signature (Sarde, & Banerjee, 2017). The unforgeability of the information is secure against any attack which might happen to affect the information. This can prevent from both internal and external attacker of the system.

2.2.5 Previous Studies from Nobo College of Pharmacy

A study by McGrath (2017) at Nobo College of Pharmacy described the college as having a mixture of students both local and foreign students but the only challenge that was found in the school was a mode of payment of school fees which is more traditional where by students have to go and deposit school fees at a bank and sometimes requires foreign students to travel in the country to carry out payment. The study also revealed that some students who lived in rural places had to travel to urban areas where most of the banks are found and make payments. In addition to the above, it was also found that students could not manage to pay school fees during holidays and weekends. Therefore, as a result, online payment was proposed which will enable students to pay school fees at any time at any place while being secure and user friendly for both students and staff of Nobo College of Pharmacy.

2.3 Review of Related Literature

2.3.1 Methods used by students to pay school fees

2.3.1.1 E-Payment

This is an electronic commerce payment system that facilitates the consent of electronic settlement for online transactions. It is sometimes called electronic data interchange (EDI). It should be noted that the increase in e-payment is a result of an increase in the use of the internet which is affordable by many people globally. Although over 90% of individuals in the United Kingdom do not trust online transactions but remains one of the most viable options globally (Tu & Meredith, 2015).

2.3.1.2 Online E-Checks

This means a sort of payment done through the internet or some other data network, designed to perform a similar function as a conventional paper check. Electronic checks are created by the merchants' worker who runs the customer's paper check through a digital detector system which is brought by the service provider. The virtual carry off the customer's banking information and therefore the payment amount. The information is then transferred digitally over to the ACH system that acquires the funds from the client's account and deposits them into the service provider account, after the electronic check is approved, the virtual terminal prints a receipt for the client to sign and keep (Check, 2017).

2.3.1.3 Credit Card

This is a small plastic card issued to clients as a method of payment for online or offline purchases. The commercial bank offers a line of credit to the cardholder who has to purchase a minimum amount for purchase of credit monthly (Harris, Guru & Avyari, 2011). The charges are billed monthly on the customer's account which subsequently pays the balance of the account to the payment service. Aigbe and Akpojaro (2014) noted that credit cards are widely accepted globally by merchants and purchases due to their easy use of it.

2.3.1.4 Mobile Payment

This is a form of M-Payment whereby a mobile device is required to initiate and confirm payments and it exists in several technologies. Sometimes M-Payment is referred to as the transfer of a digital method of payment from the payer to the payee via the usage of a digital payment instrument that could be a mobile device held by a minimum of one particular system that is not bound anywhere and sends and receives information over a wireless link (Wessel, Huber, Stumpf & Eckert, 2015).

2.3.1.5 Wire Transfer

This refers to an electronic transaction of finance from a specified bank account to a special specified bank and accounts either domestically or internationally. The users of the system create and edit wires and wire templates, check on the status of wireless and beneficiaries, approves wires and run wire usage reports, the main example of this is Western Union through their online payment service (Kagan, 2020).

2.3.1.6 Debit Cards

This is a widely used system for electronic payments. In this method, the customer deposits funds to the account and can be withdrawn from the Automatic Teller Machines or can be used to pay for any services or products and cash is subtracted automatically from the customer's account (Teoh, Chong, Lin & Chua, 2013). Wulandari, Soseco and Narmaditya (2016) noted that debit and credit cards are convenient, flexible easy to use, high speed, accessible and available for customers at any time.

2.3.1.7 Smart Card

This is plastic cards that are installed with the microchip on which funds can be loaded in order to make an instant payment of bills and transactions. Sometimes they are called chip cards and are loaded with clients data about the business of the customer and sometime used to store money with lessened usage and can be authorized using a pin provided to customers

by the merchants. They are secure because the data is encoded and have higher speed examples of this include, Visa cards and Mondex (Rankl & Efung, 2010).

2.3.1.8 Mobile Wallet

Mobey Forum (2011) defines a mobile wallet as practicality on a mobile device that may be securely interacting with digitized valuables. It can be run by a smart phone or by a remote on secure servers but accessed by a mobile device, M-Wallet modifies the functions of services through the mobile devices on the monetary, user identification and M-Commerce fronts (Mobey forum, 2011).

2.3.1.9 Secure Electronic Transaction (SET)

Singh, Supriya and Joshna (2016) define secure electronic transactions as an arrangement for online payments for guaranteeing the security of money related exchanges on the web. It is an open, technical standard for business created by master card and VISA, it permits secure transactions by payment card over the net and the system is formed by means of a digital certificate, confirming seller legitimacy and cardholders.

2.3.2 Features of other existing online school fees payment systems in Tanzania and African Universities

Most of the universities in Tanzania such as the University of Dar es Salaam (UDSM), Mzumbe University, and University of Dodoma (UDOM) among others, their methods/ways or system of school fees payment is done by control number, whereby a registered student through his or her university's personal account in the university system has to first log in and put in his or her credentials (username and password), for example, ARIS (Academic Registration Information System) for UDSM. In the student account, there is an option for making payment for this case it will show the tuition fees or amount required to be paid, graduation fee, transcripts fee, provisional statement of results fees and after the selection, you save and request a control number. Therefore, a student will be required to download an invoice to complete making the payment. The payment is mainly done via Mobile Network Operators (MNO) and Bank method (through banks like CRDB, NMB and BOT). Mobile

payment becomes an alternative to cash, check, credit cards and debits because it can all sort of payment to be solved via mobile phone (Shin, 2010). In this case, someone to accomplish the payment has to go to the bank area physically.

A study by Ferguson, Soutter and Neubert (2019) in South African Universities especially the University of Cape Town (UCT) reveals that the form of payment of school fees was through credit cards, debit and credit cards at cashers' offices and the pin number is entered to authorize the payment. For the student who was outside the country, telegraphic transfer to a university account was accepted. This mode of payment fees helped to save time and congestion at the banks in South Africa as students could pay fees at their convenience.

A study by Aladi (2019) for Loyola Marymount University in Nigeria discussed Automating School Fees Transactions in Nigerian Universities and Tertiary Institutions. An automated payment becomes the solution (Roumani & Nwankpa, 2016) to keep all the payment systems in line with Nigeria in international standards in order to meet up with developed countries. This has helped to decrease the percentage usage of cash and cheque for this case automated or electronic payment has grown much. The rise in the use of the electronic model is core-driven and rapidly updatable of the new technologies by Nigeria.

In school fees payment, an automated system has also been most important because through the school's bank account, money that is to say student fees paid are automatically transferred to the school bank irrespectively. For this reason, there is no any physical contact with cash which makes it harmless and reliable. For this case due to the technological growth of electronic payment the students have been relieved stress of visiting bursaries and queuing to make payment of school fees. Also, transport cost is incurred to the bank area or location to pay their fees and obtaining receipts indicating the payment made which has to be taken to the bursary as evidence that the fees have been paid by the students (Aladi, 2019).

2.4 Research Gap

The review of related literature above indicates that the implementation of an online school fees payment system would enable students to complete all the payments of school fees in a secure manner and be able to print examination cards wherever they are. However, none of

these studies have indicated a system that would perform and operate such tasks. It is from this factor of view that this study intended to fill this gap by designing and developing a such system that is secure, reliable, efficient and can be able to perform all the tasks as requested by all the users in demand with a provisional of data storage in the cloud whereby unauthorized users will not be in a position of tempering with it.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

Goretti (2008) explained research methodology as a systematic procedure to solve research problems. This chapter contains the research design, research approach, target population, sample size, sampling techniques, research instruments, data gathering procedure, data analysis, system development cycle, ethical considerations and limitations of the study.

3.2 Research Design

Kothari (2004) defines research design as a blueprint of research or a master plan of research. For this study, the descriptive cross sectional research design was used. Cross sectional research design was selected due to the fact that a descriptive cross-sectional study inspects the superiority of a disease or circumstance in a described population at a specific factor or duration in time without trying to draw any inferences or provide any reason for prevalence. For this case relying on the nature of the study Descriptive cross sectional design was the perfect fit because it went through the problems and analyzed them within a particular period of time. The research approach for the study was both quantitative and qualitative, whereby quantitative research was used to interpret questionnaires especially the statistics and qualitative approach was used to interpret interview findings during the study using the content analysis method.

3.3 Target Population

Kothari (2012) describes the target population as a set of elements or items that have similar characteristics. For this study, the populations used were the users of the current services for paying school fees at Nobo College of Pharmacy and a total of 110 respondents were chosen to participate in the study that including Staff, Bank accountants, college accountants and revenue officers, sponsors of fees, parents and students of Nobo College of Pharmacy.

3.4 Sample Size

From a target population of 110 respondents only 86 respondents were chosen to take part in the study and calculated using the Slovenes formula:

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

Where by

N: is the population

n: sample size

e: the level of significant which is fixed at 0.05

$$= \frac{110}{1+110(0.05^2)}$$

$$= \frac{110}{1+110(0.05^2)}$$

$$= \frac{110}{1+110(0.0025)}$$

$$= \frac{110}{1.275}$$

$$= 86$$

3.5 Sample Techniques

Saunders et al. (2012) explained sampling Techniques as steps used to arrive at a representative sample size which is fair and none biased. The study adopted a stratified sampling technique. This technique was used because it helps to divide the population of the study into groups called strata of which the sample was chosen based on their gender, age and level of education.

3.6 Research Instruments

These are tools that were used to collect data from the field both primary and secondary; for primary data questionnaires and interviews were applied, and secondary data were obtained from a documentary review on official reports regarding fee payment systems at Nobo College of Pharmacy.

3.6.1 Questionnaires

Kothari (2017) describes questionnaires as the most useful tools that capture measurable data for statistical testing so as to understand the relationships between the study variables. However, in this study, both close-ended and open-ended questions were applied. Close-ended questions were used to limit respondents from writing many stories which were not relevant to the study and cleaning and sorting data would be hard Example “yes” or “no” or “true” or “false 'I Agree' and 'I Disagree. On the other hand, open-ended questions were used to give the respondents chance to express freely what they knew regarding the subject but such data was usually tiresome to work with during sorting and cleaning.

3.6.2 Interview

This was used to collect information from different personnel at Nobo College of Pharmacy in Tanzania. The interview was carried out in a free open way on the current system and the setbacks that occur in the fee payment operations based on the study objectives.

3.7 Data Gathering Procedure

These are procedures used in data collections which are before, during and after. Before data collection, the researcher requested for an introduction letter from the Directorate of Post graduate Studies and Research of Kampala International University in Tanzania. This letter was submitted to the authorities at Nobo College of Pharmacy such that they could allow the researcher to continue with the study. During the study, the researcher sought consent from the respondents to take part in the study willingly without any form of coercion and after data collection, the data became sorted, cleaned and coded. Then was evaluated based on SPSS and qualitative data was analyzed using content analysis.

3.8 Data Analysis

The quantitative data were analyzed using descriptive analysis found in SPSS version 20 which is easy and faster and has a wide variety of functions, this is where frequencies and percentages were generated and represented on tables and graphs. The qualitative data were analyzed using content analysis. Rwegoshora (2016) describes data evaluation as the ordering of data into constituent elements on the way to reap solutions to the research objectives. The system developed was tested by several users to find out its capabilities in promoting online fee payment for Nobo College of Pharmacy students.

3.8.1 System Development Life Cycle

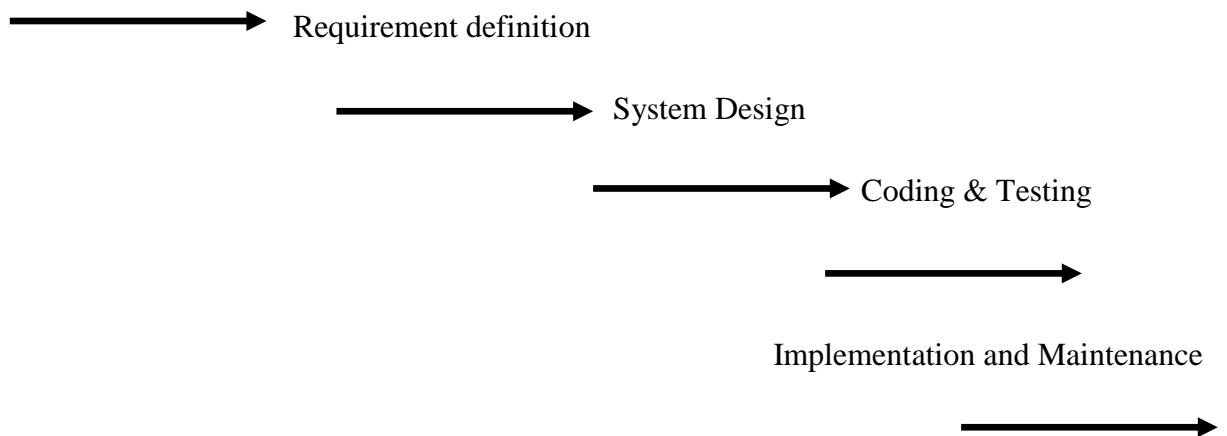
The system development life cycle (SDLC) has several phases before the system is fully developed and involves a lot of activities. Developing a system starts from a need or problem identification, then problem analysis and alternatives, after need identification the next crucial step is the feasibility study. When the system is fully developed the crucial step is testing and re-testing the system and findings from each test is what improvements are based on until it starts functioning normally without major complications before implementing it, and all the data for each next phase is kept safely (Geoffrey & Josh, 2004) and the researcher will use waterfall model to develop the system.

3.8.2 Waterfall Model

Sommerville (2011) explains that the waterfall model is a sequential software development process which progresses steadily downwards like flowing water through phases of conception. It commences from Initiation analysis, design (Validation), construction, testing and maintenance. In this model the work progress in a sequential manner. The model takes essential process activities of specification, development, validation and evolution and presents them as separate process phases which include requirements specification. This model was applied because it solves the problem from one step to another step in a systematic manner.

The model is described below.

Initial Investigation



The system development starts with a prototype design methodology which is based on the waterfall model that deals with developing an initial implementation, exposing it to users and using comments to refine many versions until the system is fully developed. The system development started with what is well known and understood then the features will be kept added to fit the user's needs. The researcher used logical diagrams, physical diagrams and state diagrams to come up with an online payment system for Nobo College of Pharmacy.

3.9 Ethical Considerations

Ethical consideration in research has gained popularity in academia due to the danger and sensitivity of certain information. All researchers are therefore expected to practice ethical conduct during any study; this is to prevent harm to respondents. This is why consent, confidentiality, enormity, ethical clearance and honesty have gained popularity in social science research today.

3.9.1 Consent form

This is whereby the respondent has to agree to participate in the study without being coerced or forced, the respondent has to agree voluntarily. Respondents have to sign what is called a consent form to show they agreed and are free to depart at any time all through the study.

3.9.2 Anonymity

This is where all the names of respondents have not been recorded anywhere, their places they live or addresses as well as contacts. The researcher made sure all information regarding the respondents was kept private. This helps to avoid bias and also causes risks to respondents' lives.

3.9.3 Honesty

Researchers are advised to be honest to respondents, need to tell the respondents the truth about the study, its impacts on their lives and quoting exactly what respondents said. Due to the fact that the researcher dealt with professionals from different disciplines, he had to be honest with them and but not falsifying wrong information. This helped to build trust among respondents during the study.

3.9.4 Confidentiality

This is where all information that was given to the researcher was kept confidential and could not be given to a third party without the consent of the respondents.

3.10 Limitations of the Study

Like any other study, this study encountered several challenges which could have affected the study in one way or the other. The first challenge was time; the study involved developing an online payment system which required testing and re-testing until it could work. This took a lot of time but the researcher kept on testing it until it worked.

Many people never knew how to use the system and required a lot of time to explain to them how the system operates, its features and how perfect it was. A lot of convincing and encouraging them with good language was done until many of them were able to participate both in questionnaires and in testing the online system.

Unsatisfactory collaboration of participants, some delayed in accomplishing the questionnaires because of their tight schedules. However, a researcher was patient enough to the respondents who were delayed in completing questionnaires and at they all managed to return the filled questionnaires.

The research was conducted during COVID-19 issues which resulted in some respondents were not easily reached, for this case, tracking questionnaires to be returned was difficult, but a researcher managed to handle it by using all precaution measures in order to reach some respondents.

Testing: Relates to the difference in time and conditions when the data were obtained from the respondents at different times and on differing days and hours. This was minimized by briefing the research assistants on data collection procedures.

Some respondents were not easily reached and very few questionnaires were returned due to circumstances within the respondents. However, this was minimized by the researcher in ensuring that he got an appropriate number of respondents for the reason of representativeness.

Validity of responses: The design of questionnaires as the major tool for data collection relied on the perspective of the individuals who were respondents. There were potential validity problems with respondents who might be inherently biased because of the nature of the study

itself. Furthermore, probably some respondents were unwilling to supply the researcher with the required information for objective measures because of their suspicion of academic research and its motives. These limits were minimized by employing interviewing as a complementary data collection method.

CHAPTER FOUR

SYSTEM ANALYSIS, DESIGN, IMPLEMENTATION AND DEVELOPMENT

4.1 Introduction

This chapter contains study findings relying on the objectives of the study; the findings are presented on tables and graphs and are interpreted. This chapter also contains the system design, how it functions, its goals, capabilities, functions and representation of the target population.

4.2 Demographic characteristics of respondents showing gender, age, level of education and marital status of the respondents

Table 4.1: Demographic characteristics of respondents showing gender, age, level of education and marital status of the respondents

Variable	Category	Frequency Number	Percent
Gender	Female	31	36
	Male	55	64
Age	>30	21	24.4
	31- 40	32	37.2
	41- 50	16	18.6
	50 and above	9	10.5
Level of Education	Certificate	3	3.4
	Diploma	16	18.0
	Bachelor	50	56.2
	Masters and above	20	22.5
Marital Status	Married	52	61.9
	Not married	32	38.1

Source: (Field Data, 2020)

Data from the table above shows that 55 (64%) respondents are male and 31 (36%) are female. More than half of the participants are male.

However, the age range of the respondents shows that 32 (37.2%) respondents are between 31 and 40 years old, 16 (18.6) are between 41 and 50 years old, 21 (24.4%) are below 30 years old, and 9 (10.5%) are above 50 years old. The biggest percentages of the respondents were between 31 and 40, whereas the least were above 50 years of age.

The level of education of the respondents shows that 50 (56.2%) respondents are at bachelor's level, 20 (22.5%) are masters and above, 16 (18.0%) are diploma level, and 3 (3.4%) are certificate level. The greatest level of education for most of the responders is at the bachelor's level.

Furthermore, the marital status shows that 52 (61.9%) responders are married and 32 (38.1%) are not married. More than half of the respondents are married.

4.3 To review the existing systems used by students in paying college fees at Nobo College of Pharmacy

Table 4.2: To review the existing systems used by students in paying college fees at Nobo College of Pharmacy

S/N	FEES PAYMENT METHODS	YES	NO
1	Bank deposit to college account	72 (83.7%)	14 (16.3%)
2	Checks and bank transfers	31(36.0%)	55(64.0%)
3	Cash payment to the college bursar	30(34.9%)	56(65.1%)
4	Payment cards	39(45.3%)	47(54.7%)
5	Visa cards	18(20.9%)	68(79.1%)
6	On line payment	16(18.6%)	70(81.4%)
7	Electronic payment	13(15.1%)	73(84.9%)

8	Tigo-Pesa	19(22.1%)	67(77.9)
9	M- Pesa	18(20.9%)	68(79.1%)
10	Airtel -Money	21(24.4%)	65(75.6%)
11	Halo-Pesa	24(27.9%)	62(72.1%)

Source: (Field Data, 2020).

Table 4.1 shows that 72 (83.7%) of the respondents agreed that they use banks to pay school fees and only 14 (16.3%) of them disagreed. These findings imply that most respondents use banks to deposit school fees. This finding tally with that of Shan, (2000) who stated that electronic transactions lead to easy access to accounts, business and information through networks using the internet, Shan further describes that electronic banking performs transactions without a physical visit to the financial institutions and a person can bank online, bank at home or use mobile banking as well virtual banking to conduct his or her transactions.

Furthermore, the study investigated to find out whether Nobo College students use checks and bank transfers in the payment of school fees and findings revealed that out of 86 respondents 55(64.0%) of them disagreed and only 31(36.0%) agreed to have used checks and bank transfers in payment of school fees in Nobo College. This finding concurs with that of Turban et al. (2008) who noted that the use of checks declined from 85% in 1979 to 59% in 2002 and at the same time electronic payment grew from 15% to 41% in the same period and the trend is increasing globally.

Findings on school fees payment to college Bursar revealed that 56(65.1%) of respondents disagreed and only 30(34.9%) of respondents agreed. These findings signified that students at Nobo College did not pay school fees through the college bursar since the majority disagreed. These findings are similar to those of Alawiye-Adams (2013) who noted that a cashless economy is on the rise and many societies today are switching from a physical cash system to non physical cash modes of payment which are used to settle all types of transactions in various economic sector.

In addition to the above, the study also wanted to find out whether Nobo college students and parents often paid fees by using payment cards but out of 86 respondents 47(54.7%)of respondents disagreed and only 39(45.3%)of respondents agreed. These findings meant that those students at Nobo College did not pay school fees by using payment cards since the majority disagreed. This finding is similar to those of Rankl and Effing (2010) who found that payment cards were used by modern economies whereby microchip is loaded with funds to make instant payments and this is not well developed in developing countries.

The study investigated to find out whether Nobo College students, sponsors and parents use Visa cards as a means of fee payment but out of 86 respondents 68(79.1%) of them disagreed and only 18(20.9%) of respondents agreed. These findings implied that visa cards were never used as a means of fee payment by Nobo College students and parents. These findings are similar to those of Singh, Supriya and Joshna (2016) who noted that Visa cards were a secure method of payment since it permits transactions over the net and the system is formed by means of a digital certificate, confirming seller legitimacy and cardholders but were not available in developing countries to be used in transactions.

Additionally, the study investigated to find out whether students pay fees through an online payment system but out of 86 respondents 70(81.4%) of respondents disagreed and only 16(18.6%) of respondents agreed. These findings signified that online payment was not applicable for students of Nobo College. These findings are equivalent to those of Oyewole et al. (2013) who profess that an online payment system is a comprehensive, representational process that varies the scope of delivery through electronic multichannel.

Furthermore students, parents and sponsors were asked whether they paid fees through Electronic payment but out of 86 respondents 73(84.9%) of respondents disagreed and only 13(15.1%) of respondents agreed. These findings implied that students at Nobo College did not pay fees through electronic means but instead pay through the bank. These findings are similar to those of Wang, Streff and Raman (2012) who found that mobile payment sometimes has challenges for cybercriminals due to many threats and attacks that occur during the transactions.

Respondents were asked whether they pay school fees through Tigo- Pesa. Out of the 86 respondents, 67(77.9%) of them disagreed while only 19(22.1%) respondents agreed. These findings signified that students at Nobo College did not pay school fees through Tigo- Pesa but instead pay through the bank. These findings are similar to those of Wang, Streff and Raman (2012) who found that mobile payment faces threats and attacks due to the high risk involved.

The investigation on M- Pesa method of fee payment by students was rejected during the study and was represented by 68(79.1%) of respondents disagreeing and only 18(20.9%) of respondents agreeing. These findings implied that payment of fee through M-Pesa was not acceptable at the college, instead, students had to go and pay fees in the college account in the bank. These findings are similar to those of Wang, Streff and Raman (2012) who found that mobile payment sometimes has challenges of network unavailability and payment could not be affected.

Furthermore, findings also revealed that students of Nobo College do not use Airtel Money as a method of fee payment and this was represented by 65(75.6%) of respondents who disagreed and only 21(24.4%) of respondents who agreed. These findings implied that payment of fees through Airtel Money was not accepted in the college, students had to go and pay to the bank. These findings are similar to those of Wang, Streff and Raman (2012) who found that mobile payment sometimes has network challenges and payment could not be affected.

The study investigated whether students, parents and sponsors pay school fees through Halo-Pesa at Nobo College and findings revealed that 62(72.1%) of respondents disagreed and only 24(27.9%) of respondents agreed. This implied that students, parents and sponsors on Nobo College did not use Halo –Pesa as a mode of fee payment since the majority disagreed. These findings are similar to those of Huber Wang, Streff and Raman (2012) who found that mobile payment sometimes has challenges of network and payment could not be affected.

4.4 Weaknesses of the existing systems faced by Parents, Students and Sponsors when paying school fees

Table 4.2: Weaknesses of the existing systems faced by Parents, Students and Sponsors when paying school fees

Challenges that parents, students and sponsors face when paying fees	Sd.	D	N	A	Sa	N	Mean	Std. Deviation	Interpretation of the mean
Long queues in the banks and causes stress	12	5	10	21	38	86	3.7907	1.42347	High
Students can be easily robed on their way to the bank	8	17	9	21	31	86	3.5930	1.38375	High
Causes delays in finance department	8	18	11	20	29	86	3.5000	1.39537	High
Transport cost to travel to the bank	9	17	9	20	31	86	3.5581	1.41092	High
The services are only available on working days and hours	8	21	8	31	18	86	3.3721	1.29294	High
It is difficult to keep papers and may get misplaced	6	18	12	24	26	86	3.5116	1.32615	High
Forgery and fraud is common	6	15	11	28	26	86	3.6047	1.28593	High
Less revenue collection for institution	6	20	11	21	28	86	3.5116	1.35251	High
Time wastage during the queuing at the bank and the	6	17	14	25	24	86	3.4651	1.31684	High

whole process of making payment									
Meeting the deadline of fees payment is hard for parents, sponsors due to unavoidable circumstances	6	17	13	32	18	86	3.4186	1.25055	High
Students may end up spending all the fees given by parents	9	13	12	25	27	86	3.5349	1.36939	High
Too much paper work promotes bureaucracy both in bank and at the college	11	8	10	30	27	86	3.6279	1.35513	High

KEY: SD - Strongly Disagree, 2- Disagree, 3- Neutral, 4- Agree, 5- Strongly Agree

N-Total Summation, Mean – Mean Average

Source: (Field Data, 2020).

The researcher asked respondents whether they faced challenges of long queues in the banks which causes them stress. This was reflected in a high overall mean score of 3.7907 and a standard deviation of 1.42347. The findings implied that students and parents in Nobo College often face challenges of delays during school fees payment and it is therefore important to design a system that is efficient and easy to use at any convenient time for students to pay fees. These findings are similar to those of Beyeler, Glass, Bech and Soramäki (2007) who stated that paying money in banks causes congestion in banks, especially in developed countries like (USA) the United States of America.

The findings also investigated whether students can be easily burgled on the way to the bank area to pay school fees as one of the challenges. This was reflected in a high overall mean score of 3.5930 and a standard deviation of 1.38375. These findings signified that students can be easily robbed since the majority of respondents agreed. It was therefore important to

develop a good financial system for fee payments at home or at school such that parents and sponsors could not be worried about students being robbed on the way to the bank by cone men or thieves. These findings concur with those of Idolor (2010) who found that bank frauds and robbery were caused by poor working conditions, poverty and low salaries.

The researcher investigated whether paying school fees in the bank causes delays in the finance department of the college. This was reflected in a high overall mean score of 3.5000 and a standard deviation of 1.39537. The findings signified that bank payment of fees for college students of Nobo College causes delays for students to be cleared at the finance department because they have to find valid evidence from the bank that fees were paid by a specific student. This delay calls upon Nobo to design a system that is prompt and faster for fee payment. These findings are similar to those of Arty (2013) who found that bank payments were delayed due to fear of fraud and forgery, therefore, every document needed to be verified before payment is affected.

Furthermore, results from the study revealed that transport cost to the bank was another challenge given the fact most banks were located in a town far away from the college. This was reflected in a high overall mean score of 3.5581 and a standard deviation of 1.41092. The findings implied that students and parents in Nobo College often face challenges of delays during school fees payment and it is therefore important to design a system that is efficient and easy to use at any convenient time for students to pay fees. These findings are similar to those of Spreen and Valley (2006) who found that many students in South Africa could not attend school due to a lack of transport to school.

The findings indicated that the services were only available on working days and hours which was a challenge for parents who wanted to pay fees during weekends and after work. This was reflected in a high overall mean score of 3.3721 and a standard deviation of 1.29294. The findings implied that payment of fees for Nobo College students was only applicable during official working hours and working days. It is therefore important to design a system whereby payment can be done at any time that is convenient for students to pay fees. These findings tally with those of Okibo and Wario (2014) who found that banks have improved on performance for customers due to the previous weakness whereby services were only

available at a specific time.

Furthermore, the study findings showed that it was hard to keep papers and could get misplaced by both parents and students. This was reflected in a high overall mean score of 3.5116 and a standard deviation of 1.32615. The findings implied that students and parents of Nobo College often misplaced bank slips after payment of fees, it's therefore important to propose to the college to adopt an online payment system such that paperwork can be reduced and also losing them could not be a challenge since everything would be integrated to the system. These findings are similar to those of Avers, Johnson, Banks and Wenzel (2012) who found that paperwork causes delays and errors in the aviation industry.

The study also investigated on whether paperwork payment of fees could lead to forgery and fraud in the payment of fees in the bank. This was reflected in a high overall mean score of 3.6047 and a standard deviation of 1.28593. The findings implied that students and parents in Nobo College often get cases of forgery of bank slips by students and when not well identified students often get away with it without being identified. This affects the college's collection of fees to run school programs and activities. These findings are similar to those of Onibudo (2007) who found that the reasons for fraudulent in the banking zone were due to the fact that many employees are involved and often do it without any detection at all, hence attracting more employees to conduct it.

Less revenue collection for institutions was also found to be a challenge during the study as many students tend to delay paying fees, also spend all the fees given to them and also long queues discourage parents and sponsors to pay fees on time. The researcher asked respondents whether they face challenges of long queues in the banks which causes them stress. This was reflected in a high overall mean score of 3.5116 and a standard deviation of 1.35251. The findings implied that the college does not collect enough fee given the circumstances that are involved in fees payment such as long queues and also students themselves spending all the fees for other things discouraging parents and sponsors to pay more fees. These findings are similar to those of Muqorobin, Kusrini, Rokhmah and Muslihah (2020) who found out that late fee payment was caused by poverty, and parents' low earnings.

Findings also indicated that time wastage during the queuing and the whole process of making payment was a challenge to sponsors, parents and students who have many other activities to do. This was reflected with a high overall mean score of 3.4651 and standard deviation of 1.31684. The findings indicated that due to long queues parents are discouraged to go and pay fees in the banks. It is therefore advisable for Nobo College to adopt efficient and effective system of fees payment. These findings are related to those of Goncharuk (2016) who noted that banks face challenges due to system breakdown which need time to repair to normal.

Meeting the deadline of fees payment was difficult for parents and sponsors due to unavoidable circumstances. This was reflected with a high overall mean score of 3.4186 and standard deviation of 1.25055. The findings implied that fees payment to the bank often meets with challenges since the parents could be having liquid cash but do not have enough time to go the bank and given many problems to solve, they end up using the fees that was to be used to pay to Nobo College. These findings are similar to those of Li, Zhu, Ren, Wang, Zhang and Chen (2013) who noted that meeting deadlines projects is often not easy due to unavoidable circumstances.

Students may end up spending all the fees when given by parents was found to be one of the greatest challenge of fees payment to the bank by Nobo College students. This was reflected with a high overall mean score of 3.5349 and standard deviation of 1.36939.42347. The findings implied that giving students fees to pay to the bank was not achievable by parents in Nobo College because they often spend all the fees and parents had to mobilize more money to pay to the college. These findings are similar to those of Mwaniki (2018) who noted that students' indiscipline causes them to misbehave in many Kenyan schools.

The researcher asked the respondents on whether they faced challenges of too much paper work which promotes bureaucracy both in banks and at the college. This was reflected with a high overall mean score of 3.6279 and standard deviation of 1.35513. The findings implied that when there is too much paper work services tend to delay because of the requirements to be approved from different offices. It also leads to corruption because delays will attempt students to pay something. These findings are concurring with those of Avers, Johnson, Banks and Wenzel (2012) who found that paper work causes delays and errors in aviation industry.

4.4 Designing an online school fees payment system that will enable students to pay fees

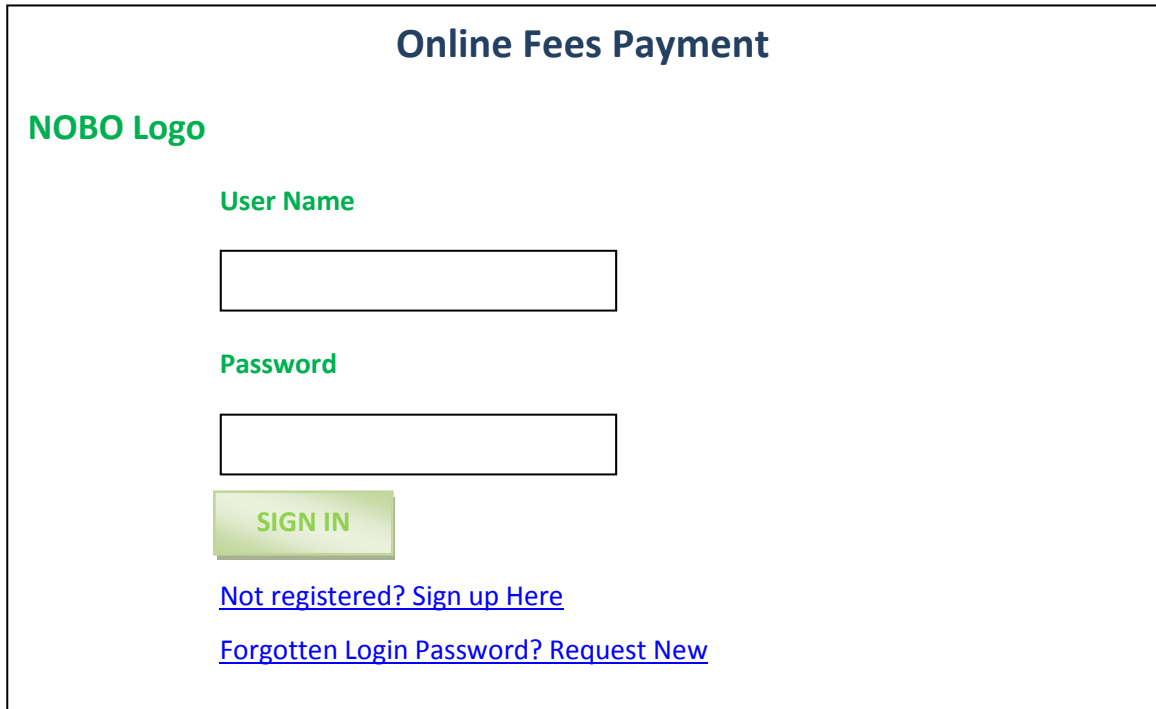
4.4.1 System Development

On user operational data of the existing system, analysis of data showed that the current system was more of manual operations, where students/parents and guardians (school fees payers) would physically go to the bank for making school fees payments. Data also showed that a high percentage of users of the current system do not support it much due to its challenges, limitations and problems faced.

On areas identified for improvement, there was a need for an online school fees payment system. Apparently, there is no operational system, and this left user stranded especially when they face problems from using the current system with no room for any assistance. Users needed to be introduced to a new system for making all school fees payments to be done online. Most users had some knowledge of computer applications and for this reason, will make use of the introduced system more effectively.

The system will be easier for any user to interact with since it is user friendly. Here are some forms users will interact with when logging in into the system.

Log in Form



The screenshot shows a web form titled "Online Fees Payment". In the top left corner, there is a green "NOBO Logo". Below the logo, the text "User Name" is displayed in green, followed by a white rectangular input field. Underneath that, the text "Password" is displayed in green, followed by another white rectangular input field. Below the password field is a green button with the text "SIGN IN" in white. At the bottom of the form, there are two blue hyperlinks: "Not registered? Sign up Here" and "Forgotten Login Password? Request New".

Figure 4.1: Log in Form of the System

Source: (Field Data, 2020).

The user will be required to apply his/her login password to login to the system. For new users they will have to register first by providing their Username and Password. After successful log in the user/student will reach a dashboard which will display his/her account in a summary form whereby student's details for each semester will be displayed. The dashboard will show Annual Fees, Semester Fees, Semester Paid Percent, and Annual Paid Percent among other features; it will be easy for a student to collaborate with the system.

4.4.2 System Scope

The system was scoped to be used by the Administrator, Students and College Revenue Officers.

4.4.3 System Requirements

The services required from the system and their constraints on the system's operation were all considered. System requirements were collected in consultation with the users of the system. Interviews were conducted and software requirements specifications were established. These requirements specifications were grouped into two categories; Functional requirements which tell what the system should do and non-functional requirements which are attributes that a system should possess in order to perform its tasks.

4.4.3.1 Functional and Non-functional requirements

4.4.3.2 Functional requirements

Functional requirements identify the system's behavior, this means they explain what the system does or must do or not do it and this should be performed on how the system reacts to inputs. They usually identify data input and business processes that allow the system to function as they were designed to do. In other words functional requirements are product features and are based on user requirements meaning that the product or output will not work if the functional requirements are not met.

4.4.3.3 Students (payers) Registration

This system shall allow students (payers) to be able to register themselves, hence enabling them to login into the system. The system should be able to provide a validation message once a user has been successfully registered. During registration it will enable users to provide their own passwords that will be easy for them to use while they login.

4.4.3.4 Making payment

After a student or payer has been successfully registered then he/she can be able to make his/her payment. So, for one to be able to do that he/she must first login using the password or confirmation number and some details which he/she provided during registration, this helps in authentication (access control) based on what the user knows (password or confirmation

number). After a successful login, the user is able to make his/her payment. Payment will be allowed at any time when someone wants to do so.

4.4.3.5 Processing payment

The system should be able to process the payment by accepting, storing and sending a confirmation message to the students or payers after successfully making their payments. The system shall record and process all the transactions which have been made or cancelled by the students and notifying the students or payer when the payment is completed. Before the payments have been made, the student or payer is allowed to review his confirmation and if he desires, he will be able to delete or change his information before the payment is finally submitted. And finally, the system shall notify the student or payer after the payment has been recorded and stored successfully, that the payment has been made.

4.4.3.6 View confirmation

The system should be able to give a notification if one has successfully paid the fees. The system should be able to process the results (automatically) and enable the users to view the results.

4.4.3.7 View help menu

For those students or payers who do not know how to a make payment and other staffs, they shall have a chance to view a help menu. This will help them to know something about what to do in the system.

4.4.3.8 Functional requirements summary

Table 4.3: Functional Requirements Summary

Functional Requirements	Description
Student Registration	Students register with the system by entering their details
Making Payment	After successful registration, students will log into the system by giving out their details so that they can proceed to make payment.
View Confirmation	This requirement includes processing of payment and processing the results to the student or payer.
View Help menu	This requirement allows the students to view the help menu about the functionality of the system.

Source: (Field Data, 2020).

4.4.3.9 Non-Functional requirements

Non-functional requirements point out how the system should do it or perform a certain task in doing a certain operation or activity. These do not affect the basic functionality of the system, but they still remain very important to the system because they define features, behavior and general characteristics experienced by users. Non-functional requirements are also executed to determine how easy the system or product is to use so that the system performance can be judged, that is why they are based on user expectation and product properties.

4.4.3.10 Usability

The fee payment system should have user-friendly interface layouts that are interactive, satisfying to the system user and facilitating acceptable responses. The interface should enable users to move from one interface to another freely and additionally, it shall display interface differently based on the user's role. The interface should be easy to learn hence users would not have difficulties once they interact with the system.

4.4.3.11 Availability

The system should be readily available for use when a user logs in (any time) and at any point where he/she is as long as it is internet-connected. There should be transparency in accessing the system.

4.4.3.12 Scalability

The system should be able to be upgraded and expanded as the requirements tend to increase after some time due to the increasing change in technology. It should also permit troubleshooting and the correction of errors.

4.4.3.13 Hardware Requirements

The hardware required during the development process of the system which will enable the process of development to be completed on time includes:

Table 4.4: Hardware Requirements

Hardware	Minimum requirement	System
Processor	2.4 GHZ processor speed	
Memory	128 MB RAM	(256 MB Recommended)
Disk space	80 GB (including 20 GB for system Management system)	
Display	1366 x 768 colors	(1024 x 768 High color - 32 bit Recommended)

Source: (Field Data, 2020).

4.4.4 Software Requirements

The software requirements are: -

Microsoft Windows Operating system (Windows 2000 or later): the system to be developed is mainly going to be running on the Windows platform this is because of the ease of use. Storage capacity can be used to provide data storage in the cloud based on the size as required and to be provided for the service.

WAMP will be used to develop the online application since it contains PHP enabled program and Apache which enables a smooth running of the PHP codes on the server.

Microsoft Office suite i.e., MS Office 2003 and above: this will enable us to word process the documents that will be used in the development such as the Gantt charts, and also produce the documentation using Microsoft office. Since the database will be MYSQL then the office suite will be used to develop the database.

Google Chrome, Mozilla Firefox, or any other browsers can be used for running the application online.

4.4.5 System Design

These are set of activities and associated results that produce a software product. These activities will be carried out by the use of various system development tools that will be discussed later in this chapter.

4.4.6 Logical Design

The system logical design overview shows system structure and flow of data as illustrated in the figure below.

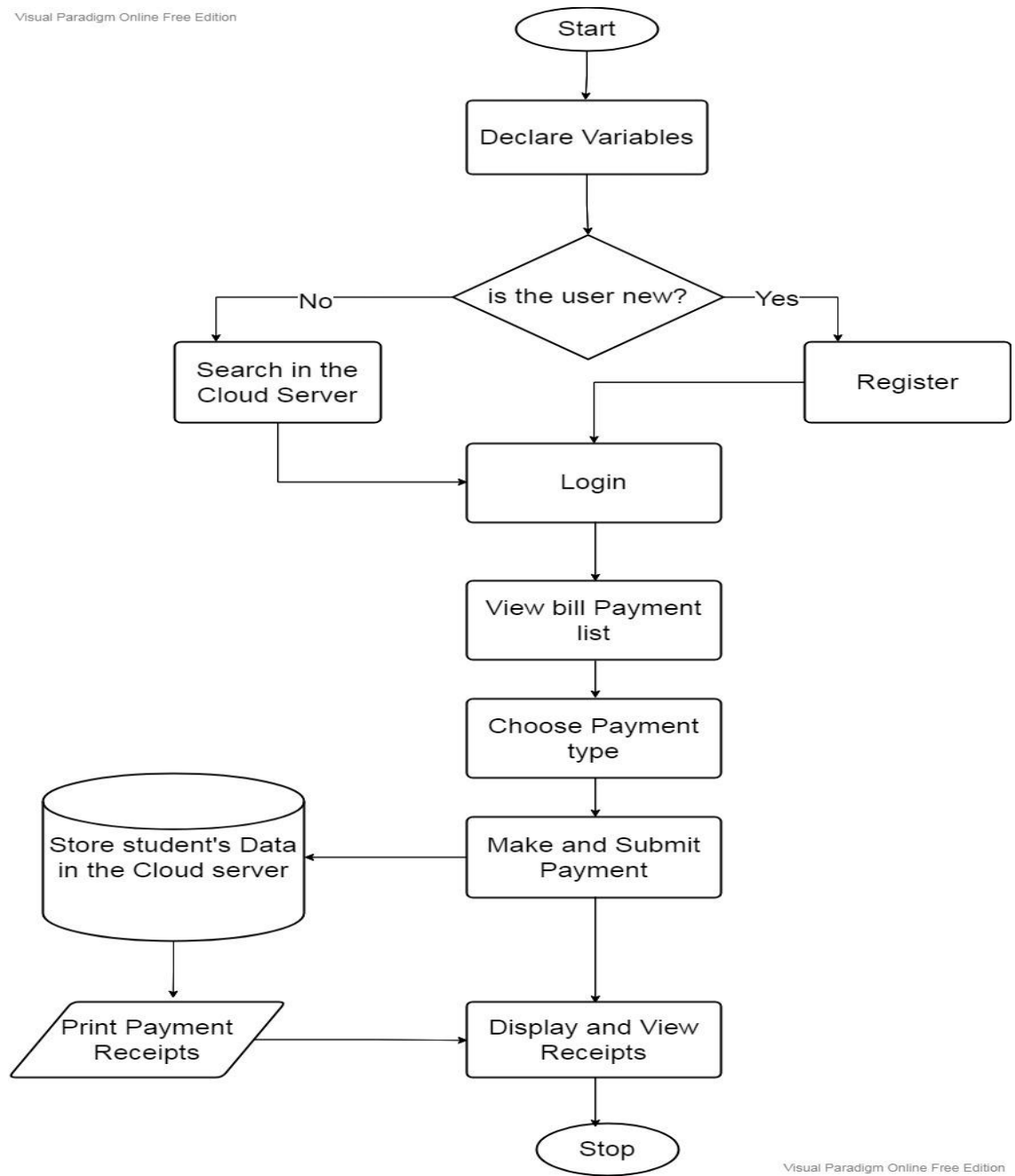


Figure 4.2: Flowchart to show the Logical Flow of the System

Source: (Field Data, 2020).

4.4.7 Use Case Diagram

The Use Case Diagram below presents the two main actors of an Online Fees payment system and how they interact with the system to complete some specific tasks.

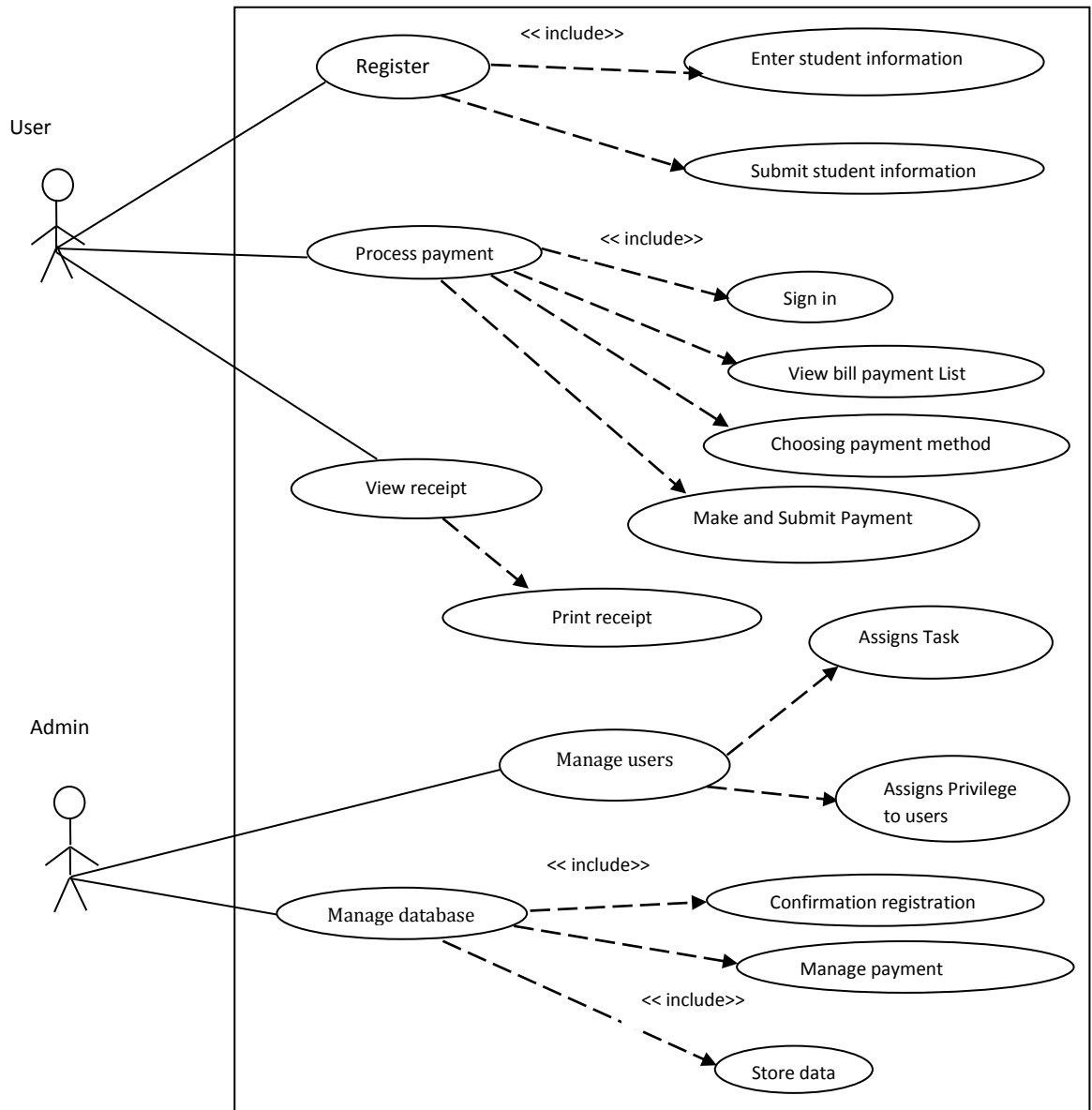


Figure 4.3: Use Case Diagram for the System

Source: (Field Data, 2020)

These are people who will interact with the online school fees payment system: regular users and everyone else who will be impacted by the use of this system for Nobo College of Pharmacy.

- i. User – individuals who use an online school fees payment system, at any time one would wish to make school fees payment in a secure way. These are students, parents and guardians.
- ii. Administrator – assigns tasks/privilege to users and monitors functionality of the system, informs a system developer regarding changes/ upgrades to the system.

4.4.8 The Physical Design

This consists of the user interface to be used by the students/school fees payers to interact with the system. In our case, there numerous interfaces the students/school fees payers interact with to Login, Register and process the school fees payment.

4.4.9 Student's Registration Form

A new student/user of the system must be registered first by filling in the registration form. Every student/user is entered into the system only once, the system assigns them an identification number for this case a user will provide username and password for every visit of the system. This section registers the Registration No, Username, First name, Last name, Email Address and Password.

NOBO COLLEGE OF PHARMACY

CREATE USER ACCOUNT
Sign Up

Student Information.

Registration No.

Username

First Name

Last Name

E-mail Address

Password

Password Confirm

Register

Already Registered? [Login here](#)

Figure 4.4: Registration Form

Source: (Field Data, 2020).

4.4.10 System Login

On accessing the system, the default page is the login screen. This is where users input user credentials, that is the username and the password.

Passwords to the system are encrypted and therefore not viewable in the event that one gets access to the database table.

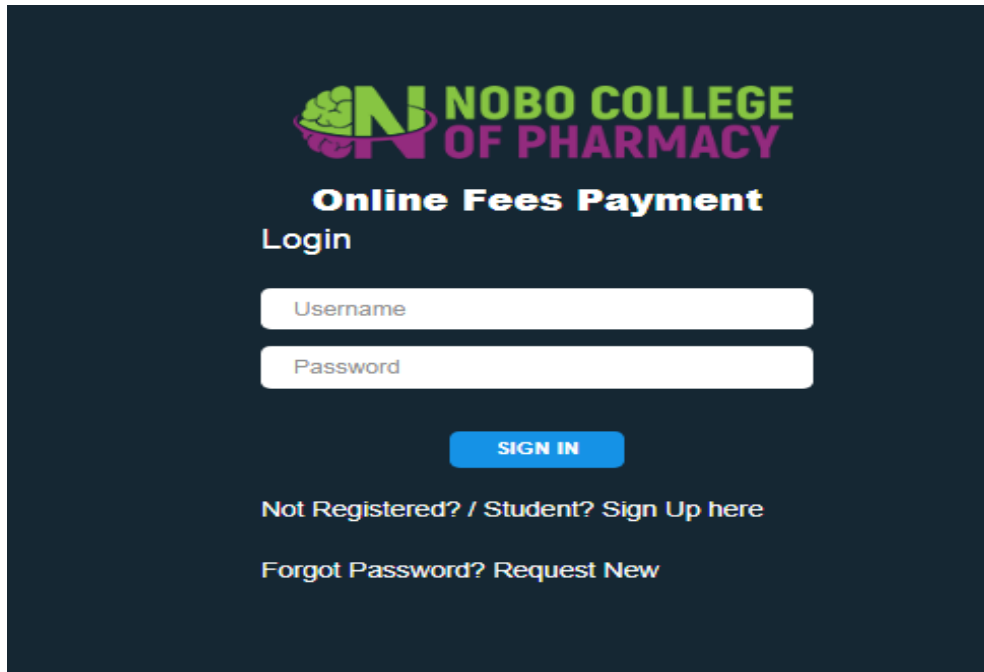


Figure 4.5: System Login

Source: (Field Data, 2020).

4.4.11 Successful Login

On successfully logging into the system, the welcome page is a dashboard that provides summaries on the current status of the student's activities pertaining to the objectives of the system, that is, all school payments statistics and financials related to the activities being conducted by a student.

4.4.12 Dashboard in the System

A system has a dashboard that summarizes student's details in a good systematic way and very easy to interact with. The dashboard contains the following features;

- Student's profile whereby there is an option of editing it and enabling a student/user to update his/her details.
- Navigate recent transactions, a student/user will be able to view and navigate all recent transactions completed.

- Print CAT 1 and CAT 2 Examination card buttons, a student/user will be able to print the examination card direct from the dashboard of the system.
- Pay Fees Button, a student/user will be able to press and make school fees payment by clicking on the button found on the dashboard.
- Statistics and analysis of all payments based on the program of the study and the amount to be paid completed, the dashboard in the system will display all payments made in a percentage calculated. This will enable the student/user to determine each percentage in every semester. This will determine Annual Fees, Annual Paid Percent, Semester Fees, Semester Paid Percent and among other features.

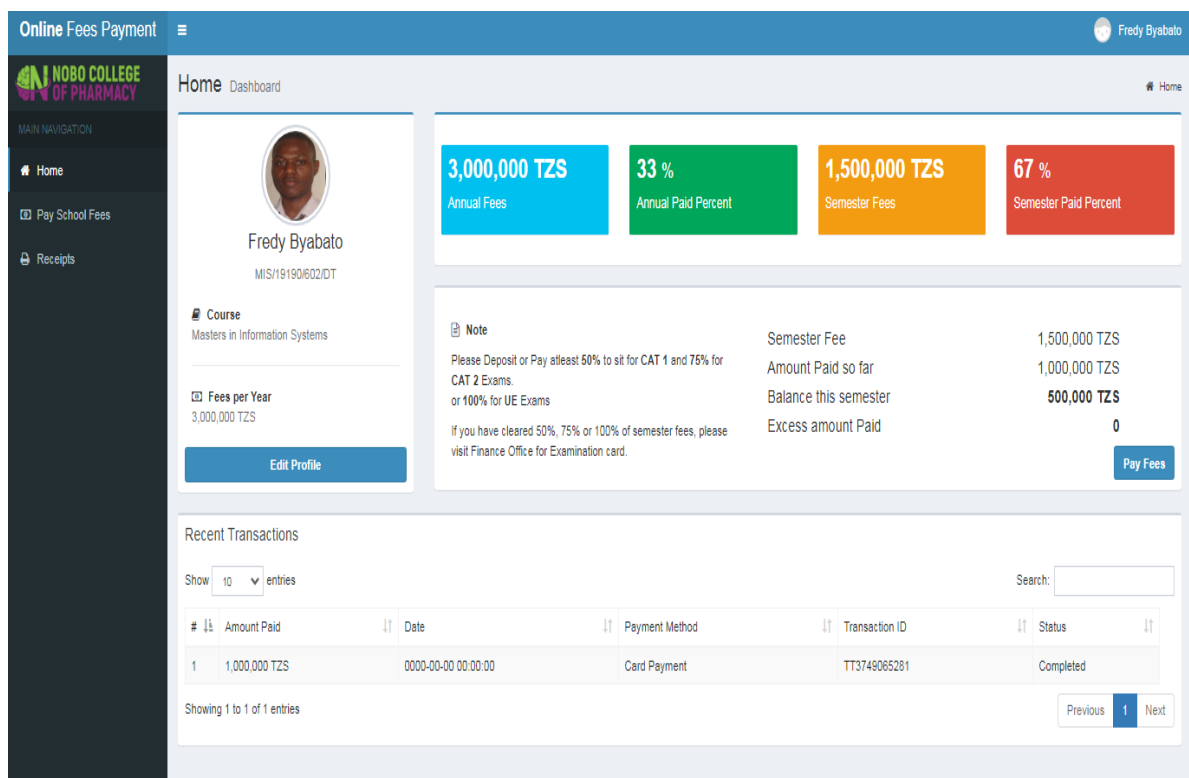


Figure 4.6: Dashboard in the System

Source: (Field Data, 2020).

4.4.13 Main Menu - Navigation

On the left side of the screen is an expandable panel that houses the main menu that enables students/ users to navigate the system. The menu is composed of menus that take a user/student to different pages. The menu is developed using XML that is populated into nodes.

Home Menu is responsible for enabling a user/student to be able to reach the home area/screen in the system whenever he/she wants. Pay School Fees Menu is for the user to be enabled to make school fees payments at any time in the system. Receipts Menu is where a student or user can be able to view his/her receipts for all the payments being made and be in the position of printing them for future references.

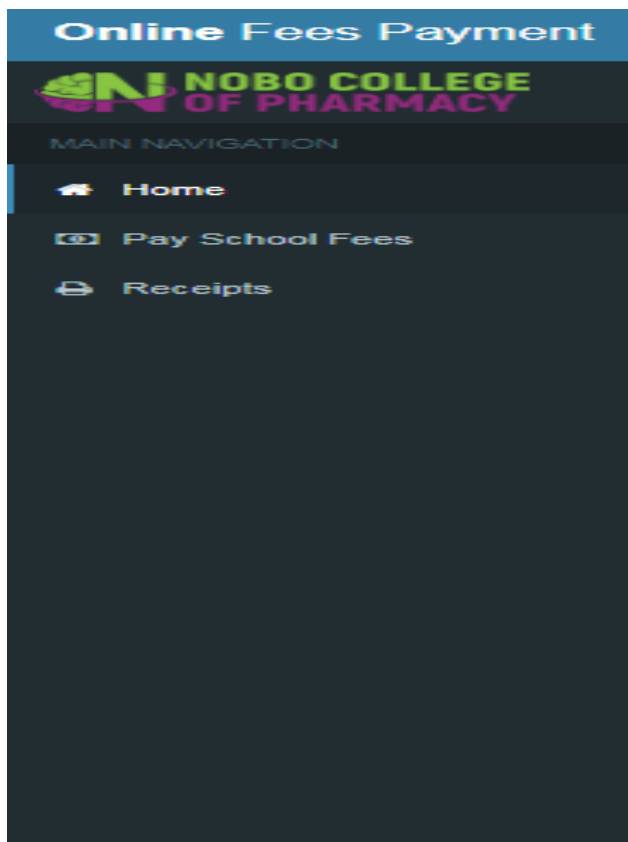


Figure 4.7: Main Menu

Source: (Field Data, 2020).

4.4.14 Pay School Fees

In making school fees payment a student/user will choose between two methods.

4.4.14.1 Card Payment Method

This is one of the methods a student will choose when making payment. A student will have to enter the amount to be paid, and then specify the name, number, expiry date and a card CVC to complete school payment. A student/user will have to click the Submit button to complete his/her school fees payment.

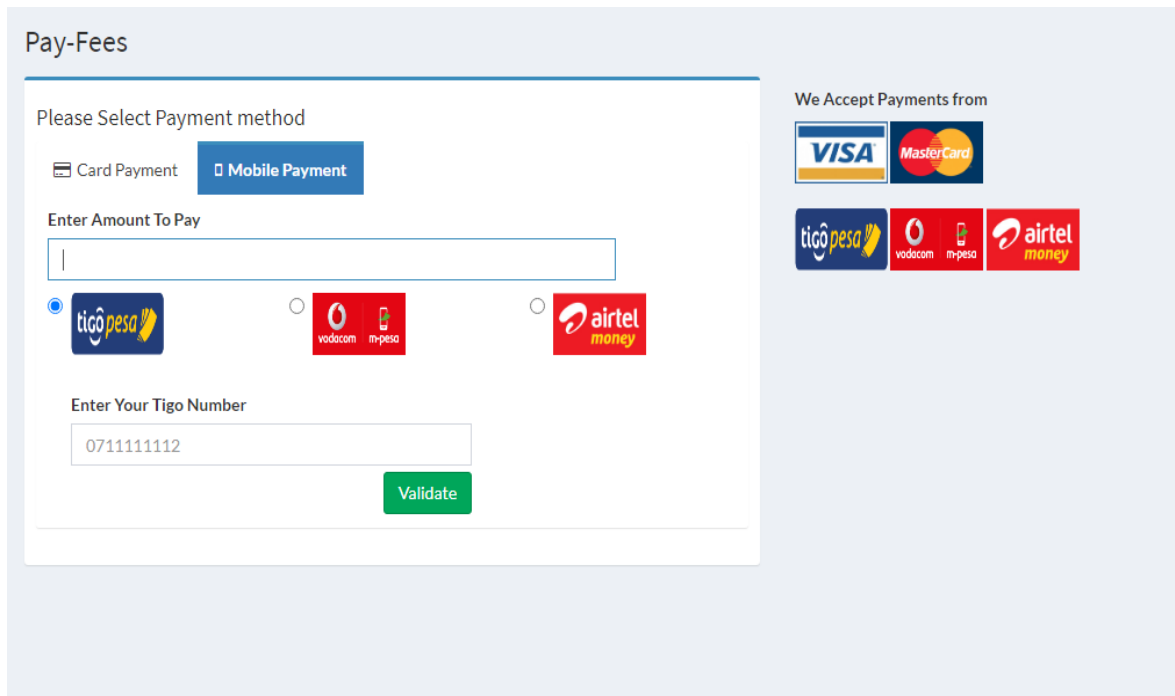
The screenshot displays a web interface titled "Pay-Fees". On the left, a form titled "Please Select Payment method" offers two options: "Card Payment" (selected) and "Mobile Payment". Below this, the "Credit/Debit Card Payment" section includes a "VISA MasterCard" logo and several input fields: "Enter Amount To Pay", "Card Holder Name", "Card Number" (with a masked field of dots), "Card Expiry" (with a date format of **/**), and "Card CVC" (with a masked field of three dots). A green "Submit Payment" button is located at the bottom right of the form. To the right of the form, a section titled "We Accept Payments from" lists logos for VISA, MasterCard, tigo pesa, yodacom, m-pesa, and airtel money.

Figure 4.8: Card Payment Method

Source: (Field Data, 2020).

4.4.14.2 Mobile Payment Method

This is another method a student will choose when making payment. The student will have to enter the amount to be paid by selecting any mobile service like Tigo, Vodacom, Airtel and TTCL to complete school payment. The mobile number must be verified first by the system before any payment to check for validity so that a student/user can continue with the payment by clicking on the submit button.



The screenshot displays a 'Pay-Fees' interface. On the left, a form titled 'Please Select Payment method' has two radio buttons: 'Card Payment' (unselected) and 'Mobile Payment' (selected). Below this is a text input field for 'Enter Amount To Pay'. Underneath are three radio buttons for mobile services: 'tigo pesa' (selected), 'vodacom m-pesa', and 'airtel money'. Below these is another text input field for 'Enter Your Tigo Number' with the value '0711111112' and a green 'Validate' button. On the right, a section titled 'We Accept Payments from' shows logos for VISA, MasterCard, tigo pesa, vodacom, m-pesa, and airtel money.

Figure 4.9: Mobile Payment Method

Source: (Field Data, 2020).

4.4.15 Transactions successfully notification message

The student/user will get a notification message for every transaction which has been made whether for a Card Payment Method or the Mobile Payment Method.

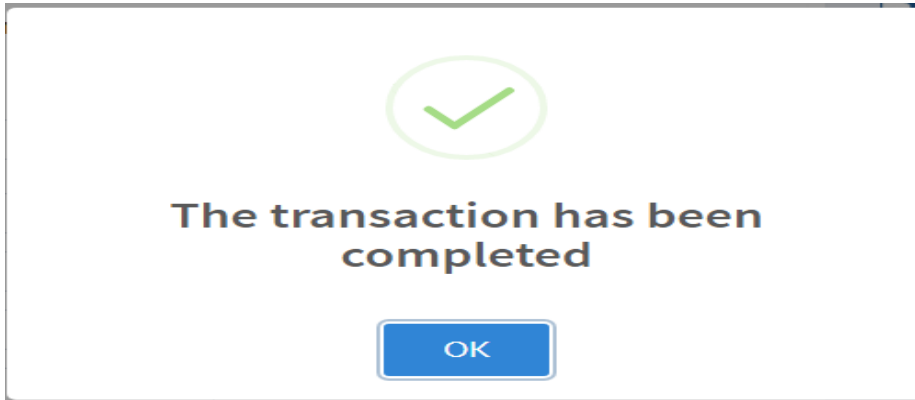
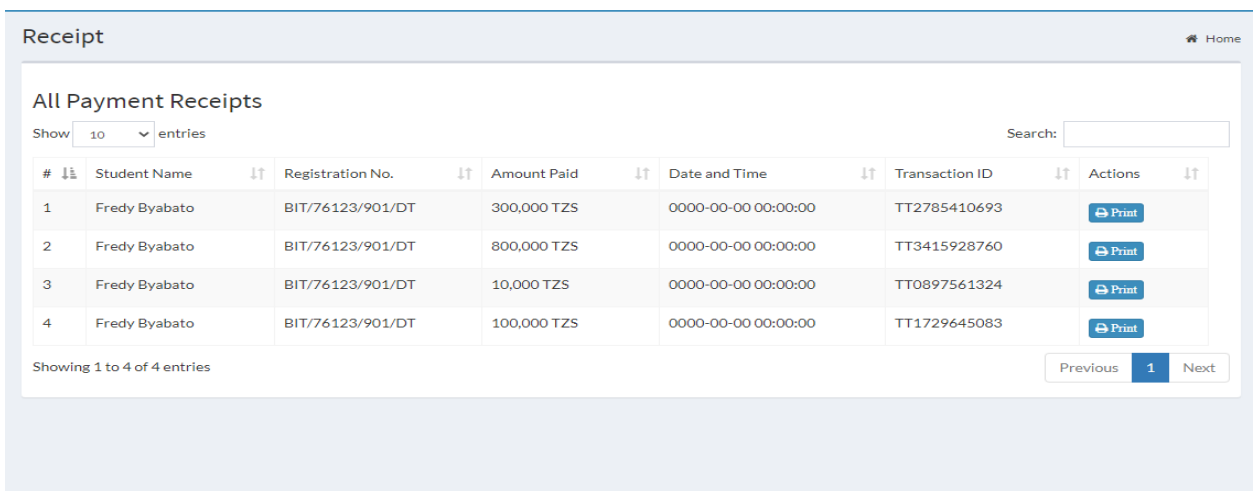


Figure 4.10: Transaction Successful Notification Message

Source: (Field Data, 2020).

4.4.16 All Payment Receipts

The student/user will be able to view all payments which have been made in his/her account whether by Mobile Payment Method or Card Payment Method.

A screenshot of a web application interface. At the top left, the word "Receipt" is displayed. In the top right corner, there is a "Home" link with a house icon. Below the header, the title "All Payment Receipts" is shown. Underneath the title, there is a "Show" dropdown menu set to "10" and the text "entries". To the right of this is a "Search:" label followed by an empty input field. The main content is a table with the following columns: "#", "Student Name", "Registration No.", "Amount Paid", "Date and Time", "Transaction ID", and "Actions". The table contains four rows of data, all for a student named "Fredy Byabato". Each row has a "Print" button in the "Actions" column. Below the table, it says "Showing 1 to 4 of 4 entries". At the bottom right, there are "Previous", "1", and "Next" navigation buttons.

#	Student Name	Registration No.	Amount Paid	Date and Time	Transaction ID	Actions
1	Fredy Byabato	BIT/76123/901/DT	300,000 TZS	0000-00-00 00:00:00	TT2785410693	Print
2	Fredy Byabato	BIT/76123/901/DT	800,000 TZS	0000-00-00 00:00:00	TT3415928760	Print
3	Fredy Byabato	BIT/76123/901/DT	10,000 TZS	0000-00-00 00:00:00	TT0897561324	Print
4	Fredy Byabato	BIT/76123/901/DT	100,000 TZS	0000-00-00 00:00:00	TT1729645083	Print

Figure 4.11: All Payment Receipts

Source: (Field Data, 2020).

4.4.17 Recent Transactions

A student/user will be able to navigate all Recent Transactions made either by mobile payment method or bank payment method.

#	Amount Paid	Date	Payment Method	Transaction ID	Status
1	300,000 TZS	0000-00-00 00:00:00	Mobile Payment	TT2785410693	Completed
2	800,000 TZS	0000-00-00 00:00:00	Mobile Payment	TT3415928760	Completed
3	10,000 TZS	0000-00-00 00:00:00	Card Payment	TT0897561324	Completed
4	100,000 TZS	0000-00-00 00:00:00	Mobile Payment	TT1729645083	Completed

Figure 4.12: Recent Transactions

Source: (Field Data, 2020).

4.4.18 Print CAT 1 and CAT 2 Examinations Button

A student/user will be able to print his/her examination card at any time as long as the required percentage is met. That is to say, in Nobo College 50% for CAT 1 Examinations, 75% for CAT 2 Examinations while 100% for EOS Examinations, the printing button will be enabled and activated in a student's account.

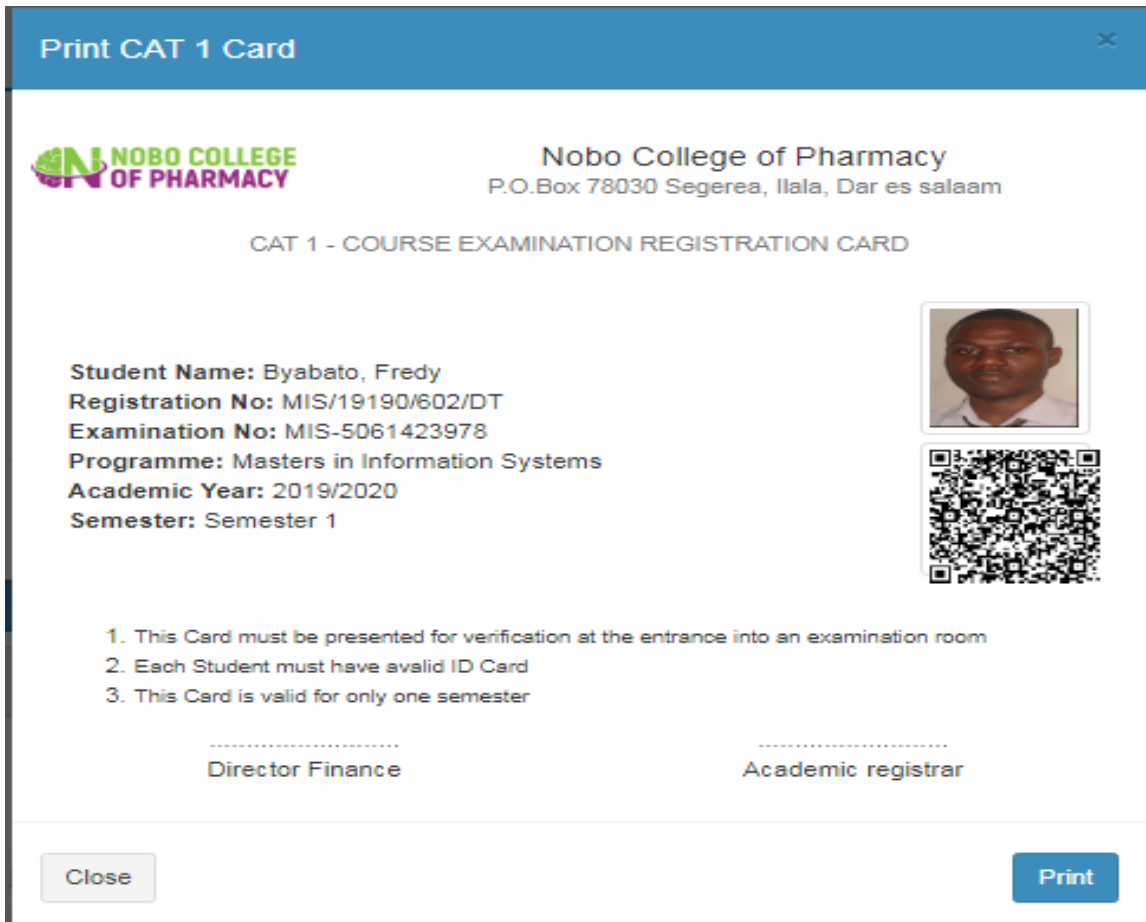


Figure 4.13: Print Cat 1 Card Button

Source: (Field Data, 2020).

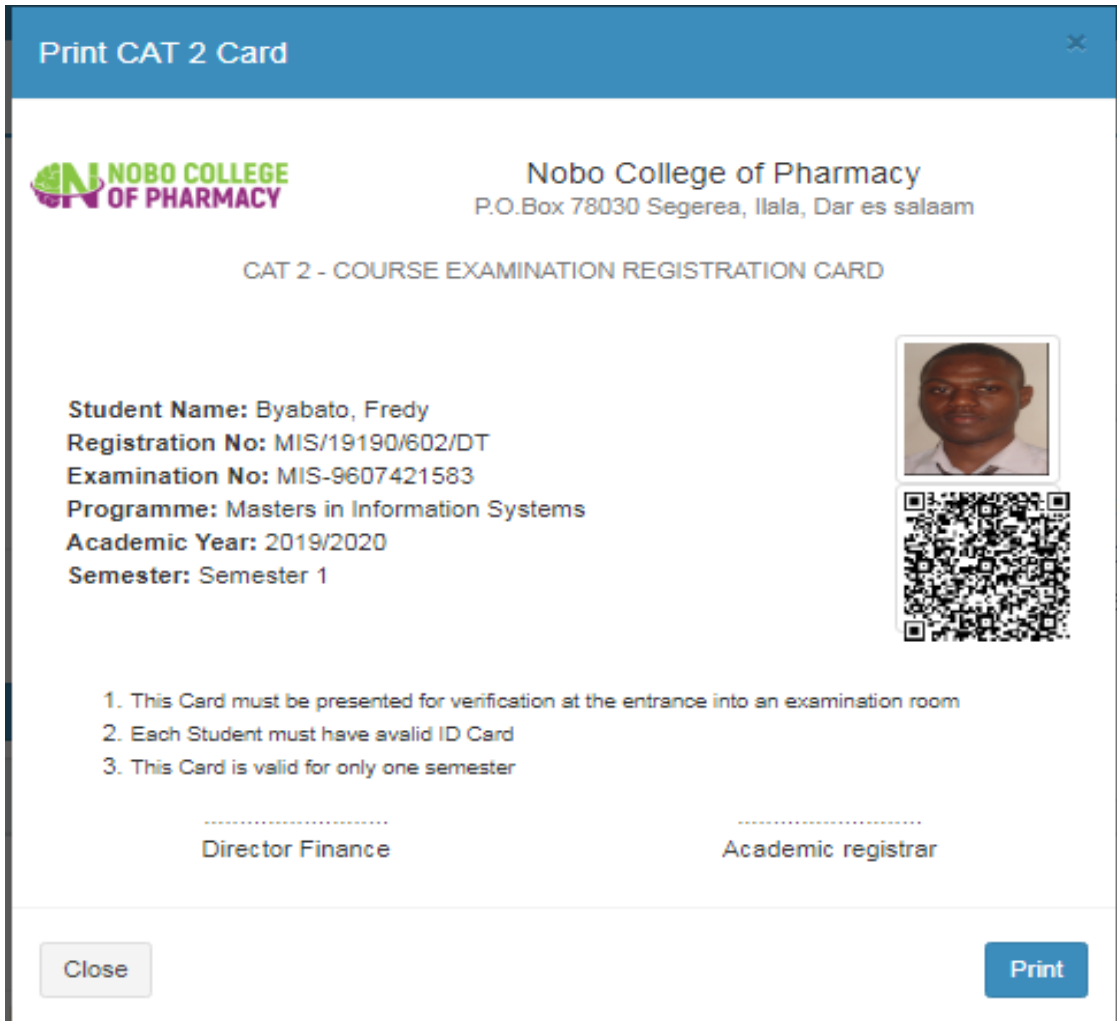


Figure 4.14: Print Cat 2 Card Button

Source: (Field Data, 2020).

4.4.19 Administrator's Dashboard in the System

The system will enable an administrator to manage students/users by creating an account, and assigning privileges. The features contained in an administrator's dashboard are;

- Statistics and analysis of all payments completed: the system administrator will be able to determine the amount paid either in the bank or mobile.

- Viewing all recent transactions: an administrator will be able to view all transactions made either in the bank or mobile money.
- Manage course: an administrator will be having an option for adding and removing the course from the system.
- Receipt: an administrator will be able to view all the transactions made and completed by student/user and can be printed.
- Reports for all bank transactions and mobile money transactions.
- Settings: an administrator of the system has this feature to enable him/her to set student's or user's privilege and right. This is done by enabling the button for CAT 1 Examinations, CAT 2 Examinations and Final Examinations in every semester.

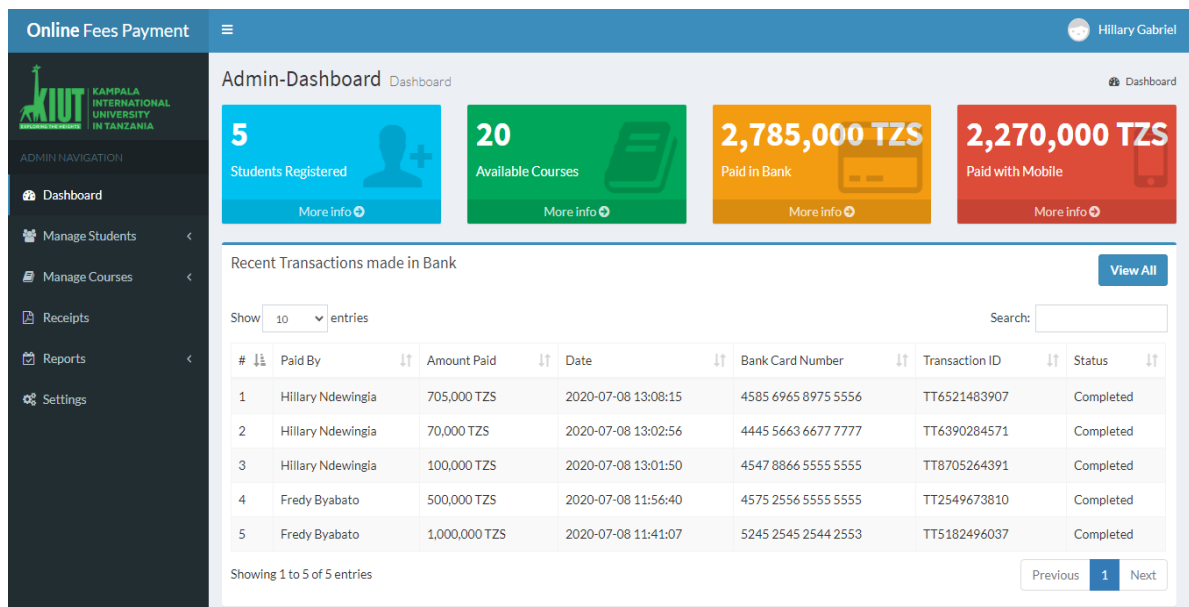


Figure 4.15: Administrator's Dashboard in the System

Source: (Field Data, 2020).

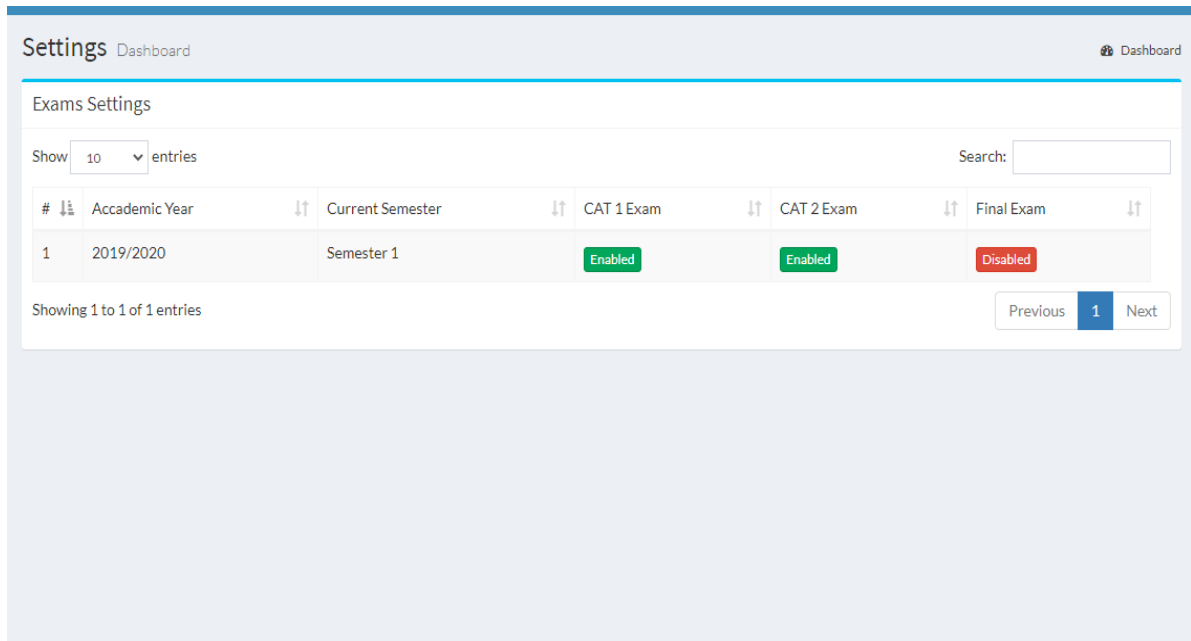


Figure 4.16: Examination Settings

Source: (Field Data, 2020).

4.5 System Implementation

Before implementation of the system, it was installed on the developer’s local computer for complete testing of the entire components one after the other. This was accomplished to guarantee that the program is working well as expected and does not destroy or partially corrupt its operating environment or cause different processes within that environment to become unworkable.

The system was successfully hosted in the cloud server named Hostgator and can be accessed through this link <https://fredy.kiut.ac.tz/>. This Service Cloud Provider offers the services of cloud hosting to clients as well as ensures that the system has enough security, is reliable, durable, and faster in handling sensitive data.

For this matter in the system instalment security is a very important aspect in cloud implementation, so an institution or organization has to plan for security in order to be protected against security threats like hackers, malware injection, DDoS (Distributed Denial of Service attack), data breaches, malicious insiders, and account hijacking.

Authentication is the important determinant of each secure communication structure especially in cloud computing because it protects shared information from unauthorized access and it is very important aspect in information security. Authentication, Authorization and Accounting (AAA) are the security module in Cloud especially when a client tries to access cloud resources from Cloud Service Provider then AAA verifies the client's authentication information. If the user is authenticated he/she gets the access level to the data, this is done by inspecting and checking the user's information from the database. This authentication techniques show how customers are identified and verified to access sensitive data (Köse, 2011).

Authentication scheme are categorized into several types for instance username and password identification, PIN-based authentication scheme and implicit password Authentication System (IPAS), electronic token and biometric authentication all of these act an important aspect in maintaining the authenticity of the shared data in cloud. In other words there are multiple authentication technologies which can be applied for identifying user access of information in the cloud such as username and password authentication and implementation of multi-factor authentication.

Since data stored in the cloud could be accessed from anywhere, there is a need to have mechanism to isolated data and protect it from client's direct access. The numerous possible security attacks on the cloud service providers are secured, saved and prevented by implementing various authentication schemes by verifying a user's identity when a user wants to inquiry any service from the cloud servers. As a result the consumer remains the sole responsible for his/her information.

When a client issues a request to access data from the cloud, the request goes directly to the endpoint interface of the proxy which is trusted. Then the proxy will forward the request to the broker using its interface, the broker will isolate storage and protect it from client's direct access in the clouds, then the broker has to request data and information from the cloud storage structure. The cloud storage or storage structure returns data or outcomes to the broker, then the broker turn backs the outcomes or data to the proxy and finally the proxy finalizes the whole process by forwarding the requested data and information to the client.

For that case in order to manage, control and ensure data security in cloud there are several layers which have to be considered in the cloud by both the consumers and the Cloud Service Providers, in other words security aspect can be shared between them. There are three layers in cloud computing as a consumer must well understand and look at in order to deploy any cloud services. The layers technologies and concepts express how hardwares and softwares are connecting or communicating. These are Infrastructure (IaaS), Platform (PaaS), Software (SaaS).

Infrastructure as a Service(IaaS) is the very basic layer of cloud computing and means that a consumer uses the cloud infrastructure for instance Microsoft azure or Amazon web Services and can be able to pay for what he/she uses. It consists of both hardware and networking like servers and storage, networking firewalls and security and data and information centres. This allows the consumers to use their own applications and platforms within the infrastructure that is deployed by the service provider. This helps and enables the consumer to perform big data analysis and handle efficiently the storage of data as the business grows, while managing the backup of the system.

Platform as a service (PaaS) is the second layer of the cloud and is the development and deployment environment in the cloud which provides the resources to actually build applications. It offers the ability to develop, test, run and host applications by the use of combination of Infrastructure as service and Platform as service because it includes development tools, database management systems, middleware and business intelligence. This is developed to support the entire web application lifecycle from generating and testing to deployment, management and updating. It is in this layer whereby a consumer can be able to host the application which he/she is building.

Software as service (SaaS) is the third layer of cloud that offers a complete software solution for the consumer. The consumers make the utilization of an app, and the users connect to it via the internet utilizing a web browser from anywhere and web based emails such as outlook, Gmail and Hotmail. The user can apply the different application provided by the service provider example is customer relationship management and enterprises resource management where by the service provider manages the software and hardware.

However in my developed system Infrastructure as a Service (IaaS) is deployed purposely to supplement or replace CSP (Consumer Service Provider) security control for the entire system, Because this layer gives out a provisional of being able to build in cyber security mechanisms using our own tools for managing applications, data, runtime, middleware, operating system, server, storage and networking security in IaaS clouds.

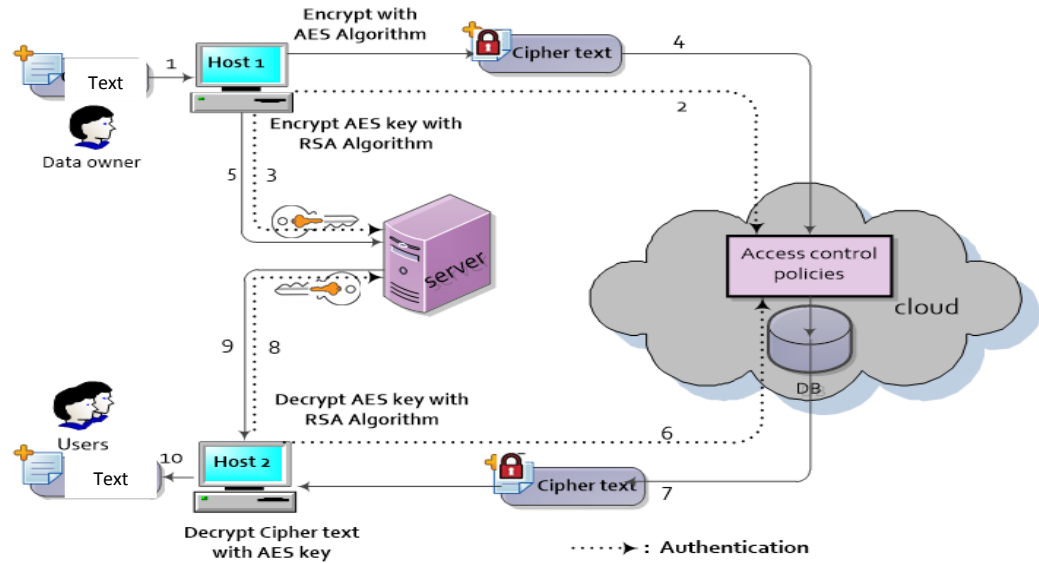


Figure 4.17: Data storage in the Cloud with Authentication mechanism

Source: (Field Data, 2020).

The above authentication mechanism shows how security is maintained and controlled by using a safe and effective algorithm for securing data stored in the cloud storage. The encrypted files are uploaded on the cloud, where by the integrity and confidentiality of the data uploaded by the users are ensured fully securely by not only providing encryption but also giving access to the data and information only on successful authentication, this means there is a double authentication of data. The existing file on the device will be encrypted using AES algorithm. The internal server is used to store both AES key and RSA algorithm, where by AES key will be encrypted using RSA algorithm in order to ensure security of data.

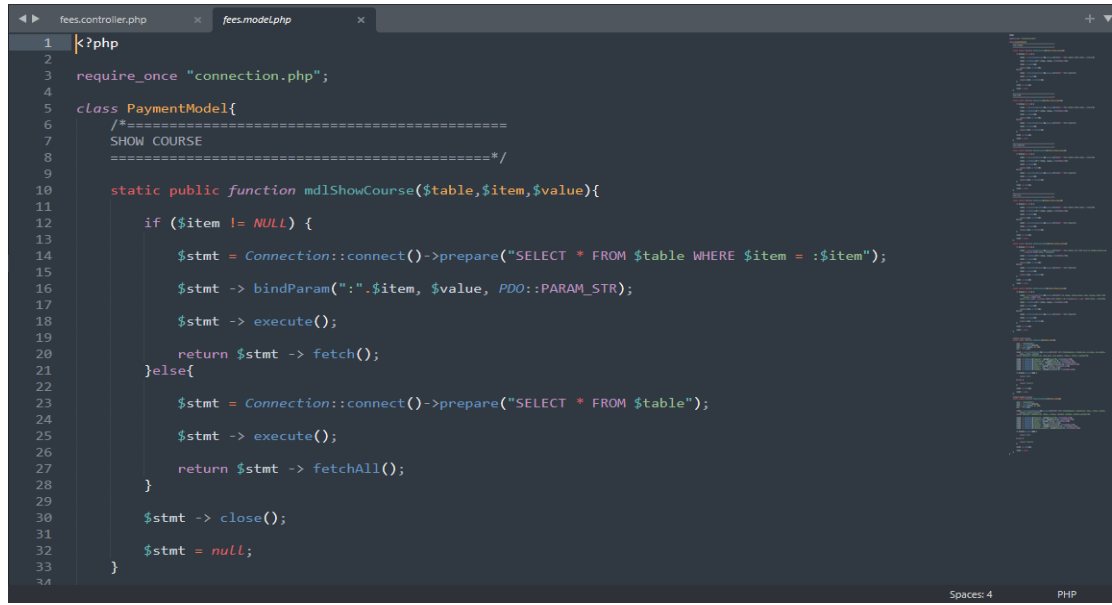
For this case only authorized user can be in situation of downloading any of the uploaded encryption files and read it on the system due to the user need to have access rights to the Institution's server and cloud storage.

4.6 System Testing and Evaluation.

Aniket Mitra (2013) asserts that System testing is identified as the investigation carried out to assess whether a complete and merged tool software system complies with its specified requirements needed by the users or clients. System testing demands the creation of test cases for any operating point of the software and execution of the test cases to justify in-case the operate point complies with the specified requirements. If failure of a test, a fault is logged that is fixed by the development team and again re-tested. The essential aim of testing was to detect defects in the system. Testing was grouped into three categories, that is, unit testing, integration and acceptance testing.

Unit testing

Tests were run on the various system modules to confirm the functionality of particular sections of code with the system. This was done by entering records to check whether they behaved in accordance to the pre-set data type settings and coded validations were tested by debugging code sections, stepping in and out of sections to ensure that they performed as expected.



```
1 | k?php
2 |
3 | require_once "connection.php";
4 |
5 | class PaymentModel{
6 |     /*=====
7 |     SHOW COURSE
8 |     =====*/
9 |
10 |     static public function mdlShowCourse($table,$item,$value){
11 |
12 |         if ($item != NULL) {
13 |
14 |             $stmt = Connection::connect()->prepare("SELECT * FROM $table WHERE $item = :$item");
15 |
16 |             $stmt -> bindParam(":".$item, $value, PDO::PARAM_STR);
17 |
18 |             $stmt -> execute();
19 |
20 |             return $stmt -> fetch();
21 |         }else{
22 |
23 |             $stmt = Connection::connect()->prepare("SELECT * FROM $table");
24 |
25 |             $stmt -> execute();
26 |
27 |             return $stmt -> fetchAll();
28 |         }
29 |
30 |         $stmt -> close();
31 |
32 |         $stmt = null;
33 |     }
34 | }
```

Figure 4.18 Unit Testing

Source: (Field Data, 2020).

The unit test above was done on new student registration whereby a student makes and process a payment of school fees in the payment mode.

Integration testing

Integration testing is a level of tool testing where individual units are combined and tested as a group. Integration testing is done to discover faults in the software where there is an interaction between merged units.

Data new registration and re-visit forms were developed to interface between system users, system logic and the database. This was done for the data entered, system setup and registration form. Integration was tested by posting students' data using data entry form and checking whether these entries had correctly been captured by the database before being allowed to proceed to the next step and generating reports for system users.

CHAPTER FIVE

DISCUSSION OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the findings in relation to the study objectives, conclusions based on the problem statement, and recommendations of the study.

5.2 Summary of the Findings

5.2.1 The existing systems used by students for paying college fees at Nobo College of Pharmacy.

The study investigated the methods used in school fees payments. According to the findings obtained from the study, the only method used for fees payment for Nobo College was through the bank deposit. Each student physically goes to the bank and deposit fees to the college account and later has to submit a receipt to the college accounting department for auditing. There are other forms of fees payment practices for example parents sending fees through mobile money networks but this method was not used at the college.

5.2.2 The challenges that parents, students and sponsors face when paying fees

The study also investigated on the challenges parents, students and sponsors face on school fees payment. From the data it was found out that those long queues in the banks during school fees payments cause delays as well stress to the parents and students. Another challenge was that forgery and fraud can always happen as students can forge receipts to prove they have paid fees while actually they did not. This cannot happen in a well developed system where every transaction can be traced and tracked. The study also found that another big challenge was paper work; it was found that after payment it could take a long time in the bank and as well keeping receipts was difficult since they can easily be misplaced by students or parents thus requiring them to pay again.

5.2.3 To Design an online school fees payment system that will enable students to pay fees and print examination cards.

According to the findings on the trail of the online system of payment of school fees that was developed and tested, it is revealed that the system can be able to efficiently simplify the task of school fees payment due to its ability of time saving, availability and easy to use.

5.3 Conclusions

Objective one of the study concluded that the only method of fees payment that was available at Nobo College of Pharmacy was through bank deposit to the university account and student given receipts to present to the university accounting office for auditing. Regarding objective two of the study it was concluded that the major challenges of fees payment for Nobo College students include long queues in the banks that could cause students to be stressed and parents to get discouraged. The other challenge that the study concluded was that it has been found that there was forgery and fraud practiced by students due to too much paper work during payment of fees. It was therefore advisable to develop a system that is easy to use and track students fees payment process for the college. On objective three, the study tested and developed an online system of school fees payment. This study has identified that respondents had high opinion on the use of an online school fees payment system based on cloud computing with an authentication scheme as a means of improving fees payment at Nobo College, However many challenges were encountered among them was inadequate infrastructure, lack of sufficient skills among users to use ICT.

Based on the findings of the study, it can be concluded that fees payments in Africa and East Africa have been carried out utilizing the manual system, however, the use of the internet has already been growing at a faster rate amongst the youths making an online school fees payment system to be very convenient for the students as they pay their fees.

The researcher has seen the internet as the greatest way to take the education sector to the next level as the world changes into a global village hence achieving the goal. Currently, extensive research is taking place all over the world in coming up with secure and well-designed online school fees payment systems.

Cloud computing have been very interesting, promising and emerging technology in today's world which is becoming higher and higher each day and there is a lot of big companies and organizations and individual users that are utilizing computing in the cloud after discovering and understanding what technology is. Cloud computing looks like is going to be used highly in the future because many organizations due to the fear of data loss and eager to protect information due to the high level of data security, they prefer cloud and not hosting all of the information in the computer storage.

5.4 Recommendations

While designing an online school fees payment system the following should be put into consideration; Web-based and website page database can be developed depending on the programming language, for example, the researcher utilized Photoshop, PHP & MySQL, on top of that cloud service providers should be involved for better storage of data in terms of the capacity and the size require. Organizational practices to include the standards, policies and procedures especially to the cloud. The system requirement requires being participatory regarding communication by the users. Through evaluation frequently involve the system users for verification as well as an understanding of the needs for advancement purposes. Include users' suggestions for the aim of system improvement if needed. System security should be considered which can be done utilizing both password and biometrics approaches since the cloud technology is growing at a rapid rate, this will include utilizing automated fingerprint sensors to authenticate students using fingerprints for authentication control. The system should be distinguished to run on different platforms for instance on mobile phones this will assist in the availability and accessibility of the system all over.

Governments in Africa and East Africa through their Ministries of Education platforms should emphasize the use of online payment system for student's school fees to be a core feature. This is because technology is still growing at a very high rate.

Online school fees payment systems should be well emphasized and used in education sector, due to the fact that it will uplift the development of this sector since many institutions and

universities will be able to manage and collect revenue or payments in a simple, secure, very easy manner and reliable way at any time.

Therefore, based on these findings, and given that Online school fees payment systems are more efficient, enable fast transaction, relatively easy to use, convenient, reliable and can keep all transaction records safely to minimize forgery, it is recommended that Nobo College of Pharmacy adopt this system.

5.5 Area for Future Study

Since the application is only a prototype, there are still a lot of activities to be done in the future. One main activity could be the capability of the system to run on different platforms with the high level of security and data storage data synchronization in the cloud such as on mobile phones applications like Androids and iOS. This will facilitate availability and accessibility of the System to all authorized users all over the world.

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APPENDICES

APPENDIX I: LETTER OF INTRODUCTION



Gongo La Mboto, Pugu Road
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Tel: +255-655 484 390
E-mail: dpsr@kiut.ac.tz
Website: www.kiut.ac.tz

DIRECTORATE OF POSTGRADUATE STUDIES AND RESEARCH

13th November 2018

Dear Sir/Madam,

Re: Request for FREDY F. BYABATO of Reg. No MIS/18559/602/DT to Conduct Research in your Institution.

The above mentioned is a bonafide student of Kampala International University in Tanzania Pursuing Master of Information System

He is currently conducting field research with a title **"School fees payment system based on cloud computing with authentication scheme; case study Nobo College of Pharmacy."**

As part of his research work, he has to collect relevant information through questionnaires, interviews and other relevant reading materials. Your institution has been identified as a valuable source of information pertaining to his research dissertation. The purpose of this letter is to request you to avail him with the pertinent information he may need.

Any information shared with him will be used for academic purposes only and the data you provide shall be kept utmost confidentially.

Any assistance rendered to him will be highly appreciated.

Yours truly,

A handwritten signature in blue ink that reads 'Sambali'.

Dr. Joseph Sambali
Director, Postgraduate Studies and Research

APPENDIX II: CONSENT FORM

CONSENT FORM

Dear respondent, I am Fredy F. Byabato, a master’s student of Information Systems at Kampala International University in Tanzania. It is a requirement that every student carries out a study with the purpose of solving a specific problem. My study title is AN ONLINE SCHOOL FEES PAYMENT SYSTEM BASED ON CLOUD COMPUTING WITH AUTHENTICATION SCHEME. I humbly request for your participation in the study by completing the questionnaire. Feel free to respond to any question included in the questionnaire. The information gathered will be used for research purposes only and treated with utmost faith and confidentiality.

IDENTIFICATION PARTICULARS

Position/Status

Date

APPENDIX III: QUESTIONNAIRE

Note: This is an academic research; your responses will be treated with the highest degree of confidentiality.

- i. Different ways used by students in paying college fees in Nobo College.

S/N	FEES PAYMENT METHODS	YES	NO
1	Bank deposit to college account		
2	Checks and bank transfers		
3	Cash payment to the college Bursar		
4	Payment cards		
5	Visa cards		
6	On line payment		
7	Electronic payment		
8	Tigo-Pesa		
9	M- Pesa		
10	Airtel –Money		
11	Halo-Pesa		

To find out the challenges that parents, students and sponsors face when paying fees, on each of the following statements indicate to what extent you agree or disagree on the following challenges faced by students when paying fees at Nobo College. 1- Strongly Disagree, 2- Disagree, 3- Neutral, 4- Agree, 5- Strongly Agree

S/No	STATEMENTS	1	2	3	4	5
1	Long queues in the banks and causes stress					
2	Students can be easily robed on their way to the bank					
3	Causes delays in finance department					
4	Transport cost to travel to the bank					
5	The services are only available on working days and hours					
6	It is hard to keep papers and may get misplaced					
7	Forgery and fraud is common					
8	Less revenue collection for institution					
9	Time wastage during the queuing and the whole process of making payment					
10	Meeting the deadline of fees payment is hard for parents, sponsors due to unavoidable circumstances					
11	Students may end up spending all the fees when given by parents					
12	Too much paper work promotes bureaucracy both in bank and at the college					

To design and develop online school fees payment system that will enable students to pay fees and print examination cards in Nobo College of Pharmacy

Can you give an overview of how the current system operates (system functionalities).

.....
.....
.....

Who are responsible for operating in the current system?

.....
.....
.....

What are the major limitations (inconveniences) of the current system?

.....
.....
.....

What are the challenges facing the current system?

.....
.....
.....

What changes do you recommend to the current system to overcome the limitation issues you have highlighted (if any)?

.....
.....
.....

Is there any need to implement a web-based solution for managing online fees payment system?

.....

In your own opinion can the proposed Web-based solution for online payment improve on fee payment operation?

.....

.....

.....

Give the system functionalities you would like to be included in on an Online fees payment system to be implemented?

.....

.....

.....

Tick (√) on the box of your preferred answer:

In which category do you belong to?

Student Parent/Guardian Others

If others please specify.....

How do you find the current fees payment in Tanzania?

Good Bad Poor

Have you ever experienced any problems with the current approach being used?

Yes No

Do you think there is need for change to a new system?

Yes No

If “yes” give the reason for your answer

.....
.....
.....

Would you like the next fees payment to be online?

Yes No

What is your opinion of the fees payment system that is in use elsewhere?

Excellent Solution Poor Solution Not applicable here

Do you think an online payment approach will be better than the current approach?

Yes No

What is your verdict on the system proposed in this project?

Excellent Poor No Idea

***** **Thank you for your cooperation*******

APPENDIX IV: SAMPLE CODES

```
<?php
require_once "connection.php";

class PaymentModel{

/*=====

        SHOW COURSE

=====*/

static public function mdlShowCourse($table,$item,$value){

if ($item != NULL) {

    $stmt = Connection::connect()->prepare("SELECT * FROM $table WHERE $item =
:$item");

    $stmt -> bindParam(":".$item, $value, PDO::PARAM_STR);

    $stmt -> execute();

    return $stmt -> fetch();

} else{

    $stmt = Connection::connect()->prepare("SELECT * FROM $table");

    $stmt -> execute();

    return $stmt -> fetchAll();

    }

    $stmt -> close();

    $stmt = null;

    }

/*=====
```

SHOW YEAR

```
=====*/  
static public function mdlShowYear($table,$item,$value){  
    if ($item != NULL) {  
        $stmt = Connection::connect()->prepare("SELECT * FROM $table WHERE $item =  
        :$item");  
        $stmt -> bindParam(":".$item, $value, PDO::PARAM_STR);  
        $stmt -> execute();  
        return $stmt -> fetch();  
    }else{  
        $stmt = Connection::connect()->prepare("SELECT * FROM $table");  
        $stmt -> execute();  
        return $stmt -> fetchAll();  
    }  
    $stmt -> close();  
    $stmt = null;  
}  
/*=====
```

SHOW SEMESTER

```
=====*/  
static public function mdlShowSemester($table,$item,$value){  
    if ($item != NULL) {  
        $stmt = Connection::connect()->prepare("SELECT * FROM $table WHERE $item =  
        :$item");  
        $stmt -> bindParam(":".$item, $value, PDO::PARAM_STR);
```

```

$stmt -> execute();

return $stmt -> fetch();

}else{

$stmt = Connection::connect()->prepare("SELECT * FROM $table");

$stmt -> execute();

return $stmt -> fetchAll();

    }

$stmt -> close();

$stmt = null;

    }

/*=====

                SHOW FEES

=====*/

static public function mdlShowFees($table,$item,$value){

if ($item != NULL) {

$stmt = Connection::connect()->prepare("SELECT * FROM $table WHERE $item =
:$item");

$stmt -> bindParam(":".$item, $value, PDO::PARAM_STR);

$stmt -> execute();

return $stmt -> fetch();

    }else{

$stmt = Connection::connect()->prepare("SELECT * FROM $table");

$stmt -> execute();

return $stmt -> fetchAll();

    }
}

```

```

$stmt -> close();

$stmt = null;

    }

static public function mdlShowFeesAdmin($table,$item,$value){

if ($item != NULL) {

$stmt = Connection::connect()->prepare("SELECT * FROM $table LEFT JOIN users ON
$table.student_id = users.id WHERE $item = :$item");

$stmt -> bindParam(":".$item, $value, PDO::PARAM_STR);

$stmt -> execute();

return $stmt -> fetch();

    }else{

$stmt = Connection::connect()->prepare("SELECT * FROM $table");

$stmt -> execute();

return $stmt -> fetchAll();

    }

$stmt -> close();

$stmt = null;

    }

static public function mdlShowFeesCard($table,$item,$value){

if ($item != NULL) {

$stmt = Connection::connect()->prepare("SELECT id, Fname, Lname,course, name, reg_no,
photo FROM course c INNER JOIN

        users u ON c.code = u.course INNER JOIN $table f ON f.student_id = u.id WHERE
$item = :$item");

$stmt -> bindParam(":".$item, $value, PDO::PARAM_STR);

```

```

$stmt -> execute();

return $stmt -> fetch();

    }else{

$stmt = Connection::connect()->prepare("SELECT * FROM $table");

$stmt -> execute();

return $stmt -> fetchAll();

    }

$stmt -> close();

$stmt = null;

    }

//Model Card Poyment

    static public function mdlPayFees($table,$data){

$str = "0123456789";

    $str = str_shuffle($str);

    $str = substr($str, 0, 18);

    $ns = "TT".$str;

$stmt = Connection::connect()->prepare("INSERT INTO $table(amount, student_id,
acc_name, acc_number, time_, trans, method)

    VALUES (:amount, :student_id, :acc_name, :acc_number, :time_, :trans, :method)");

$stmt -> bindParam(":amount", $data["amount"], PDO::PARAM_STR);

    $stmt -> bindParam(":student_id", $data["name"], PDO::PARAM_STR);

    $stmt -> bindParam(":acc_name", $data["cardname"], PDO::PARAM_STR);

    $stmt -> bindParam(":acc_number", $data["cardnumber"], PDO::PARAM_STR);

    $stmt -> bindParam(":time_", $data["time"], PDO::PARAM_STR);

```

```

$stmt -> bindParam(":trans", $ns, PDO::PARAM_STR);

$stmt -> bindParam(":method", $data["paymethod"], PDO::PARAM_STR);

if ($stmt->execute()) {

return 'ok';

} else {

return 'error';

}

$stmt -> close();

$stmt = null;

}

//Model Mobile Poyment

static public function mdlPayFeesMobile($table,$data){

$str = "0123456789";

$str = str_shuffle($str);

$str = substr($str, 0, 18);

$ns = "TT".$str;

$stmt = Connection::connect()->prepare("INSERT INTO $table(amount, student_id, time_,
trans, method, mobile, mobile_variant)

VALUES (:amount, :student_id, :time_, :trans, :method, :mobile, :mobile_variant)");

$stmt -> bindParam(":amount", $data["amount"], PDO::PARAM_STR);

$stmt -> bindParam(":student_id", $data["name"], PDO::PARAM_STR);

$stmt -> bindParam(":time_", $data["time"], PDO::PARAM_STR);

$stmt -> bindParam(":trans", $ns, PDO::PARAM_STR);

$stmt -> bindParam(":method", $data["paymethod"], PDO::PARAM_STR);

$stmt -> bindParam(":mobile", $data["mobilenumber"], PDO::PARAM_STR);

```

```

        $stmt -> bindParam(":mobile_variant", $data["mtandao"], PDO::PARAM_STR);
    if ($stmt->execute()) {
        return 'ok';
    } else {
        return 'error';
    }
    $stmt -> close();
    $stmt = null;
    }
}
</script>';
}else{
    echo '<script>
        swal({
            type: "error",
            title: "There is an error on processing the payment",
            showConfirmButton: true,
            confirmButtonText: "Close",
            closeOnConfirm: false

        }).then((result)=>{
            if(result.value){
                window.location = "pay-fees";
            }
        });
    </script>';

```

```
$answer = PaymentModel::mdlPayFeesMobile($table,$data);  
if($answer=='ok'){  
    echo '<script>  
    swal({  
        type: "success",  
        title: "The transaction has been completed",  
        showConfirmButton: true,  
        confirmButtonText: "OK",  
        closeOnConfirm: false  
    }).then((result)=>{  
    if(result.value){  
        window.location = "receipt";  
    }  
    });
```