

DECLARATION

I hereby truthfully declare that I am the sole author of this report and that all content is my original work that has not been presented before for an award at any university or learning institution:

Signed_____ Date: _____

Mary Nyondo Author

Signed_____ Date: _____

Mr. Nsama Lameck Supervisor

ACKNOWLEDGEMENT

This project would not have been possible without the support of many people. Many thanks go to my supervisor, Mr. Nsama Lameck, who took time to read my numerous revisions of the project and helped me make sense out of the confusion. Many thanks further go to my relatives and friends, who provided the motivation, as well as financial and spiritual support needed to complete this project. Last but not least, many thanks go to my family, co-workers, and many friends who endured this long process with me and always offered their support and love.

GLOSSARY

B2C Business-To-Consumer

B2B Business-To-Business

C2C Consumer-to-Consumer

EPSs Electronic payment systems

GRZ Government of the Republic of Zambia

ICT Information and Communication Technology

IS Information System

I.T Information Technology

LANs Local Area Networks

MOGE Ministry of General Education

PCs Personal Computers

SSPS Secondary School Payment System

WANs Wide Area Network

ABSTRACT

The extensive developments in Information and Communication Technologies have made impact in all sectors of the society, including institutional payments management. This has seen the proliferation of numerous web applications bearing various functionalities such as health records management, business records management, registration operations, payment for services and much more are done using the web. It is now mandatory for learning institutions across the globe to declare their payments for services offered at each needed moment to for the purposes of enhanced decision making based on factual payment patterns. However, this when done manually as it is at the present moment is associated with multiple fallacies inherent in manual systems. This unpleasant trend prompted the researcher to seek to design and develop a computerised secondary school payment to present an automated way to keep track of school payments to reduce the extant pen and paper based manual method of declaring school payments. Replacing the tedious old method this system will save time, reduce the amount of work the administrators have to do and will replace the stationery material with a computer based system. This system deals with the maintenance of the student's school payment details seamlessly. It generates the payments of the student on basis of presence in the school in a particular time period. It is maintained on the basis of student's school payments. The staffs will be provided with the separate username and password to make the student's presence. The staffs handling the school fees payment records will be responsible to generate reports for as would be needed. It is an unarguable fact that a system such as the **Secondary School Payment System** would enable its users to capture and record data, fill and submit necessary educational forms, and easily comment on each document seamlessly. The survey helps in building the system for automating the school payments system. The schools have a large number of students who pay all their school fees through cash deposits, electronic funds transfer or bank drafts to the school's accounts in specific bank branches. Traditional methods of paying fees have not been efficient enough especially during periods of tests and examinations when most of the students are paying fees to meet the requirements for entering examination rooms. The process of paying fees is characterized by long queues, too much waiting by students and congestion at banks where payments are made. It was upon such background that the researcher embarked on the project to develop of an alternative system that enables online fees payment by students. This proposed system along taking and viewing school payments will provide additional features as it grows. Also, there will be a provision for other optimal features. Thus this system will be beneficial for schools. Functional requirements were collected through I purposive semi structured interviews with selected interviewees from the Zambia's Ministry of General Education. The proposed system was developed using HTML (and CSS), PHP, and MySQL using the spiral software development model. This light-weight system brings in efficiency in declaring school payments once implemented.

Keywords: alternative system, automation, payment system, web-Application, and school fees.

Table of Contents

DECLARATION.....	i
ACKNOWLEDGEMENT.....	i
GLOSSARY.....	ii
ABSTRACT.....	iii
LIST OF FIGURES	viii
Figure 1 Operation of the Systems.....	viii
Figure 2 Consumer Mercantile Activities Model	viii
Figure 3 Electronic payments for different types of e-commerce.....	viii
Figure 4 Research Approach.....	viii
Figure 5 Context Diagram.....	viii
Figure 6 System architectural design	viii
Figure 7 SSPS Database Schema diagram.....	viii
Figure 8 Data model design	viii
Figure 9 Home Page (login.php)	viii
Figure 10 Student Page: Showing the Dashboard of a Student	viii
Figure 11 Student Page: Viewing the Student Balance	viii
Figure 12 Deposit Page	viii
Figure 13 School Fees Payment Page: Before a student pays his/her school fees	viii
Figure 14 School Admin	viii
CHAPTER ONE INTRODUCTION TO THE RESEARCH.....	1
1.1 Introduction	1
1.2 Motivation and Significance of the study	3
1.3 Scope.....	4
1.4 Problem Statement.....	5
1.5 Aim.....	6
1.6 Objectives	6
1.7 Research Questions	6
1.8 Organization of the thesis	7
1.9 Summary	7

CHAPTER TWO LITERATURE REVIEW	8
2.1 Introduction	8
2.2 Review of the Literature.....	9
2.2.1 EMERGENCE OF INFORMATION TECHNOLOGY (IT)	9
2.2.2 Information and Communication Technology (ICT)	10
2.2.3 Application of Information and Communication Technology in modern Payment Systems	12
2.2.4 Information Systems	13
2.2.5 Electronic payment systems and their place in electronic commerce	14
2.2.6 E-commerce and electronic payment systems	15
2.2.7 Limitations of traditional payment systems in the context of online payments	16
2.2.8 The need for new payment systems designed for e-commerce	20
2.2.9 User acceptance of electronic payment systems	21
2.2.10 User acceptance: understanding and issues	22
2.2.11 User factors in payment technology	25
2.2.12 The role of electronic payments in customer e-commerce activities	27
2.2.13 Scope of payment systems	29
2.2.14 Electronic Payment Systems	32
2.2.15 Card Payment Processing	33
2.2.16 Web-Based Application	35
2.2.17 Acceptable and Primary Requirements for Web-Based Management Systems	36
2.2.16 Quality criteria for Web-based information systems	36
2.3 Related Works	41
2.3.16 Net Bank	41
2.3.17 PayPal.....	41
2.3.18 Google Wallet	41
2.3.19 Amazon Payment	42
2.3.20 Authorize.Net	42
2.3.21 Wechat Wallet	42

2.3.22	AliPay	42
2.4	Summary	43
CHAPTER THREE METHODOLOGY		44
3.1	Introduction	44
3.2	BASELINE STUDY	44
2.2.1	Data Collection	44
2.2.2	Research Approach.....	44
2.2.3	Development of the application	45
3.3	SYSTEM DESIGN	46
3.3.1	Context diagram.....	46
3.3.2	System Software Level architectural design.....	47
3.3.3	System Class Diagram	48
3.3.4	Database Schema Diagram	49
3.3.5	System Data Model Design.....	51
3.3.6	User Interface Design	53
3.4	Summary	59
CHAPTER FOUR RESULTS		60
4.1	Introduction	60
3.5	BASELINE STUDY RESULTS.....	60
3.5.1	Survey Results and Discussion.....	60
3.6	SYSTEM IMPLEMENTATION RESULTS	82
3.6.1	Functional Requirements	82
3.6.2	Non Functional Requirements	82
3.6.3	Hardware and Software Requirement.....	83
3.7	Summary	83
CHAPTER FIVE DISCUSSION AND CONCLUSION		84
5.1	Introduction	84
5.2	DISCUSSION	84
5.2.1	The baseline study	84
5.2.2	Use of technology.....	84

5.2.3	Development of the system as a solution.....	85
5.2.4	Comparison with other similar works	85
5.2.5	Possible application.....	85
5.3	Summary	85
5.4	Conclusion.....	86
5.5	Future works.....	87
REFERENCES.....		88
APPENDICES		93
Appendix 1: Source Code		93
Appendix 2: Database Access Sample Code		96
Appendix 3: Questionnaire used to solicit data from students		99

LIST OF FIGURES

Figure 1 Operation of the Systems

Figure 2 Consumer Mercantile Activities Model

Figure 3 Electronic payments for different types of e-commerce

Figure 4 Research Approach

Figure 5 Context Diagram

Figure 6 System architectural design

Figure 7 SSPS Database Schema diagram

Figure 8 Data model design

Figure 9 Home Page (login.php)

Figure 10 Student Page: Showing the Dashboard of a Student

Figure 11 Student Page: Viewing the Student Balance

Figure 12 Deposit Page

Figure 13 School Fees Payment Page: Before a student pays his/her school fees

Figure 14 School Admin

CHAPTER ONE INTRODUCTION TO THE RESEARCH

1.1 Introduction

Developments in Information and Communication Technologies (ICTs) have made impact in all sectors of the society, including education. In higher education, application of ICTs in form of e-learning is changing the mode of learning and teaching processes. School management process is now done online, records are being kept in databases that are accessible through the web. In addition, Registration, payment of school fees, generating timetables and much more are done using the web. The world of IT has gone far and wide that now makes us see the importance of using automated systems rather than manual systems.

Proper financial management is important to the general development of the school. Accounting for finances is one of the key in managing finances in any organisation. A school like any other organisation requires finance in order to run. There must be an efficient control of finance to keep the school afloat. Funds have to be obtained, utilised and budgeted for. Efficiency in handling school funds requires proper records to avoid misappropriation (Mwamba and Musonda, 2017). Monitoring of expenditures is another important role of a head teacher in managing finances. Educational scholars and practitioners such as (Mwamba and Musonda, 2017), agree that the school administrator or the head teacher in Zambia is the most influential factor in the success of the school. According to (Mwamba and Musonda, 2017). The Zambian Ministry of Education in 2015 reviewed that the head teacher oversees the entire educational programs of the school he or she and is in the best position to provide the necessary direction to various aspects of the school (Mwamba and Musonda 2017).

School, students are required to undergo a thorough clearance process which is aimed at (Pelekelo K. J, 2017) determining their status whether they owe the School anything worth of return such as , unpaid fees, mattresses, books, and many other such items in order to successfully permit them to disengage. A clearance form is given to such students where all parties represented on the form are required to clear the student up to the final authority who mainly happens to be the School Head Teacher (Shamaoma and Kabutu, 2017). This is common among students that have satisfied the academic requirement and go back to their former Secondary Schools to get their statements of results or school certificates. The process of student clearance involves many parties such as Boarding, Faculty, Bursary, Library, and Sports,

Examinations etcetera after which the student is allowed to collect their School certificate or given transfer for those under transfer to other Schools (Shamaoma and Kabutu, 2017).

Referring to the problem of school fees and hostel allocation as the Secondary School Payment System (SSPS) problem with the large number of learners that are typically involved in such problems, there is a growing interest in automating the process of payment using centralized matching schemes that incorporate efficient algorithms for SSPS. Examples of similar automated systems are in use in several learning institutions.

In recent years, the advancement of technology has thus brought us into a new era of Web-based systems (Nonny, 2013). These systems are also known as enquiry systems and have the ability to input data, with a guaranteed response time and an assurance that the information is accurate and timely, then one is said to have a “Real Time System”. A real time system is also a Web based system and comprises mainly of four (4) main components:

A data-gathering component that collects data from the external environment.

An analysis component that transforms the received information as required by the application.

A control component that responds to the external environment.

A monitoring component that co-ordinates all other form of these components so that real-time response can be achieved.

Due to these advancements, organizations need no longer be centralized when information services can reach the home and offices for processing from a number of geographical locations. However, Web based systems have helped tremendously in every field of human existence today. Hence this project work provides and creates a **Secondary School Payment System (SSPS)** for secondary schools through the development of a Web based system that will in turn improve the efficiency and effectiveness of the secondary school.

1.2 Motivation and Significance of the study

The existing system or mode of payment results to stress due to the factors and conditions encountered during registration. Every new and returning learner has to register at the beginning of every term. Most learners are in a state of confusion during registration either because they do not currently have the money to pay for their school fees or will have to come down to school to pay during process with no guaranteed accommodation or send the money to a friend who is in school.

Based on these observations, a Web based system for Payment which will enable learners overcomes these problems during registration will be designed and implemented. The system will allow a learner to open an account at a designated bank and keep his/her school fees in the account anytime and any day. Due to the present situation of the country, parents can also keep their children's entire school fees in their account. Therefore, the system allows you to keep your school fees incrementally or at once. The development of this Web based system will eliminate the major problems of the existing system.

Literature asserts that, for nearly every business, the simple act of collecting payments from consumers is actually quite complex and yet organizations want to make it easy and convenient for customers to pay, so they offer multiple choices of payment types and channels. Therefore, this project proposes the development of an alternative platform that enables learners and their sponsors securely pay secondary school fees online from wherever during registration. This will reduce the lengthy queues, and congestion at banks for payments. Sponsors of learners will also be able to save their school fees before the period of registration and as such will make it easier to cater for their wards.

The significance is threefold:

To the Students: Through this system, the students will be able to use the portal to effectively do their online school payments and registration processes especially for registering their personal information.

To the Faculty Members: Through this system, the faculty members can provide all the necessary information and resource material to their students and also be able to get the student information from the website.

To the Future Researchers: The future researchers could gain knowledge from the study on the benefits, advantages and disadvantages, impact of developing web portals which they may apply to their research in the future. By improving on the portal in such a way that is being connected with inter-switch whereby students will be able to make any necessary payment through the website, payment like school fee, acceptance fee, and departmental fee and so on.

1.3 Scope

The scope of this project is to develop a Secondary School Payment System for the Zambian Secondary Schools. The system will accommodate only the administrator, bank staffs and learners into one integrated Database system. This project is also scoped to only grade 8-to-12 levels at the Zambian Secondary School.

1.4 Problem Statement

In most Zambian Institutions of learning especially the secondary schools, learners' enrolment to these institutions is continuously on the increase, and each year every learner is expected to register for a term and therefore the learner has to make payment for the term. This increase in learner's population over the years makes the period of registration stressful and payment of school fees and hostel accommodation a very tedious exercise. Pelekelo and Silumbe (2017) reviewed that there have been a lot of legislation in our country, Zambia, towards the implementation of ICTs and e-governance, but none of it seems to focus on E-Systems for administration and management for schools. The existing system of payment of school fees and hostel allocation in the Zambian Secondary Schools involves a learner going to the bank to deposit the money into the school account and take the payment slip to the school accounts office for verification and issuance of meal card(BOZ, 2016). Pelekelo and Silumbe (2017) also established that the electronic school management system brings about workflow automation, better knowledge management, efficient communications management, management of records in effective and efficient manner, quality assurance, better productivity management, better performance management, better cost-effectiveness, ease in accessibility, accountability with better audit trails and more integration of all departments and offices in schools. This process is causing a lot of problems because many learners will have to line up in unending queues in offices and banks where so many unforeseen events might happen. A learner might lose his/her money or payment slip; get tired due to stress and so many other events. Most learners during registration are always at home and will have to come back to school for registration once queues are reduced.

1.5 Aim

The aim of this project was to develop a Secondary School Payment System (SSPS) that allows learners securely and comfortably pay their school fees and accommodation fees during registration.

1.6 Objectives

The principle objective of this research project was to design and develop a secure web application dubbed *Secondary School Payment System* for Zambian public schools for the purposes of capturing and management learners' school fees payments seamlessly.

The specific objectives where to:

- i. To identify and analyse the acceptable requirements for modern web-based school management systems.
- ii. To design a model for a secure school payment system riding on the identified requirements.
- iii. To develop, test and validate the Secondary School Payment System.

1.7 Research Questions

The researcher devised and adopted the following research questions to inform the study:

- i. What are the acceptable requirements for modern web-based school management systems?
- ii. What are the primary functional requirements for modern school management information systems?
- iii. What are some of the crucial software testing techniques?

1.8 Organization of the thesis

The project is divided into five (5) chapters.

1.9 Summary

This chapter was an introduction to the research problem. It discussed several matters over which the research was affixed. Key to it, the research gap was clearly stated and the research objective was equally made known. The next section is a survey of various literature consulted to further seek understanding in the light of the research problem under investigation.

CHAPTER TWO LITERATURE REVIEW

2.1 Introduction

As the number of users on the World Wide Web increases every day, its use in different areas is also growing. One of the most powerful uses of web-based applications is that they are used to simplify work normally done manually. This chapter presents a literature review on; information systems, electronic payment systems, card payment processing, fees payment systems in Zambian Learning institutions and comparison of the existing online systems with the intended system. Information and communication technologies (ICTs) have become common place entities in all aspects of life, more so in education sector. Education is a very socially oriented activity and quality education has traditionally been associated with lecturing staff having high degree of personal contact with learners. However, with the advent of these ICTs generally in provision of education and assessments and feedback in particular, it is inevitable that there is a rethink and a paradigm shift in the manner assessments and feedback are delivered (Kawimbe, 2017).

Information and Communication Technologies (ICTs) brought in tools and methods in the field of education that presented new models of teaching and learning and ELearning management system is one of the key tools used in educational establishments/schools (electronic learning) to expedite learning among learners (Kawimbe, 2017). The remarkable development in (ICTs) has paved the way for e-learning. Use of computers and computer related gadgets in education sector can be traced back to the early 1980s when simple word processors were in use. ICT has become an important enabler to facilitate open education and distance learning at broader communities. E-Learning ensures access to information about education, training and lifelong learning through the use of multimedia technologies. The recent growing trend of eLearning is mostly benefiting the developed countries due to some predominant facilities like infrastructure, technology, relevant content and responsive learner community. The beauty of eLearning is anyone can avail himself of the service of learning/teaching aid from anywhere, as there is no geographic barrier among the learners. The Internet brings learners great learning opportunities by having access to large amount of information with benefits in terms of time and cost savings (Kawimbe, 2017).

2.2 Review of the Literature

There are various aspects that need be considered in developing modern web applications starting from models, tools, functionalities and security. Some of these aspects are considered in the following section. We shall start by making sense of what an information system is, we shall then bring to light the concept of electronic payment systems, acceptable and primary requirements for web-based school management systems, some crucial software testing techniques and we shall end by giving quick highlights of some of the existent software relative to our proposed software.

2.2.1 EMERGENCE OF INFORMATION TECHNOLOGY (IT)

The information revolution of today is indisputably caused by the unprecedented advances in technology. Computers, Telecommunications, Micro graphics and Reprographics have emerged to give shape to the familiar phase known as Information Technology (Misal A.S, 2016). This advancement has made accessibility to world information and knowledge possible from any part of the globe. In other words, the increasing importance of information and the need for its users has resulted in the application of different technologies widely termed as information technologies. The term Information Technology is a recent origin and comprehensive term.

The term ‘Information Technology’ in English, ‘Informatique’ in French and ‘Informatika’ in Russian encompass the notation of Information handling. In its strictest sense, Information Technology is a science of collecting, storing, processing and transmitting information. The word ‘Information Technology’ is a combination of two words. One is Information and the other is Technology. Information means knowledge, it can be a bit or a para or a page. In addition, dictionary definition of technology is the systematic application of scientific and other organized knowledge, skills to practical tasks by the use of computers and communication (Boot, 2011).

Information Technology is a generic term used to denote activities connected with computer based processing, storage and transfer of information. It includes microprocessors, cable access television, fibre optics, satellite, tele text, word processing, electronic mail, video, robotics and such others. Information Technology is collective term for the whole spectrum of technologies providing ways and means to acquire, store, transmit, retrieve and process information. Information Technology is not one technology but many, which have converged to serve the

needs of the information revolution. Computing technology, Telecommunications, Audio and Video technology, printing technology all are part of it. Any definition of Information Technology (I.T.) must therefore be very broad.

2.2.2 Information and Communication Technology (ICT)

Information Technology (IT) is the automation of processes, controls, and information production using computers, telecommunications, software and ancillary equipment such as automated teller machine and debit cards (Djail BOUBEKEUR, 2016). It is a term that generally covers the harnessing of electronic technology for the information needs of a business at all levels. For a time now, some banking services have been revolutionized through the use of ICT as including account opening, customer account mandate, and transaction processing and recording.

Information and Communication Technology has provided self-service facilities (automated customer service machines) from where prospective customers can complete their account opening documents direct online. It assists customers to validate their account numbers and receive instruction on when and how to receive their chequebooks, credit and debit cards. Communication Technology deals with the Physical devices and software that link various computer hardware components and transfer data from one physical location to another.

ICT products in use in the banking industry include Automated Teller Machine, Smart Cards, Telephone Banking, MICR, Electronic Funds Transfer, Electronic Data Interchange, Electronic Home and Office Banking (Bashir, 2014). Several authors have conducted investigation on the impact of ICT on the banking sector of the African economy. Following dimensions are subject to automation in the banking industry in Africa:

Bankers Automated Clearing Services: This involves the use of Magnetic Ink Character Reader (MICR) for cheque processing. It is capable of encoding, reading and sorting cheques.

Automated Payment Systems: Devices used here include Automatic Teller Machine (ATM), Plastic Cards and Electronic Funds Transfer.

Automated Delivery Channels: These include interactive television and the Internet.

Electronic Banking has tremendously improved the services of some banks to their customers in most developing countries. IT is becoming the backbone of banks' services regeneration in Africa. Nowadays, banking in Africa is increasingly dependent on the deployment of Information Technology and that the IT budget for banking is by far larger than that of any other industry in Africa. On-line system has facilitated Internet banking in many countries in Africa as evidenced in some of them launching websites and web applications.

Banks now offer customers the flexibility of operating an account in any branch irrespective of which branch the account is domiciled. In other places like Nigeria, banks since 1980s have performed better in their investment profile and use of ICT systems, than the rest of industrial sector of the economy. An analysis of the study carried out by African Development Consulting Group Ltd. (ADCG) on IT diffusion in Nigeria shows that banks have invested more on IT, have more IT personnel, more installed base for PCs, LANs, and WANs and better linkage to the Internet than other sectors of the Nigerian economy (Powell, 2017).

2.2.3 Application of Information and Communication Technology in modern Payment Systems

Today's business environment is very dynamic and undergoes rapid changes as a result of technological innovation, increased awareness and demands from customers. Business organisations, especially the banking industry of the 21st century operates in a complex and competitive environment characterized by these changing conditions and highly unpredictable economic climate (Brown, 2016). Information and Communication Technology (ICT) is at the centre of this global change curve. Managers cannot ignore Information Systems because they play a critical role in contemporary organisation. They point out that the entire cash flow of most fortune 500 companies is linked to Information System.

The application of information and communication technology concepts, techniques, policies and implementation strategies to banking services has become a subject of fundamental importance and concerns to all banks and indeed a prerequisite for local and global competitiveness (Delali Kumaga and Jan Svanberg , 2010). ICT directly affects how managers decide, how they plan and what products and services are offered in the banking industry. It has continued to change the way banks and their corporate relationships are organized worldwide and the variety of innovative devices available to enhance the speed and quality of service delivery.

Financial service providers should modify their traditional operating practices to remain viable in the 1990s and the decades that follow. They claim that the most significant shortcoming in the banking industry today is a wide spread failure on the part of senior management in banks to grasp the importance of technology and incorporate it into their strategic plans accordingly. Only banks that overhaul the whole of their payment and delivery systems and apply ICT to their operations are likely to survive and prosper in the new millennium. He advices banks to re-examine their service and delivery systems in order to properly position them within the framework of the dictates of the dynamism of information and communication technology.

The banking industry in Zambia like any other countries in Africa has witnessed tremendous changes linked with the developments in ICT over the years (Pelekelo, 2017). The quest for survival, global relevance, maintenance of existing market share and sustainable development has made exploitation of the many advantages of ICT through the use of automated devices imperative in the industry. Adoption of ICT world over has influenced the content and quality of

banking operations. From all indications, ICT presents great potential for business process reengineering of African Banks.

Investment in information and communication technology should form an important component in the overall strategy of banking operators to ensure effective performance. It is imperative for bank management to intensify investment in ICT products to facilitate speed, convenience, and accurate services, or otherwise lose out to their competitors (Misal A.S., & Chavhanke A.R., , 2016). The banking industry in Africa presents ICT providers with great opportunity to market their innovations. Success in this area however depends on how they can customise their services to appeal to the ready minds of various stake holders in the industry.

2.2.4 Information Systems

Information System (IS) is the study of complementary networks of hardware and software that people and organizations use to collect, filters, and process, create, and distribute data. The study bridges business and computer science using the theoretical foundations of information and computation to study various business models and related algorithmic processes within a computer science discipline. An Information system refers to information technology and people's activities that support operations, management and decision-making (Ching, 2017). Alternatively, an information system is the interaction between people, processes, data and technology.

Sina and Silumbe (2017) Reviewed that Student Information Management Systems have become an important factor in modern educational institutions and these systems help learning institutions to manage student records and easily streamline administrative tasks and provide real-time access to data. In this sense, the term is used to refer not only to the information and communication technology (ICT) that an organization uses, but also to the way in which people interact with this technology in support of business processes.

Information system is an integrated set of components for collecting, storing, and processing data and for delivering information, knowledge and digital products. Business firms and other organizations rely on information systems to carry out and manage their operations, interact with their customers and suppliers, and compete in the labour market.

2.2.5 Electronic payment systems and their place in electronic commerce

In the early 1990s the business and consumer world encountered a new way of conducting trade business, which was named electronic commerce (e-commerce) (Ching, 2017). Over the years electronic commerce has evolved into a popular and acknowledged way of conducting business. While researchers are still trying to understand it and gauge its importance and turnover, e-commerce is changing and growing incredibly quickly, producing such extraordinary results from both business and customer perspective that its phenomenon cannot be overlooked by anyone who has ever thought of conducting business, whether in online or offline environments.

With many organisations and people labouring in the field of e-commerce it has become very clear that ecommerce is here to stay and organisations and customers are trying to get maximum benefit from it. E-commerce has become especially important in two interrelated dimensions, namely business-to-consumer (B2C) and business-to-business (B2B) e-commerce. Business-to-consumer e-commerce is enabling customers to have an increasing influence on products created, how products are customised, and how services are delivered (Kumaga, 2010). Ecommerce offers customers convenient shopping methods for products, information and services, electronic banking, and personal finance management.

It is making it easier for consumers to find the desired products and services, match them more precisely to their requirements, and compare prices (Agboola, 2014). Several business models have been developed to support various customers' needs; among them are online portals, content providers, transaction brokers and community creators. For business-to-business relations e-commerce facilitates the form of organisation where companies rely on suppliers and product distribution to respond more effectively to the changing market and customers demand and to achieve more efficient operation.

This type of e-commerce relationships offers organisations the possibility to work in the direct contact with producers, giving more room for customization and control over business activities. This helps to reduce the costs significantly by removing 'middlemen' from the supply chain. Good examples of companies that employ this business model are Dell and Cisco. Consequences that e-commerce brings for business-to-business relationships are eliminating inventory, and operational and distributional costs that indirectly provide customers with lower prices.

E-commerce can help businesses to increase production flexibility by ensuring timely availability of components from suppliers, to improve quality of the products by increasing cooperation between buyers and sellers and reducing quality issues, to increase opportunities for collaborating with suppliers and distributors, and to create greater price transparency — the ability to see the actual prices on the market (Onyebu, 2015). In this way e-commerce responds to the customer demand of lower prices and greater convenience.

2.2.6 E-commerce and electronic payment systems

The most popular definition of e-commerce is based on the online perspective of the conducted business. E-commerce provides the capability of buying and selling products, information and services on the Internet and other online environments (Mashreghi, 2011). As for any trading activity, the issue of safe and reliable money exchange between transacting parties is essential. In an e-commerce environment, payments take the form of money exchange in an electronic form, and are therefore called electronic payments. Electronic payments are an integral part of e-commerce and are one of its most critical aspects.

Generally defined, electronic payment is a form of a financial exchange that takes place between the buyer and seller facilitated by means of electronic communications. An e-commerce electronic payment is a financial exchange that takes place in an online environment. Electronic payment systems (EPSs) are summoned to facilitate the most important action after the customer's decision to pay for a product or service to deliver payments from customers to vendors in a most effective, efficient and problem-free way (Agboola, 2014). The role of e-commerce electronic payment systems is pivotal for future of ecommerce, whose further growth depends on the timely development of EPSs.

The development of new types of e-commerce purchasing relationships and business models has created the need for new ways of money exchange and new EPSs. For instance, online auctions, (has spurred the necessity for person to-person payment systems to allow online money exchange between individuals. Certain types of information products and services require small payments and micropayments. Businesses would like to sell information content that costs very little, accumulating revenues with high turnover. E-commerce EPSs can be designed for selling specific types of products, for example for trading copyrighted online content, such as music.

Another unforeseen earlier requirement is conducting e-commerce using wireless mobile devices, such as mobile phones or personal digital assistants (PDA). The need for paying with mobile devices has urged the development of payment systems for mobile electronic commerce. In addition, ecommerce provides the possibility to enhance current payment systems or substitute them with online variants. The need for online payments was first addressed by using extant payment methods of the offline world for online payments (Ching, 2017).

For example credit cards, originally intended as an offline credit instrument, have become the major payment instrument for ecommerce. As e-commerce and online purchasing grows, the weaknesses of credit and debit cards and cheques are becoming more apparent. These limitations are discussed in section 2.2.5. The lack of the fit-for purpose payment mechanisms and infrastructure is one of the main restricting factors that hold back the growth and evolution of ecommerce).

2.2.7 Limitations of traditional payment systems in the context of online payments

Three factors are stimulating the development of electronic payment systems: reduced operational and payments processing costs, growing online commerce and decreasing the costs of technology (Yang, 2017). Reduction of costs is one of the major reasons for research and development of EPSs. The central impetus for ecommerce and e-business is to provide a more efficient service, primarily in terms of costs. In this light, paying online with traditional payment systems such as credit cards is rather paradoxical, given that credit cards are one of the most expensive of all available mainstream payment means for both end consumers and merchants, defeated perhaps only by paper checks.

Several limitations of traditional payment systems in the context of e-commerce can be outlined. Existing payment systems, such as credit cards, are inadequate for retail customer digital business from the following viewpoints (Bashir, 2014) (LAZO, 2017):

Lack of usability. Existing payment systems for the Internet require from the end user to provide a large amount of information, or make payments using complex elaborated web site interfaces. E.g. credit card payments via a web site are not the easiest way to pay, as these require entering extensive amounts of personal data and contact details in a web form.

Lack of security. Existing payment systems for the Internet are an easy target for stealing money and personal information. Customers have to provide credit card or payment account details and other personal information online. This data is sometimes transmitted in an unsecured way. In practice this happens even in spite of introduction of secure transactions mechanisms, such as Secured Socket Layer. Providing these details by mail or over the telephone also entails security risks.

Lack of trust. Users tend not to trust existing systems with the long history of fraud, misuse or low reliability, as well as novel systems without established positive reputation. In the present situation, money loss by customers is quite possible when using existing payment systems, such as credit cards, for Internet payments. Potential customers often mention this risk as the key reason why they do not trust a payment service and therefore do not make Internet purchases.

Lack of applicability. Not all web sites support a particular payment method, thus limiting customers' ability to pay. Credit cards work only with merchants who have signed-up to the services of the corresponding credit card company, and do not support direct business-to-business or interpersonal payments.

Lack of eligibility. Not every potential customer with money and intention to pay can make use of certain payment methods. Not all potential buyers can obtain credit cards due to credit history limitations, low income or other reasons.

Lack of efficiency. Some payments over the Internet can be too small to be handled by existing payment systems, because of overheads included in the processing of payments and transaction. Credit cards are too expensive for effecting small payments and are unsuited for small transactions. The minimum fixed fee charged to the retailer for processing a transaction could even surpass the value of the goods sold. High usage costs for customers and merchants.

Existing payment systems use a rather expensive infrastructure to facilitate the payment process. Credit cards are very expensive for end users, not in the least because of the enormous and growing size of fraud, which amounts to billions dollars per year. This loss is invisibly re-financed by users by the higher costs of credit card services (Brown, 2016). In addition, credit card payments are still heavily paper-dependent. Most credit card bills are sent in a paper form to

customers by post, and the bills are mostly settled by posting paper documents, like checks of giro payments, which makes the whole cycle rather expensive.

As mentioned above, this means that resources employed in processing of credit cards transactions render them rather ineffective for small payments, because the high overhead of credit cards. In online credit card payments credit cards are not physically available for inspection by the payee, (this situation is referred as 'card not present'). This imposes higher charges for merchants, because the chance of fraud is higher; see section 2.3.6 for more discussion. Credit cards have low finality of payments because users can refute or repudiate credit cards payments in certain situations.

Moreover, financial regulations in certain countries, e.g. in the USA and the UK, place the risks of repudiation, fraud, or non-payment largely on the merchant and issuing banks. These issues make credit cards less attractive to merchants. Certain authentication schemes, e.g. Verified by Visa and SecureCode from MasterCard allow shifting fraud liability from merchant to credit cards issuing banks, and can ease this burden for merchants (Suryanto Nugroho, Sigit Hadi Waluyo & Luqman Hakim, 2017). However, end users can found themselves paying more for the cards issued by the banks to refinance bank's losses due to fraud.

There are more concerns related to the credit card use in online e-commerce that are responsible for reluctant user's acceptance of credit cards and e-commerce. According to the report published by marketing research firm IDC, almost half of European users of the Internet do not buy goods online because they either do not trust the Web merchants or fear their credit card details will not be secure (Djail BOUBEKEUR, 2016). According to analysts, total credit card fraud is on the rise for every card issued. Industry estimates that the amount of online credit card fraud could be in the ranges of thousand millions.

Authorities believe that hackers have stolen more than one million credit card numbers from E-commerce sites. It would not be a surprise that many customers use their credit cards with reservations. A survey by Visa of 15 Banks from 12 EU countries in 2002 found that online credit card payments account for nearly half of all complaints (Onyebu, 2015). More than one in five of these came from people who had not even shopped on the Internet, but were billed for online transactions.

Privacy issues are also associated with the use of existing payment systems. There are cases when users' identities (i.e. personal data such as credit card numbers, names and addresses) were stolen when hackers break into websites' databases and obtain personal information of the customers. Fraudsters then attempt to use this information to open new credit and bank accounts using the stolen identity. These and other issues with existing payment systems such as credit cards render them not very suitable for online payments.

2.2.8 The need for new payment systems designed for e-commerce

Despite that electronic commerce is a growing phenomenon, its future development is, to a large extent, hampered by the lack of appropriate payment systems (Ching, 2017). Since most of business-to-consumer payments over the Internet are performed currently via credit cards, an admittedly problematic payment medium due to costs, security and trust problems, the need for new payment systems clearly emerges from the existing situation. Research and development in Internet-based payments tried to resolve this situation by conjuring numerous online EPSs, a good proportion of which has been put to use.

This was possible due to the stimulating factors listed above, and in the first place due to the availability and reduced costs of the enabling technology. However, the new payment systems, purposely crafted for the Internet, also could not avoid their own share of problems. This has led to the reluctant use of new online electronic payment systems, i.e. resulted in low user acceptance of newly introduced payment systems by customers.

2.2.9 User acceptance of electronic payment systems

At this stage the situation with the development of online EPSs is far from ideal. A survey on electronic money developments by the Bank for International Settlement reports a rather low level of EPSs use, even in the most advanced countries. According to the European Central Bank, the proportion of online payments among cashless payment instruments in the European Union is rather low. The report admits that although there has been a lot of discussion on the use of EPSs and their importance “it is still not a widely used medium” (Boot, 2011).

The lack of customer demand, the diversity of technological standards and the lack of support by financial institutions are mentioned among the reasons preventing the development of electronic payment systems. Some experts estimate that about 85% of all Internet transactions are done with credit cards that were not originally designed for the Internet (Musonda S, 2017). According to a survey by marketing research firm Jupiter Research, credit cards are still the dominant payment method for online purchases, accounting up to 95% of online transactions in the United States. This demonstrates still low user acceptance of alternative electronic payment systems, designed specifically for e-commerce.

2.2.10 User acceptance: understanding and issues

End user acceptance of such sensitive technology as money-circulating payment systems is the critical key aspect of the whole path of payment systems' establishment. Without such acceptance no technology can successfully exist on the market, and payment systems are not an exception. User acceptance is “the demonstrable willingness within a user group to employ information technology for the tasks it is designed to support” (Onyebu, 2015). This definition can be enhanced with the understanding that the user perception of information technology (IT) can be influenced by objective characteristics of technology, as well as by human factors and interaction with other users and related parties.

For example, the social information processing model (SIPM). Attitudes towards technology are influenced by opinions, information, and behaviour of others. User acceptance is a pivotal factor determining the success or failure of any information system project. Many studies on information technology report that user attitudes and human factors are important aspects affecting the success of an information system. The arguments in section 1.1 and in the following paragraphs suggest that this is the case also with EPSs.

Besides SIPM, a well-known approach to explaining and modelling user acceptance is the Technology Acceptance Model (TAM), (Yang, 2017). TAM suggests that users formulate attitudes toward the technology that depends on whether they perceive the IT to be useful and easy to use. However, TAM does not take into account other factors that may be critical to user acceptance or rejection of such specific technology as EPSs, such as security, trust, privacy and involved risks. Extending the SIPM assumption, user acceptance of online EPSs could be affected by a number of factors and parties, creating a broader sense of the social context of EPSs in the Internet environment.

User experience with an EPS can be influenced or manipulated by various aspects, such as marketing, publicity, the reputation of the bank behind the system, trust towards the company operating the system and technology behind the system, and convenience of the user interface. We illustrate the social context in which parties and factors could possibly influence user perception and experience with electronic payment systems. These parties and factors should be taken into consideration when exploring issues of user acceptance of online EPSs.

They are either required for a successful operation of a payment system (banks), its promotion (marketing organisations), or monitor and regulate its operation (government). For example, the company operating the payment service will have to address users' concerns about security, privacy and trust (Kazimierz Worwa & Jerzy Stanik, 2008). Users can be influenced in their experience by other parties than the operator itself, e.g. the bank or financial institution that facilitates the payment transactions. Customers can be influenced by the user interface, or by other parties involved in the payment service, such as technical partners.

Since e-commerce EPSs operate in the Internet environment, the reputation and impression of the system can be easily communicated to other users via online communities, creating yet another social impact on the system. Therefore, social influences, e.g. opinions and behaviour of other users, like family and friends, and reputation of banks and the parties involved, should be taken into account for user acceptance of EPSs. This argument can be supported by above-mentioned SIPM.

Issues such as trust, usability, applicability, security, and convertibility are extremely important because they can influence subsequent decisions of people whether to use a payment system or not. There are several obstacles to user acceptance of EPSs: developers not only have to sell the service to potential users, they also have to convince the users to entrust their money to a third party institution, to rely on the payment system in their business and personal finance, and to use it frequently for convenience, reliability, specific applications, services and for a variety of other reasons.

To achieve this high standard of user acceptance, the creators of a payment system should bear in mind user-related factors from the very beginning of the conception of the payment system (Boot, 2011). Designing for user acceptance of online electronic payment systems is thus the main issue put forward by research described in this thesis. An open challenge remains for designers and developers of novel Internet-based payment systems to meet user expectations, requirements, preferences and needs in design and operation of the systems. Resolving these issues is critical for the development and operation of new payment systems and future growth of e-commerce.

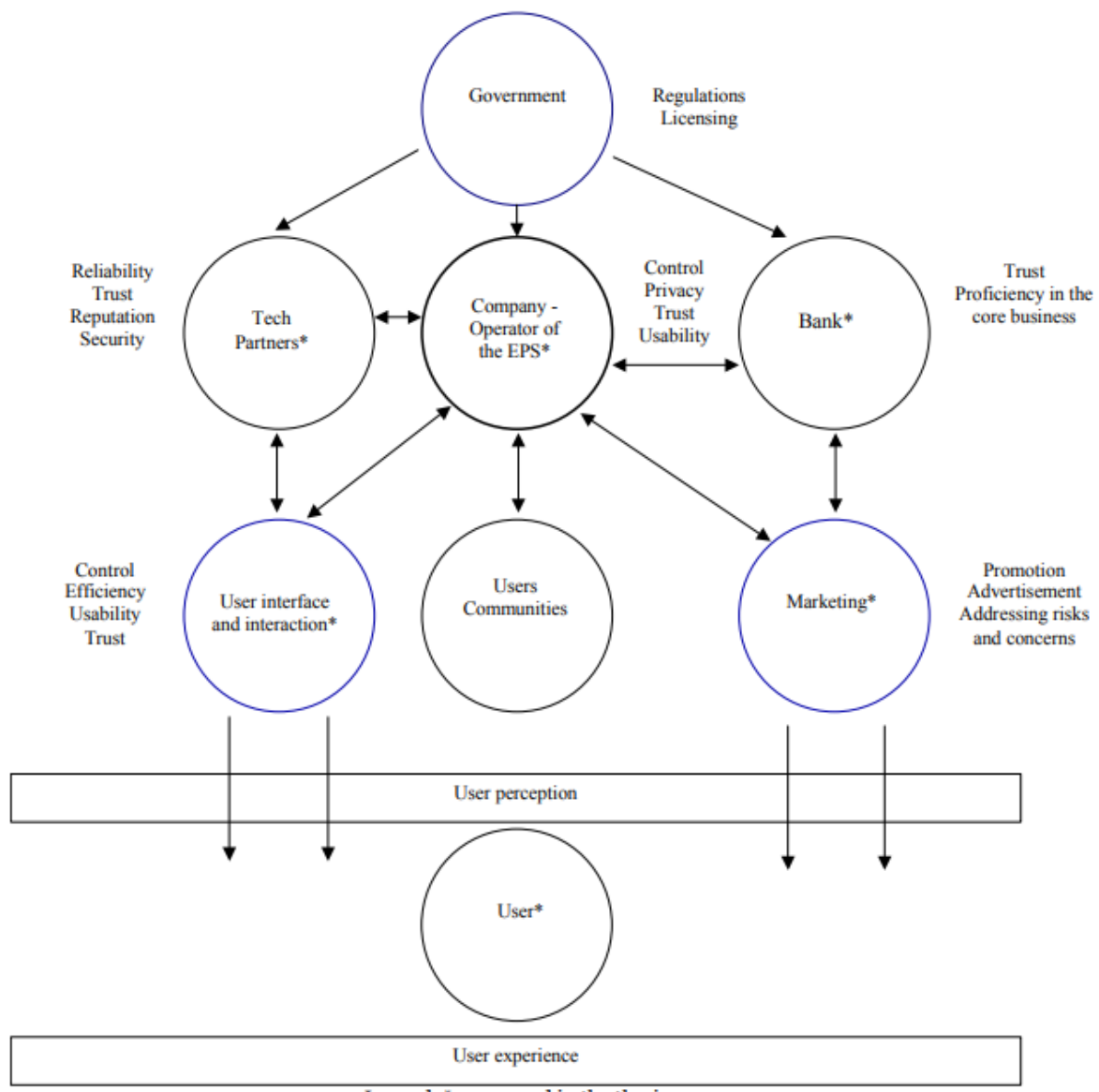


Figure 1: Operation of the Systems (Boot, 2011)

2.2.11 User factors in payment technology

The importance of user-related factors can be demonstrated in the example of the notorious problem of security of information systems. There are thousands of security mechanisms, matched with a growing number of hacks and security breaches (Suryanto Nugroho, Sigit Hadi Waluyo & Luqman Hakim, 2017). However, the nature of security issues is changing with the constant improvement of information technology. While security technology is becoming increasingly sophisticated and tamper-proof, experts in information security admit that user factors are the most important issues for security problems.

The vast majority of all security issues in IT environments is caused or assisted by users inside organisations, rather than hackers and other outsiders. Security experts know many stories about people exchanging their passwords, or IT managers attaching notes with logins and passwords to their monitors, or about hackers finding these notes in the trash (Misal A.S., & Chavhanke A.R., 2016). To avoid this kind of mistakes, experts are talking about enforcing security policies in organisations, to be able to address user-related factors in security. Therefore, security practices have embraced user-related factors. This example helps to illustrate the importance of user-related factors in the design and operation of information systems.

The following example illustrates a failure of a payment system due to neglecting to focus on user and market needs. The Chipknip™ and Chipper™ smart card payment technologies, were introduced in the Netherlands in early 90s (Delali Kumaga and Jan Svanberg, 2010). Both systems were intended to provide a way of paying small amounts in everyday transactions, which people would normally pay with cash. However, these two systems competed with each other for some time, being incompatible, so customers could not pay with the competitor's card at certain shops. Eventually, this created problems of interoperability and limited the user base for both systems.

Another obstacle was that the card readers were installed in shops where people already had another method of payment – debit cards, which worked very effectively and efficiently and which were used by most people for all kinds of payments. In a way, Chipknip and Chipper duplicated the functions and applications of debit cards. On the other hand, the real need for Chipknip and Chipper for small payments at parking lots, vending, and public transport tickets machines was not met. A serious situation arose regarding the high costs of accepting Chipknip

for merchants. As the result, the union of Small and Medium Enterprises in the Netherlands threatened to boycott Chipknip (Misal A.S., & Chavhanke A.R. , 2016).

In this case, an important factor stimulating the development of EPSs was not met, namely the reduced operational and processing costs. Despite of a certain potential for uses acceptance of e-purse technology, this situation is changing slowly. All these issues led to a low acceptance of Chipper and Chipknip technologies. Chipper International decided to stop operations and support of Chipper in the Dutch market, Chipper has fused with Chipknip, and while some issues have been addressed, the expected applications for this smart-card technology are yet to come.

The example above helps to illustrate the complexity of human and marketing factors in the context of payment systems and their crucial influence on the eventual success of a payment system. Therefore, for successful design of electronic payment systems from the user perspective it is important to find out what user-related factors and systems' aspects have the most direct impact on user acceptance and which of them can cause problems when neglected in design.

2.2.12 The role of electronic payments in customer e-commerce activities

The process of paying is an essential part of customers' online buying activities. These activities are well described by the Consumer Mercantile Activities Model. The model comprises prepurchase interaction, purchase consummation and postpurchase interaction phases. The payment activity takes place within the purchase consummation phase as per the following figure. "The purchase consummation phase specifies the flow of information and documents associated with purchasing and negotiating with merchants for suitable terms, such as price, availability, and delivery dates; and electronic payment mechanisms that integrate payment into the purchasing process" (Ching, 2017).

The buyer arrives to payment activities after identifying products or services to be purchased. The buyer and seller conduct then a mercantile transaction. In a mercantile transaction the buyer and the seller exchange information followed by the necessary payment (Abrazhevich, 2004). The payment methods they use should be mutually negotiated and agreed on. Therefore, in order to conduct a successful e-commerce mercantile transaction the buyer should at least be willing to use the payment method offered by merchants. From this viewpoint, user acceptance of e-commerce EPSs is critical for the completion of the purchase consummation phase and the whole purchasing process. It can be therefore observed that the payment process and the user involvement in it are highly important for e-commerce activities.

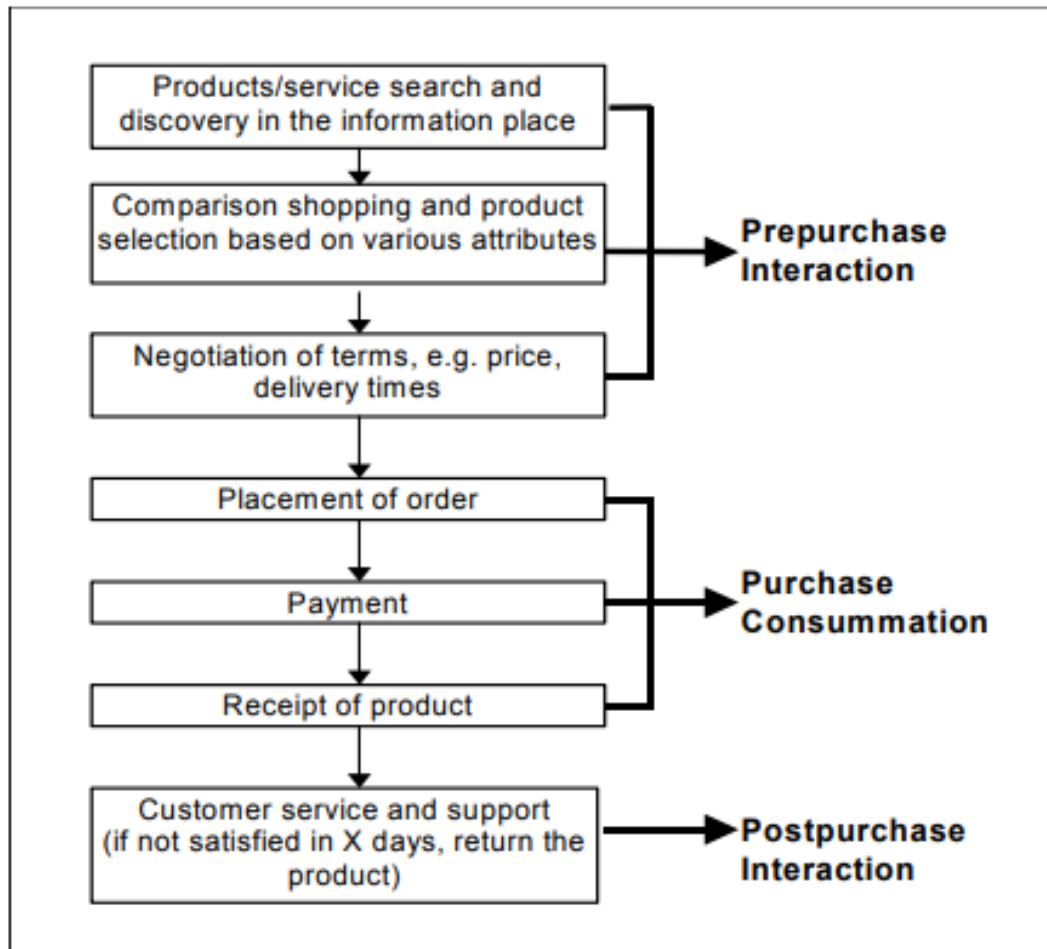


Figure 2: Consumer Mercantile Activities Model (Yang, 2017)

2.2.13 Scope of payment systems

Business-to-consumer Payment Systems. We focus on user acceptance of new payment systems in consumer ecommerce environments. The main focus of the presented work is therefore Business to-Consumer e-commerce EPSs, which are designed with the main purpose to facilitate payments for consumer e-commerce (Boot, 2011). Taking into account the B2B systems would have made the scope too broad to handle within this research.

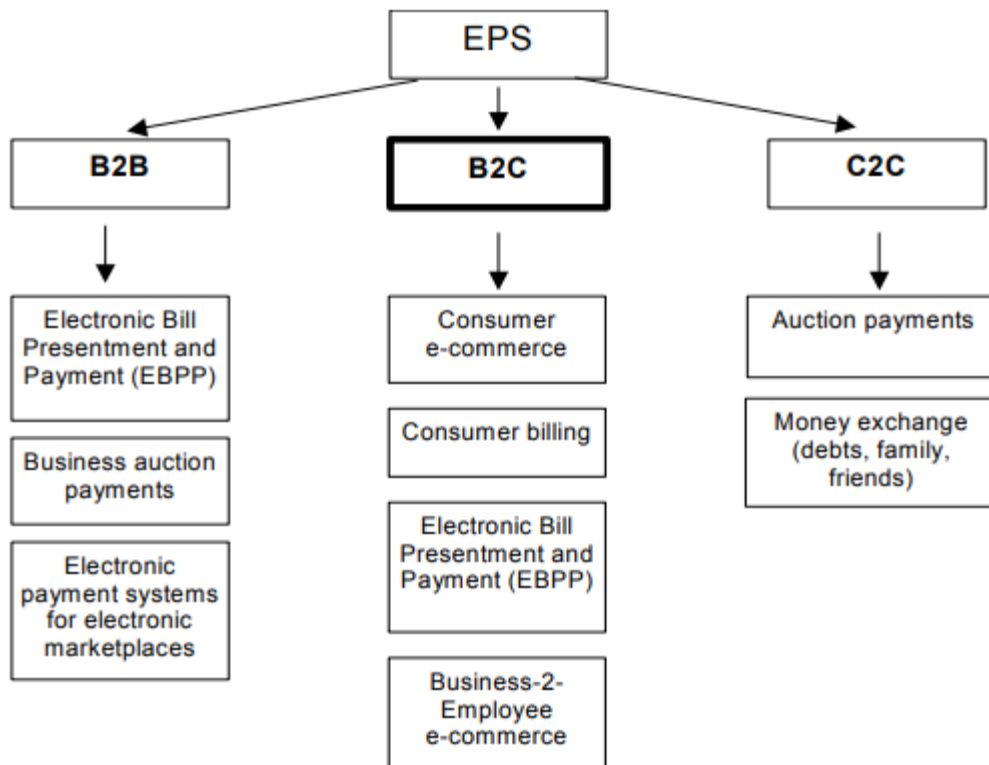


Figure 3: Electronic payments for different types of e-commerce (Boot, 2011).

Payment Systems designed for the Web. Currently, consumer e-commerce is done mainly via the WWW (Web) service of the Internet. The market for conducting e-commerce payments via wireless PDAs, mobile phones and other Internet services is development at an alarming rate, and therefore has not had a wide user basis and usage experience. Thus, in the scope are Web-oriented online e-commerce EPSs and Web e-commerce applications.

Scope of payment tasks. Because the scope of the defined business relations is Business-to-Consumer, the payment tasks in the focus are related to consumer e-commerce and trade of goods and services. In these tasks there should be at least one 1) business party involved and 2) one physical person, who is conducting purchasing activities in an ecommerce environment.

Scope of target activities. These activities include those that are related to buying goods and services, and essentially represent consumer e-commerce. The scope of these activities is embracing a significant and, arguably, the most important part of the consumer e-commerce represented by B2C relations.

Purchasing goods: tangible, require shipping, intermediated (by shipping companies).

Purchasing information and software: intangible, immediate, not intermediated (by shipping companies).

Purchasing services: intangible/tangible, not always immediate, can be intermediated (by service companies).

The following activities are therefore excluded from the scope because they are not in line with the defined scope of electronic payment systems, namely B2C consumer ecommerce.

Consumer-to-Consumer (C2C) money payments and exchange. C2C payments do not belong to B2C e-commerce, e.g. personal auctions payments, debt settlement.

Specific payment applications, for instance, gambling or adult-content sites. In this context the sites place specific requirements on B2C relations and user related factors, e.g. on privacy.

Related activities. Additional activities that have to be explored are the influence of pre- and postpurchase interaction phases, on the user experience with a payment system on the whole. It is very likely that correct introduction, application and follow up of payment products and services in retail e-commerce are important for user acceptance of EPSs, and therefore the pre-

and post-purchase interaction phases cannot be reasonably disregarded when investigating the payment process. The user experience within these phases could affect their decision as to whether to use the e-commerce service at all, without even arriving at the payment process itself.

Amount of money. The minimum amount of money within the scope was chosen to be above €2. This means excluding small and micropayments. The nature of payment tasks in case of micropayments is different from higher amounts. For instance, users may wish to automate this kind of payments to avoid the need to authorize a payment of €0.01 every time, while with bigger amounts they are likely to have control over each transaction. Furthermore, different researches show that at this moment there is little market for services that support small and micropayments.

In the focus are therefore small to medium sized payments, e.g. from €2 to €1,000. The upper payment limit is set to €1,000 to indicate that highest amount within the scope of this research. The suggested range of payment amounts is typical for the current status of the domain and is similar to range of payments with existing offline EPSs, like credit, debit and smart cards. Larger payments can be expected to raise different user acceptance issues, because of more user attention to risks, security, efficiency and other aspects of transactions with such amounts.

2.2.14 Electronic Payment Systems

Electronic payment system is a term to describe any exchange of funds initiated via an electronic communication channel (Brown, 2016). An e-commerce electronic payment is a financial exchange that takes place in an online environment. Such systems are summoned to facilitate the most important actions after the customer's decision to pay for a product or service. Several initiatives have been undertaken to create and develop electronic payment systems and successful ones include various types of smart cards, electronic cash, and electronic cheque mechanisms (Nonny, 2013).

Electronic payment systems can be categorized into four groups: online credit card payment system, online electronic cash system, electronic cheque system and smart cards-based electronic payment systems. For the purpose of the present study, the researcher focuses on the Electronic Fund Transfer Methods which can be categorized under online electronic cash system. Information and Communication Technologies (ICTs) brought in tools and methods in the field of education that presented new models of teaching and learning. ELearning management system is one of the key tools used in educational establishments/schools (electronic learning) to expedite learning among learners.

The remarkable development in (ICTs) has paved the way for e-learning. Use of computers and computer related gadgets in education sector can be traced back to the early 1980s when simple word processors were in use. ICT has become an important enabler to facilitate open education and distance learning at broader communities. E-Learning ensures access to information about education, training and lifelong learning through the use of multimedia technologies. The recent growing trend of eLearning is mostly benefiting the developed countries due to some predominant facilities like infrastructure, technology, relevant content and responsive learner community.

The beauty of eLearning is anyone can avail himself of the service of learning/teaching aid from anywhere, as there is no geographic barrier among the learners. The Internet brings learners great learning opportunities by having access to large amount of information with benefits in terms of time and cost savings. This could be face-to-face in a schoolroom, online, or combination of both. Imparting education in this way is termed as e-learning (Sahil Barjtya, Ankur Sharma and

Usha Rani, 2017). E-Learning facilitates distance learning and provides means to learners to access learning material any time and at any place.

Despite the advantages of eLearning in education in the world, there is incredible digital divide among urban and rural areas in Zambia and many other developing countries. This is due to the existing reverse economic and social conditions of developing countries, countries in Africa like Zambia could not yet establish a reliable eLearning system or institution in rural settings (Musonda S, 2017). The acceptance of such learning facilities is not yet accredited or even accepted by the local authorities in most of the times. Schools and the learners of the rural institutions have financial constraints to participate in the eLearning program.

2.2.15 Card Payment Processing

There are six parties involved in a traditional credit card processing cycle; customer, card issuing bank, merchant, merchant's bank, acquirer, and a credit card processor. The card-issuing bank issues credit cards to customers and maintains their accounts and the merchant opens an account with a bank to receive payments.

In order to accept credit cards, the merchant needs to register with an acquirer, a bank or financial institution that sets up an account for the merchant and provides a terminal to process credit cards. The processor is a large data centre maintained by the credit card network, and it acts as a clearing house for all credit card transactions.

2.2.15.1 Credit Cards

A *credit card* is a small plastic card issued to users as a method of payment for online or off-line transaction. The service provider or the commercial bank grants a line of credit to the card user, and the card user is required to pay at least a minimum amount for any transaction made every month (BOZ, 2016). With the credit approach, charges are posted against the customer's account and the customer is billed for this amount later or subsequently pays the balance of the account to the payment service. Credit cards are the most commonly used method of electronic payment and are widely accepted by consumers and merchants throughout the world, especially in retail markets.

2.2.15.2 Debit Cards

One of the most widely used systems for electronic payments is the debit card; Debit cards combine the service of Automatic Teller Machines (ATM) cards and cheques. When customers pay with a debit card, the money is automatically deducted from their checking bank account. In contrast with the credit cards, the spent money comes from the bank account directly.

Many banks issue a combined ATM/debit card that looks like a credit card and can be used in places where credit cards are accepted (Bashir, 2014). In this case, when users pay with a debit card, the payment will still be processed as a debit transaction. Both debit and credit cards are associated with advantage of convenience, speed, flexibility, simplicity, ease of use, accessibility and availability.

2.2.16 Web-Based Application

Web based applications are playing very important role in many business domain like retail, finance, sales, marketing and management. Web-based Applications (WBAs) are a type of software package that can be accessed through the web browser over a network which can be local or an internet (Powell, 2017). The software and database reside on a central server rather than being installed on the desktop system and is accessed over a network. Web-based applications are the ultimate way to take advantage of today's technology in enhancing your organizations productivity and efficiency.

These applications give you an opportunity to access your business information from anywhere in the world at any time. It also facilitates you to save time & money and improve the interactivity with your customers and partners. It allows the administration staff of any organization to work from any location and sales staff to access information remotely 24/7. With a computer connected to the Internet, a web browser and the right user name and password, you can access the systems from any location. Web-based applications are easy to use and can be implemented without interrupting your existing work process (Misal A.S., & Chavhanke A.R., , 2016). The web-based software enables you to interact with the application and data in a fluid and highly responsive manner.

It is an unarguable fact that Web-Based Applications are fast becoming more widespread, larger, more interactive, and more essential to the international use of computers. The most successful WBA companies are beginning to realize that key critical factors of success or failure of any WBA must be highly dependable on delivering on a high quality web site. Therefore, to attain the desired quality of WBA, it is necessary to suggest a model that organizes and enables the identification of WBA quality perspectives.

The ISO9126 standard for software engineering product quality states that the main purpose of software quality evaluation is to provide quantitative reference for software products evaluation that is reliable, understandable, and acceptable. There exists a need to develop and use modern software quality models as traditional quality models are not adequate for WBA because they do not address all problems associated with the new features of WBA.

2.2.17 Acceptable and Primary Requirements for Web-Based Management Systems

A Web application is a software system that can be accessed through the Internet or Intranet and is built following certain technologies and standards.

It must be noted from the onset that a Web application is a software system that can be accessed through the Internet or Intranet and is built following certain technologies and standards (Agboola, 2014). Web applications are widely deployed in this modern era of data processing mainly due to their efficiency and easy of development and maintenance. These types of software are built to be in compliance to some the principle requirements to promote their continued use.

2.2.16 Quality criteria for Web-based information systems

We evaluate software by measuring the quality of attributes such as reliability, usability, and maintainability, yet academics often fail to acknowledge that the basic economics behind software production has a strong impact on the development process (Musonda S, 2017). Although the field of software engineering has spent years developing processes and technologies to improve software quality attributes, most software companies have had little financial motivation to improve their software's quality. Software contractors receive payment regardless of the delivered software's quality and, in fact, are often given additional resources to correct problems of their own making.

So-called “shrink wrap” vendors are driven almost entirely by time-to-market; it is often more lucrative to deliver poor-quality products sooner than high-quality products later. They can deliver bug fixes as new “releases” that are sold to generate more revenue for the company. For most application types, commercial developers have traditionally had little motivation to produce high-quality software (AZEEL, 2016). Web-based software, however, raises new economic issues. Unlike many software contractors, Web application developers only see a return on their investment if their Web sites satisfy customers' needs. And unlike many software vendors, if a new company puts up a competitive site of higher quality, customers will almost immediately shift their business to the new site once they discover it.

Thus, instead of “sooner but worse,” it is often advantageous to be “later and better.” Despite discussions of “sticky Web sites” and development of mechanisms to encourage users to return,

thus far the only mechanism that brings repeat users to Web sites has been high quality. This will likely remain true for the foreseeable future. In software development, a process driver is a factor that strongly influences the process used to develop the software. Thus, if software must have very high reliability, the development process must be adapted to ensure that the software works well. Web software development managers and practitioners see the seven most important quality criteria for Web application success.

2.2.16.1 Reliability

Extensive research literature and a collection of commercial tools have been devoted to testing, ensuring, assuring, and measuring software reliability. Safety-critical software applications such as telecommunications, aerospace, and medical devices demand highly reliable software, but although many researchers are reluctant to admit it, most software currently produced does not need to be highly reliable (Brown, 2016). Many businesses' commercial success depends on Web software, however - if the software does not work reliably, the businesses will not succeed.

The user base for Web software is very large and expects Web applications to work as reliably as if they were going to the grocery store or calling to order from a catalogue. Moreover, if a Web application does not work well, the users do not have to drive further to reach another store; they can simply point their browser to a different URL. Web sites that depend on unreliable software will lose customers, and the businesses could lose much money. Companies that want to do business over the Web must spend resources to ensure high reliability. Indeed, they cannot afford not to.

2.2.16.2 Usability

Web application users have grown to expect easy Web transactions—as simple as buying a product at a store. Although much wisdom exists on how to develop usable software and Web sites, many Web sites still do not meet most customers' usability expectations. This, coupled with the fact that customers exhibit little site loyalty, means unusable Web sites will not be used - customers will switch to more usable Web sites as soon as they come online.

2.2.16.3 Security

When our application deployed and launched on the network or Internet, there are great risks of unauthorized used. There are great threats of vulnerabilities. The hackers try to unauthorized access in the intent of some profit or for some other aims. Sometimes internal personnel can be involved in unauthorized access of particular application for their specific benefits and aims or malicious intents. Therefore security measures are very important to build high quality Web applications (Jönsson, 2014). A lot of security measures are being applied to minimize the threats of vulnerabilities and malicious use of the particular applications like firewall, encryption, and other security policies.

We have all heard about Web sites being cracked and private customer information distributed or held for ransom. This is only one example of the many potential security flaws in Web software applications. When the Web functioned primarily to distribute online brochures, security breaches had relatively small consequences. Today, however, the breach of a company's Web site can cause significant revenue losses, large repair costs, legal consequences, and loss of credibility with customers. Web software applications must therefore handle customer data and other electronic information as securely as possible. Software security is one of the fastest growing research areas in computer science, but Web software developers currently face a huge shortfall in both available knowledge and skilled personnel.

2.2.16.4 Availability

In our grandparents' time, if a shopkeeper in a small town wanted to take a lunch break, he would simply put a sign on the front door that said "back at 1:00." Although today's customers expect to be able to shop during lunchtime, we do not expect stores to be open after midnight or on holidays. On the Web, customers not only expect availability 24 hours a day, seven days a week, they expect the Web site to be operational every day of the year—"24/7/365."

Availability means more than just being up and running 24/7/365; the Web software must also be accessible to diverse browsers (Mark Lycett & Omar Radwan, 2017). In the seemingly never-ending browser wars of the past few years, some software vendors actively sought to make sure their software would not work under competitors' browsers. By using features only available for one browser or on one platform, Web software developers become "foot soldiers" in the browser wars, sometimes unwittingly. To be available in this sense, Web sites must adapt their

presentations to work with all browsers, which requires significantly more knowledge and effort on the developers' part.

2.2.16.5 Scalability

We must engineer Web software applications to be able to grow quickly in terms of both how many users they can service and how many services they can offer. The need for scalability has driven many technology innovations of the past few years. The industry has developed new software languages, design strategies, and communication and data transfer protocols in large part to allow Web sites to grow as needed. Scalability also directly influences other attributes.

Any programming teacher knows that any design will work for small classroom exercises, but large software applications require discipline and creativity (Suryanto Nugroho, Sigit Hadi Waluyo & Luqman Hakim, 2017). Likewise, as Web sites grow, small software weaknesses that had no initial noticeable effects can lead to failures (reliability problems), usability problems, and security breaches. Designing and building Web software applications that scale well represents one of today's most interesting and important software development challenges.

2.2.16.6 Maintainability

One novel aspect of Web-based software systems is the frequency of new releases. Traditional software involves marketing, sales, and shipping or even personal installation at customers' sites. Because this process is expensive, software manufacturers usually collect maintenance modifications over time and distribute them to customers simultaneously. For a software product released today, developers will start collecting a list of necessary changes. For a simple change, (say, changing a button's label), the modification might be made immediately (Moonde Rodgers, Chuunga Kabutu & Nsunga Innocent, 2018). But the delay in releases means that customers won't get more complex (and likely important) modifications for months, perhaps years.

Web-based software, however, gives customers immediate access to maintenance updates - both small changes (such as changing the label on a button) and critical upgrades can be installed immediately. Instead of maintenance cycles of months or years, Web sites can have maintenance cycles of days or even hours. Although other software applications have high maintenance requirements, and some research has focused on "on-the-fly" maintenance for specialized applications, frequent maintenance has never before been necessary for such a quantity of

commercial software. Another ramification of the increased update rate has to do with compatibility.

Users do not always upgrade their software; hence, software vendors must ensure compatibility between new and old versions. Companies can control the distribution of Web software to eliminate that need, though Web applications must still be able to run correctly on several Web browsers and multiple versions of each browser. Another possible consequence of the rapid update rate is that developers may not feel the same need to fix faults before release - they can always be fixed later.

2.2.16.7 Time-to-market

This has always been a key business driver and remains important for Web software, but it now shares the spotlight with other quality attributes. Most of the software industry continues to give priority to first to market. Given the other factors discussed here, however, the requirement for patience can and must impact the process and management of Web software projects. Software researchers, practitioners, and educators have discussed these criteria for years, but no type of application has had to satisfy all of these quality attributes at the same time (Boot, 2011).

Web software components are coupling more loosely than any previous software applications. In fact, these criteria have until recently been important to only a small fraction of the software industry. They are now essential to the bottom line of a large and fast growing part of the industry, but we do not yet have the knowledge to satisfy or measure these criteria for the new technologies used in Web software applications.

2.3 Related Works

We live in a time of extraordinary technological change. We should be open to the new ideas and innovations that will drive economic growth and improvements in our financial system. At the same time, the public rightfully expects that authorities will do whatever it takes to keep their money safe. Those of us in the public sector will insist on safety and security, while also working to assure that our citizen benefit from payments system innovation.

2.3.16 Net Bank

Net Bank is a virtual counter of the bank to provide network technology for the customer to complete some traditional services such as opening an account, inquiries, transfer, online securities, investments and financial management (Powell, 2017). By comparison with traditional bank services, online banking cuts down operating cost. There are no time or location limits, the bank can offer services anytime and anywhere, even anyhow. Furthermore, net bank provides a variety of personalized services, such as insurances, securities and other financial products.

2.3.17 PayPal

PayPal allows any business or individual with an email address to transfer money online in a more secure, convenient and efficient way. The network is based on the existing bank account and the credit card to create a real-time payment solution. PayPal is the most popular third-party online payment system in the world. It has 8 million transactions every day and has over 137 million PayPal accounts in 193 markets and includes 26 currencies that it can transfer all over the world (Michael, 2012).

2.3.18 Google Wallet

Google Wallet is a peer-to-peer payments service produced by Google Company. Google Wallet must link to an existing credit card or bank account in the US. Payment transfer is completed by using an email address or a phone number. The most important revolution is that Google Wallet released real card to connect to user's accounts so customers can use Google wallet at retails businesses. It can also be used like a debit card to withdraw cash at ATM. Unfortunately, Google Wallet card was abolished on June 30, 2016 (Misal A.S., & Chavhanke A.R., , 2016).

2.3.19 Amazon Payment

Amazon Payment was launched in 2007 by Amazon Company. It is an online payment system which is owned by Amazon.com. The customer does not have to leave the site to complete a transaction (AZEEZ, 2016). It is safe and fast way to buy products online.

2.3.20 Authorize.Net

Authorize.Net provides a payment gateway service. It allows merchants to accept credit payment through their website and over an Internet Protocol connection. Since 1996 there are around 375,000 merchants and more than 88 billion dollars transactions in 2015.

2.3.21 Wechat Wallet

In China, Wechat payment is the most widely used payment gateway with the mobile phone, based on Wechat app (Powell, 2017). By linking your debit cards to Wechat payment is enough to complete transaction. In Wechat Wallet there are plenty of payment methods:

Quick Pay: Vendors scan the QR code shown by customers on the Quick Pay page to finish transaction.

QR Code Payment: Vendors create different QR codes for different goods. After users scanning these codes, customers can see related product information and transaction guides on their phone.

In-App web-based payment: Vendors push product messages to their followers via the official account. With Wechat payment enabled, their followers can purchase products on the shopping page.

In-App payment: Vendors can integrate Wechat Pay SDK (software development kit) into their apps. When users make payment in other apps, Wechat will be authorized to process the payment. Once the transaction is done, the page will redirect to the other app. (WeChat Wallet User Agreement.

2.3.22 AliPay

In 2013, AliPay overtook PayPal as the world's largest mobile payment system. It is used by more than 5 percent of world's population. Up to now, there are 270 million user accounts. The

amount of mobile payment transactions peaked 1.97 million times. AliPay is operated by Ant Financial of China, which is one of the largest FinTech companies in the world. AliPay is a way to pay for goods and services online, but now it is more than that. It is a global lifestyle “super app”.

2.4 Summary

This section was dedicated to the review of the available material with the sole purpose of informing the study and clearly identify the gaps needing filling. Various yet like software with the one under investigation have been highlighted in clear formats. The following section gives the methodology employed in developing the SSPS.

CHAPTER THREE METHODOLOGY

3.1 Introduction

Understanding of what system analysis mean will be great importance before giving into detail discussion about analysis of existing system. In order to just computerize without solving the problem, information collected should be organized and analysed because it is when the problems and potentials are clearly identified that the new system could be used to solve the problem.

3.2 BASELINE STUDY

2.2.1 Data Collection

As a best practice in keeping with the research ethics, the researcher obtained a letter of introduction from the Research department at the Information and Communications University to facilitate the gathering of all the necessary requirements in this research. Hastily, the researcher drafted the objectives for the research and sought to devise a semi-structured questionnaire which was administered to the purposively identified respondents aurally.

To ensure that we deliver an application meeting the needs for the customer accurately, we gathered all the necessary functional requirements from the Ministry of General Education offices in Lusaka which we could easily generalize. This was key to ensure that we identify the needful objectives and help to elaborate and analyze all the objectives as identified at the start of the first phase in the sequential order. Alternative solutions for the first phase were proposed within this phase for redundancy ahead of time.

2.2.2 Research Approach

As earlier stated, the researcher employed purposive sampling strategy of enquiry. A purposive sample is a non-probability sample that is selected based on characteristics of a population and the objective of the study. Purposive sampling is also known as judgmental, selective, or subjective sampling. Strictly speaking, we used the variation/heterogeneous purposive procedure.

A maximum variation/heterogeneous purposive sample is one which is selected to provide a diverse range of cases relevant to a particular phenomenon or event. The purpose of this kind of sample design is to provide as much insight as possible into the event or phenomenon under

examination (Banda, 2019). For example, when conducting a street poll about an issue, a researcher would want to ensure that he or she speaks with as many different kinds of people as possible in order to construct a robust view of the issue from the public's perspective. This was important to help us gather various views concerning the proposed system. The following figure simplifies this phase.

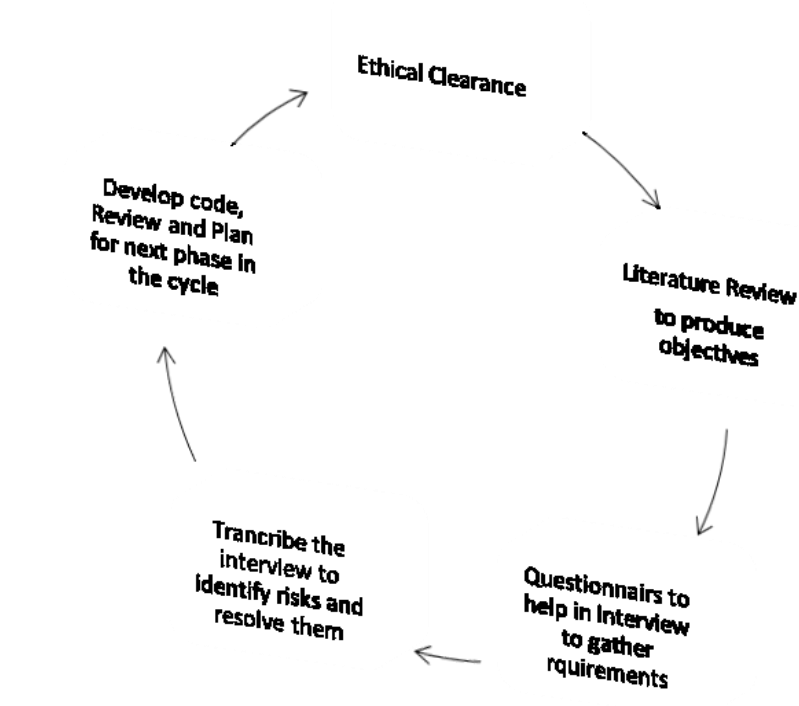


Figure 4: Research Approach

2.2.3 Development of the application

The development model chosen for this system was the spiral software development model. Spiral Model is a combination of a waterfall model and iterative model. Each phase in spiral model begins with a design goal and ends with the client reviewing the progress (Sharma, 2017). The spiral model was first mentioned by Barry Boehm in his 1986 paper. The development team in Spiral-SDLC model starts with a small set of requirement and goes through each development phase for those set of requirements. The software engineering team adds functionality for the

additional requirement in every-increasing spirals until the application is ready for the production phase.

In the development of the SSPS web application, we used such tools as HTML and CSS, JAVA, MySQL and PHP. This is a client and server system which where the server searches the data and sends it back to the client. As a matter of fact a client server system is a special case of a cooperative computer system. All such systems are characterized by the use of multiple processes that work together to form the system solution.

3.3 SYSTEM DESIGN

3.3.1 Context diagram

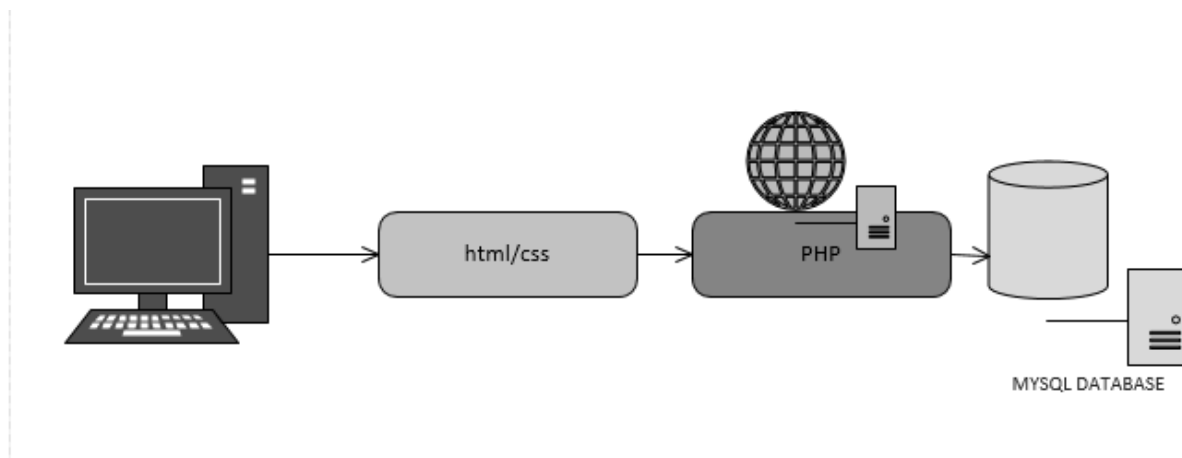


Figure 5: Context Diagram (Author Compilation)

3.3.2 System Software Level architectural design

Based upon the experiences of the previous registration process, it was anticipated that 30 workstations would be necessary for the purposes of the registration exercise. These workstations, which would be a mixture of PC-compatible machines and Apple Macintosh systems, would be distributed throughout the school departments and campus. For each of these two types of system, a user-friendly interface program (front-end) was written, which would display the equivalent of the original paper registration form. The student data would be retrieved from an information store, written using System. In the following sections we shall examine this architecture in more detail.

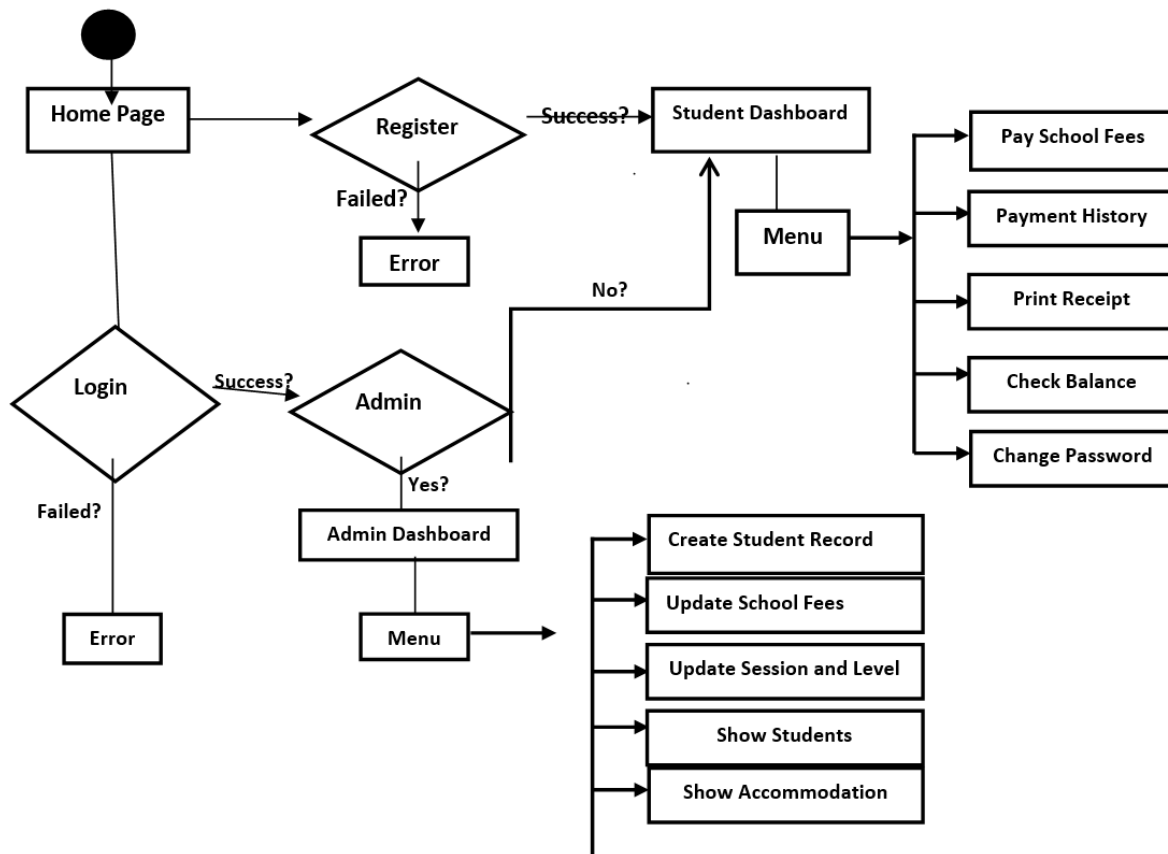


Figure 6: System Software Level architectural design

3.3.3 System Class Diagram

One major consideration of the work is to determine a suitable file structure and organization so as to maintain integrity, reduce redundancy, and ensure easy retrieval of data from the application. This phase specifies all the files to be used for the system and their structures. The database will be designed using MySQL. The Secondary School Payment System (SSPS) designed specifically for the case study of Zambian public Secondary School will be made of database objects such as entities (tables), routines, attributes (fields), views (virtual tables) etc. The table names, field names, data type, character length, attributes, null, default values, extra action and other descriptions for all tables used are also specified.

3.3.4 Database Schema Diagram

Below is a diagram showing an entity relationship diagram for the Secondary School Payment System.

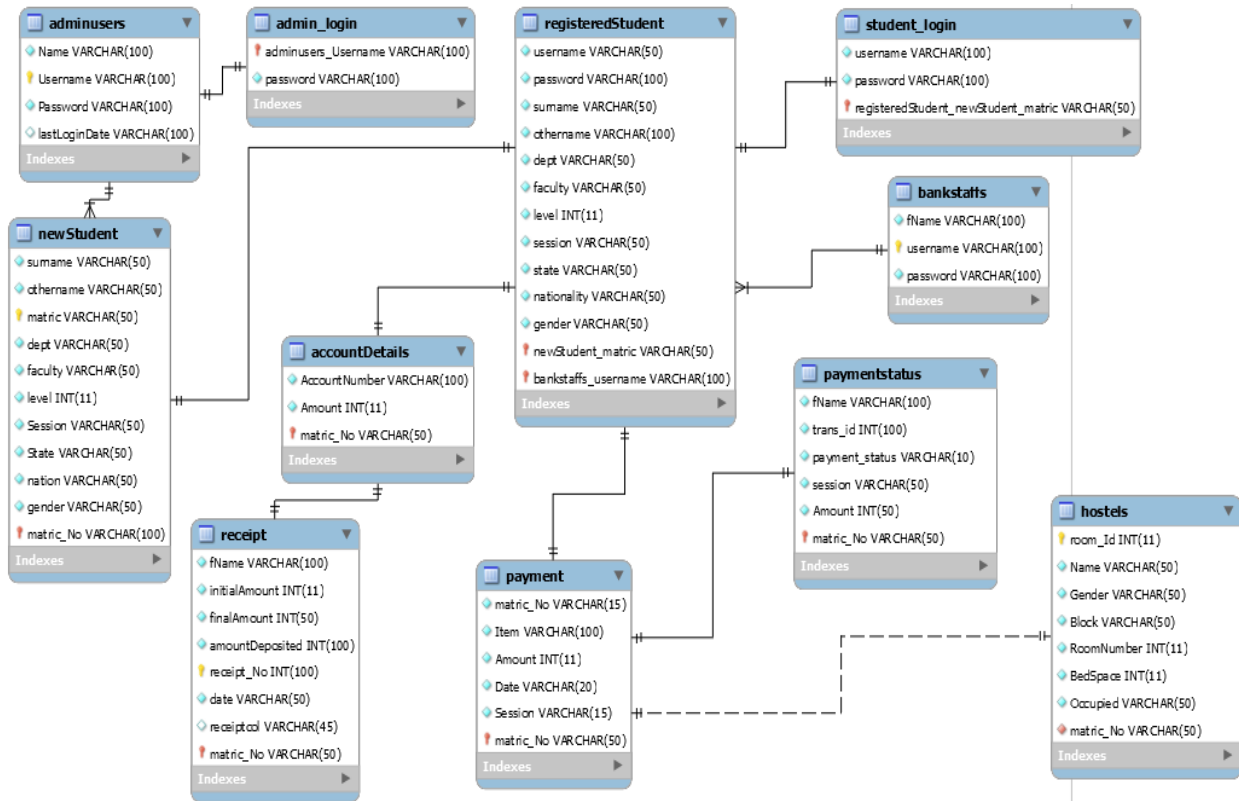


Figure7: SSPS Database Schema diagram (Author compilation)

The schema in the above figure comprises of various entities (tables) such as

new_Learner: This table will keep records of all the details of learners to be created by the administrator. It will show the learners of the secondary school that will have been created by the administrator.

registered_Learner: This table will keep records of learners that will have registered to use the SSPS system.

account_Details: This table will keep records of a learner's account details which will include the learner's account number, learner matric number and the amount of money in the learner's account.

receipt: This table will keep track of the learners' receipt for every deposit to be made into his/her account. It will include the date of payment, receipt number, amount deposited, the name of who made the deposit etc.

payment: This table will keep track of what a learner has paid for and the amount such item costs. It will also include the date of payment, who made the payment and some other details.

payment_Status: This table will keep record of learners that will have paid their school fees. It will include the name and matric number of the learner, transaction id for the payment, term for which the payment is made and the amount paid and the status of the learner to show that he/she has paid his/her school fees.

bank_Staffs: This table will record the name, username and password of bank staffs that have access to the SSPS system.

hostels: This table records the details of each bed space in the hostel. It contains the hostel name, gender that uses the hostel, block name, room name and bed space.

admin_Users: This table will record the name, username and password of the administrator and the date and time the admin last logged into the system.

3.3.5 System Data Model Design

SSPS is a web-based application to be hosted on a web server that communicates to a database server. The user on a web interface makes a web request which is received by the web server. The web server processes the request and interacts with the database server using SQL embedded in PHP scripts. The response is a web page data sent on the web interface for the user.

The SSPS system will consist of three different parts. The Learner Interface, Administrator Interface and the Bank Interface.

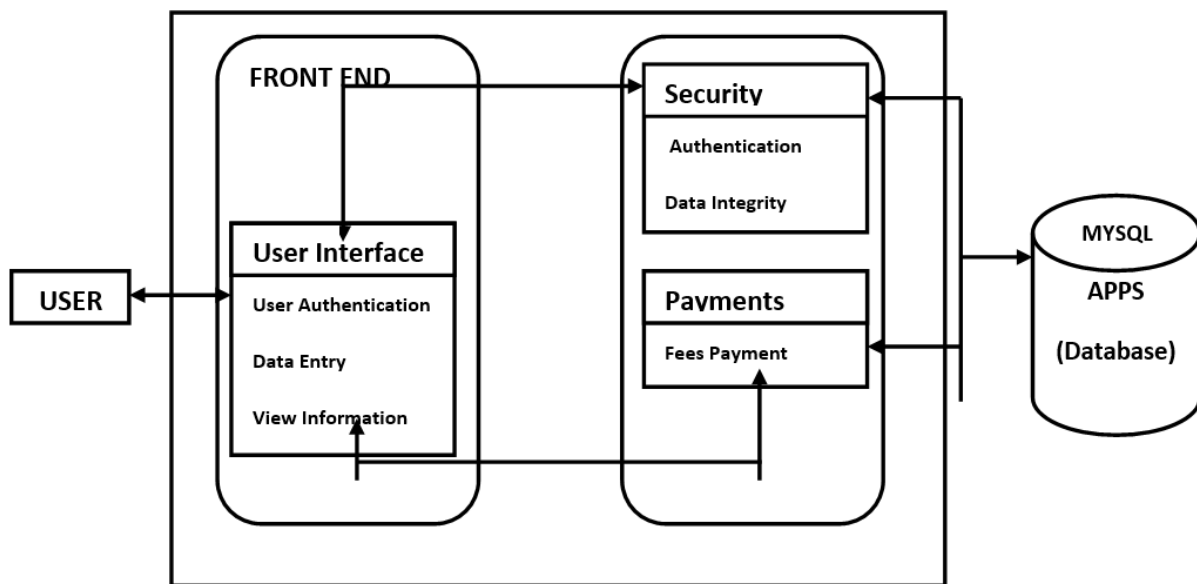


Figure 8: Data Model Design

The Learner Interface will provide the functionality which enables a learner pay his/her school fees, view his/her payment details, check balance, get hostel accommodation and change password. Secondly, the Administrator interface allows the administrator to create a new learner, update learner school fees, update term and level and also view learners and accommodation. Lastly, the Bank interface allows a bank staff to register a learner, confirm learner deposit whenever a learner deposits into his/her account.

3.3.5.1 Input Specification

This is an interface between the user and the system that allow the user to enter data. Data input is generally done through the standard terminal keyboard or with the mouse in case of combo boxes, option lists (or command buttons). At this stage, different screen (window or forms) will be designed to guide data entry procedure. The input variables needed for this work will be based on three categories of users:

Learner -: Login form that requires username (matric number) and password, after logging in, there is the *pay school fees* form that allows a learner pay his/her school fees, an *accommodation* form that allows the learner get hostel accommodation and finally a *change password* form that allows modification of existing passwords etc.

Administrator -: Login form that requires username and password, after logging in, there will be a form to allow the administrator create new learners, a form to update term and another form to update level and school fees etc.

Bank Staff: Login form that will also require username and password. When the bank staff logs in, he/she can view a learner profile, deposit a sum of money into a learners' account, print receipt for the learner payment and view the learners deposit history.

3.3.6 User Interface Design

This provides an interface that restricts an unauthorized user from accessing the application, its objective is to validate and authenticate a user before granting access to him/her based on his/her access level (i.e. Student or Administrator) so as to access different aspect of the application, depending on their privileges defined by the application. It also allows new students that have being created by the administrator to register and use the application.

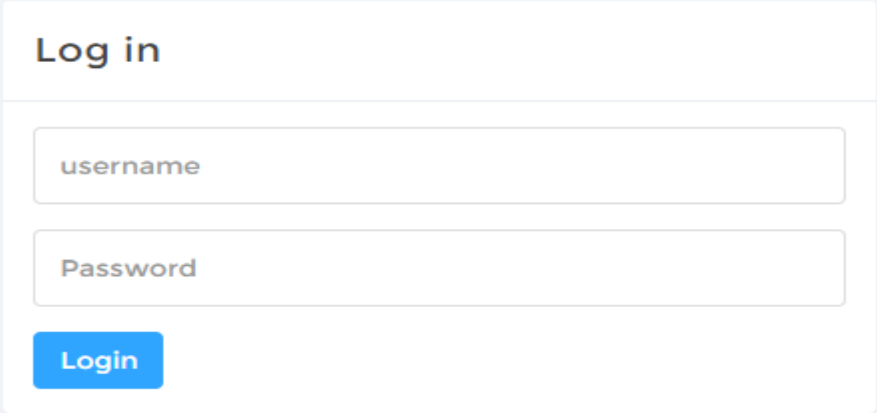
A screenshot of a web application's login page. The page has a light blue background. In the center, there is a white rectangular box with rounded corners. Inside this box, at the top, is the text 'Log in' in a bold, dark blue font. Below this text are two input fields: the first is labeled 'username' in a light gray font, and the second is labeled 'Password' in a light gray font. Below the input fields is a blue button with the word 'Login' in white text.

Figure 9: Home Page (login.php)

We present the backend code responsible for producing this interface:

```
<?php
include "include/config.php";
session_start();
if (isset($_SESSION["id"])){
    if ($_SESSION["AccessLevel"]== "Student"){
        header("location:student.php");
    }
}
```

```
if ($_SESSION["AccessLevel"] == "Admin"){  
    header("location:index.php");  
}  
  
}  
  
?>  
  
<!DOCTYPE html>  
  
<html>  
  
<head>  
  
    <meta charset="utf-8">  
  
    <meta name="viewport" content="width=device-width, initial-scale=1">  
  
    <title>Login: School</title>  
  
    <link href="css/bootstrap.min.css" rel="stylesheet">  
  
    <link href="css/datepicker3.css" rel="stylesheet">  
  
    <link href="css/styles.css" rel="stylesheet">  
  
    <!--[if lt IE 9]>  
  
    <script src="js/html5shiv.js"></script>  
  
    <script src="js/respond.min.js"></script>  
  
    <![endif]-->  
  
</head>  
  
<body>  
  
    <div class="row">
```

```
<div class="col-xs-10 col-xs-offset-1 col-sm-8 col-sm-offset-2 col-md-4 col-md-  
offset-4">
```

```
<div class="login-panel panel panel-default">
```

```
<div class="panel-heading">Log in</div>
```

```
<div class="panel-body">
```

```
<?php
```

```
if (isset($_POST["submit"])){
```

```
    $username = trim($_POST["username"]);
```

```
    $pass = trim($_POST["password"]);
```

```
    $accessLevel = trim($_POST["accesslevel"]);
```

```
    $hashed = md5($pass);
```

```
    $sql = "SELECT*FROM users WHERE username = ? OR password = ? ";
```

```
    $binder = $con->prepare($sql);
```

```
    $binder->bindValue(1,$username);
```

```
    $binder->bindValue(2,$hashed);
```

```
    $binder->execute();
```

```
    if ($binder->rowCount()===1){
```

```
        $row = $binder->fetch(PDO::FETCH_OBJ);
```

```
        /*
```

```
        1 ID
```

```
        2 firstName
```



```

3 surname
4 email
5 mobile
6 password
7 accountLevel
8 username
9 status

* */

//$_SESSION["AccessLevel"] = $accessLevel;

$_SESSION["id"] = $row->ID;

$_SESSION["fname"] = $row->firstName;

$_SESSION["lname"] = $row->surname;

$_SESSION["email"] = $row->email;

$_SESSION["mobile"] = $row->mobile;

$_SESSION["accountLevel"] = $row->accountLevel;

$_SESSION["username"] = $row->username;

$_SESSION["status"] = $row->status;


$_SESSION["AccessLevel"] = $_SESSION["accountLevel"];

if ( $_SESSION["accountLevel"]=='student'){

    header("location:student.php");

}

```

```

if ($_SESSION["accountLevel"]=='Admin'){

    header("location:index.php");

}

}else{

    echo "<div class='alert alert-danger'>

        <h4>Wrong Password!</h4>

        <a href='#' class='close' data-dismiss ='alert' aria-label ='close'>&times;</a>

        <b>Enter a correct Password/Username!</b>

    </div>";

}

}

?>

<form role="form" action="login.php" method="post">

    <fieldset>

        <div class="form-group">

            <input                class="form-control"

placeholder="username" name="username" type="text">

        </div>

        <div class="form-group">

            <input                class="form-control"

placeholder="Password" name="password" type="password" value="">

        </div>

```

```

<!--          <div class="form-group">-->

<!--          <select name="accesslevel" class="form-control" title="accesslevel">-->

<!--          <option disabled>SELECT ACCESS LEVEL</option>-->

<!--          <option>Student</option>-->

<!--          <option>Admin</option>-->

<!--          </select>-->

<!--          </div>-->


                                <button    type="submit"    name="submit"
id="submit" class="btn btn-primary">Login</button>

        </fieldset>

                                </form>

        </div>

    </div>

</div><!-- /.col-->

</div><!-- /.row -->

<script src="js/jquery-1.11.1.min.js"></script>

    <script src="js/bootstrap.min.js"></script>

</body>

</html>

```

3.4 Summary

This chapter dedicated itself into bringing out all matters regarding the methodology and methods used in ensuring that we reach project fruition timely. The next section presents the findings.

CHAPTER FOUR RESULTS

4.1 Introduction

This chapter is intended to give the main findings derived from this research study. We concatenate the survey results and the discussion. We conclude by discussing resonant matters concerning the system implementation results. Within this section we show and identify a fully documented operational system that is implemental on a computer system. By so doing, the following activities would be carried out; Development of computer-based software. To test-run the computer program with capture data to ensure proper execution and Preparing the documentation.

3.5 BASELINE STUDY RESULTS

We present the baseline study results in the following section.

3.5.1 Survey Results and Discussion

3.5.1.1 Implementing the Proposed Project

For a computing service to support the mission aims and strategic direction of its institution, its support devices must be responsive to and flexible in meeting the needs of those who are their customers and it must undertake research into what is required of them. In order to achieve reasonable success in implementing this project, the following aspects must be considered.

To design by making affordable hardware for the implementation scheme, Configuration of the hardware which will be discussed in the next phase, Handling of online registration information, Continuous updating and upgrading of the developed systems and Infrastructures and the types of network implemented.

3.5.1.2 Network Scale

The type of network to be used in this project as discussed earlier is the local area network (LAN). We will consider the network scale which will determine the number of client computer to use, the review of the software and some special requirement that will leads to the configuration of the network client/server. The entire organization will be preferred to run on a single server network. This allows the centralization of a number of file services, the maintaining of a strong control over the network environment, workflow and group ware achieving simple administration and easy installation configuring the network server.

The server here performs the following tasks: client-server application, Database and communication. They are the waiters of the network world, existing simply to satisfy the requirements of the clients. Many computers rely on the services of a server. Good network operating systems are therefore implemented with features such as protected pre-emptive multitasking which prevents poorly server components software from crashing the server and strong security which allows the management of whoever has access to the different resources stored or provided by the server. The only difference between a server and a client is the software each one is running.

Network operating system, which runs on the client and provides access to the resources shared by the server. The purpose of the client network software is to make the services that are available on the network appear to the client's computer. After the network server software installation is the network adapter card configuration. Servers communicate on the network through their network adapter card.

3.5.1.3 Network Clients and Network Services

The final link to connecting the client computers to the network is the network clients and the network services software. They are packages that bring a log into the Network but with the application of Sequential query language (SQL) database, it makes the work very easier because SQL package is already a network-based server, and the most important thing needed is the installation of Database on the server and the interface in the client system.

3.5.1.4 How it Works

The database runs on the server computer and only the user interface runs on the client-server database. It provides a better database performance and reduces the network traffic. The database runs a program in the server computer that takes over the tasks of manipulating the database files stored on the file server. Then, the client database program send requests to the database program to perform and manipulate for them.

3.5.1.5 Implementation

As discussed earlier in the previous chapter about the module we have in the program, we shall review them by starting the program one by one, to really see how each module is implemented.

3.5.1.6 Using the Graphical User Interface Forms

A very good example of a graphical user interface (GUI) form is the student data form. This serves as a link/platform between the user and the database. This page provides all the functionalities a student can perform i.e. Pay school fees, check payment history, print receipt, check balance, accommodation and change password.

The screenshot shows the 'STUDENT DASHBOARD' with navigation links: Home, Pay School Fees, Payment History, Update Profile, and Moonga kelvin. The 'Make Payments' form contains the following fields:

- Student ID:** Input field with value '2'.
- Student Name:** Read-only field with value 'Moonga kelvin'.
- Amount Paid:** Input field with placeholder 'eg. ZMW 1,554'.
- Term:** Dropdown menu with 'SELECT TERM'.
- Payment Type:** Dropdown menu with 'SELECT PAYMENT TYPE'.
- Receipt Batch Number:** Input field.
- Description:** Textarea.
- Attachment:** 'Choose File' button and 'No file chosen' text.
- Confirm Payment:** Green button.

Figure10: Student Page: Showing the Dashboard of a Student

The screenshot shows the 'STUDENT DASHBOARD' with navigation links: Home, Pay School Fees, Payment History, Update Profile, and Moonga kelvin. The 'Payment History' section displays a payment record for the date 2019-07-04:

- Payment Type:** School Fee
- Term:** 1
- Amount:** K 1,200.00 ZMW
- Status of Approval:** approved
- Receipt Batch Number:** 23173691873
- Description:** Registration, meals
- Attachment:** 📎

Figure11: Student Page: Viewing the Student Balance

This is where new records are brought into the system; there is a need to keep the records of each one of the students. Clicking the login button on the password form, enters the student data and immediately changes until student data is made and it is updated by confirm payment button on student data form which updates the data entered and also data could be edited by clicking on the edit button. The same process of opening the Graphical User Interface (GUI) form is applicable to the other modules available as will be demonstrated here below.

Here is the code for the output displayed:

```
<?php include "include/stHead.php"; ?>

<br>

<div class="col-md-1"></div>

<div class="col-md-2"></div>

<div class="col-md-6">

    <div class="panel panel-warning">

        <div class="panel panel-heading">Make Payments</div>

        <div class="panel-body">

            <?php

                $fullname = $_SESSION["fname"]." ".$_SESSION["lname"];

                if (isset($_POST["submit"])){

                    try {

                        // paymentID    studentID    amountPaid    term    paymentType
                        receiptBatchNumber    description    attachment

                        $studentID = $_POST["studentID"];

                        $amount = $_POST["amount"];

                        $term = $_POST["term"];
```

```

$paymenttype = $_POST["paymenttype"];

$receiptNumber = $_POST["receiptNumber"];

$desc = $_POST["desc"];

//attachment

$fileName = $_FILES["attachment"]["name"];

$fileTemLoc = $_FILES["attachment"]["tmp_name"];

$fileNameType = $_FILES["attachment"]["type"];

$fileNameSize = $_FILES["attachment"]["size"];

$fileNameError = $_FILES["attachment"]["error"];

//insert

//                                     $sql = "INSERT INTO
payment(paymentID,studentID,amountPaid,term,paymentType,receiptBatchNumber,description,
attachment)

//
VALUE(null,':studentID',':amountPaid',':term',':paymenttype',':receiptBatchNumber',':description
',':attachment')";

//          $sql = "INSERT INTO `payment` (`paymentID`,`studentID`,`amountPaid`,`term`,
`paymentType`,`receiptBatchNumber`,`description`,`attachment`)

//          VALUES (NULL, ':studentID', ':amountPaid', ':term', ':paymenttype',
':receiptNumber', ':description',

//          ':attachment')";

$sql = "INSERT INTO payment VALUES (NULL,?,?,?,?,?,NOW(),?)";

$binder = $con->prepare($sql);

$binder->bindValue(1,$studentID);

```

```

$ binder->bindValue(2,$amount);

$ binder->bindValue(3,$term);

$ binder->bindValue(4,$paymenttype);

$ binder->bindValue(5,$receiptNumber);

$ binder->bindValue(6,$desc);

$ binder->bindValue(7,$fileName);

$ binder->bindValue(8,'pending');

//      $ binder->bindParam(":studentID", $studentID);

//      $ binder->bindParam(":amountPaid", $amount);

//      $ binder->bindParam(":term", $term);

//      $ binder->bindParam(":paymenttype", $paymenttype);

//      $ binder->bindParam(":receiptNumber", $receiptNumber);

//      $ binder->bindParam(":description", $desc);

//      $ binder->bindParam(":attachment", $fileName);

$target_dir = "receipt/";

//      $file = $studentID.$_SESSION[]

$attach = $target_dir.basename($fileName);

if (move_uploaded_file($fileTemLoc,$attach)) {

    if ($binder->execute()) {

        echo "<script>alert('Successfully')</script>";

    }else{

        $error1 = $con->errorInfo();

        $error1 = $con->errorInfo();

```

```

        echo $error1;

    }

} else {

    $error1 = $con->errorInfo();

    echo $error1;

    var_dump( $binder->bindParam(":term", $term));

}

} catch (PDOException $e) {

    $error = $e->getMessage();

    echo "<script>alert($error)</script>";

}

}

?>

<form      method="post"      class="form-horizontal"      action="payFees.php"
enctype="multipart/form-data">

    <div class="row">

        <div class="col-md-6">

            <label for="studentID">Student ID</label>

            <input type="text" class="form-control" id="studentID" name="studentID"
value="<?php echo $_SESSION["username"] ?>"/>

        </div>

        <div class="col-md-6">

            <label for="studentName">Student Name</label>

```

```

        <input type="text" class="form-control" disabled id="studentName"
name="studentName"

        value="<?php echo $fullname ?>"/>

    </div>

</div>

<div class="row">

    <div class="col-md-6">

        <label for="amount">Amount Paid</label>

        <input type="number" class="form-control" placeholder="eg. ZMW 1,554"
id="amount" name="amount"/>

    </div>

    <div class="col-md-6">

        <label for="term">Term </label>

        <select name="term" id="term" class="form-control">

            <option>SELECT TERM</option>

            <option value="1">1</option>

            <option value="2">2</option>

            <option value="3">3</option>

        </select>

    </div>

</div>

<div class="row">

    <div class="col-md-6">

```

```

<label for="paymenttype">Payment Type</label>

<select name="paymenttype" id="paymenttype" class="form-control">

    <option>SELECT PAYMENT TYPE</option>

    <option>School Fee</option>

    <option>Balance Fee</option>

    <option>Exams</option>

    <option>Other</option>

</select>

</div>

<div class="col-md-6">

    <label for="receiptNumber">Receipt Batch Number </label>

    <input type="text" name="receiptNumber" id="receiptNumber" class="form-
control">

</div>

</div>

<div class="row">

    <div class="col-md-6">

        <label for="desc">Description</label>

        <textarea name="desc" id="desc" class="form-control"></textarea>

    </div>

    <div class="col-md-6">

        <label for="attachment">Attachment</label>

        <input type="file" name="attachment" id="attachment">

```

```

        </div>

    </div>

    <br>

    <div class="row">

        <div class="col-md-2"></div>

        <div class="col-md-2"></div>

        <div class="col-md-6">

            <input type="submit" name="submit" id="submit" value="Confirm Payment"
class="btn btn-success">

        </div>

    </div>

</form>

</div>

</div>

<!--<

    <div class="row">

        <div class="col-md-12">

            <div class="row">

                <div class="col-md-7">

                    <div class="col-md-7">

                        <label for="StudentID" >Student ID</label>

```

```
        <input type="text" name='studentID' id="StudentID" value="180464649"
disabled class="form-control" placeholder="StudentID">
```

```
    </div>
```

```
  </div>
```

```
</div>
```

```
<div class="row">
```

```
  <div class="col-md-7">
```

```
    <div class="col-md-7">
```

```
      <label for="studentName" >Student Name</label>
```

```
      <input type="text" name="studentName" id="studentName" value="Mary
Nyondo" class="form-control" placeholder="Student Name">
```

```
    </div>
```

```
  </div>
```

```
</div>
```

```
</div>
```

```
</div>
```

```
-->
```


3.5.1.7 Deposit Page

This page provides the basic functionality of the bank staff i.e. allows a student to pay into his/her account. The payment is confirmed by the bank staff. This page provides a way for students to credit their accounts anytime.

The screenshot shows a web application interface for a student dashboard. At the top, there is a dark navigation bar with the text 'STUDENT DASHBOARD' and several buttons: 'Home', 'Pay School Fees', 'Payment History', 'Update Profile', and 'Moonga kelvin'. Below this, the main content area has a light blue background. A central white box with an orange header titled 'Make Payments' contains a form. The form is divided into two columns. The left column includes fields for 'Student ID' (containing '2'), 'Amount Paid' (with a placeholder 'eg. ZMW 1,554'), 'Payment Type' (a dropdown menu showing 'SELECT PAYMENT TYPE'), and 'Description' (a text area). The right column includes a 'Student Name' field (displaying 'Moonga kelvin'), a 'Term' dropdown menu (showing 'SELECT TERM'), a 'Receipt Batch Number' text field, and an 'Attachment' section with a 'Choose File' button and the text 'No file chosen'. At the bottom center of the form is a green button labeled 'Confirm Payment'.

Figure 12: Deposit Page

3.5.1.8 School Fees Page

The functionality enclosed in this page is to allow student successfully pay his/her school fees without having to walk to a bank to make payment. It however only confirms the payment if the student has enough funds in his/her account or otherwise tells the student to credit his/her account before making payment.

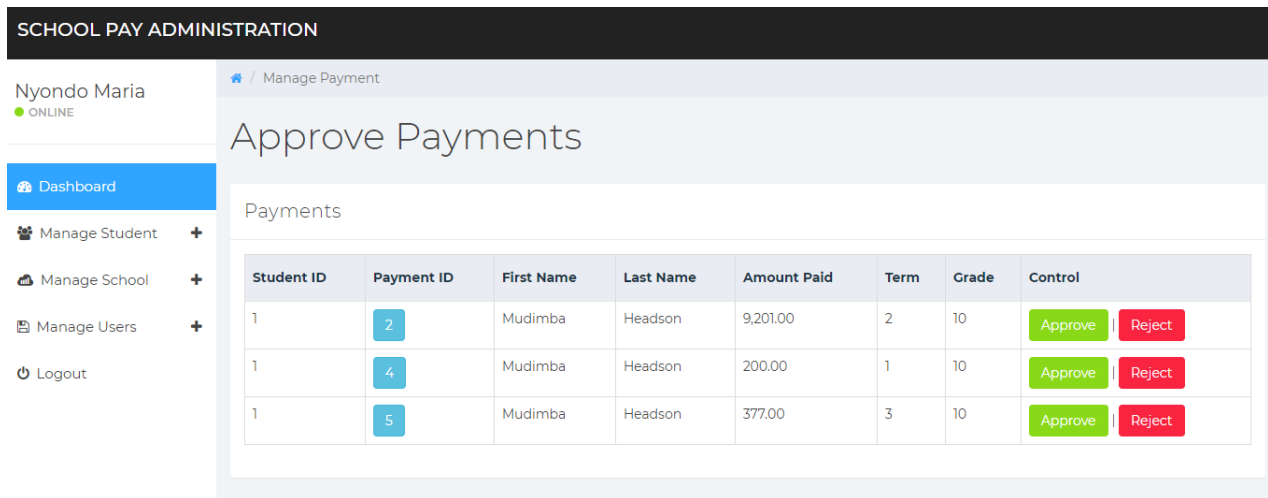


Figure 13: School Fees Payment Page: Before a student pays his/her school fees

```
<?php include 'include/leader.php'?>

<!--/.sidebar-->

<?php include "include/side.php"; ?>

<div class="col-sm-9 col-sm-offset-3 col-lg-10 col-lg-offset-2 main">

<div class="row">

<ol class="breadcrumb">

<li><a href="#">

<em class="fa fa-home"></em>

</a></li>

<li class="active">Manage Payment</li>

</ol>
```

```

</div><!--/.row-->

<div class="row">

  <div class="col-lg-12">

    <h1 class="page-header">Paid Students</h1>

  </div>

</div><!--/.row-->

<div class="row">

  <div class="col-md-12">

    <div class="panel panel-default">

      <div class="panel-heading">

        Payments

      </div>

      <div class="panel-body">

        <!--          Modal-->

        <!--          <div class="modal fade" id="moreDetails" tabindex="-1"
role="dialog" aria-labelledby="firefoxModalLabel" aria-hidden="true">-->

        <!--          <div class="modal-dialog" role="document">-->

        <!--          <div class="modal-content">-->

        <!--          <div class="modal-header">-->

        <!--          <h4 class="modal-title" id="firefoxModalLabel">More
Detail</h4>-->

        <!--          </div>-->

        <!--          <div class="modal-body">-->

```

```

<!-->

<!--          <div id="displayInformation"></div>-->

<!-->

<!--          </div>-->

<!--          <div class="modal-footer">-->

<!--          <button type="button" class="btn btn-secondary" data-
dismiss="modal">Close</button>-->

<!--          </div>-->

<!--          </div>-->

<!--          </div>-->

<!--          </div>-->

<!--          Modal-->

<div class="canvas-wrapper">

    <table class="table table-bordered table-responsive ">

        <thead class="bg-warning">

            <tr>

                <th>Student ID</th>

                <th>Payment ID</th>

                <th>First Name</th>

                <th>Last Name</th>

                <th>Amount Paid</th>

                <th>Term</th>

                <th>Grade</th>

```

```
<th>Control</th>
```

```
</tr>
```

```
</thead>
```

```
<tbody>
```

```
<?php
```

```
/*
```

```
* 1 paymentIDPrimary
```

```
2 studentID
```

```
3 amountPaid
```

```
4 term
```

```
5 paymentType
```

```
6 receiptBatchNumber
```

```
7 description
```

```
8 attachment
```

```
9 dateOfPayments
```

```
10          statusApproval
```

```
* */
```

```
$sql = "SELECT * FROM payment INNER JOIN student ON studentID = sn  
WHERE statusApproval = ?";
```

```
$binder = $con->prepare($sql);
```

```
$binder->bindValue(1,"approved");
```

```

$binder->execute();

if ($binder->rowCount()>0){

    while($row = $binder->fetch(PDO::FETCH_OBJ)){

        /*

        * sn

        firstName

        surname

        dob

        grade

        class

        address

        account

        * */

        //Student Details

        $sn = $row->sn;

        $fname = $row->firstName;

        $lname = $row->surname;

        $grade = $row->grade;

        $class = $row->class;


        //Account

        $payID = $row->paymentID;

        $statusApproval = $row->statusApproval;

```

```

$amount = number_format($row->amountPaid,2);

$term = $row->term;

$paymentType = $row->paymentType;

$receiptBatchNumber = $row->receiptBatchNumber;

$description = $row->description;

$attachment = $row->attachment;

$dateOfPayments = $row->dateOfPayments;

```

```

echo "

```

```

<tr>

```

```

<td>$sn</td>

```

```

<td>$payID</td>

```

```

<td>$fname</td>

```

```

<td>$lname</td>

```

```

<td>$amount</td>

```

```

<td>$term</td>

```

```

<td>$grade</td>

```

```

<td><a href='viewPayment.php?stID=$sn' class='btn btn-info'>View

```

```

Payment</a></td>

```

```

</tr>

```

```

";

```

```

}

```

```

}else{

```

```
echo "
```

```
<tr>
```

```
<td>0</td>
```

```
<td><a href='?payID=0' class='btn btn-info'>0</a></td>
```

```
<td>No Record</td>
```

```
<td>N/A</td>
```

```
<td>N/A</td>
```

```
<td>N/A</td>
```

```
<td>0</td>
```

```
<td><a href=" class='btn btn-success disabled'>Approve</a> </td>
```

```
</tr>
```

```
";
```

```
}
```

```
?>
```

```
</tbody>
```

```
</table>
```

```
<!-- Approve-->
```

```
</div>
```

```
</div>
```


</div>

</div>

</div><!--/.row-->

<!--/.row-->

<div class="row">

<!--/.col-->

<!--/.col-->

<?php include 'include/footer.php'?>

3.5.1.9 School Admin

SCHOOL PAY ADMINISTRATION

Nyondo Maria
● ONLINE

Dashboard

Manage Student +

Manage School +

Manage Users +

Logout

/ Manage Payment

Paid Students

Payments

Student ID	Payment ID	First Name	Last Name	Amount Paid	Term	Grade	Control
2	3	Moonga	kelvin	1,200.00	1	10	<button>View Payment</button>

Figure 14: School Admin

This is the form that takes shows the details of students that paid.

3.6 SYSTEM IMPLEMENTATION RESULTS

3.6.1 Functional Requirements

- i. The system shall accept valid input of registered learners' payment details from users intending to pay fees online.
- ii. The system shall process fees payment transactions so that learner fees accounts are credited with the specified amount in each transaction.
- iii. The system shall produce a receipt as a proof of payment for every transaction made.
- iv. The system shall produce a listing of transaction information to learners.
- v. The system shall provide feedback to the learner describing the status of the transaction.
- vi. The system shall be able to generate payment reports to learners.

3.6.2 Non Functional Requirements

- i. The system should be easy to maintain.
- ii. The system should be compatible with different platforms.
- iii. The system should be fast as customers always need speed.
- iv. The system should always be available online all times.
- v. The system should be secure.
- vi. The system should be accessible to online users.
- vii. The system should be easy to learn by both sophisticated and novice users.
- viii. The system should provide easy, navigable and user friendly interfaces.
- ix. The system should have a standard graphical user interface that allows for the on-line data entry, editing, and deleting of data with much ease.

3.6.3 Hardware and Software Requirement

The SSPS can be implemented on any micro-computer configuration with the following capacities:

- i. An hard disk of at least 120 GB
- ii. 4 GB RAM memory
- iii. Core i3 1.6 GHz
- iv. Window 7 operating system
- v. Macromedia Dreamweaver CS5
- vi. Wamp server
- vii. Microsoft Office suite

Any microcomputer of the above capacity is required to be used, the only important thing is that PHP is used to design the package resides on the hard disk. The computer used in designing and implementing this package is Lenovo ThinkPad T430. Processor 2.5 GHz, 2.9 GHz, 8 GB of RAM, 500 solid state drive capacity.

3.7 Summary

Chapter four intended to give the main findings derived from this research study. We concatenated the survey results and the discussion. We concluded by discussing resonate matters concerning the system implementation results.

CHAPTER FIVE DISCUSSION AND CONCLUSION

5.1 Introduction

This is the final chapter of the research project. It focus on offering the candid discussion of the whole research project and gives a general conclusion to the study. Essentially, it considers different aspects including how this system would solve the challenge of school payment operations in Zambian schools and concludes by stating its possible application.

5.2 DISCUSSION

5.2.1 The baseline study

This research has come at a good time when the Government of the Republic of Zambia has invested so much in the field of Information and Communications Technology. The use of technology would benefit the Zambian public schools all around the country, and deploying such a system, we would be assured of efficiency, accuracy, reliability and unquestionable position of flawless payment management and reporting. This technology implementation would help reduce the flaws associated with the manual systems in present use.

5.2.2 Use of technology

Looking back at what has been revealed in this project report, the manual system in discharging critical financial management operations is not free from human error. Hence a system which automates the school payments management operations with use of various algorithms is highly needed to curtail the present challenges. Zambia has for long been crusading the agenda of e-governance and digital culture and such a system as this one comes in at a right time which the tech environment is still in the Greenfield awaiting exploitation.

5.2.3 Development of the system as a solution

SSPS accumulate and analyze payments data in order to make good payments management decisions in running the school. It can be realized that numerous school payment management software do exist in many localities around the globe today. The likes of AIMS at the information and Communications University and others.

5.2.4 Comparison with other similar works

Each of these applications have their own strengths and weaknesses. Our application rides on some of the strengths mined from the reviewed applications and adds some few fascinating features. Unlike the other discussed applications, ours is light on memory uptake and takes a defence in-depth approach to bar known possible attacks. A system such as this one halves the existent problems and brings about enhanced efficiency.

5.2.5 Possible application

This software's main potential application is in the management of school payments in Zambian schools to bring in the much needed efficiency in such operations.

5.3 Summary

This section has offered a general view regarding the discussion and conclusions based on the developed system. It has also illustrated that other such software are already in existence though variant in functionalities.

5.4 Conclusion

There is an enormous amount of potential for the schools to exploit the implementation of the SSPS. This technology can stipulate schools' growth and development. The scope magnitude of change that are occurring in department today are both exciting and daunting, very particularly we are contemplating how we will manage the many streams of technological innovations pouring into our department and networked information world.

Therefore, it is concluded that studies on user requirements of e-payments and e-registration should be continuous and at intervals to receive feedback from users by managers of the portal with a view to meeting user requirements for better ease of use. It may not be enough to just initiate online payment and registration and associated services without taking into consideration user perceptions, requirements, needs and challenges, all of which will contribute to the overall goal of the institution to enhance learning and at the same time manage student records appropriately. It becomes even more important to conduct similar studies in our 21st century electronic driven environment.

5.5 Future works

Very particularly, there are aspects that we can more or less call our limitation; they are discussed in this area. It is important to get people's feedback to really have an understanding of how we can improve rapidly, and it is important to let them know what has been done, the sort of the risks that are deemed unacceptable, and what we do to minimize the organization's exposure to them. For now, the program software will not be able to function as a web-based application. Hence, external users or user that is not within Open and Distance Learning will not be able to access information.

This limitation can be corrected by incorporating the software on a website to enable it function as an on-line application. But this requires the use of *scripting language* to code, load the application into the website and also to set the necessary protocols and access methods, the software will respond to. Although, in any computer based process, computer applications, as we all know are susceptible to virus. The only measure for this is to install an antivirus, which protects the project from being destroyed by them. Also on the user's part, some flaws are bound to happen since users are not 100% perfect, errors such as wrong typing of information and accessing information from a wrong module are bound to happen.

Another consideration may be the limitation to accommodate new kinds of information. As different kinds of information are required by the department, it is possible that the software will become obsolete overtime. Hence, in order to be able to store such information, there will be a need for modification, addition modules and adjustments of the already existing modules. This can be costly in most cases depending on the amount of work to be done. The school would have to decide on either buying new software or modifying the old one at almost the same cost.

REFERENCES

- [1] A.S.Misal, S.R.Misal, A.R.Chavhanke, P.A.Ambatkar, Prof. V. S. Tamboli, 2016. Online Fee Payment System. *International Journal for Research in Applied Science & Engineering Technology (IJRASET)*, 4(III).
- [2] Abrazhevich, D., 2004. *Electronic Payment Systems: a User-Centered Perspective and Interaction Design*. Eindhoven – The Netherlands. : J.F. Schouten School for User-System Interaction Research.
- [3] Abrazhevich, D., n.d. *Electronic Payment Systems: a User-Centered Perspective and Interaction Design*. Netherlands. : CIP-DATA LIBRARY TECHNISCHE UNIVERSITEIT EINDHOVEN.
- [4] Agboola, A., 2014. Information and Communication Technology (ICT) in Banking Operations in Nigeria – An Evaluation of Recent Experiences. Ile-Ife, Nigeria : Obafemi Awolowo University .
- [5] Anon., 2007. NATIONAL PAYMENT SYSTEMS ACT. Lusaka: GRZ.
- [6] AZEEZ, I. A., 2016. *Design And Implementation of a Payment Management System*.
[Online]
Available _____ at:
https://www.academia.edu/19856069/Design_And_Implementation_of_a_Payment_Management_System
[Accessed December 2018].
- [7] Banda, D., 2019. Disertation Writing lecture notes. Lusaka: UNZA.
- [8] Bashir, L., 2014. DESIGN AND IMPLEMENTATION OF AN ONLINE PORTAL REGISTRATION: A CASE STUDY OF NATIONAL OPEN UNIVERSITY OF NIGERIA, DAMATURU STUDY CENTRE. *Research Gate*.
- [9] Boot, M., 2011. *ELECTRONIC RETAIL PAYMENTS AT PUBLIC EVENTS*. Enschede, The Netherlands: University of Twente.

- [10] BOZ, 2016. Overview Of Payment Systems In Zambia. Lusaka: BOZ.
- [11] Brown, M., 2016. Case Study: Online School Payments. UK: s.n.
- [12] Ching, M. R. D., 2017. Challenges and Opportunities of Electronic Payment Systems in the. 20(22).
- [13] Delali Kumaga and Jan Svanberg , 2010. The challenges of implementing Electronic Payment Systems – The Case of Ghana’s E-zwich Payment System. s.l.:BTH.
- [14] Djail BOUBEKEUR, 2016. Database systems development. *DSJ*, 2(4).
- [15] Gianluca Lax, Francesco Buccafurri & Gianluca Caminiti, 2015. Digital Document Signing: Vulnerabilities and Solutions. *Information Security Journal: A Global Perspective* , 24(1-3).
- [16] Iqbal H. Sarker, Faisal Faruque, Ujjal Hossen & Atikur Rahman, 2015. A survey of software development process models in software engineering. *International Journal of Software Engineering and Its Applications*, 9(11), pp. 55-70.
- [17] IRENE, N., 2011. DESIGN AND IMPLEMENTATION OF AN AUTOMATED INVENTORY MANAGEMENT SYSTEM. Uganda: Uganda Martyrs University .
- [18] Jönsson, T., 2014. Efficiency determination of automated techniques for GUI testing. Jönköping i: Jönköping.
- [19] Kabutu C, S. M., 2017. Design and Implementation of a web-based. *Lusaka, IJMDR*.
- [20] Kamran Ali and Xia Xiaoling , 2019. A RELIABLE AND AN EFFICIENT WEB TESTING. *International Journal of Software Engineering & Applications (IJSEA) SYSTEM*, 10(1).
- [21] Kazimierz Worwa & Jerzy Stanik, 2008. Quality of Web-based information systems. *Journal of Internet Banking and Commerce* .

- [22] Kobusinge, G., 2013. ONLINE FEES PAYMENT SYSTEM FOR MAKERERE UNIVERSITY (MUK-OFPS). Makerere : Makerere University.
- [23] Konka, B. B., 2011. *A case study on Software Testing Methods and Tools*. Göteborg, Sweden: University of Gothenburg.
- [24] K, P., 2017. The Effect of an Electronic Data Capture and Records Management System on a School's Administration and Managemen. *Lusaka, IJMDR*.
- [25] Kumaga, D., 2010. The challenges of implementing Electronic Payment Systems – The Case of Ghana's E-zwich Payment System. s.l.:s.n.
- [26] LAZO, E., 2017. Towards a new transformation of epayments paradigm: a case study on Moldovan public services. Sweden : s.n.
- [27] Mark Lycett & Omar Radwan, 2017. Developing a Quality of Experience (QoE) model for Web Applications. UK: Royal Holloway,.
- [28] Mashreghi, B., 2011. An Analysis of the Factors Influencing Success of Bank-issued Micropayment Systems in Iran. Iran: LULEA UNIVERSITY OF TECHNOLOGY .
- [29] Michael, O., 2012 . THE METHODS OF PAYMENT AND THEIR IMPACT ON FEES PAYING IN TERTIARY INSTITUTION: A CASE OF TAKORADI POLYTECHNIC. Ghana: KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY.
- [30] Michael, O., 2012. THE METHODS OF PAYMENT AND THEIR IMPACT ON FEES PAYING IN TERTIARY INSTITUTION: A CASE OF TAKORADI POLYTECHNIC. Kabwe: Nrumah University.
- [31] Milad Hanna, Amal Elsayed Aboutabl & Mostafa-Sami M. Mostafa, 2018. Automated Software Testing Framework for Web Applications. *International Journal of Applied Engineering Research* , 13(11).

- [32] Misal A.S., & Chavhanke A.R. , 2016. Online Fee Payment System. International Journal for Research in Applied Science & Engineering Technology (IJRASET), 4(3).
- [33] Moonde Rodgers, Chuunga Kabutu & Nsunga Innocent, 2018. Design and Implementation of a Policing Control Information System (PCIS) for the Zambian Police Service (ZPS). *The International Journal of Multi-Disciplinary Research* .
- [34] Muddassir Masihuddin , Burhan Ul Islam Khan *, M. Mueen Ul Islam Mattoo , Rashidah F. Olanrewaju , 2017. A Survey on E-Payment Systems: Elements, Adoption, Architecture, Challenges and Security Concepts. *IJST*, 10(20).
- [35] Musonda S, M. A., 2017. Headteachers' Effectiveness in managing Finances for the Implementation of Free Primary Education in Kabwe District, Zambia.. *Lusaka, IJMDR*.
- [36] Nonny, 2013. *Design and implementation of an online payment portal for secondary school administration*. [Online] Available at: <http://www.classgist.com/projectdetails.aspx?id=576> [Accessed December 2018].
- [37] Onyebu, U. F., 2015. *Implementation of a Web System for College of Education Administration*. Pankshin State, Nigeria: Federal College of Education,.
- [38] Pelekelo K. J, a. S. R., 2017. The Effect of an Electronic Data Capture and Records Management System on a School's Administration and Managemen. *Lusaka, IJMDR*.
- [39] Peter J. Denning, Dorothy E. Denning, 2010. Discussing Cyber Attack. *Communications of the ACM*, 53(9), pp. 29-31.
- [40] Powell, J. H., 2017. Innovation, Technology, and the Payments System. New Haven: Yale University.
- [41] Sahil Barjtya, Ankur Sharma and Usha Rani, 2017. A detailed study of Software Development Life Cycle (SDLC) Models. *International Journal Of Engineering And Computer Science*, 6(7).

- [42] Sharma, M. K., 2017. A study of SDLC to develop well engineered software. *International Journal of Advanced Research in Computer Science* , 8(3).
- [43] S, K., 2017. Evaluating the Impact of ICTs and Education Assessment and Feedback in Modern Era. *Lusaka, IJMDR*.
- [44] S, T., 2017. Designing and Implementation of an Advanced Information Management System at Information and Communication University- Zambia. *Lusaka, IJMDR*.
- [45] Suryanto Nugroho, Sigit Hadi Waluyo & Luqman Hakim, 2017. Comparative Analysis of Software Development Methods between Parallel, V-Shaped and Iterative. *International Journal of Computer Applications*, 169 (11).
- [46] T, S., 2017. Designing and Implementation of an Advanced Information Management System at Information and Communication University- Zambia. *Lusaka, IJMDR*..
- [47] WAHAB, Y. A., 2012. THE ADOPTION AND USE OF ELECTRONIC PAYMENT SYSTEMS IN GHANA, A CASE OF E-ZWICH IN THE SUNYANI MUNICIPALITY. Ghana: Kwame Nkrumah University of Science and Technology.
- [48] Yang, W., 2017. *ANALYSIS ON ONLINE PAYMENT SYSTEMS OF E-COMMERCE*. Oulu : Oulu University of Applied Sciences Business Information Technology.

APPENDICES

Appendix 1: Source Code

```
<?php include 'include/leader.php'?>

<!--/.sidebar-->

<?php include "include/side.php"; ?>

<div class="col-sm-9 col-sm-offset-3 col-lg-10 col-lg-offset-2 main">

    <div class="row">

        <ol class="breadcrumb">

            <li><a href="#">

                <em class="fa fa-home"></em>

            </a></li>

            <li class="active">Dashboard</li>

        </ol>

    </div><!--/.row-->

    <div class="row">

        <div class="col-lg-12">

            <h2 class="page-header"><?php

                echo 'Welcome, '.$_SESSION['fname'].' " '.$_SESSION["lname"];

            ?></h2>

        </div>

    </div><!--/.row-->

    <div class="panel panel-container">

        <div class="row">

            <div class="col-xs-6 col-md-3 col-lg-3 no-padding">

                <div class="panel panel-teal panel-widget border-right">

                    <div class="row no-padding"><em class="fa fa-xl fa-money color-blue"></em>

                    <div class="large"><?php

                        $binder = $con->prepare("SELECT sum(amountPaid) as totalAmount FROM payment");

                        $binder->execute();

                        $row = $binder->fetch(PDO::FETCH_OBJ);

                        echo 'K '.number_format($row->totalAmount);

                    ?></div>

                    <div class="text-muted">Current Money</div>

                </div>

            </div>

        </div>

    </div>
```

```

</div>
<div class="col-xs-6 col-md-3 col-lg-3 no-padding">
    <div class="panel panel-blue panel-widget border-right">
        <div class="row no-padding"><em class="fa fa-xl fa-users color-orange"></em>

        <div class="large"><?php

            $binder = $con->prepare("SELECT count(*) as total FROM student");

            $binder->execute();

            $row = $binder->fetch(PDO::FETCH_OBJ);

            echo $row->total;

        ?></div>

        <div class="text-muted">Total Number of Students</div>
    </div>
</div>
</div>
<div class="col-xs-6 col-md-3 col-lg-3 no-padding">
    <div class="panel panel-orange panel-widget border-right">
        <div class="row no-padding"><em class="fa fa-xl fa-adn color-teal"></em>

        <div class="large"><?php

            $binder = $con->prepare("SELECT count(*) as total FROM users WHERE accountLevel=?");

            $binder->bindValue(1,'admin');

            $binder->execute();

            $row = $binder->fetch(PDO::FETCH_OBJ);

            echo $row->total;

        ?></div>

        <div class="text-muted">Users</div>
    </div>
</div>
</div>
<div class="col-xs-6 col-md-3 col-lg-3 no-padding">
    <div class="panel panel-red panel-widget ">
        <div class="row no-padding"><em class="fa fa-xl fa-tachometer color-red"></em>

        <div class="large"><?php

            $binder = $con->prepare("SELECT count(*) as total FROM payment");

            $binder->execute();

            $row = $binder->fetch(PDO::FETCH_OBJ);

```

```

        echo $row->total;

        ?></div>

        <div class="text-muted">Transactions</div>

    </div>

</div>

</div>

</div><!--/.row-->

</div>

<div class="row">

    <div class="col-md-12">

        <div class="panel panel-default">

            <div class="panel-heading">

                Overview

                <span class="pull-right clickable panel-toggle panel-button-tab-left"><em class="fa fa-toggle-up"></em></span></div>

            <div class="panel-body">

                <div class="canvas-wrapper">

                    <canvas class="main-chart" id="line-chart" height="200" width="600"></canvas>

                </div>

            </div>

        </div>

    </div>

</div>

</div><!--/.row-->

<!--/.row-->

<!--/.col-->

<?php include 'include/footer.php'?>

```


Appendix 2: Database Access Sample Code

```
-- phpMyAdmin SQL Dump
-- version 4.8.5
-- https://www.phpmyadmin.net/
--
-- Host: 127.0.0.1:3306
-- Generation Time: Jul 04, 2019 at 10:39 AM
-- Server version: 5.7.26
-- PHP Version: 7.2.18

SET SQL_MODE = "NO_AUTO_VALUE_ON_ZERO";
SET AUTOCOMMIT = 0;
START TRANSACTION;
SET time_zone = "+00:00";

/*!40101 SET @OLD_CHARACTER_SET_CLIENT=@@CHARACTER_SET_CLIENT */;
/*!40101 SET @OLD_CHARACTER_SET_RESULTS=@@CHARACTER_SET_RESULTS */;
/*!40101 SET @OLD_COLLATION_CONNECTION=@@COLLATION_CONNECTION */;
/*!40101 SET NAMES utf8mb4 */;

--
-- Database: `schpay`
--

--
-- Table structure for table `payment`
--

DROP TABLE IF EXISTS `payment`;
CREATE TABLE IF NOT EXISTS `payment` (
  `paymentID` int(50) NOT NULL AUTO_INCREMENT,
  `studentID` varchar(150) NOT NULL,
  `amountPaid` varchar(100) DEFAULT NULL,
  `term` int(10) NOT NULL,
  `paymentType` varchar(100) NOT NULL,
  `receiptBatchNumber` text,
```

```

`description` text,
`attachment` text,
`dateOfPayments` date NOT NULL,
`statusApproval` varchar(11) NOT NULL,
PRIMARY KEY (`paymentID`)
) ENGINE=MyISAM AUTO_INCREMENT=5 DEFAULT CHARSET=latin1;

--

-- Dumping data for table `payment`

--

INSERT INTO `payment` (`paymentID`, `studentID`, `amountPaid`, `term`, `paymentType`, `receiptBatchNumber`, `description`, `attachment`,
`dateOfPayments`, `statusApproval`) VALUES

(1, '1', '1200', 1, 'School Fee', '29890710857', 'Registrations, meal', 'How To Make An Ethernet Cable - Simple Instructions.pdf', '2019-07-04',
'rejected'),

(2, '1', '9201', 2, 'School Fee', '23173691873', 'Registration', 'Candidate Registration Schedule Combined (SSA)_Interactive_PDF.pdf', '2019-07-
04', 'pending'),

(3, '2', '1200', 1, 'School Fee', '23173691873', 'Registration, meals', 'Candidate Registration Schedule Combined (SSA)_Interactive_PDF.pdf',
'2019-07-04', 'approved'),

(4, '1', '200', 1, 'Exams', '131308301', 'Exams', 'The Python Standard Library â€” Python 3.7.1 documentation.pdf', '2019-07-04', 'pending');

-----

--

-- Table structure for table `student`

--

DROP TABLE IF EXISTS `student`;
CREATE TABLE IF NOT EXISTS `student` (
`sn` int(10) NOT NULL AUTO_INCREMENT,
`firstName` varchar(100) NOT NULL,
`surname` varchar(100) NOT NULL,
`dob` date DEFAULT NULL,
`grade` enum('1','2','3','4','5','6','7','8','9','10','11','12') DEFAULT NULL,
`class` varchar(100) NOT NULL,
`address` text,
`account` int(11) NOT NULL,
PRIMARY KEY (`sn`)
) ENGINE=MyISAM AUTO_INCREMENT=4 DEFAULT CHARSET=latin1;

--

-- Dumping data for table `student`

```

```
--

INSERT INTO `student` (`sn`, `firstName`, `surname`, `dob`, `grade`, `class`, `address`, `account`) VALUES

(1, 'Mudimba', 'Headson', '2019-06-25', '10', 'A', 'MKUSHI', 1),

(2, 'Moonga', 'kelvin', '2019-06-25', '10', 'A', 'MKUSHI', 1),

(3, 'Linda', 'Kamuti', '1966-12-22', '11', 'C', 'Kalingalinga, kamploops road lusaka', 0);

-----

--

-- Table structure for table `users`

--

DROP TABLE IF EXISTS `users`;

CREATE TABLE IF NOT EXISTS `users` (

  `ID` int(20) NOT NULL AUTO_INCREMENT,

  `firstName` varchar(100) NOT NULL,

  `surname` varchar(100) NOT NULL,

  `email` varchar(200) NOT NULL,

  `mobile` int(11) DEFAULT NULL,

  `password` varchar(200) NOT NULL,

  `accountLevel` varchar(100) DEFAULT NULL,

  `username` varchar(100) DEFAULT NULL,

  `status` int(10) NOT NULL,

  PRIMARY KEY (`ID`)

) ENGINE=InnoDB AUTO_INCREMENT=5 DEFAULT CHARSET=latin1;

--

-- Dumping data for table `users`

--

INSERT INTO `users` (`ID`, `firstName`, `surname`, `email`, `mobile`, `password`, `accountLevel`, `username`, `status`) VALUES

(1, 'Mudimba', 'Headson', 'n/a', 0, '41b7fa1956f021a54f3c290ec60e469c', 'student', 'I', 1),

(2, 'Nyondo', 'Maria', 'nyondo@gmail.com', 39121, 'ce679f7b3f30a53a18e7cead77c983c9', 'Admin', 'nyodo', 1),

(4, 'Moonga', 'kelvin', 'n/a', 0, '7fde97cf4cf355af302cf9e90cfd701a', 'student', '2', 1);

COMMIT;

/*!40101 SET CHARACTER_SET_CLIENT=@OLD_CHARACTER_SET_CLIENT */;

/*!40101 SET CHARACTER_SET_RESULTS=@OLD_CHARACTER_SET_RESULTS */;

/*!40101 SET COLLATION_CONNECTION=@OLD_COLLATION_CONNECTION */;
```

Appendix 3: Questionnaire used to solicit data from students

Design and Development of a Secondary School Payment System

I MARY NYONDO a full-time student at the Information and Communications University and pursuing a Bachelor's Degree in Information and Communication Technology with Education researching on the topic stated above. You have been picked purposively to participate in this research project. The purpose of this questionnaire is to gather sincere opinions about the subject. Your participation / contribution to this study will be highly appreciated. It is my sincere assurance that the findings generated from this study will be handled with the highest level of confidentiality and it is solely for academic reason and purpose. Be assured that all the information you will give, will be treated in utmost confidence and anonymity. Please respond to the following questions as truthful as possible.

1. What is your gender?
2. What is your gender?
3. Your Age?
4. Who sponsors your fees at the school?
5. How do you get money from your sponsor?
6. How do you pay fees to the school?
7. How satisfied are you with the method used to pay fees to the school?
8. In which period of the term do you mostly pay school fees?
9. Are there attributes you like about the method of fees payment you use? If yes, list them.
10. Suggest ways in which the fees payment method can be improved.
11. Do you operate a bank account?
12. Does your sponsor(s) operate a bank account?
13. Does your sponsor or you use credit/debit cards for bill payments in some transactions?
14. Do you think the introduction of fees payment through debit/credit cards can improve the fees payment process at the school?
15. What do you think can be done to let people adopt use of credit and or debit cards for fees payment?
16. What could be your worries about using online banking for your fees payment, List?

Thank you