ONLINE FEES PAYMENT SYSTEM FOR MAKERERE UNIVERSITY (MUK-OFPS)

By

BIS 13-5

INFORMATION SYSTEMS

DEPARTMENT OF INFORMATION SYSTEMS

SCHOOL OF COMPUTING AND INFORMATICS TECHNOLOGY

A Project Report submitted to the School of Computing and Informatics Technology
For the Study Leading to a Project in Partial Fulfillment of the
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Information Systems Of Makerere University.

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Declaration

We, Group BIS13-5 do hereby declare that this project report titled "An Online Fees Payment System for Makerere University" is original and has not been published and/or submitted for any other academic credit to any university or institution of learning before.

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Dedication

This project is dedicated to our loved ones, families, comrades and all those who have contributed towards our studies.

Acknowledgment

We glorify the Lord God who enabled us merge ideas so as to achieve and present this solution.

We would also like to appreciate our supervisor, Ms. Grace Kobusinge for the tremendous support, guidance and encouragement offered to us during this project's undertaking.

We also extend our gratitude to our family members and friends whose support, tireless efforts and prayers gave us the faith to accomplish this project.

May God richly bless you all!

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List of Abbreviations

ARIS	Academic Records Information System
ATM	Automatic Teller Machines
BoU	Bank of Uganda
CHUSS	College of Humanities and Social Sciences
CoBAMS	College of Business and Management
CoCIS	College of Computing and Information Sciences
CSS	Cascading Style Sheets
DFD	Data Flow Diagram
ECS	Electronic Clearing System
EFT	Electronic Funds Transfer
ERD	Entity Relationship Diagram
FINIS	Financial Information System
FK	Foreign Key
HTML	Hypertext Markup Language
ICT	Information and Communication Technology
ID	Identifier
IS	Information Systems
MUK-OFPS	Online Fees Payment System for Makerere University
PHP	Hypertext Pre-processor
PK	Primary Key
SQL	Structured Query Language

Abstract

Makerere University has a large number of students who pay all the university fees through cash deposits, electronic funds transfer or bank drafts to the university's accounts in specific bank branches. These 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. This has always resulted in students missing to sit for their tests and/or examinations while they are queuing to make payments. It was upon such background that the researchers embarked on the project to develop of an alternative system that enables online fees payment by students and their sponsors.

With the use of questionnaires, interviews, observation and document reviews, data was collected from project stakeholders and analysed. Data flow diagrams and Entity relationship diagrams were used to accomplish system analysis and design. The system was implemented using Apache web server, Mysql database server, Hypertext Preprocessor, Hypertext markup language, Cascading style sheets and JavaScript. System testing and validation was also done by allowing users of the system interact with it using test data.

Findings showed that most of the students were unsatisfied with the current modes of paying fees to the university and agree that an online fees payment system can improve the process of fees payment. The result of the project was an online fees payment system for Makerere University (MUK-OFPS) and researchers recommend the university to implement the system that provides relief of the long endured problems of the current modes of payment at the university.

Chapter 1

Introduction

1.1 Introduction

Fees payments by students in Makerere University are made through cash deposits, Electronic Funds Transfer (EFT) and Bank drafts to the university's accounts in specific bank branches (Makerere University, 2004). Plymouth and Martin (2009) stress that, "For nearly every business, the simple act of collecting payments from consumers is actually quite complex. Organizations want to make it easy and convenient for customers to pay, so they offer multiple choices of payment types and channels". Therefore, the project provides an alternative method that enables secure online fees payment by students and their sponsors.

1.2 Background

Makerere University has a large number of students who are supposed to pay all the university fees through cash deposits or bank drafts to the university's accounts in specific bank branches. This method of paying fees has 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 fees payment in such periods is characterized by long queues, too much waiting by students and congestion at banks where payments are made. Students queue to pay fees and those who do not reach counters within the banks' working hours are advised to return the next day.

This process has always resulted in students missing to sit for their tests and/or examinations while they are queuing to make payments. It has also resulted to too much costs and a lot of time used in transferring and withdrawing money whenever sponsors of students make money transfers to students who can pay university fees at specific bank branches. The process requires sponsors of students from wherever they are to send money to students through either banks, mobile money or any other possible way(s) so that students pay university fees or use EFT that require swift codes to pay fees to the university. This consumes time and sponsors incur extra costs in this process of sending money to students.

It was upon this background that the researchers suggested an alternative method which enables secure online fees payment by students and their sponsors.

1.3 Problem Statement

The available modes of fees payment to Makerere University through cash deposits, Electronic Funds Transfer (EFT) and bank drafts have caused long queues, students missing to sit for their tests and examinations, and loss of money intended for fees while waiting to reach bank counters to make payments among others.

The problem is addressed by developing a system that enables students and their sponsors to securely pay university fees online from wherever they are using credit and debit cards.

1.4 Main Objective

To develop an online fees payment system that enables students and their sponsors to securely pay university fees online using credit and debit cards.

1.5 Specific Objectives

i. To review the existing system used in paying university fees so that its strength and weaknesses are identified.
ii. To design a new system that enables students and their sponsors to pay university fees online from wherever they are using credit and debit cards.
iii. To implement the prototype of the designed system.
iv. To test and validate the system prototype.

1.6 Scope of the Study

The study was carried out in Makerere University and was intended to offer an extra channel for fees payment, through the development of a secure online fees payment system. The study focused on the development of a web based system that allows secure online fees payment for Makerere University. The system will be used by students and their sponsors to pay all kinds of university fees online, and by university accounts offices to verify students' payments. The system captures financial information after payments are made.

1.7 Significance

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.
(Plymouth and Martin, 2009).

Therefore, this project proposed the development of an alternative platform that enables students and their sponsors securely pay university fees online from wherever they are using credit and debit cards. This will reduce the lengthy queues, and congestion at banks for payments.

Further still, the project will also help to reduce the number of students that currently miss sitting their tests and examinations while waiting to reach bank counters to make payments.

Sponsors of students, especially those abroad, will save money and time since it will no longer necessitate them to first transfer money to students before it is paid to the university.

Chapter 2

Literature Review

2.1 Introduction

This chapter presents a review of the literature on; information systems, electronic payment systems, card payment processing, fees payment systems in Uganda, examples of online fees payment systems, and comparison of the existing online systems with the intended system.

2.2 Information Systems

From Wikipedia, (2013), Information system (IS) is the study of complementary networks of hardware and software that people and organizations use to collect, filter, 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.

According to Singh, (2004), an information system refers to information technology and people's activities that support operations, management and decision-making. Alternatively, an information system is the interaction between people, processes, data and technology (Singh, 2004). 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 marketplace (James, 2009).

2.3 Electronic Payment Systems

Shon and Swatman. (1998) introduced the term electronic payment system to describe any exchange of funds initiated via an electronic communication channel, while Kalakota and Whinston (1997) showed that an e-commerce electronic payment is a financial exchange that takes place in an online environment.

Abrazhevich (2004) stated that electronic payment systems are summoned to facilitate the most important action after the customer's decision to pay for a product or service.

Several initiatives have been undertaken to create and develop electronic payment systems (Kalakota and Winston, 1996), and successful ones include various types of smart cards, electronic cash, and electronic cheque mechanisms. (Harris, Guru, and Avvari, 2011). Singh (2009) broadly classified electronic payment systems into four categories: 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 researchers focused on the use of debit and credit cards for secure online fees payment by students and their sponsors in Makerere University.

2.4 Card payment processing

According to Mohammad and Emmanuel (2003), 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 center maintained by the credit card network, and it acts as a clearinghouse for all credit card transactions (Mohammad and Emmanuel, 2003).

2.4.1 Credit Cards

A credit card is a small plastic card issued to users as a method of payment for online or off-line purchases. 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 purchases made every month (Harris, Guru, and Avvari, 2011). 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 (Chou, Lee and Chong, 2004) and are widely accepted by consumers and merchants throughout the world, especially in retail markets. (Laudon and Traver, 2001)

2.4.2 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 (Chou, Lee and Chong, 2004).

When customers pay with a debit card, the money is automatically deducted from their checking bank account (Abrazhevich, 2004). 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.

In this case, when users pay with a debit card, the payment will still be processed as a debit transaction. (Abrazhevich, 2004). Both debit and credit cards are associated with advantages of convenience, speed, flexibility, simplicity, ease of use, accessibility and availability.

2.5 Fees payment systems in Uganda

Banking halls are flooded with parents and students trying to clear their school fees in time for the new semester. For most of them, the long queues they have to endure seem to be the biggest challenge ((BoU), 2012). In a quest to achieve the mission of developing and maintaining efficient, reliable and secure payment systems for Uganda, the payments and settlements department of Bank of Uganda is currently engaged in operating and improving the following payment systems; cash, cheques, Electronic Clearing System (ECS), Electronic Funds Transfer (EFT), credit and debit cards payment systems ((BoU), 2012).

To provide a variety of adequate payment instruments to the growing corporations and the corresponding increase in their transactions, Bank of Uganda in August 2003 implemented the Electronic Funds Transfer (EFT) for both credit transfers and direct debits. The EFT system provides fast, convenient, reliable and secure domestic payment and collection of funds.

Credit transfers are predominantly being used by government and corporate customers to transfer salary payments to the employees' and beneficiaries' accounts ((BoU), 2012).

On 1st July 2009, Bank of Uganda (BoU) and commercial banks implemented a local clearing of items denominated in foreign currency. To automate both cheque processing and clearing, Bank of Uganda in May 2002, implemented an Electronic Clearing System ((BoU), 2012).

2.6 Existing Electronic payment systems

2.6.1 PayPal

PayPal.com, developed by Max Rafael Levchin, John Bernard Powers, Peter Thiel and publicized in 2002 (Wikipedia, 2013), is one of the most successful online payment systems on the market in the beginning of the 21st century (Abrazhevich, 2004). It enables businesses to securely, conveniently and cost-effectively receive payments online (Connie, 2010).

To be able to use the service, it is necessary to register providing credit card or bank account details as the source of payments. To pay, buyers only need to know the seller's e-mail address, which is verified and linked to a PayPal account. The payment will be debited from the buyer's personal PayPal account and no further financial information is transmitted to the seller. (Abrazhevich, 2004).

2.6.2 Agresso Web Payments

According to The University of Huddersfield (2013), Agresso web payments is a web based application, for use with Agresso Business World (ABW), which allows payment of student/customer debt remotely. The University of Huddersfield uses this application and is accessed at https://www.webpayments.hud.ac.uk/webpayments//

The remote payment function allows for payment against specific items of debt, or recording of 'payment on account'. Items of outstanding debt are displayed once the student/customer has logged in. This secure system allows students to pay tuition fee invoices and make payments on account directly over the web. The types of cards accepted by the application include Visa, MasterCard, Visa delta, Electron, Maestro and Switch and user that can have access to the system are student/customer, sponsors and parent.

2.6.3 Active Network School Software

This school software developed by Active Network allows schools, districts and all types of educational organizations to easily and securely manage student fees and data. The software integrates with school accounting software and financial systems and stream lines tuition processing. Active Network School Software is one of the best payment processing and school credit card processing solution (Fiat, 2008)

2.6.4 FeePay

This is an online payment system that is the bottom line on student fees and is used to stream line the fee payment process. It is a one stop for all fees related to students or family school expenses and payments. Detailed fees and payment histories can be tracked across multiple years and the unlimited numbers of optional fees are supported. It also interfaces with general ledger systems for receivables and collection. (Feepay, 2013)

2.6.5 Other online fees payment systems in different institutions

Other various universities have implemented online fees payment systems where students and their sponsors pay fees using their pay cards. Some of the universities include;

i. Glasgow Caledonian University at https://onlinepayments.gcu.ac.uk/open/
ii. Northumbria University at https://www.northumbria.ac.uk/sd/central/stud_serv/sws/int_adviser/visa_info/stuwbvisa1/?view=Standard
iii. The University of the West Indies Mona, Jamaica at https://eservices.mona.uwi.edu/finserv/tuition/
iv. University of Leicester at https://epay.le.ac.uk/open/
v. Qatar University at https://secure.touchnet.com/C24950_tsa/web/login.jsp
vi. Heriot-Watt University, Edinburgh, Scotland at https://my.hw.ac.uk/payments/faces/Start.jsp

2.7 Comparative Evaluation of Existing Payment Systems

The table below shows both similar and different features between the proposed system and some existing payment systems.

Table 2.1: Comparative Evaluation of Existing Payment Systems

System feature	PayPal	Active Network School Software	Agresso Web Payments	MUK-OFPS
security	✓	✓	✓	✓
Electronic fund transfer	✓	✓	✓	✓
Ability to pay fees using debit cards	✓	X	X	✓
Convenience (No user accounts required)	X	X	✓	✓
Immediate payments and money transfers	✓	X	X	✓
Payments in Uganda Shillings (UGX)	X	X	X	✓
Learnability (Ease of use)	✓	X	✓	✓
Customization to Makerere University	X	X	X	✓

Chapter 3

Methodology

3.1 Introduction

This chapter illustrates the procedures used by the researchers to achieve the objectives of this study. It contains the following sections; Study Population, Data Collection Methods and Tools, Data Analysis, System Analysis and Design, System Implementation, System Testing and Validation.

3.2 Study Population

Makerere University was the population studied and is comprised of more than 30000 students. Much focus and attention was drawn to a random sample of 60 respondents including; students, college bursars, university bursar and Stanbic bank staff members of Makerere Branch.

3.3 Data Collection Methods and Tools

Data was collected through use of questionnaires, interviews and in-depth literature review with the aim of collecting reliable and complete data that can provide concrete conclusions and recommendations for the study.

3.3.1 Questionnaires

Neuman, (2003) asserts, "Questionnaires are a set of open or closed ended questions administered to respondents to gather information on a research phenomenon." Questionnaires are categorised into three (3); Qualitative, Quantitative and Mixed Questionnaires (Johnson and Turner, 2003). In qualitative questionnaires the type of questions are unstructured, exploratory, and in-depth open-ended, while those in quantitative questionnaires are closed ended, respondents answer by selecting from a set of possible responses. On the other hand, mixed questionnaires are a self-report instrument filled out by respondents and contain a mixture of completely open and closed-ended questions (Johnson and Turner, 2003).

We used mixed questionnaires because of their appropriateness in measuring attitudes of participants and in gathering extra information that could miss out in a closed ended question (Johnson and Turner, 2003).

Besides, we preferred to use questionnaire method because the sample size was large. The questionnaire developed consisted of an introduction, reason for the study, and set of questions as shown in appendix.

3.3.2 Interviews

An interview is a data collection method where a researcher asks a respondent a set of questions and records his/her answers (Neuman, 2003). We used interviews to establish grounds for accessing the acceptability and feasibility of our proposed solution and to understand the business environment with its associated needs.

Face-to-face interviews were carried out with the interest of getting data about the current mode of payment and exploring the entire fees clearing environment at the university. This is vital in probing for the theory to get respondent's opinions about the appropriateness of the intended solution and the challenges in the current system.

3.3.3 In-depth literature review

Neuman, (2003) explains, "In-depth literature review is the analyzing of existing documentation on a given subject." We expressed interest in using this technique to identify different methods used by different institutions and business enterprises in accepting payments from their clients, exploring the challenges faced and the associated benefits with using such platforms, usage of electronic cards in Uganda and the level of their penetration into the economy to back our project idea.

3.4 Data Analysis

After the data collection exercise, researchers carried out data analysis of the administered questionnaires using SPSS and a post interview follow-up on the interviews was conducted to eliminate inconsistencies.

3.5 System Analysis and Design

System analysis and design was achieved using Data flow diagrams (DFD), Entity relationship diagrams (ERD) and the Unified modeling language (UML).

3.6 System Implementation

We implemented the system using Apache web server, Mysql database server, Hypertext Pre-processor (PHP) for business logic and Hypertext markup language (HTML), Cascading style sheets (CSS), JavaScript for system interfaces.

3.7 System Testing and Validation

System testing and validation was done through testing of components/modules, integration testing, and finally, system testing.

Chapter 4

System Study, Analysis and Design

4.1 System Study

Data that was collected through the use of questionnaires, interviews and in-depth literature review enabled researchers study how fees is paid and what is involved in the process of paying fees to Makerere University.

4.1.1 The Current System

Makerere University has an efficient and effective Financial Information System (FINIS) that records, monitors, and reports about student fees payment transactions and other finances in the university. Fees payments by students are made through cash deposits, electronic funds transfer and bank drafts to the university's accounts in specific bank branches and later reflected in FINIS which integrates with the Academic Records Information System (ARIS) that provides information on students. These 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 fees payment in such periods is characterized by long queues, too much waiting by students and congestion at banks where payments are made. This process has always resulted in students missing to sit for their tests and/or examinations while they are queuing to make payments. It has also resulted to too much costs and a lot of time used in transferring and withdrawing money whenever sponsors of students make money transfers to students to enable pay university fees at specific bank branches.

4.1.2 The Proposed System

MUK-OFPS will provide an additional channel for fees payment to the university online and shall integrate with the already existing systems, FINIS and ARIS. MUK-OFPS was proposed to solve the problems associated with the current fees payment methods in the university. MUK-OFPS is an alternative platform that enables students and their sponsors to securely pay university fees online using credit and debit cards from wherever they are.

The system helps to reduce the number of students that currently miss sitting for their tests and examinations while waiting to reach bank counters to make payments. Sponsors of students, especially those abroad, will also save money and time since it will no longer necessitate them to first transfer money to students before it is paid to the university.

4.2 System Analysis

This presents the analysis of user, functional and non-functional requirements that guided the design and implementation of MUK-OFPS.

4.2.1 User Requirements

The major users of the system include students, student sponsors and finance officers in the university finance department. Their requirements include the following;

i. Students/sponsors shall be able to input transaction information on a user interface that accepts them.
ii. Students/sponsors shall be able to complete fees payment transactions online.
iii. Students/sponsors shall receive feedback that relates the process of online fees payment
iv. Students/sponsors shall be able to view and print or save proof of payment whenever fees payment transactions are successful.
v. Finance officers shall provide authentication credentials to be able to use the system securely.
vi. Finance officers shall be able to perform searches on details of online payments made for students.
vii. Finance officers shall be able to view summarised reports on all payments made through the system.
viii. Finance officers shall be able to view fees payments in an editable format.

4.2.2 Functional Requirements

i. The system shall accept valid input of registered students' payment details from users intending to pay fees online.
ii. The system shall process fees payment transactions so that student fees accounts are credited with the specified amount in each transaction.
iii. The system shall communicate fees payment details for each transaction to the university financial information system, FINIS.
iv. The system shall produce a receipt as a proof of payment for every fees payment transaction made.
v. The system shall provide access to information about how to make payments online.
vi. The system shall produce a listing of transaction information to the finance officers.
vii. The system shall provide feedback to the student describing the status of the transaction.
viii. The system shall be able to generate payment reports to finance officers.

4.2.3 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 produce reports in different forms such as tables and graphs for easy visualization by management.
x. 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.

4.3 System Design

The MUK-OFPS system design defines the architecture, components/subsystems, modules, interfaces and data required of the system to satisfy specified requirements. In system design the following tools and techniques were used; process modeling, architectural design, data modeling and database design.

4.3.1 Architectural Design

MUK-OFPS 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.

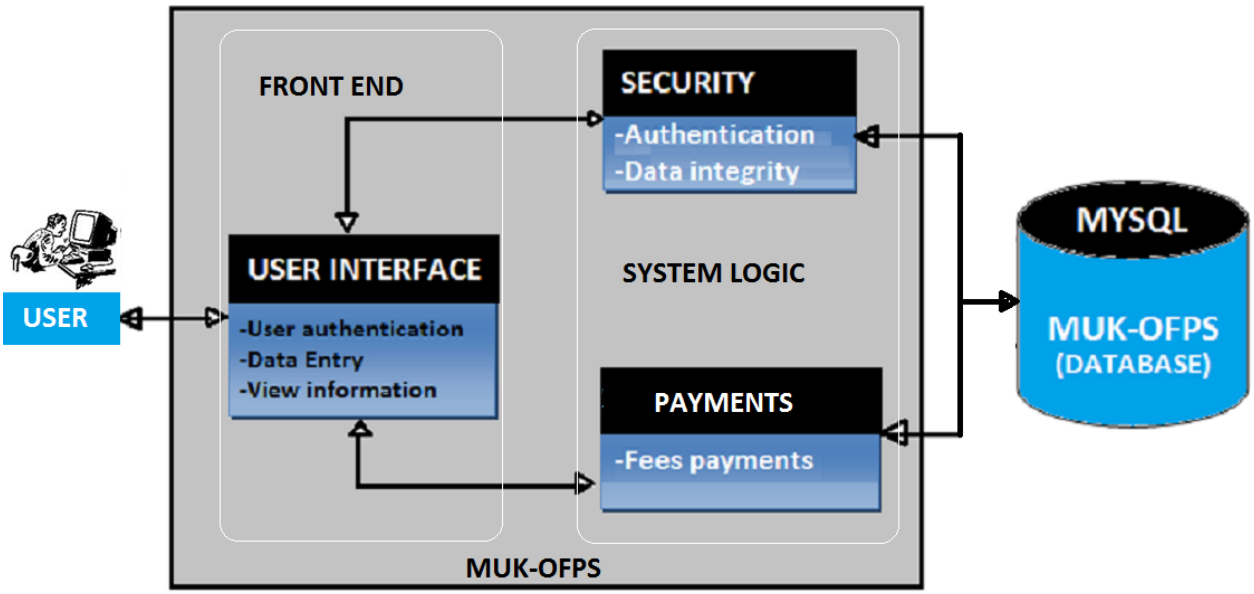
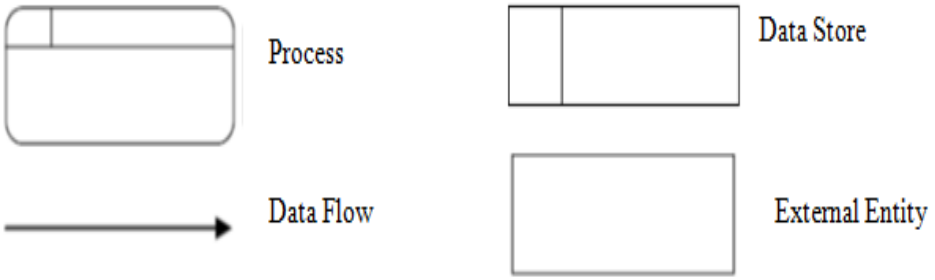


Figure 4.1: The Architectural Design for MUK-OFPS

4.3.2 Process Modeling

A context diagram and a data flow diagram were used to illustrate the activities that are performed and how data move in MUK-OFPS.

During process modeling, the following key symbols were used;



4.3.2.1 Context Diagram for MUK-OFPS

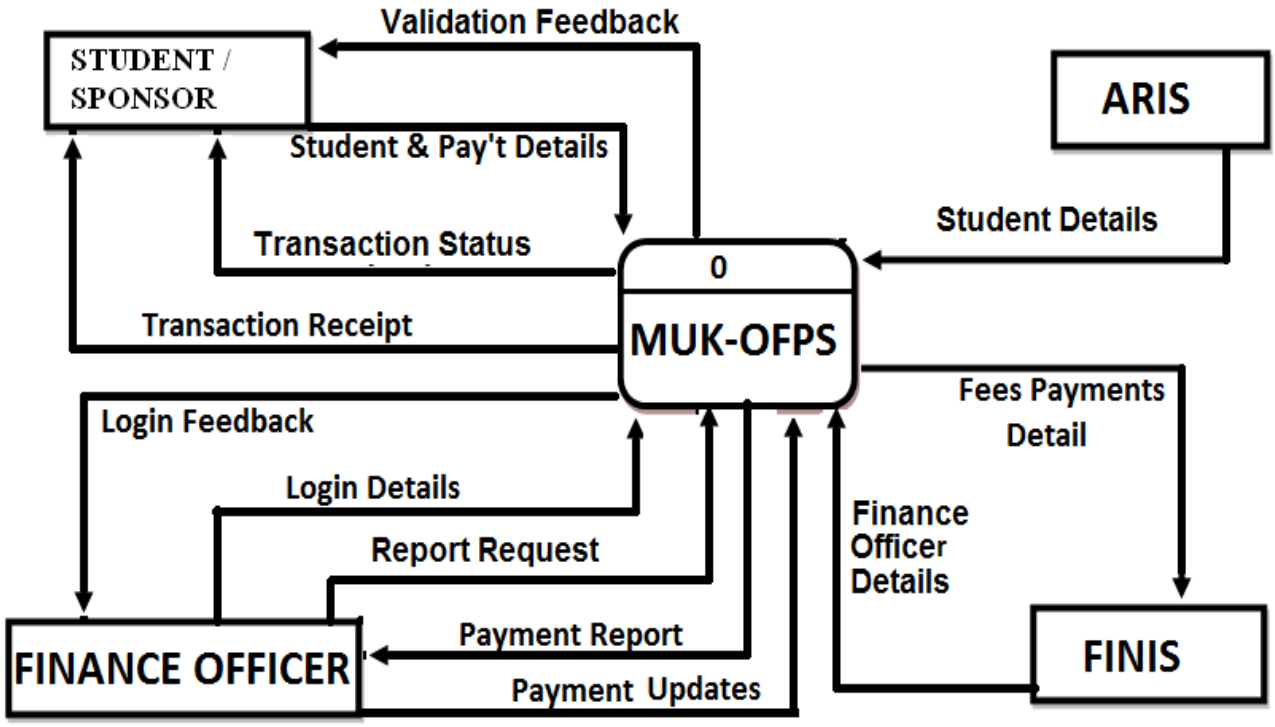


Figure 4.2: The context diagram for MUK-OFPS

4.3.2.2 Data flow Diagram for MUK-OFPS

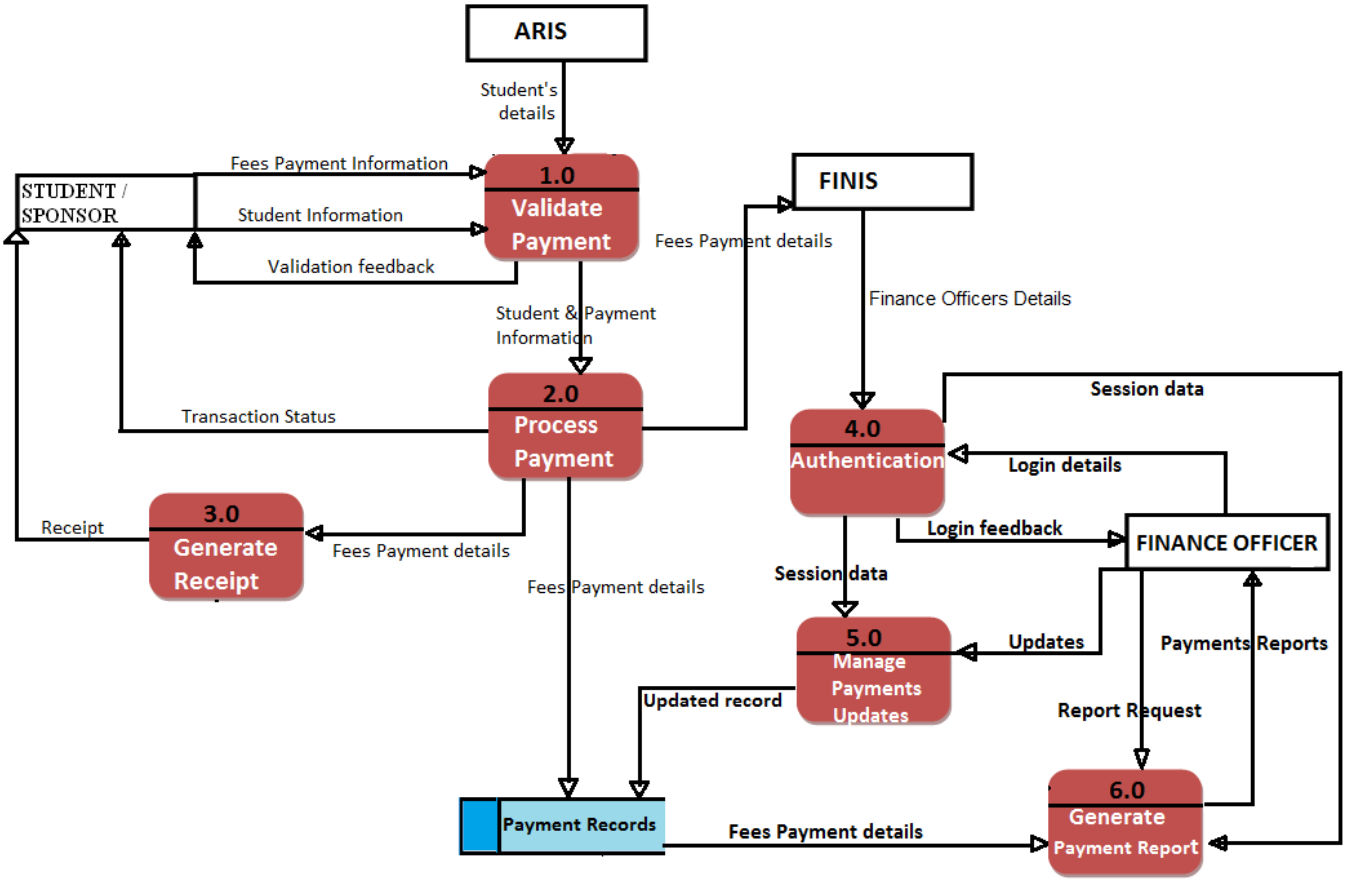


Figure 4. 3: The Data Flow Diagram for MUK-OFPS

4.3.2.3 Data definition of the design objects

The tables below give a description of all design objects that were used in developing the system which include processes, data flows, data stores and the external entities.

Table 4. 1: Description of Processes

Process	**Description**
Validate Payment	Compares user input with details of registered students.
Process Payment	Processes money transfer to the university.
Generate Receipt	Generate receipt as proof a payment transaction.
Authentication	Authenticates users to access the system, and blocks unauthorized access.
Manage Payments Updates	Processes updates to payment records.
Generate Payment Reports	Generates reports as requested by Finance Officers.

Table 4. 2: Description of Entities

Entity	**Description**
Student	A student for whom a payment is made. She/he also makes a payment transaction.
Sponsor	Pays fees online for a student.
Finance Officer	Views reports about online payment transactions and updates payment records whenever necessary.
FINIS	Receives payment records for online transactions. Also provides information about finance officers.
ARIS	Academic Records Information System that provides information about registered students.

Table 4.3: Description of Data Stores

Data store	**Description**
Payment Records	Stores transaction details for online fees payments made for students.

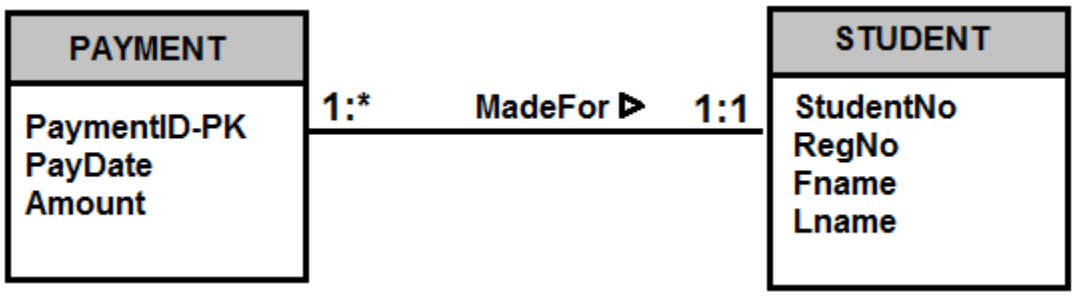
4.3.3 Data Modeling

4.3.3.1 Identification of Entities and the associated attributes

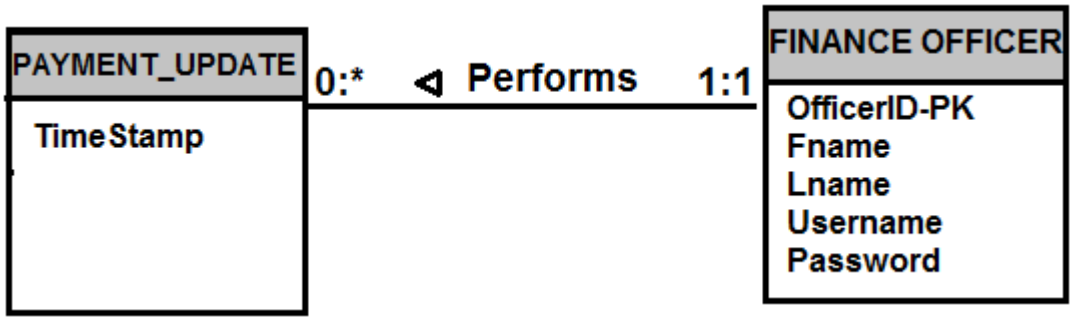
Table 4. 4: Entities and their attributes

ENTITY	ATTRIBUTES	DESCRIPTION
Payment	PaymentID	Unique identifier of a payment
	Paydate	Date of payment
	Amount	Amount paid
Student	StudentNo	Student Number, unique student identification number
	RegNo	Student registration number
	Fname	Student first name
	Lname	Student last name
PaymentUpdate	TimeStamp	Date and time when an update is made to a payment
FinanceOfficer	OfficerID	Finance officer ID number, a unique identifier of finance officers
	Fname	Finance officer first name
	Lname	Finance officer last name
	Username	Username
	Password	Password

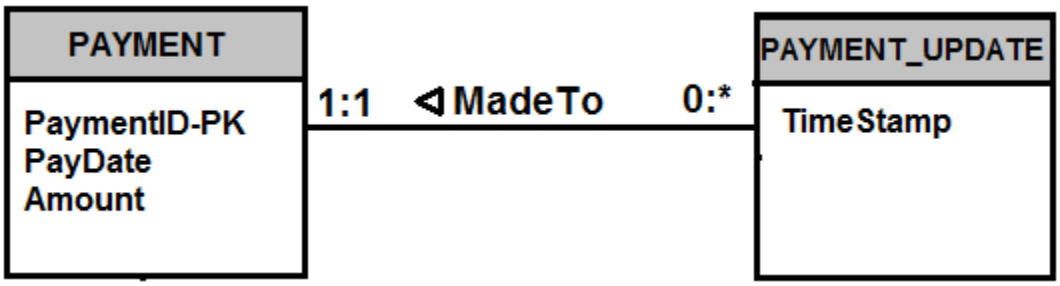
4.3.3.2 Modeling Relationships that exist between Entities



A payment is made for one student and a student can be paid for several times. It is a One-to-Many relationship between student and payment.



A finance officer can either not make any updates on any payment or make several payments and a payment update is made by a single office, it is a One-to-Many relationship between finance officer and the payment update.



A payment update is made to a single payment and a payment can either not be updated or updated several times. It is a One-to-many relationship between payment and payment update.

4.3.3.3 Entity Relationship Diagram (ERD) for MUK-OFPS

An ERD was used to show the relationships between the entities involved in the system together with their attributes and indicate the number of occurrences an entity can exist for a single occurrence of the related entity.

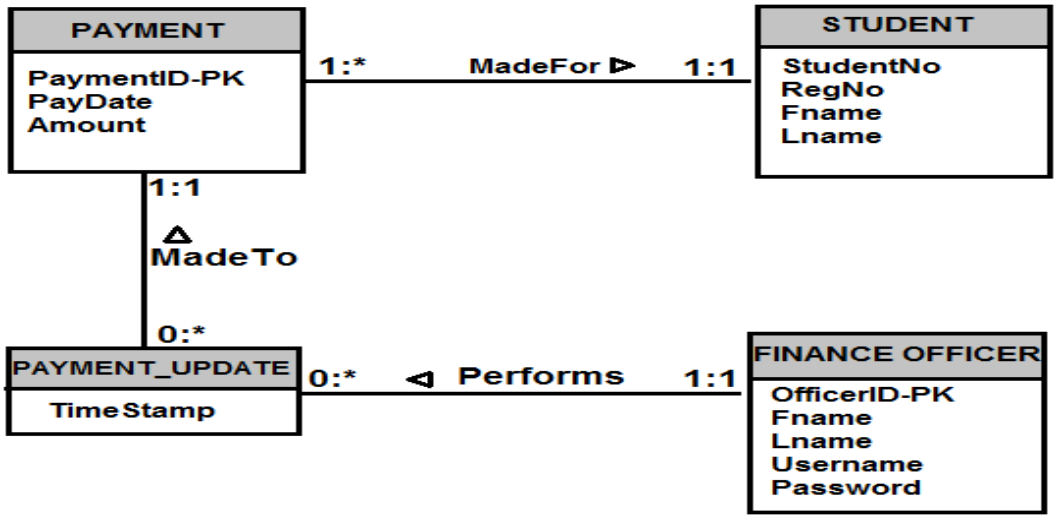


Figure 4. 4: Entity Relationship Diagram for MUK-OFPS

4.3.4 Database Design

4.3.4.1 Logical Database Design

The following are the derived relations;

Payment (PaymentID, Paydate, Amount, StudentNo)

PK: PaymentID

FK: StudentNo references Student (StudentNo)

Student (StudentNo, RegNo, Fname, Lname)

PK: StudentNo

PaymentUpdate (PaymentID, TimeStamp, OfficerID)

PK: PaymentID, TimeStamp, OfficerID

FK: PaymentID references Payment (PaymentID)

FK: OfficerID references FinanceOfficer (OfficerID)

FinanceOfficer (OfficerID, Fname, Lname, Username, Password)

PK: OfficerID

4.3.4.2 Physical Database Design

Table 4.5: Database Schema for MUK-OFPS

Entity	Field	Type	Null	Key	Default	Extra
Payment	PaymentID	Int()	NO	PRI	Null	Auto_Increment
	Paydate	Timestamp	NO		Current_ Timestamp	On update CURRENT_ TIMESTAMP
	Amount	Double	NO		Null	
	StudentNo	Varchar(25)	NO	MUL	Null	
Student	StudentNo	Varchar(25)	NO	PRI	Null	
	RegNo	Varchar(25)	NO		Null	
	Fname	Varchar(25)	NO		Null	
	Lname	Varchar(25)	NO		Null	
PaymentUpdate	PaymentID	Varchar(25)	NO	PRI	Null	
	TimeStamp	Timestamp	NO		Current_ Timestamp	On update CURRENT_ TIMESTAMP
	OfficerID	Varchar(25)	NO	MUL	Null	
FinanceOfficer	OfficerID	Varchar(25)	NO	PRI	Null	
	Fname	Varchar(25)	NO		Null	
	Lname	Varchar(25)	NO		Null	
	Username	Varchar(25)	NO		Null	
	Password	Varchar(25)	NO		Null	

Chapter 5

Presentation of Results

5.1 Data Analysis Results

Figure 5.1 presents the respondents' views concerning their satisfaction with the current modes of fees payment being used at the university. These results were achieved from the questionnaires that were issued to different students from different colleges at the university. Findings show that 50% of the respondents are unsatisfied with how they pay fees.

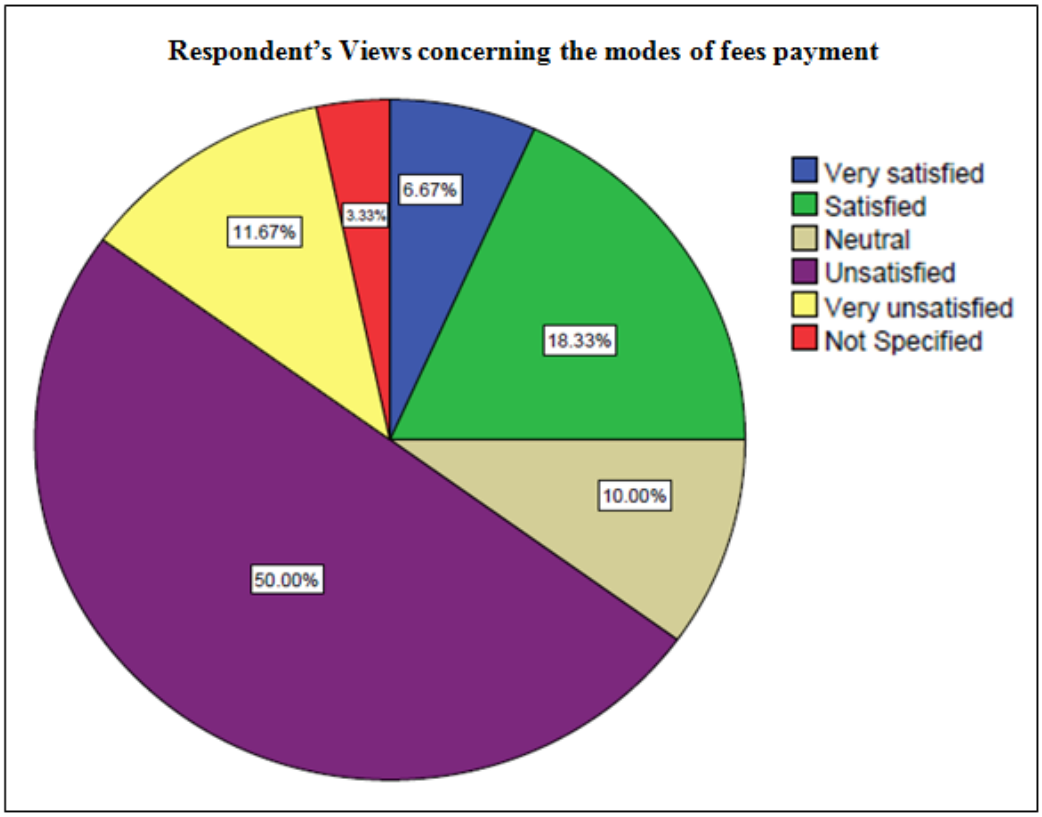


Figure 5. 1: Respondents' views about modes of fees payment

Table 5.1 presents respondents' opinions about whether the introduction of MUK-OFPS can improve fees payment at the university. Findings show that 50% of the respondents agree and 10% strongly agree that MUK-OFPS will improve fees payment at the university.

Table 5. 1: Respondents' opinions about the implementation of MUK-OFPS

		Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	10.0	10.0	10.0
	Agree	50.0	50.0	60.0
	Neutral	33.3	33.3	93.3
	Disagree	3.3	3.3	96.7
	Strongly Disagree	3.3	3.3	100.0
	Total	100.0	100.0	

Basing on the data analysis results above, researchers considered it important to develop MUK-OFPS.

5.2 System Implementation Results

Researchers implemented the system that users were able to interact with and different results generated from the system are shown in the following screens.

5.2.1 MUK-OFPS Home Page

Figure 5. 2: MUK-OFPS home page

Figure 5.2 presents the system home page with options to pay fees, read the terms and conditions and login as a finance officer.

5.2.2 Inputting student details

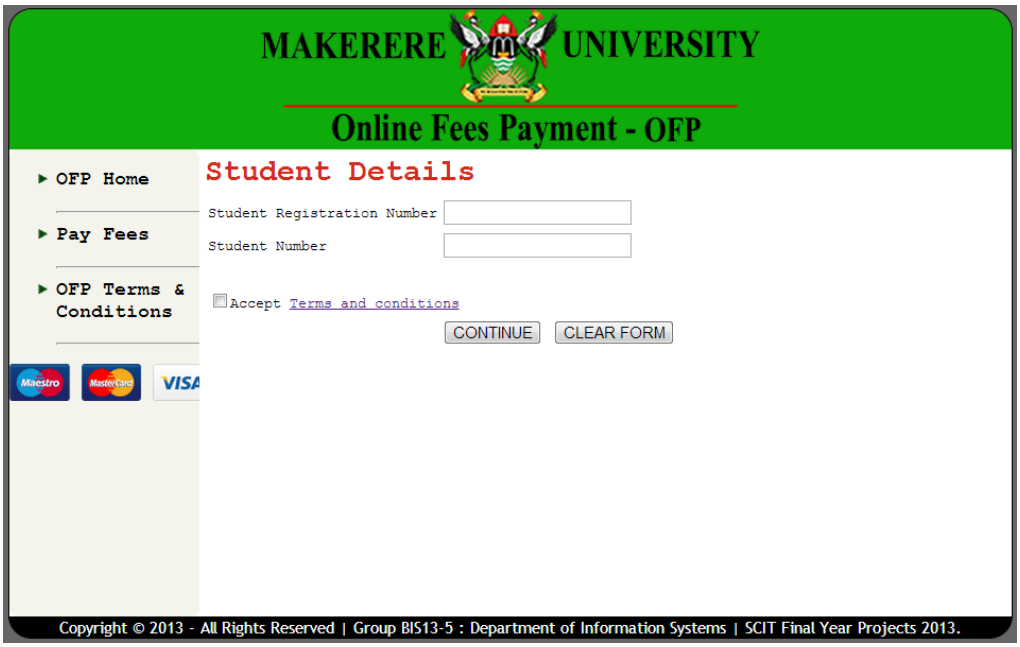


Figure 5. 3: Inputting student details

Figure 5.3 presents an interface for inputting details of a student to be paid for. The student or sponsor intending to make a payment is required to specify correct student number and registration number and must accept the MUK-OFPS terms and conditions in order to continue to make a transaction. For cases of mismatch in student number and registration number, the payer cannot exceed to the next step.

5.2.3 Inputting payment details.

Figure 5.4 presents a form for specifying payment details when correct student details were entered. It provides additional information about the student details provided earlier for the payer to ascertain that he/she is paying for the right person, and in case of a different student being presented based on the provided details, the payer can cancel the transaction.

Figure 5. 4: Inputting payment details

5.2.4 Confirming payment details

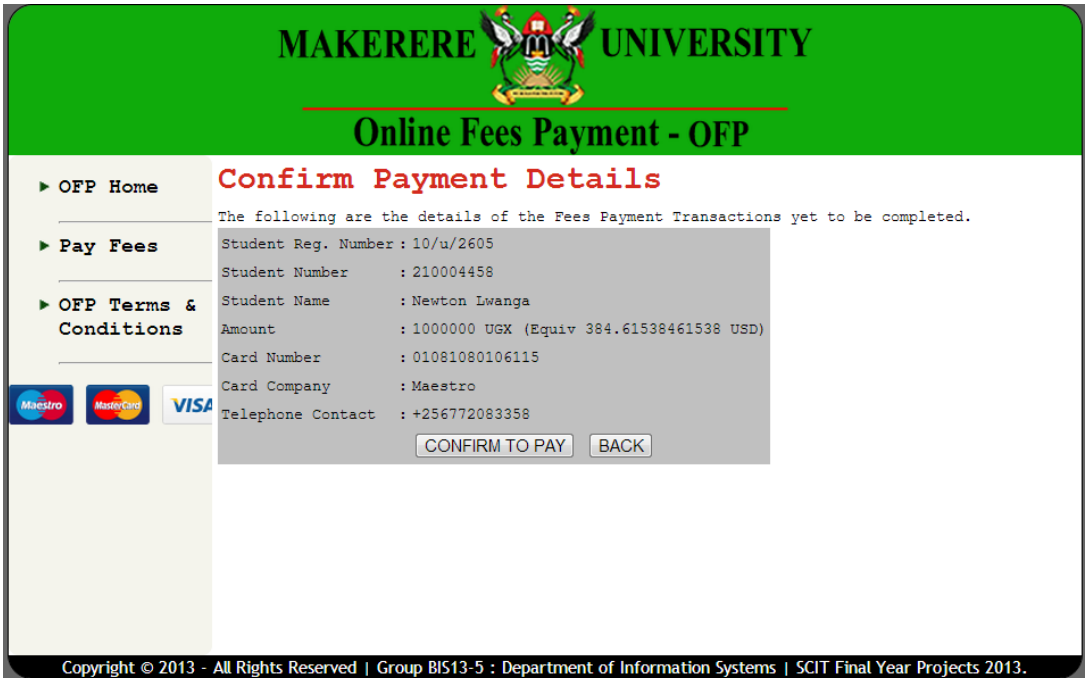


Figure 5. 5: Confirming payment details

Figure 5.5 presents an interface for confirming a payment before a transaction is completed. The payer is presented with the screen with all the payment details he/she specified earlier for the transaction. The payer can confirm to complete the payment or decline the payment in case of any discontent with the payment details entered made.

5.2.5 Notification of transaction status

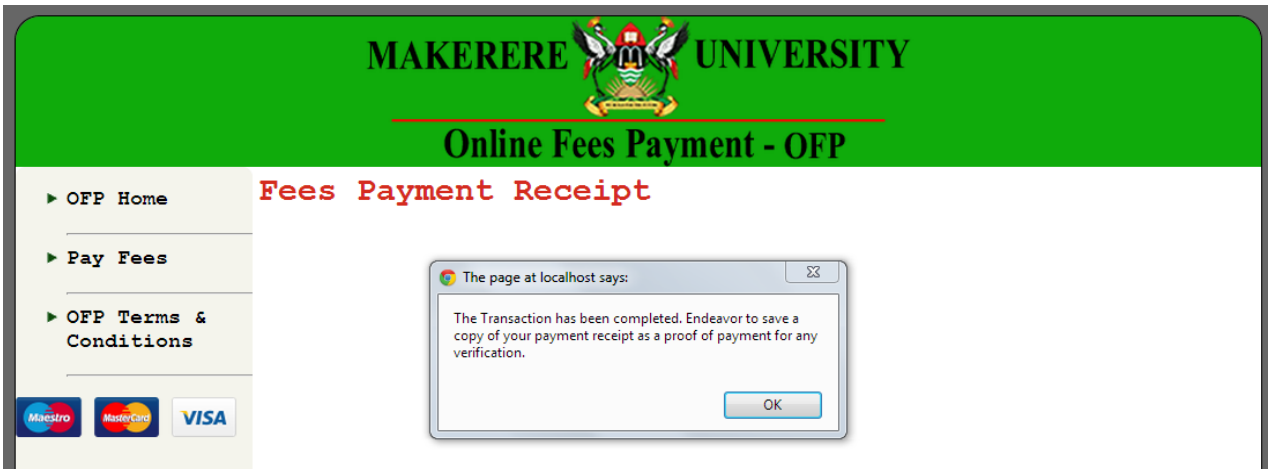


Figure 5. 6: Notification of transaction status

Figure 5.6 is an alert showing the status of the transaction and a reminder to the payer to endeavour saving the transaction receipt for future reference.

5.2.6 Fees Payment Receipt.

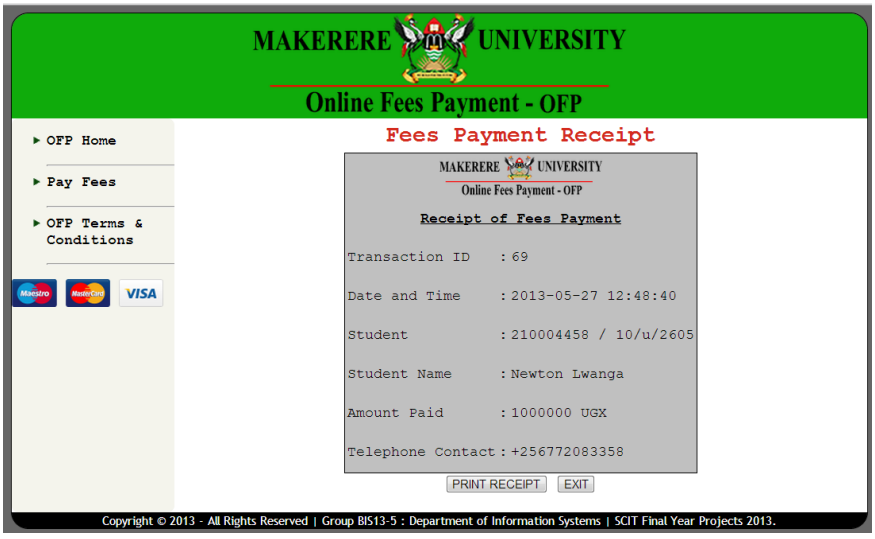


Figure 5.7 shows a receipt, the proof of payment, which is generated and the payer is supposed to print/save a copy for future reference.

Figure 5. 7: Fees payment receipt

5.3 System Testing and Validation Results.

System testing was done after the system was duly coded. Individual modules of the system were checked to ensure they are fully functional units before the integrating them. This was done by examining each unit; each script was checked to ensure that it functions as required and that it performed exactly as intended. The success of each individual unit gave us the go ahead to carryout integration testing. Different system modules were put together to make a complete system and integration testing ensured modules were compatible to be integrated to form a complete working system.

The system was validated using a short questionnaire (Appendix C) that was filled by representatives of the users who were let to interact with the system using test data and provided feedback about the system features. This was done to assess if the system met their needs and requirements as regards paying fees to the university. It was found out that the system performed in conformance to the then defined user needs and requirements. Results of the validation are shown in Table 5.2 as percentages of respondents against each requirement.

Table 5.2: System testing and validation results

Requirement	**Strongly Agree**	**Agree**	**Not Sure**	**Disagree**	**Strongly Disagree**
System validates user input.	17%	78%	5%	0%	0%
System processes fees payment transactions.	17%	78%	5%	0%	0%
System provides payers with proof of payment for each transaction made.	20%	80%	0%	0%	0%
System provides guidelines on what is required to pay fees online.	10%	70%	13%	7%	0%
System generates reports of online transactions that are accessed by finance officers.	11%	76%	8%	5%	0%
System provides security to user data.	13%	70%	7%	5%	5%

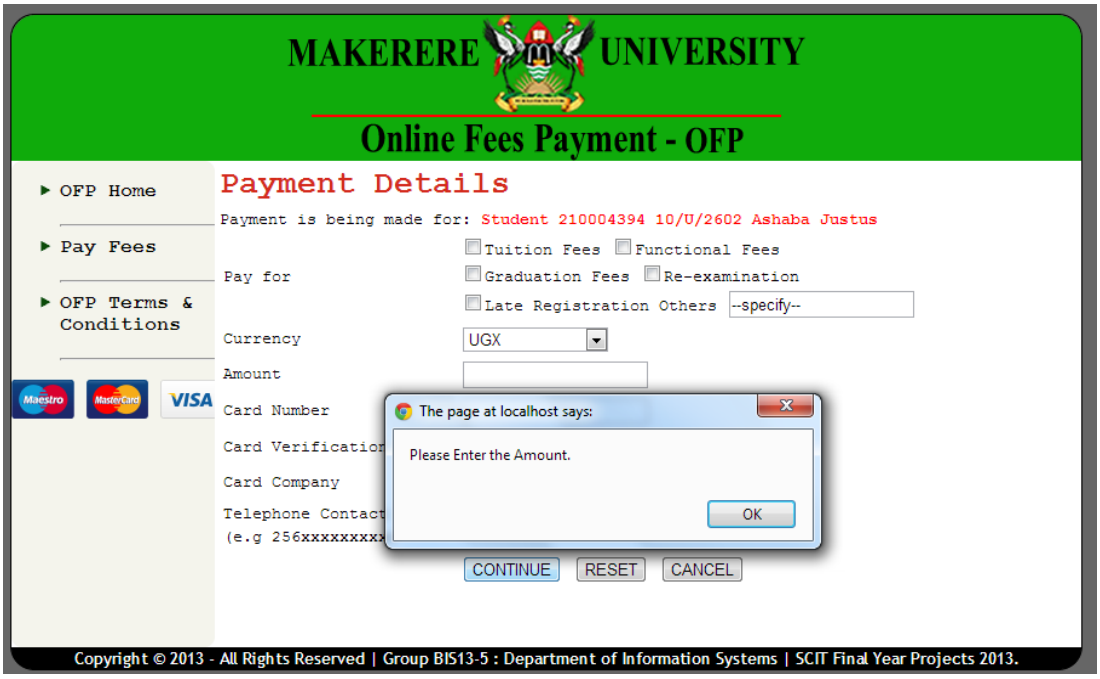


Figure 5.8: System validation results

Figure 5.8 above shows how the system ensures valid data is entered by users.

Chapter 6

Conclusion, Limitations, Recommendations and Further Work

6.1 Conclusion

The project sought to develop an online fees payment system that provides relief of the long endured problems of the current modes of paying fees in Makerere University. Problems that students and their sponsors faced regarding paying fees to the university were identified and a solution was designed. Researchers developed a web based system that enables students and their sponsors to pay university fees from wherever they are using credit and debit cards. This system was welcomed by all its users who believed it would solve most of the problems and improve conditions regarding paying fees in Makerere University.

The project achieved all its objectives and as a result, MUK-OFPS was designed, developed, tested and validated with real users. Hence, it was proved that this online system was fit to be implemented.

6.2 Limitations

i. Researchers did not involve all users in the project because of limited time; instead they worked with user representatives during data collection and system validation activities.

ii. The project involved the use of technical terms which required researchers to explicitly explain them during interactions with stakeholders that never knew the meanings of such terms.

iii. The researchers' attempts to access and connect to the university existing information systems were futile as managers and administrators of those systems claimed it would compromise their security.

iv. The developed product is a prototype and not a fully functional system that is integrated with other existing university systems.

6.3 Recommendations

1. Makerere University should embrace and implement the developed system as it will improve the conditions of fees payment.
2. The Government of Uganda should enact laws and implement policies that encourage and favor online payments by citizens in the country.
3. Makerere University should put in much effort on mass education and sensitization campaigns so that the users of the system are equipped with enough information
4. The researchers acknowledge that security is a threat to every system and therefore encourage that maximum effort be dedicated to ensure security of the online transactions through establishment of sound security infrastructure.

6.4 Further Research

i. Refining the system developed by this project.
ii. Establishing the feasibility of integrating mobile money payments into MUK-OFPS to enable fees payment by mobile money subscribers.
iii. Providing a mobile based system with same functionality as MUK-OFPS to allow fees payment operations be done on mobile phones.

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Appendices

Appendix A: Questionnaire used to solicit data from students

MAKERERE UNIVERSITY

SCHOOL OF COMPUTING AND INFORMATICS TECHNOLOGY

Questionnaire for data collection for a Bachelor's project to be carried out in Makerere University during March – April 2013

Objective: This questionnaire is intended to collect data to be used for a study leading to the award of a bachelor's degree of Information Systems of Makerere University

---

Dear respondent**,**

We are Group BIS13-5, students from the School of Computing and Informatics Technology carrying out a research study on fees payment methods in Makerere University.

We kindly request you to provide correct information to enable the researchers derive concrete conclusions. The information you provide will be kept confidential and used for academic purposes only.

TICK AS APPROPRIATE

1. Nationality

Ugandan ☐ Non-Ugandan ☐

2. Gender

Male ☐ Female ☐

3. Age group

16-25 ☐ 26-35 ☐ 36-45 ☐ Above 45 ☐

4. Year of study ☐

5. College or school

COCIS ☐ COBAMS ☐ CHUSS ☐

6. Who sponsors your fees at the university?

Government ☐ Private ☐ Other, Specify _____

7. Residence of your sponsor(s)

Uganda ☐ Outside Uganda ☐

8. How do you get money from your sponsor?

EFT ☐ Mobile Money ☐ Hard cash ☐ Bank deposit ☐

Other, Specify _____

9. How do you pay fees to the university?

EFT ☐ Bank deposit ☐ Bank Draft ☐ Other, specify_____

10. How satisfied are you with the method used to pay fees to the university?

Very satisfied ☐ Satisfied ☐ Neutral ☐

Unsatisfied ☐ Very unsatisfied ☐

11. In which period of the semester do you mostly pay university fees?

Beginning ☐ Middle ☐ End ☐

12. Are there attributes you like about the method of fees payment you use?

Yes ☐ No ☐

If yes, list them.

---

13. Are there attributes you do not like about the method of fees payment you use?

Yes ☐ No ☐

If yes, list them.

---

14. Suggest ways in which the fees payment method can be improved.

---

15. Do you operate a bank account?

Yes ☐ No ☐

16. Does your sponsor(s) operate a bank account?

Yes ☐ No ☐

17. Which of the following payment cards does your sponsor or you posses?

Debit card ☐ Credit card ☐ Others ☐ None ☐

18. Does your sponsor or you use credit/debit cards for bill payments in some transactions?

Yes ☐ No ☐

19. Do you think the introduction of fees payment through debit/credit cards can improve the fees payment process at the University?

Strongly agree ☐ Agree ☐ Neutral ☐

Disagree ☐ Strongly Disagree ☐

20. What do you think can be done to let people adopt use of credit and or debit cards for fees payment?

---

21. What could be your worries about using online banking for your fees payment, List?

Appendix B: Interview guide used to collect data from Bursars/Accountants

Interview guide

1. Gender
2. Department/ office/position
3. What methods does the university provide through which students can pay fees?
4. What are your job description/roles?
5. In executing your roles, are you satisfied with the methods the university provides for fees payment?
6. Do you think the introduction of fees payment through use of credit and debit cards can improve/ease the fees payment?
7. Suggest ways in which fees payment methods can be improved

Appendix C: Questionnaire used to solicit data from users during system validation.

MAKERERE UNIVERSITY

SCHOOL OF COMPUTING AND INFORMATICS TECHNOLOGY

Questionnaire for the validation of an Online Fees Payment System for Makerere University (MUK-OFPS)

Dear respondent**,**

We are Group BIS13-5, students from the School of Computing and Informatics Technology carrying out a research study on fees payment methods in Makerere University.

We were able to develop a system that enables students and their sponsors securely pay university fees online from wherever they are and we have brought it to you so you can test if it meets needs and requirements in regard to paying fees to the university.

This validation will be based on testing whether the system implements the given user requirements.

We kindly request you to provide correct information to enable the researchers derive concrete conclusions. The information you provide will be kept confidential and used for academic purposes only.

TURN TO THE NEXT PAGE

Indicate by ticking: To what extent do you agree that the system meets the following requirements?

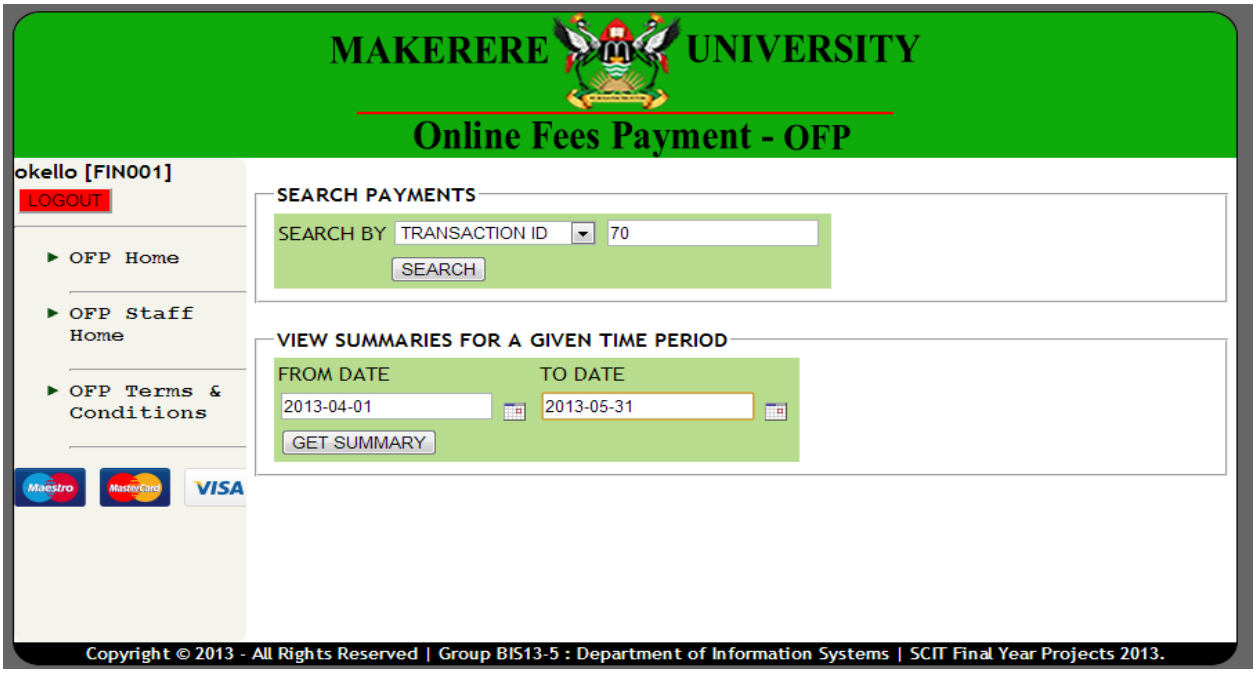
Requirement	**Strongly Agree**	**Agree**	**Not Sure**	**Disagree**	**Strongly Disagree**
System validates user input.					
System processes fees payment transactions.					
System provides payers with proof of payment for each transaction made.					
System provides guidelines on what is required to pay fees online.					
System generates reports of online transactions that are accessed by finance officers.					
System has easily navigable interfaces and is easy to learn.					
System provides security to user data.					

Thanks for participating.

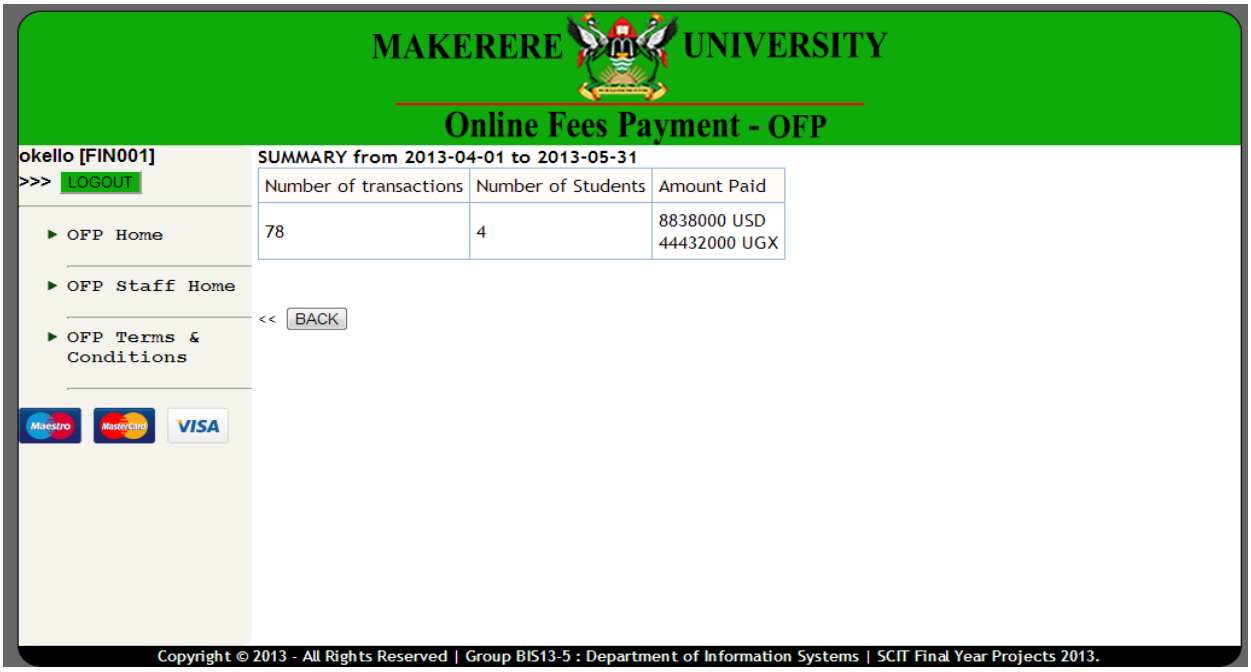
Appendix C: Pseudo code for making a payment

```
Require student details
IF student details are valid and matching
        Require payment details
        IF payment details are valid and correct
                Process payment transaction
                Print payment receipt
                Exit
        ENDIF
        ELSE
                Notify user of invalid or incorrect payment details
ENDIF
ELSE
        Exit
```

Appendix D: System interface for searching and making summaries of payments



Appendix E: System interface showing summaries of payments



Appendix F: System interface showing payments search results

Appendix F: System interface for editing a payment