Chapter 1: INTRODUCTION

1.1. Background information

An Education Management Information System (EMIS) is a system that provides timely, cost effective and user-appropriate information for the management of education development at all levels (Bernbaum & Moses, 2011). Anon (2020) states that a well-developed EMIS comprises of computer hardware, software, telecommunications, databases and different procedures that work together to provide a right direction for action. In EMIS, data is accurate, timely, reliable and understandable in order to support well planning, policy formation and decision making hence improving the efficiency of school office capabilities (Bernbaum & Moses, 2011). Most schools implement EMIS in order to generate quality and good information in the education sector.

Information Systems have rapidly increased in the education sector due to its efficiency and effectiveness in achieving high education standards. This is due to the large amounts of data that need to be managed by these education institutions. Several studies have been conducted on how to improve secondary school education in Malawi. Despite several researches conducted in Malawi secondary schools across the country face many challenges some of them being information management and utilization of technology as a whole. These reasons have prompted the need to roll out a customised education management system that will be piloted to secondary schools within Blantyre.

1.2. Problem Identification.

The current mode of operations in secondary schools has many problems among others, calculating student's assessments and reporting is done manually. This has proved to be tiresome and prone to unnecessary errors. Secondly, during registration, students have to fill in registration forms which are later kept in files by the school management. The registration form holds all the information for a student. Once the forms are lost or damaged, the data for students is lost as well. In addition, monitoring teaching and learning progress is a problem. It is difficult to know the attendance and participation of students on daily, weekly or monthly basis. The school administrators are also unable to know how each teacher is delivering his or her subject due to lack of necessary ways to get feedback on the progress of learning from students. Also aggregating fees for students by the accounts departments is done manually and on excel sheets by some schools. On the other hand, students and parents have to visit the accounts department if they want enquire for the student's financial statement. Furthermore, harmonizing set of schools on a single platform so that they carry out some operations and activities together like curriculum and examinations is not possible. Last concern is lack of privacy and confidentiality of paper-based files which are in use by secondary schools.

1.3. Project objectives

1.3.1. Main objective

The main objective of the project is to develop a web-based education management information system to be used by secondary schools in Blantyre

1.3.2. Specific objectives

The development of a secondary school education management information system for Blantyre secondary schools will specifically have these objectives;

- To investigate current systems in Blantyre Secondary Schools.
- To identify major day to day management operations for secondary schools.
- To analyse challenges with the existing systems.
- To gather user requirements for EMIS that addresses the current challenges in the existing system.

1.4. Research Questions

The following questions will be answered to achieve the objectives of the project:

- How do secondary schools in Blantyre manage their day to day operations?
- What are the operational challenges faced by secondary schools with the current system?
- How does the current system affect academic activities and schedules?
- How will the proposed system alleviate the challenges being faced with the current system?
- How will secondary schools find necessary resources to implement this secondary school EMIS?

1.5. Justification

In as far as a school's success is concerned, technology and management of information remains the key factor towards its success. As stated in the problem statement, schools in Blantyre are facing a lot of challenges in their operations. Hence a need of a solution towards the problems faced by these schools. The project aims at automating schools' operations in the following esteemed areas; reporting, registration, fees, student information management, assessments and tracking learner participation. It is through this automation that most work will be simplified by teachers, students and the administration.

1.6. Ethical Consideration

Ethical considerations are important when conducting research or in development of any

system. As such this project will take into account all applicable ethical considerations.

- Any confidential information that will be encountered during the research will not be disclosed to any individuals without an appropriate consent from its proprietors.
- Users will not, be influenced to make choices, participate in any interviews or studies without their consent and against their will.
- The project will be conducted in a professional manner taking into account all ethical issues in computer software design and development such as accuracy and privacy.

Chapter 2: LITERATURE REVIEW

2.0 Introduction

The previous chapter has discussed the background of the project, it has highlighted on the problem and the objectives to be achieved. This chapter will review literature of the project in areas of the background of an information system, classifications of information systems, background of a Management Information System, School Management Information System, make-up of a School Management Information system, examples of school management information systems globally. Finally, the chapter analyses the gap between the reviewed literature and the position of secondary schools in Blantyre.

2.1 Classifications of Information Systems

Information systems are interrelated components working together to collect, process, store, and disseminate information to support decision making, coordination, control, analysis, and visualization in an organization (Alcami & Caranana, 2012). The following are the classifications of information systems that are used at different levels of an organization in operations and decision making; Transaction processing system, management information system, decision support system, Executive support system, office automation system and business expert system. The focus will be on management information system.

2.3 Management Information system

A management information system, or MIS, is any computer system used to collect and store information, with tools for analyzing that information (Weedmark, 2019).

Martin (2017) says that an information consists of data that have been processed and are meaningful to a user. Information is an important resource in the operation, transaction and management of any institution. Timely availability of required information is important for effective and efficient performance of managerial functions like planning, organizing, leading and control. A system is a set of components that operate together to achieve a common purpose (Martin, 2017). Thus, a management information system aim is to collect, transmit, process and store data on an institution's resources, programs and accomplishments. The system makes it possible for conversion of such data into management information for use by decision makers and managers within an organization. A management information system, therefore, produces and provides information which supports the management functions of an organization. The business areas of the management information system include the following: Marketing, Finance, Production, Human resources and Logistics. The management information system can combine business areas and be applied to any field, institution or company and one of them being schools.

2.4 School Management information system

In this information system, the school data is stored in one central location whereby it is only accessible by registered users; this ensures the safety of the stored information. Reporting, registration, grading, demand generation, admission, tuition, progress, finance, teaching and learning progress, teacher’s management and many other things can be managed with ease making the whole process of school management quick, simple, organized, systematic and undemanding (Bernbaum & Moses, 2011).

2.5 Functional areas of school Management information system

The school management information system has helped numerous schools and higher education learning institutions in the following highly esteemed areas.

Figure 1: Functional Areas a School Management System (Source: techjockey.com)

2.5.1 Admissions

The system makes easy the process of student admission and registration because these are done online hence eliminating the manual admission and registration process which is tedious and time consuming. Timely notifications are sent to students to keep them updated on their registration status (Dave & Bourgeois David, 2015).

2.5.2 Fee

This ensures that problems which exists during the process of fee collection by the staff and fee payment by the student are trouble-free. Fees can be paid through the bank and notifications are sent automatically after receiving the fees amount making the process transparent and secure. The student’s fees balance is updated automatically in the system (Anon., 2020)

2.5.3 Assessments

The system makes the grading process flexible and transparent. The schools can predefine grades for the end of term examinations, assignments & quizzes from the system. The student accesses the results through his or her student portal (Alcami & Caranana, 2012).

2.5.4 Student information management

The behavior of a student can easily be tracked using the school management information system. The system stores important student data like personal data, exam records, and even hostel and library details. In addition, it keeps track of the day-to-day progress of students. For Instance, the system can suggest the regions that attract the majority of students, the gender ratio, mode of registration which could help the school further optimize its operations (Anon., 2014).

2.5.5 Payroll Management

The system calculates salaries, tax deductions, incentives and bonuses by itself, sorts out the issues related to payments and deductions and records digitally into its database (Anon., 2014). This means that the system helps to streamline and centralize the salary payments of the staff at the school

2.5.6 Finance

An effective school management information system improves short- and long-term school’s performance by streamlining invoicing and bill collection, eliminating accounting errors, minimizing record-keeping redundancy, ensuring compliance with tax and accounting regulations, helping personnel to quantify budget planning, and offering flexibility and expandability to accommodate change and growth (Anon., 2014).

2.5.7 Learning management

The system offers teachers and instructors in delivering study material, monitoring learner participation, and assessing performance with ease. This in turn offers a smart alternative to educational institutions in such a scenario and allows instructors to deliver customized content, leverage various pedagogical models, and engage their students much better (Anon., 2014).

2.5.8 Reporting and Dashboard

The system's structured and scheduled set of reports designed for specific personnel that allows the school to track performance, identify trends, analyze data and align performance to overall goal. This has the following advantages; increase communication, improves accuracy and timeliness, improves decision making and efficiency and identify potential shortfalls early (Bernbaum & Moses, 2011).

2.6 Examples of School Management Systems

2.6.1Alma

Alma's integrated Student Information System empowers learning communities with a future-ready software platform developed for today's challenges and tomorrow's opportunities. Impressively designed and easy to use, Alma provides the industry's best SIS, including: admissions, enrollment and registration, student demographics, attendance, advanced scheduling, discipline, grades, state reporting, custom report cards, parent portal, student portal, standards-based grading, and more (Anon., 2018).

2.6.2 Isam

A web-based system to support independent and international schools in south Africa. Combining a single core database and suite of portals and apps for parents, students and staff, iSAMS gives schools bespoke management of all academic, wellbeing, sport, culture, administrative and financial information (Fornes, et al., 2015).

2.6.3 BigSIS

This is a cloud-based, highly customizable Student Information System, providing solutions to private schools across North America, BigSIS is comprised of modules that manage everything from Admissions, Enrollments, Transcripts Narrative Report Cards, Attendance, Gradebooks, Donations, Volunteers, Aftercare and more.

2.6.4 Claster

This is a global pioneer in the field of Education Technology, offering an all-in- one Cloudbased SaaS that bundles: Student Information System (SIS), School Management System (SMS) & Learning Management System (LMS). The platform is fully integrated with Office 365, Google G-Suite and other 3rd party systems: from ERP and government databases to SMS services and BI tools (Anon., 2021).

2.6.5 Schoolbic

This is an innovative collaboration application for modern schools & institutions. To automate everything Makes student, parent, employee and school owners' engagement, scheduling, curriculum & lesson sharing, tracking achievements & progress, fee payments and much more amazingly easy, Schoolbic is an All in¬-one School Management Application. A state of art school management System for a 360 Quality Visibility and Administration of your Institution, Fits perfectly for School/Universities of every size.

2.6.6 Eduwonka

Insights, performance, management, communication - all in one simple and secure dashboard for schools! Make better sense of any school's data and performance. Non-technical users can generate reports for insights quickly and easily (Fornes, et al., 2015). Track school’s performance over time and uncover trends in the school automatically. Empower staff and administration to act on findings and make intelligent decisions for the school in less time.

2.7 Analyzing the Gap

In Blantyre, secondary schools use Microsoft packages such as Excel and Access in Managing their Schools’ information and operations. This is the case due to costs of school management systems from global vendors, number of students in the schools and unfamiliarity with new technologies. It is therefore the aim of this project to come up with a customized an education management information system which is cheap, affordable, accessible and should be readily available for use in schools of Blantyre. The project will address some of the following features of school management system; student information system, registration, fees, reporting and dashboard, grading as well as teaching and learning tracking.

Chapter 3: METHODOLOGY

3.1. Introduction

The project aims at developing an Education Management Information System for Blantyre secondary schools by analyzing the intended objectives in chapter 1 and reviewing the intended literature in chapter 2. This chapter provides a hallmark of the project methodology employed for the study to answer the intended questions. The chapter specifically outlines the system development methodology, the data collection techniques, system architecture, system design concepts, technologies and matters relating to project testing as well as installation.

3.2. System Development Approach

The system will be developed using Rapid Application Development (RAD) by prototyping approach. RAD describes a method of software development which heavily emphasizes rapid prototyping and iterative delivery (Morse, 2016). RAD utilizes structured techniques and prototyping to refine requirements of a user and design the final system. This is user centered because users are heavily involved in the course of system development. At the end, costs and time are saved due to the involvement of the user and the system is tailored to fit needs based on their contributions. RAD is shown in the figure as the following.

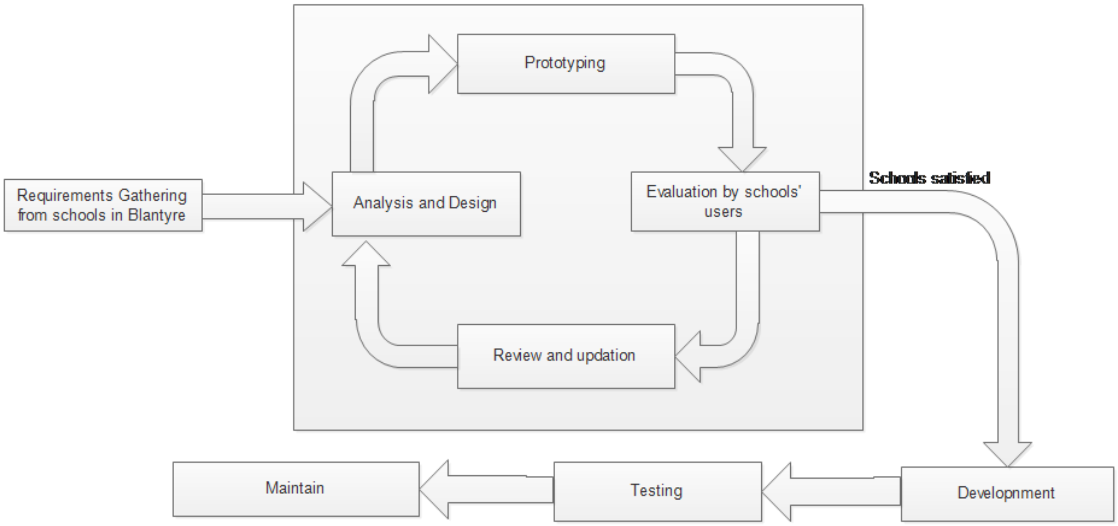


Figure 1: System development methodology (Source: Drawn on Edraw)

3.2.1 Requirements Gathering from schools from Blantyre

This will be an initial step in system prototyping and requirements collection. The requirements collection will involve students, academic staff and school supporting staff on the functionality and their expectations on the interfaces of the system

3.2.2 Design

The second step will involve analyzing the collected requirements in order to proceed to system design. Once the analysis is complete, system design will take its course. During the system design stage, simple and not complete designs will be sketched and showed to some of the users or clients.

3.2.3 Prototyping, Evaluation, Review and Updating

The initial design will be used to develop the first prototype. This step will be iterated several times in order to come up with the final design. As stated already, the designs will be evaluated by users and changes shall be made accordingly. Once the clients are satisfied with the prototypes it’s when development of the final system shall begin.

3.2.4 Development

Development shall be another step in RAD by prototyping. Based on the designs from the design step, the interfaces and system modules shall be developed accordingly.

3.2.5 Testing

Once the modules are developed, they need to be tested individually or as a whole if they are functioning as defined in the requirements stage. This step involves working around the improvements that the users wanted to be made on the first prototypes. Testing is very important because it helps you to align the project towards the users’ needs before deployment.

3.2.6 Maintain

This will be the last stage of the system development approach. This involves the post-testing support of the system.

3.3 Data Collection

Data collection is useful in any research or project. Effective and efficient collection of data helps to gather clear and intended user requirements. The project has used the following data collection methods.

3.3.1 Questionnaires

A simple and straight forward survey was carried out on a number of schools. The survey involved students, teachers, supporting staff as well as parents or guardians. This has helped in getting unbiased data from all users of the system. The survey has mainly focused on the usability and accessibility of the manual systems currently in use. The survey form was formulated and distributed to the students, teachers and other people in both boarding schools and non-boarding schools within Blantyre.

3.3.2 Individual interviews

A sampled population from a group of students, teachers and supporting staff from different schools around Blantyre were asked questions orally on their opinion about the current system in terms of time, costs and impacts on daily operations.

3.3.3 Group Interviews

This is an interview of different types of users in a group. Students were asked how the current manual systems affects their learning process and what they like or hate about the current system. The teachers were asked as a group probably in staff rooms on what impacts does the current system has when it comes to teaching, grading and producing reports for students? How do they feel about the current system on their daily operations? Finally, a group of supporting staff or administrators were interviewed to provide their opinion on the same.

3.3.4 Observation

It is very important to know how users feel about the current manual system. Monitoring how they interact with the current manual system. For instance, observing how the registration, fee payment, grading, assessments and reporting processes are carried out. This has helped in system development, being aware of the hassles which are available so that a fully functioning system.

3.4 System Architecture

This is a web-based system which shall be hosted on any central web server and it will be accessed by any client computer which is connected to the internet. The users will use the client computers to get resources from the system. This type of system architecture is known as client-server architecture. Client-server based attempts to balance the processing between the client and the server. This helps in controlling and implementing security measures at the server level. In this architecture, the client is responsible for the presentation logic, whereas the server is responsible for the data access logic and data storage. The client server for the to-be system is demonstrated in the diagram as below.

4. Chapter 4: REQUIREMENTS ANALYSIS

4.0. Overview

The systems development life cycle (SDLC) is the process of determining how an information system (IS) can support business needs, designing the system, building it, and delivering it to users. During a systems development project, requirements will be created that describe what the business needs are, what the users need to do, what the software should do, characteristics the system should have, and how the system should be built (Denis, Wixom, & Roth, 2012) A requirement is simply a statement of what the system must do or what characteristics it needs to have (Dennis, Wixom, & Roth, 2012). Requirement analysis focuses on the tasks that determine the needs or conditions to meet the new product or project. This process ensures that system design needs are analyzed, decomposed and functionally detailed. It is very critical to the success or failure of the system. Several techniques for example scenarios, use cases, holding interviews or focus groups can be employed by analysts to elicit the system requirements. Requirements are classified into functional and non-functional requirements.

4.1. Functional Requirements

These are the requirements that describe activities, processes and services that the SMIS must provide.

- Grade management system
- Fees management system
- School reports generation system
- Timetable management system
- System users; accounts, teachers and administrator management

4.2. Non-functional requirements

These are the requirements that are not directly concerned with specific services delivered.

Operational Requirements

- It describes the physical and technical environments in which the system will operate. For example;
- The system should be able to operate on handheld devices.
- The system should be able to work on any Web browser.

Performance

- This determines the speed, capacity, and reliability of the system.
- The system should not take more than 20 seconds to load a page.
- The system should respond faster to users request and input.

Availability

There should be no cases of system downtime, the system will be available to users all the time.

Authentication

- All users of the system must be able to login using their usernames or email addresses
- and password in order to access it.
- Every user of the system will have a strong password that consists of combination of letters, numbers and symbols. Password will have a specific pattern and an expiration period and will have to be changed when necessary
- The system will only allow registered Teachers allocated to that particular class to login and manage student's grades.
- The system must allow only administrators that were added to have access to the system.

Usability

- The system should be easy to use by new users; for example, teachers that have just recently joined the school.it will have a user manual that will be used by new employees.
- The system will have colors, menus and icons that are familiar and easy to use.

Security

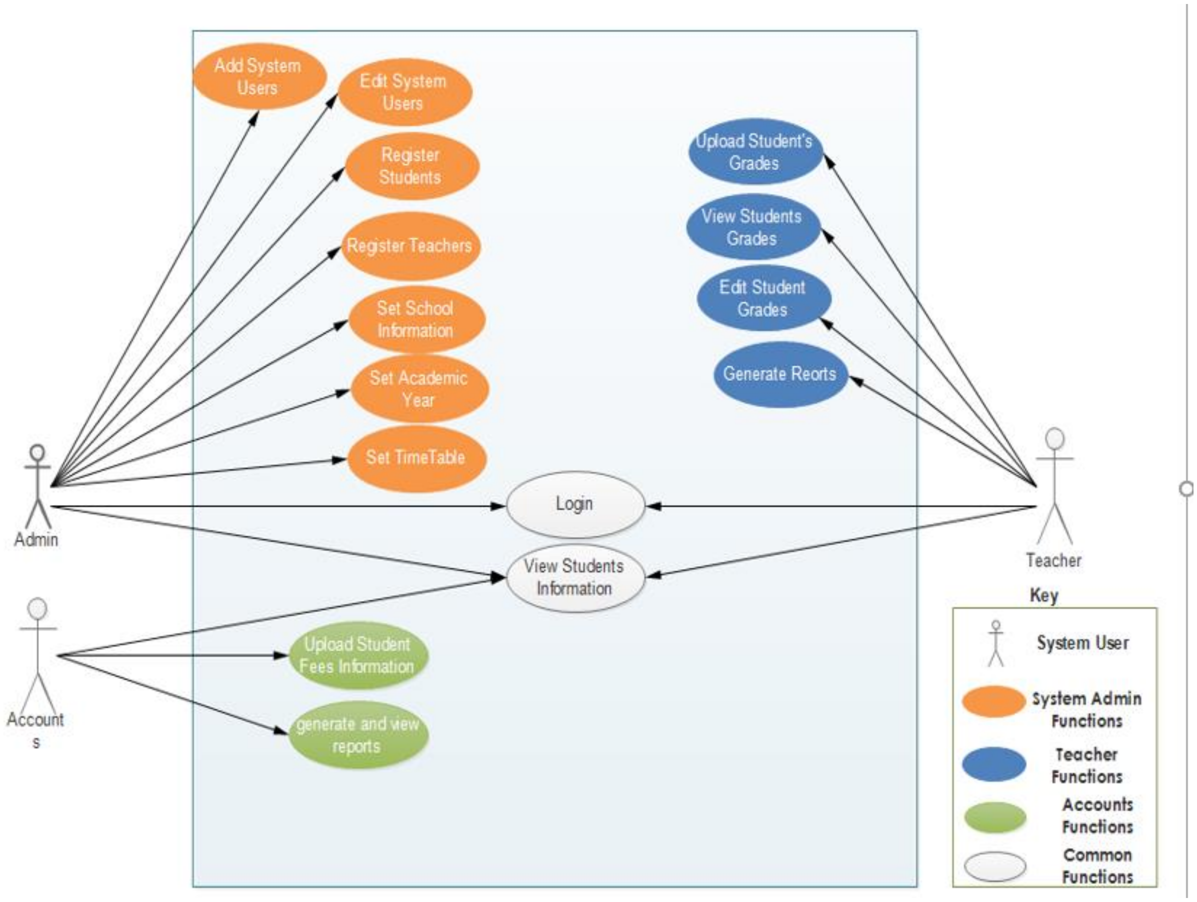
- This refers to who has authorized access to the system and under what circumstances.
- Only direct system administrators can see the student's records.
- The system also includes all available safeguards from viruses, worms, Trojan horses.

4.3 Use Case analysis

When the requirements were collected, they were analyzed into use case diagrams in order to describe the activities going on in the system and how the system responds to events a user can trigger. The use case has three actors; administrator, employee and customer.

4.3.1 Use case diagram

A written description of the user's interaction with the software products to accomplish a goal (Toriak, 2015). This is the representation of how users will interact with the system including depicting the specifications. The use case below is describing in depth the key requirements of the system and the responsible users.



(Source; Drawn by Edrawmax)

4.4. Use case Descriptions

The use case descriptions explain in detail each use case, the conditions required and course of the events which are needed for the successful execution of the use case.

USE CASE 1

Use case title	Login
Actor	System users (Administrator, Teacher, Accounts)
Description	This is a use case for logging in into the system thus to gain access to the system. All users submit their login credentials on the login page form and authentication process is carried on.
Pre-condition	The one to perform this task must be connected to the server.
Post-condition	Dashboard screen is presented depending on the logged in user role.

Normal Course of events	On login page, click login and the system does the authentication process.

USE CASE 2

Use case title	Add System User
Actor	System Administrator
Description	This is a use case meant for adding new users to the system. All users to access the system has to be registered using their credentials thus **email** and **password.** Other information which is required include user's name, gender, phone number etc. Only registered users with their accounts active and roles specified are the only one who access the system.
Pre-condition	The one to perform this task must be logged in as administrator.
Post-condition	Upon successful registration, the registered user is able to login.
Normal Course of events	On the user's home page (which is on the admin portal), click on register user button and a user registration page with a user registration form is shown which allows the administrator to enter the user's information.
Alternative Course	The information is not successfully added due to incomplete information, mistakes in data input for instance wrong dates, invalid data types, etc.

USE CASE 3

Use case title	Edit System User
Actor	System Administrator
Description	This is a use case meant for editing registered user's information in the system.
Pre-condition	The one to perform this task must be logged in as administrator.
Post-condition	Upon successful update, user's details are updated.

Normal Course of events	On the user's home page (which is on the admin portal), click on register user button and a user registration page with a user registration form is shown which allows the administrator to enter the user's information.
Alternative Course	The information is not successfully updated due to incomplete information, mistakes in data input for instance wrong dates, invalid data types, etc.

USE CASE 4

Use case title	Register Student.
Actor	System Administrator.
Description	This is a use case meant for registering students in the system. Basically all students are to be registered in the system with their respective unique registration numbers.
Pre-condition	The one to perform this task must be logged in as administrator.
Post-condition	Upon successful student's registration, student's records are kept.
Normal Course of events	On the user's home page (which is on the admin portal), click on register user button and a user registration page with a user registration form is shown which allows the administrator to enter the user's information.
Alternative Course	The information is not successfully updated due to incomplete information, mistakes in data input for instance wrong dates, invalid data types, etc.

USE CASE 5

Use case title	Register Teachers
Actor	System Administrator
Description	This is a use case meant for registering teachers in the system. Basically all teachers are to be registered in the system with their respective unique employment numbers and login credentials.
Pre-condition	The one to perform this task must be logged in as administrator.

Post-condition	Upon successful teacher registration, a user account for the newly registered teacher is created and is specified as a user account with teacher as its role.
Normal Course of events	On the teacher's home page (which is on the admin portal), click on register teacher button and a teacher registration page with a teacher registration template and form is shown which allows the administrator to enter the teacher's information.
Alternative Course	The information is not successfully stored due to incomplete information, mistakes in data input for instance wrong dates, invalid data types, etc.

USE CASE 6

Use case title	Set School Information
Actor	System Administrator
Description	This is a use case meant for setting up school information including the name, location and district.
Pre-condition	The one to perform this task must be logged in as administrator.
Post-condition	Upon successful setting of the user information, the information is stored.
Normal Course of events	On the settings home page (which is on the admin portal), click on set school information.
Alternative Course	The information is not successfully stored due to incomplete information, mistakes in data input for instance wrong dates, invalid data types, etc.

USE CASE 7

Use case title	Set Academic Year
Actor	System Administrator
Description	This is a use case meant for setting the academic year and term of the school in the system.
Pre-condition	The one to perform this task must be logged in as administrator.

Post-condition	Upon successful student's setting up, academic year and term is set.
Normal Course of events	On the settings home page (which is on the admin portal), click on set school information.
Alternative Course	The information is not successfully set due to incomplete information, mistakes in data input for instance wrong dates, invalid data types, etc.

USE CASE 8

Use case title	Set Time Table
Actor	System Administrator
Description	This is a use case meant for setting the time table in the system.
Pre-condition	The one to perform this task must be logged in as administrator
Post-condition	On the academics drop down on the left menu (which is on the admin portal), click on time table to set it up.
Normal Course of events	On the academics drop down on the left menu (which is on the admin portal), click on time table to set it up.
Alternative Course	The time table is set up and stored in the database of the system.

USE CASE 9

Use case title	View Students Information
Actor	System Administrator, Teacher and Accounts
Description	This is a use case meant for viewing all the students who are registered in the system.

Pre-condition	The one to perform this task must be logged in as a teacher.
Post-condition	All students with their details are displayed. Also specific number of students are displayed per choice.
Normal Course of events	On the left menu, click on students and a student's home page is displayed with all students listed.

USE CASE 10

Use case title	Upload Students Grades
Actor	Teacher
Description	This is a use case meant for uploading student's grades in the system.
Pre-condition	The one to perform this task must be logged in as a teacher.
Post-condition	Upon successful upload of the student's grades, the grades are stored.
Normal Course of events	On the student's page, click on the grade upload and a grade upload form is displayed.

USE CASE 11

Use case title	View Students Grades
Actor	Teacher
Description	This is a use case meant for querying student's grades in the system.
Pre-condition	The one to perform this task must be logged in as a teacher.
Post-condition	Grades for students or a particular student are displayed.
Normal Course of events	On the student's page, click on the examinations and select view student's grades. Also on the student listing page, select view examination history of a particular student and the grades are displayed.

USE CASE 12

Use case title	Edit Students Grades
Actor	Teacher
Description	This is a use case meant for editing uploaded student's grades in the system.
Pre-condition	The one to perform this task must be logged in as a teacher.
Post-condition	Upon successful update of the student's grades, the stored grades are updated.
Normal Course of events	On the grades page, click on edit grade upload and a grade update form.

USE CASE13

Use case title	Generate Reports
Actor	Teacher
Description	This is a use case meant for generating reports for a particular examination. It lists students and their grades.
Pre-condition	The one to perform this task must be logged in as a teacher.
Post-condition	Upon successful reports generation, the reports are displayed or extracted.
Normal Course of events	On the examinations page, select generate report for a particular exam.

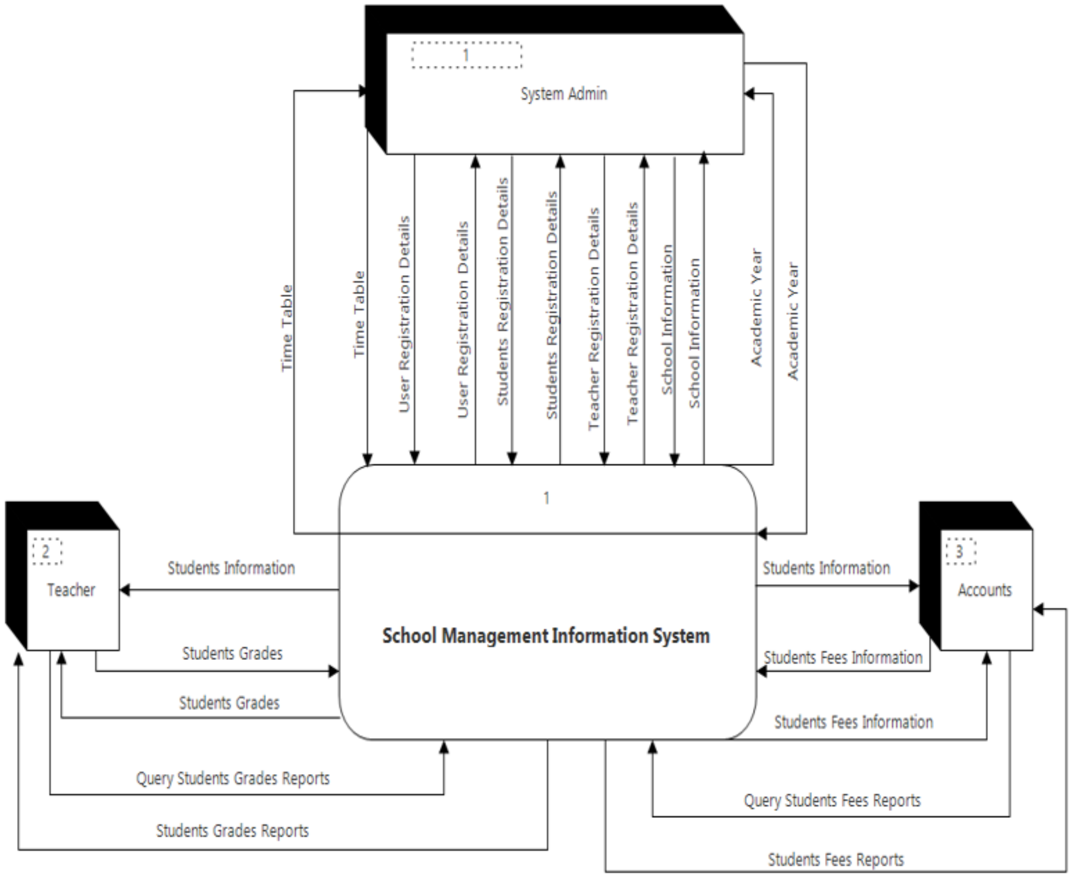
USE CASE 14

Use case title	Upload Students Fees Information
Actor	Accounts
Description	This is a use case meant for uploading student's fees information in the system.

Pre-condition	The one to perform this task must be logged in as an accountant.
Post-condition	Upon successful upload of the student’s fees information, the information is kept and the students account is updated.
Normal Course of events	On the accounts, select upload fees information and select the student to upload the information.

4.5 Data Flow Diagram

This section seeks to show the Data Flow Diagrams that have been produced for the system. These include the context diagram, level 0 data flow diagram and major process analysis diagram. DFDs basically do represents the flow of data as well as depicting the inputs and outputs of each entity and processes.


1
System Admin
Time Table
Time Table
User Registration Details
User Registration Details
Students Registration Details
Students Registration Details
Teacher Registration Details
Teacher Registration Details
School Information
School Information
Academic Year
Academic Year
1
School Management Information System
2
Teacher
Students Information
Students Grades
Students Grades
Query Students Grades Reports
Students Grades Reports
3
Accounts
Students Information
Students Fees Information
Students Fees Information
Query Students Fees Reports
Students Fees Reports

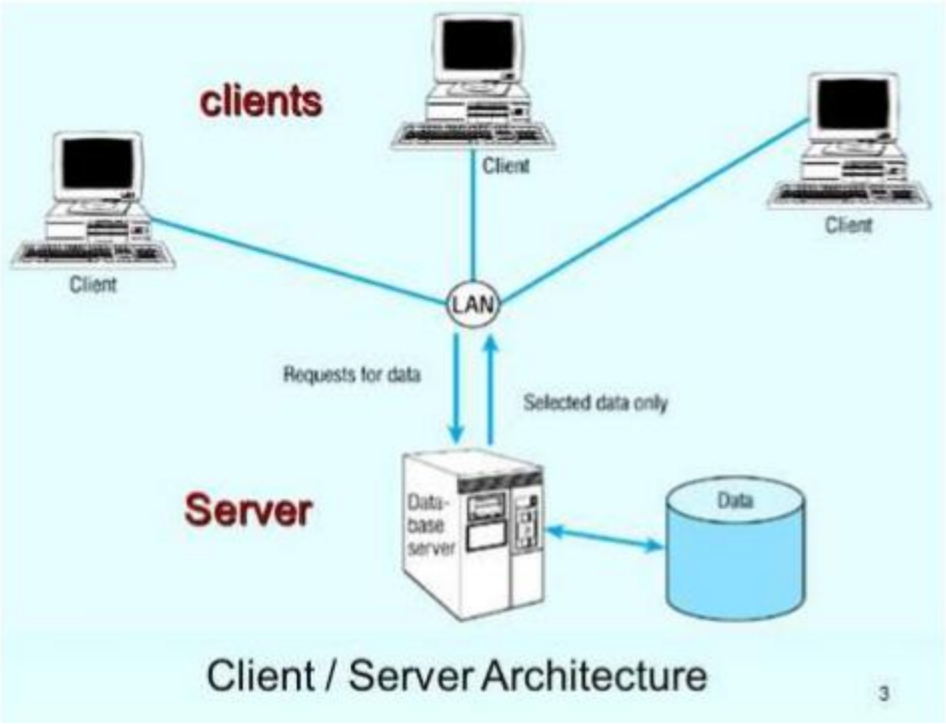
(Source; Drawn by Edrawmax)

5. Chapter 5: SYSTEM DESIGN

This chapter encompasses the designing of the system which include the database design as well as the user interface design. This can be viewed as a process which involves defining the architecture, modules, components, interfaces, and the data for a system to accrue to the stipulated system requirements.

5.1. Architecture Design

The system is a Web-Based system which is operating in a client-server architecture. Basically a client-server architecture is a system design approach which has a server acting as the engine room or the backbone of the system. The client will normally hit the server with requests for data retrievals and inputting. The server responds to the client with the requested data upon authentication and confidentiality measures present in the system. There is also a mechanism (network) which connects these two (client and the server) and this can be in form of wireless or Ethernet cables. The diagram below illustrates the client-server architecture.



This system has been developed in a way that the logic (presentation and application) and the data access as well as the storage logic are residing on the server. On the client, there is only an installed internet browser for instance Google Chrome (preferred) or Firefox which will be hitting the server via email addresses and correct port numbers requesting for data and also sending data to the server for insertions and deletions operations. XAMP is used to manage the server (apache2 and mysql) on the server.

5.2. Database Design

This design shows the organization of data in the database. It is presenting the physical **Entity Relationship (ERD)** Diagram. Entity Relationship Modelling involves the creation of Entity Relation Diagram. This model is adopted because as a need of showing logical structure of the database.

Entity Relationship Diagrams basically shows entities, their associated attributes and relationships existing among the entity sets. This is vital in the process of visualizing the relationships which is the core part of each and every design.

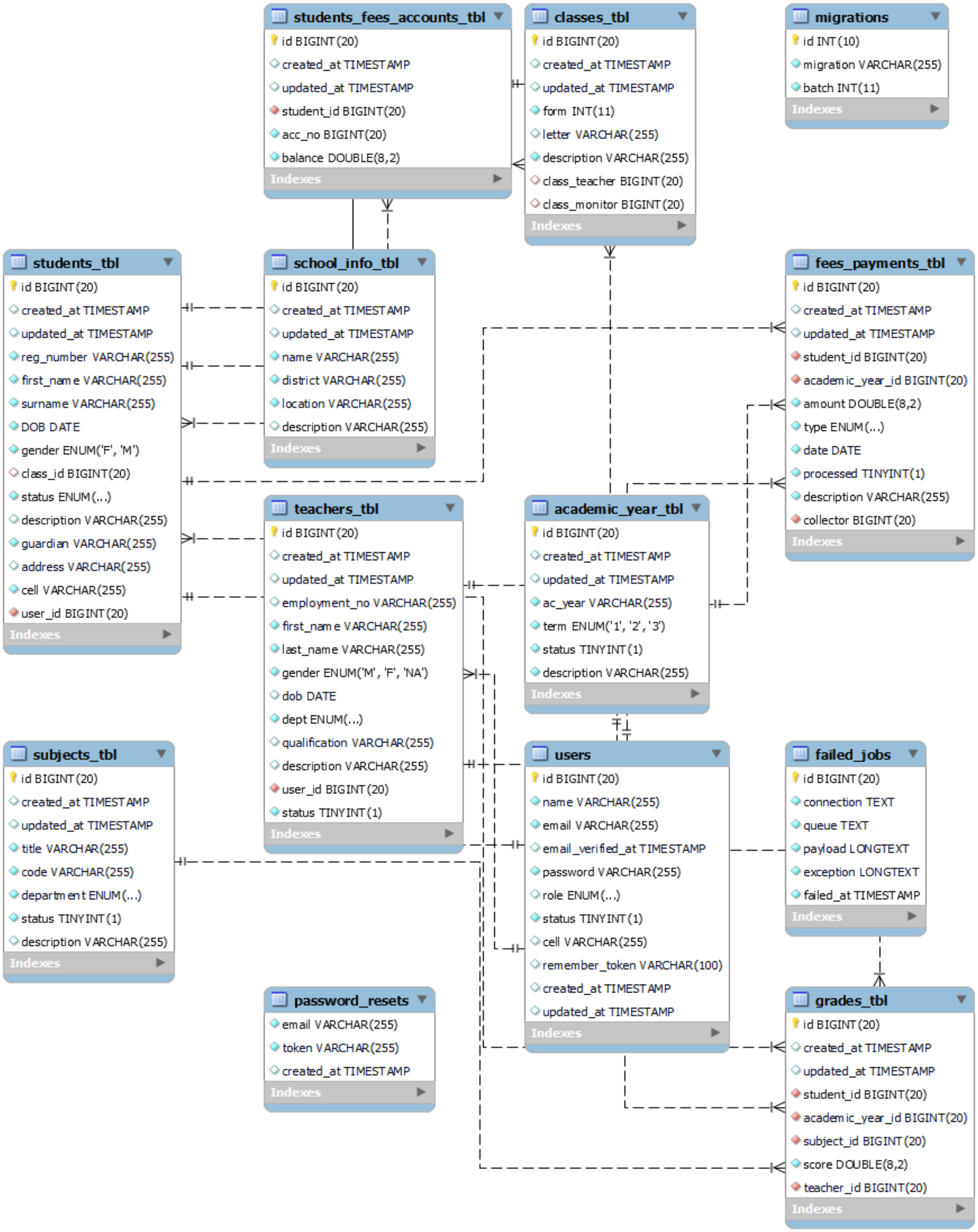


Fig 1: Entity Relationship Diagram

5.2.1. Data Dictionary

The following table lists all entities in the database for the system (Bss_Smis_DB).

Entity Name	**Number of Columns**	**Description**
users	**11**	This is responsible for the keeping of registered users' details including their associated login credentials
school_info_tbl	**7**	This table keeps the information of the school
academic_year_tbl	**7**	This table keeps the information of the school academic years including the current
students_tbl	**15**	This table keeps information for all the registered students in the system
teachers_tbl	**13**	This table keeps information for all the registered teachers in the system
subjects_tbl	**8**	This table keeps information for all the registered subjects in the system
classes_tbl	**8**	This table keeps information for all the registered classes in the system
students_fees_accounts_tbl	**6**	This hold the student fees account information for each and every student registered in the system.
fees_payments_tbl	**11**	This keeps records of fees payments for each end every school fees payment entered in the system
grades_tbl	**8**	This is responsible for holding all the student's grades entered in the system.
subject_class_teacher	**6**	This is the table responsible for holding class-subject-teacher allocation.

Table 1: Data Dictionary

5.2.2. Database Schema

This is the database without data populated.

Table 2: Users Table

Attribute	**Data Type**	**Primary Key**	**Foreign Key**	**Comment**
Id	BIGINT(20)	Yes	No	Unique Key
Name	VARCHAR (255)	No	No	Non Key
Email	VARCHAR (255)	No	No	Non Key
email_verified_at	TIMESTAMP	No	No	Non Key

Password	VARCHAR (255)	No	No	Non Key
Role	ENUM	No	No	Non Key
Status	TINYINT	No	No	Non Key
remember_token	VARCHAR (255)	No	No	Non Key
created_at	TIMESTAMP	No	No	Non Key
created_at	TIMESTAMP	No	No	Non Key

Table 2: school_info_tbl

Attribute	**Data Type**	**Primary Key**	**Foreign Key**	**Comment**
Id	BIGINT(20)	YES	NO	Unique Key
Name	VARCHAR(255)	No	No	Non Key
District	VARCHAR(255)	No	No	Non Key
Location	VARCHAR(255)	No	No	Non Key
created_at	TIMESTAMP	No	No	Non Key
created_at	TIMESTAMP	No	No	Non Key
Description	VARCHAR(255)	No	No	Non Key

Table 3: academic_year_tbl

Attribute	**Data Type**	**Primary Key**	**Foreign Key**	**Description**
Id	BIGINT(20)	YES	NO	Unique Key
created_at	TIMESTAMP	No	No	Non Key
created_at	TIMESTAMP	No	No	Non Key
Term	ENUM	NO	NO	Non Key
Status	TINYINT	No	No	Non Key
Description	VARCHAR(255)	No	No	Non Key

Table 4: students_tbl

Attribute	**Data Type**	**Primary Key**	**Foreign Key**	**Description**
Id	BIGINT(20)	YES	NO	Unique Key
created_at	TIMESTAMP	No	No	Non Key
created_at	TIMESTAMP	No	No	Non Key
reg_number	VARCHAR(255)	No	No	Unique Key
first_name	VARCHAR(255)	No	No	Non Key
Surname	VARCHAR(255)	No	No	Non Key

DOB	DATE	No	No	Non Key
Gender	ENUM	No	No	Non Key
class_id	BIGINT(20)	No	Yes	Non Unique
Status	ENUM	No	No	Non Key
Description	VARCHAR(255)	No	No	Non Key
Guardian	VARCHAR(255)	No	No	Non Key
Address	VARCHAR(255)	No	No	Non Key
Cell	VARCHAR(255)	No	No	Unique Key
User_id	BIGINT(20)	NO	Yes	Unique Key

Table 5: <u>teachers_tbl</u>

Attribute	**Data Type**	**Primary Key**	**Foreign Key**	**Description**
Id	BIGINT(20)	YES	NO	Unique Key
created_at	TIMESTAMP	No	No	Non Key
created_at	TIMESTAMP	No	No	Non Key
employment_no	VARCHAR(255)	No	No	Unique Key
first_name	VARCHAR(255)	No	No	Non Key
Last_ame	VARCHAR(255)	No	No	Non Key
Dob	DATE	No	No	Non Key
Gender	ENUM	No	No	Non Key
Dept	ENUM	No	No	Non Key
Qualification	VARCHAR(255)	No	No	Non Key
Description	VARCHAR(255)	No	No	Non Key
User_id	BIGINT(20)	NO	Yes	Non Unique Key

Table 6: <u>subjects_tbl</u>

Attribute	**Data Type**	**Primary Key**	**Foreign Key**	**Description**
Id	BIGINT(20)	YES	NO	Unique Key
created_at	TIMESTAMP	No	No	Non Key
created_at	TIMESTAMP	No	No	Non Key
Form	INT(11)	No	No	Unique Key
Letter	VARCHAR(255)	No	No	Unique Key
Description	VARCHAR(255)	No	No	Unique Key

Department	ENUM	No	No	Non Key
Status	TINYINT	No	No	Non Key
Description	VARCHAR(255)	No	No	Non Key

Table 7: classes_tbl

Attribute	Data Type	Primary Key	Foreign Key	Description
Id	BIGINT(20)	YES	NO	Unique Key
created_at	TIMESTAMP	No	No	Non Key
updated_at	TIMESTAMP	No	No	Non Key
Form	INT(11)	No	No	Composite Key
Letter	VARCHAR(255)	No	No	Composite Key
Description	VARCHAR(255)	No	No	Non Key
class_teacher	BIGINT(20)	No	Yes	Non Unique Key
class_monitor	BIGINT(20)	No	Yes	Non Unique Key

Table 8: student_fees_accounts_tbl

Attribute	Data Type	Primary Key	Foreign Key	Description
Id	BIGINT(20)	YES	NO	Unique Key
created_at	TIMESTAMP	No	No	Non Key
updated_at	TIMESTAMP	No	No	Non Key
student_id	BIGINT(20)	No	Yes	Non Unique Key
acc_no	BIGINT(20)	No	No	Non Key
balance	DOUBLE(8,2)	No	No	Non Key

Table 9: fees_payments_tbl

Attribute	Data Type	Primary Key	Foreign Key	Description
Id	BIGINT(20)	YES	NO	Unique Key
created_at	TIMESTAMP	No	No	Non Key
updated_at	TIMESTAMP	No	No	Non Key

student_id	BIGINT(20)	No	Yes	Non Unique Key
academic_year_id	BIGINT(20)	No	Yes	Non Unique Key
Amount	DOUBLE(8,2)	No	No	Non Key
Type	ENUM	No	No	Non Key
Description	VARCHAR(255)	No	No	Non Key
Collector	BIGINT(20)	No	Yes	Non Unique Key

Table 10: grades_tbl

Attribute	**Data Type**	**Primary Key**	**Foreign Key**	**Description**
Id	BIGINT(20)	YES	NO	Unique Key
created_at	TIMESTAMP	No	No	Non Key
updated_at	TIMESTAMP	No	No	Non Key
student_id	BIGINT(20)	No	Yes	Non Unique Key
academic_year_id	BIGINT(20)	No	Yes	Non Unique Key
student_id	BIGINT(20)	No	Yes	Non Unique Key
Score	DOUBLE(8,2)	No	No	Non Key
teacher_id	BIGINT(20)	No	Yes	Non Unique Key

Table 11. subject_class_teacher_tbl

Attribute	**Data Type**	**Primary Key**	**Foreign Key**	**Description**
Id	BIGINT(20)	YES	NO	Unique Key
created_at	TIMESTAMP	No	No	Non Key
updated_at	TIMESTAMP	No	No	Non Key
subject_id	BIGINT(20)	No	Yes	Non Unique Key
class_id	BIGINT(20)	No	Yes	Non Unique Key
teacher_id	BIGINT(20)	No	Yes	Non Unique Key

5.3. User Interface Design

This design seeks to define the basic components of the interface present in the system and how they are integrating to provide the functionality to the users.

The user interface mainly consists of four parts, the top bar, left-navigation bar, content area and the footer. The left-navigation bar contains the links of the system including users, students, etc. The content is being the heart of the interface which users interact with the system. The preceding diagram illustrates the main layout.

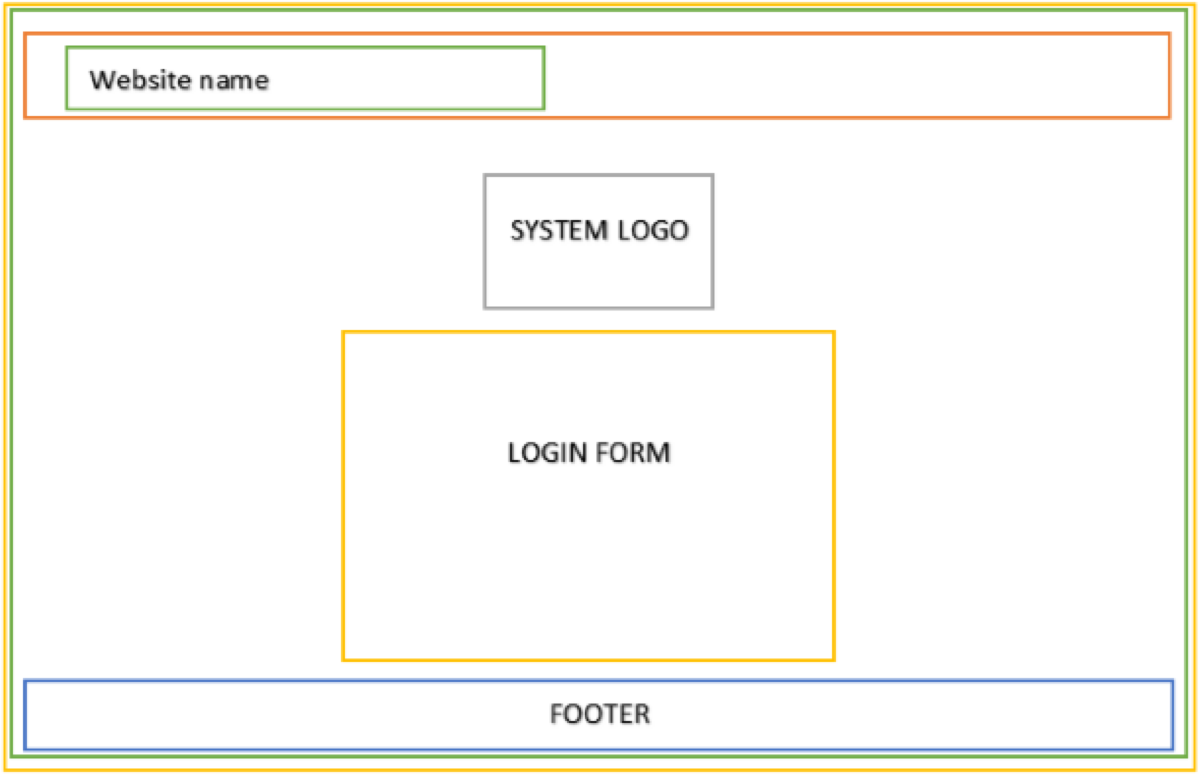


Fig 1: System login layout

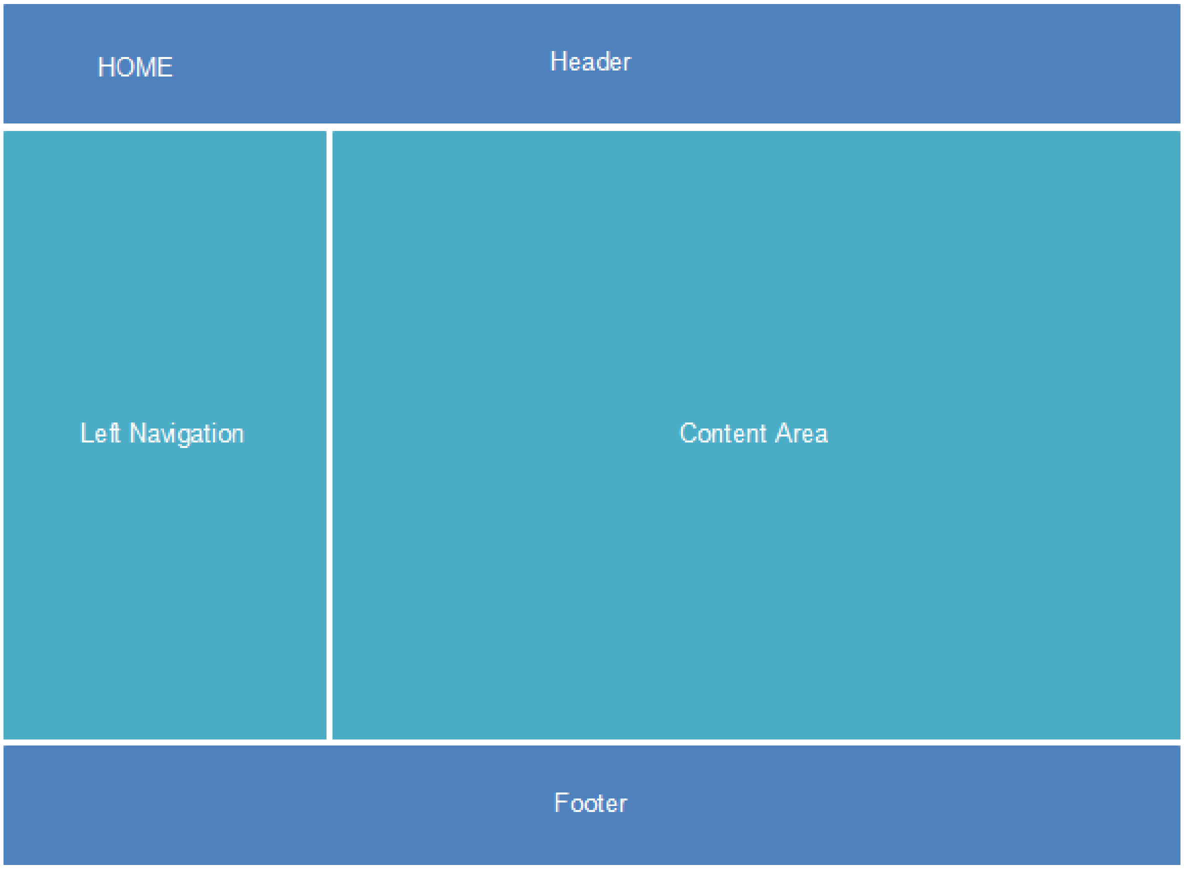


Fig 2: General structure for the rest of the screens of the system

Conclusion;

In conclusion, so far there has been progress in terms of both system coding and documentation although I have faced other challenges. I believe that I will be able to complete the project in the coming weeks.

System coding

The approach used is modular so the system is split in smaller functional modules.

Modules that have been completed;

- Students module
- Users module
- Teachers module
- Classes module
- School information module

Modules that are yet to be completed

- Grades management module
- Fees management module

Overall on the coding part 65% has been done from the smaller modules and when the remaining modules are completed, the system will be tested to check if its fully functional.

System Documentation

Chapters that have been completed

- Introduction
- Literature Review
- Methodology
- Requirements Analysis
- System Design

Chapters that are yet to be completed

- System implementation
- Management and Resources
- Conclusion and Recommendations

After these chapters are completed the project report will be done that’s when Appendices; user manual and system guide, Table of Tables, Table of figures, Abbreviations, Questionaries’ and Interview questions can be included. Then grammar will be checked and the Table of contents will be updated therefore the entire documentation will be completed.

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