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FACULTY OF PHYSICAL SCIENCES
DEPARTMENT OF COMPUTER SCIENCE

PROJECT TOPIC: WEST AFRICA EXAMINATION COUNCIL ENTERPRISE RESOURCE PLANNING (WAEC ERP)

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Declaration

We declare without any reservation that this project has been a team effort of our research submitted under supervision of Dr. Yaw Marfo Missah.

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I declare that I have supervised Mr. Aryeetey Nii Aryee Samuel and Miss Djan Akua Marfoah in undertaking the study submitted herein and I confirmed that Mr. Aryeetey Nii Aryee Samuel and Miss Djan Akua Marfoah have been in constant consultation with me and have my permission to present this work for assessment.

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DR. YAW MARFO MISSAH DATE

Acknowledgement

With the kind support of many individuals this project has become a reality and we would like to show our profound gratitude to them all.

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Finally, we thank our families for their financial support, our colleagues and friends for their moral support and encouragement. Without you we would not have come this far.

SUMMARY

WAEC ERP is single windowed applications that aims at managing the core activity of the West Africa Examination council electronically to do away with the paper work associated with the process.

This system provides a much friendly user environment for schools and self-explanatory button to carry out each action, to aid in all the needed registrations associated in the preparation for WAEC examinations. It helps to do away with errors associated with manual processes in the school selection process category wise.

Other features include giving students access to cross check their registration to notify their school heads of any error before the deadline of registration. Also, students can check results and placements via their portal.

The system further gives WAEC an overview of statistics, to aid in the generation of yearly reports and administrate the system.

The system architecture used ensures that the independence of users is ensured.

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CHAPTER ONE INTRODUCTION

1.1 Overview

WAEC ERP is an educational platform that primarily focuses on the existing role of the West Africa Examination Council (WAEC) that chiefly encompasses the pre- and post-examination processes.

WAEC plays an important role in ensuring that student progress from basic education level, through high school and finally to university. WAEC serves as a central assessment centre for all existing educational institution since it lays out a universal standard of assessment for all final year student at different educational level (that is either Junior High School or Senior High School) to prove them worthy of progressing to the next step on the educational ladder.

1.2 Motivation

The government of Ghana has made it possible for as many students who pass the Basic Education Certificate Examination (B.E.C.E) to be enrolled for the free in free Senior High School policy.

Many a time student normally do not adhere to the simple rules of selecting only one 'Category A' school instead they choose four category A schools such that failure to meet the criteria prevent them from being given other schools that their grades could have qualified them for.

This system seeks to do away with the numerous human errors and make the processes simplified by computerization of all processes.

1.3 Problem Definition

No matter how conversant we may be with paper work there is an undeniable fact that the existence of computers tends to make life easier and efficient. Typically, paper documents do not last long and are prone to errors. It is unlikely that performing repetitive task with well programmed systems will produce unfavourable results, however any interference in human reasoning for repetitive task will affect many other documents.

1.4 Aim of Project

- To build a system that simplifies the pre- examination processes of WAEC and the post-examination processes as well.

1.5 Specific Objectives

- ❖ To provide computerize system for the efficient registration of student for examinations at all levels.
- ❖ Clarification of processes involved in schools' selection process.
- ❖ Integrating the result checker and school placement platform in a portal designed for students in the unit system.
- ❖ Easily generation of statistics to offer essential insight in determining trustworthy summaries to WAEC.
- ❖ Provide timely, concise, absolute guidance and support to students and registrars at various institutions.
- ❖ Stress free and user-friendly interface.
- ❖ Incorporate authentication methods to be used to ensure security of information and prevent malicious users from gaining access.
- ❖ The automation of process involved leads to time saving and eradication of common user errors.

1.6 Definition of Terminologies

- WAEC ERP – Name of Application
- HTML -Markup Language used for creating web pages
- PHP – Hypertext Preprocessor

1.7 Project Beneficiaries

The beneficiaries of WAEC ERP include:

- WAEC Administrator
- Junior High and Senior High schools' registrar

- Students

1.8 Project Scope

I. SYSTEM ADMINISTRATOR

The administrator platform is one from which WAEC administrator can easily manage the core processes including managing databases, monitoring the various registration submitted, generating responses and uploading results. Administrator provides core maintenance to this system. Further, the administrator is in charge of making sure there is consistent back-ups for all the website content and application in case of disaster or emergency.

II. REGISTRATION OF STUDENTS

Student who are eligible to sit for the examinations are registered for the exams by their schools' registrar through the registration portal. The registration process captures the personal details of students' parent/ guardian information and educational details of each student.

III. SCHOOL SELECTION/ COURSE SELECTION

On acceptance of registered student, particularly Junior High School Student, registrar can further proceed to select the preferred courses from ranging from General Arts, General Science, Vocational Studies, Business, Technical and Agriculture. In addition to selection of schools from a range of public schools, private school or technical/vocational schools. This is the core component of the school selection process and thus error in the selection can leave the candidate disappointed. As such the system enforces that schools are rightly grouped based on their categories and the courses they offer as well.

Also based on the student's gender, categories of school to be selected from are gender based so that female candidates do not mistakenly make selection from male schools and vice versa.

IV. RESULT CHECKER

Student can access their result on release from their portals, by using stipulated credentials. This is an original platform that enables all candidates to check their results easily. Result available on this application are authentic. Thus, to check a result, candidate will have to provide:

-Examination Number

-Examination Year

-Result Checker Serial Number

-Result Checker Pin

V. SCHOOL PLACEMENT

By integrating the WAEC ERP with the Computerized School Selection and Placement System (CSSPS), students will be allowed to see the schools they have been admitted to and programs offered. Qualified Basic Education Certificate Examination (BECE) candidate are placed into Senior High Schools, Technical Institutions and Vocational institutions. The final process for the student will be to check their placement aided by the computerized schools' selection placement System.

To receive details of their school placement: BECE candidates can text their 10-digits index numbers to specified short codes to confirm schools they have gained admission to for the year.

VI. REPORTS

Generations of summary statistics on:

- The total number of registered candidates for an examination
- The number of candidate who registered for particular paper
- The total number of boys or girls
- The average age of candidates
- The average grade scored at the end of the examination.
- The region with the highest selection of school
- The school with the best score

1.9 Deliverables

The following will be delivered at the end of this project:

I. A web application
II. Project documentation with all relevant features of the application.

CHAPTER TWO - LITERATURE REVIEW

2.1 Review of Related Works

ERP systems are the largest software applications adopted by many education institution, most especially universities, along with quite significant investments in their implementation. However, unlike other applications research has been conducted regarding some systems in this environment. This paper aims at providing a critical review of applications that support educational system with regards to examinations, students' biography, results checking and related activities. In modern times education has been strongly influenced by global trends, therefore there is a need to improve and enhance educational systems to meet the current technological standard.

2.1.1 KNUST ACADEMIC INFORMATION MANAGER

Academic Information Manager (AIM) is the official app for students of Kwame Nkrumah University of Science and Technology(KNUST) operating both in a mobile android version and online web version. It was developed by the University Information Technology Services (UITS). It is a mobile companion of the online student portal which is also a part of KNUST Academic Record Management Information System (ARMIS). Its main objective is to bring functions of the online student portal to mobile device. The key functions of AIM are listed below.

- Result Checking

  This feature allows students to access verified semester's examination result from their portal as often as possible as far as they have been released.
- Course Registration

  Students are expected to register the courses that they will offer in the semester to ascertain the number of students present for the semester and also to get the student informed about the details of the courses in relation to the credit hour per course, the course codes and the total number of credit hour.
- Editing of personal details

  Student can make changes to suite their current states such as change of residence status, editing contacts information and other details like phone numbers which need to be changed to provide timely information.

- Access to news from university website

  Students are privileged to access news directly from the main KNUST website to get informed about news such as scholarships, seminars, workshop, campus recruitment programs and other beneficial or educative programs or events that are bound to happen in the KNUST environs. This will help the students and staff with keeping themselves abreast with current affairs.
- Notification

  Student receive notifications for fees paid, and also notifications to assess lecturers.
- Fees Checking and download of bills

  Students can check for fees owned, balances and other transaction through university's bank account number via accredited banks such as Barclays Bank, Cal Bank, Ecobank, GTBank hfcbank, UBA, GCB and UniBank. To meet the current mobile money transaction system the system allows for mobile money payment as well and online receipt is generated for student for such payments for verification.

other functionality includes:

- Accessing course materials once they have been uploaded
- Customize your quick access menu

Pros of KNUST AIMS:

- Student can easily academic information
- Smooth and Convenient
- Enables student to access result almost anytime
- Students assess lecturers based on previous semester performance
- Student can pay school fees via the system with any mode of payment be it mobile money or through the bank payment.
- It allows student to access trending issues on campus
- Enhances online registration of semester courses
- It's very interactive and has a friendly user interface
- Pretty lightweight and fast
- Security authentication to prevent intrusion into another students account

2.1.2 CREATRIX CAMPUS

Creatix Campus is a total education management solution flexible enough to support the unique needs of management, students, staff and parents for Attendance, Timetable, Gradebook, Report Cards, Learning Management System (LMS), Teacher's Evaluation, Discipline, Mobile Apps, Library, Transport, Hostel, Admissions with online Applications Tracking System, and much more. Creatrix Campus is a cloud -based solution designed for higher education. It is easy -to-use, install and maintain.

Creatrix Campus delivers a complete Education Management System that includes a fully integrated Student Information System to support intelligent data-driven decisions. It saves time and so users can better use the educational resources in ways that directly benefit their students and their ability to excel academically. The accomplishments of students directly impact the success and contribute a quota to the reputation of institutions, thus Creatix campus stands as defenders of learning and passionately believe that education is the key to the future.

Creatrix campus offers sophisticated and state of the student information system that is engineered to bring total quality for colleges and universities of any size to accomplish any task. The student information system for colleges connect departments and improve academic and administrative processes to help students achieve success. The online college management system also supports seamless integration with Moodle and other prominent software system. Using the student information system, all the departments within the college or university can be synchronized and accessed by students, faculty and parents from website and mobile devices to view and perform functions such as admission, attendance, grades, timetable, report card, library and more. College administrators can send automatic email notifications and SMS alerts to students, faculty and parents. Customized reports can be generated on demand using the college management system.
The advance reporting features of creatrix includes:

- Students Information system

  Creatrix Campus provides customizable, scalable and easy-to-use student data management software that ensures a superior end-user experience with cross-system integration for today's educators to take timely decisions.

- Admission

  Streamline the admission process from start to finish and help achieve enrollment goals. Easily convert prospects into applicants and admitted students.
- Classroom

  A single repository for student information, class administration, course notes, progress reports, grading, parent notifications and more.
- Faculty and Staff

  The faculty and staff can securely access student and administrative data as well as powerful communication tools to connect and collaborate with students, administrators and parents.

  Pros of Creatrix Campus
- Highly customizable
- Modernized user interface
- Covers most daily educational issues
- User friendliness
- One-time data in a cloud storage
- It is easy -to-use, install and maintain.

2.1.3 ISCHOOL

ischool is the official students' portal for Valley View University-Ghana. Its main function is to bring the academic activities of the student online. The key functions mainly include:

- Online Student registration

  This module of the app allows the student to login with its credentials and register the required courses for that particular semester. And also makes printing of the registered courses possible.
- Online Results Checker

  Here the students check his/her results using the app.

- Payment of Fees

  The app also makes it possible for the student to pay the school fees online.
- Updating of Students' Personal Details

  This section contains each student's personal details and academic detail in the school's database. Details such as the name, place of birth, parent/guardian information hall affiliated to, programme offering, type of certification and so on. The student can also update these details to match with the currents information.

2.1.4 PRIMARY SCHOOL LEAVING EXAMINATION OF SINGAPORE

The Primary School Leaving Examination (PSLE) of Singapore is administered by the Ministry of Education and taken by all students near the end of their sixth year in primary school before they move on to secondary school. The examination grading system at the moment runs on a narrow band scoring system known as the 'T Scoring System'.

Pupils have choice of six schools to apply to for their secondary school education and these choices are ranked in order of their preference. If two pupils have the same PSLE score and have chosen the same school, the one who has put it down as a first choice will get priority over the one who listed it as a second choice. Computerized balloting is used as a tie-breaker if there are two pupils with the same PSLE score and citizenship status, vying for a place in a school for which they have both listed in the same choice order.

Candidates who attempted the PSLE would be "queued" in order of merit, with the places in schools being filled up from the highest scorer to the lowest scorer. Thus, the pupil with a higher aggregate score would get into his school of second choice (if he was not accepted into his school of first choice) over a pupil with a lower aggregate score who chose the same school as the first choice.

Pros of the Singapore PSLE

- It allows student on completion of primary school, to proceed to secondary school based on their results in the PSLE. This propels students to sit for the UK based GCE 'O' Level examination upon completion of the secondary school, or IB program leading up to pre-college years and university.

- Student can make informed choices about the secondary schools after the examination scores were released.
- Candidates who does not get admission to any of the six schools are placed in schools based on the proximity and location of school.

Cons of the Singapore PSLE

- Inability to measure student performance

  There is a need for a far better grading system that will allow students performance to be accurately measured. For instance, implementing wider scoring band
- Absence of tiebreaker

  There will be a need to adjust to secondary school one time posting by introducing choice in selection as a new tiebreaker for the existing selection process.
- The current T-score system reflects a student's relative performance against the rest of his cohort.

2.2 PROPOSED SYSTEM

The proposed system will be used for the effective and efficient dispatch of monitoring, registration as well as viewing of result. This system adopts an approach to minimize the manual and paper work. The core of the system centres on getting all the necessary pre- examination requirement, that facilitates the work of the WAEC. Upon completion of registration for the WAEC examination the information is processed by the administrator of the system to allow authentic feedback given to the respective recipients. Some of the merit of the proposed system over the existing systems includes:

1. Easy and effective capturing of information.

The strategy to capture every bit of information beginning from registration of school, to registration of students and finally to the creation of the various databases to accommodate the data entry as well as authentic data retrieved for various purposes is enhanced. The aim is to deliver high quality customer data, allowing for better understanding of the entire operation of the system.

2. Authentic gathering of information.

The system at every point has not allowed users to access any page. For instance, a student cannot directly access the registrar's portal because the authentication measures at that page is solely geared to the registrar of a particular school. Likewise, aside the school having a collated master sheet of the general results of all students from their institution, no one else can access any individual students results because the index numbers are peculiar to each individual.

3. Quick report generation for further analysis.

The WAEC ERP system purposefully take variety of data and produce a document in the format that is clear to all human readership. By so doing information delivered is timely, accurate and relevant. The report system of the application highlights the statics of various collated results including total number of candidate who sat for an examination in a particular year, the total number of registered schools for the BECE , total number of females as well as total number of males , the subjects that recorded the highest number of student passes and the subjects that recorded the highest number of student failure and many other summary results that is presented in the way most readily understood by the target reader.

4. User-friendly experience design.

The design of the WAEC ERP system take keen interest in avoiding unnecessary elements and use clear English language in labelling and spelling out information. Also, the design factors in account using consistent common user interface elements that users feel easily conversant with. This facilitate efficiency. In addition, the page is properly structured, such that items that are most important pieces of information can be easily captured by the user. The strategic use of color and texture makes the pages appealing to the users. Furthermore, the arrangement of text, the use of different font increases the scan-ability, legibility and readability.

5. Minimizing errors associated with the manual processes.

In the manual system which is a paper based system, when mistakes are made or changes or corrections needed, often a manual transaction must be completely redone rather than just updating as in the case of using a software based system. The manual process also takes more effort and physical space to keep track of paper document which are often tedious to go through just to

retrieve a document. With the significant increase in the number of pupils who sits for the examination in a yearly basis, there is the need to put a system in place that will take care of some shortfalls in a manual system including:

- Inconsistency of data entry.
- Room for error.
- Time consuming process.
- Duplication of entry.
- Poor security on information.

6. One-time access to examination result and automatic save to the student's portal.

The student portal will serve as the repository for student to access their saved data, anytime and anywhere. For the existing online checker that student use from WAEC when results are released, it does not operate like the student portal in the ERP system which is able to keep the results. Once a student has successfully being able to check his result online using the WAEC result checking voucher, she will be able to view his or her result anytime she logs in to her portal and not having to necessarily buy vouchers over and over again.

7. Accessibility for student to preview details.

Students will have the ability to view the registration details filled out and submitted to WAEC on their platform. Any errors in data entry can be seen by the student, who intends sends report to the registrar for the information to be updated before the closing date for the registration. This serves as a verification process so that the data obtained can be certified to be genuine, authentic and reliable.

8. Easily accessible on the web.

The variety of phones and PCs have different specification, thus making some applications compatible with other machines whiles others cannot access. The WAEC ERP seeks to bridge this gap by allowing even low spec PCs and smart phones to use the system. Also, because it's web based there will be no need to wait for the application to be installed by the user. With the browser of PCs and phone, users can interact with the system.

In general, the proposed WAEC ERP is a hallmark for the following:

- Quality and Efficiency

  The ERP focuses on creating a framework for integrating and improving the WAEC's processes that results in significant improvements in the quality and efficiency of the role of WAEC in meeting the diverse need of student as they are of major concern.

- Decreased Costs

  As a result of the integration of the various system that coalesce to make the WAEC pre- and post-examination processes complete, there is a significant reduction in cost of running nonintegrated legacy systems.

- Enhancing the agility of WAEC

2.2.1 Development Tools and Environment

The developmental environment comprises of a set of process and tools that are used for development of the program.

Sublime Text Editor

This is a sophisticated text editor for code, markup and prose. Among its many features includes the following:

- GOTO ANYTHING

  Which opens files with only a few keystrokes, and instantly jump to symbols, lines or words.

- PERFORMANCE

  Sublime Text is built from custom components, providing for unmatched responsiveness. From a powerful, custom cross-platform UI toolkit, to an unmatched syntax highlighting engine, Sublime Text sets the bar for performance.

- MULTIPLE SELECTION

  Makes ten changes at the same time, not one change ten times.

- POWERFUL API AND PACKAGE ECOSYSTEM

  It has a powerful python API that allows plugins to augment built-in-function.

- INSTANT PROJECT SWITCH

  Projects in sublime text captures the full contents of the workspace, including modified and unsaved files. You can switch between projects in a manner similar to GOTO Anything, and the switch is instant, with no save prompts-all your modifications will be restored next time the project is opened.

PHP

PHP is a server-side scripting language that has use for web development. It is not limited only to the web but also used for general -purpose programming language. Embedded into the HTML codes of this project work is PHP: which is further used in conjunction with various web template system, web content management systems, and web frameworks.

JavaScript

This is one of the three core technologies of the World Wide Web content production alongside HTML and CSS. It is used to make webpages interactive and provide online programs. It is widely supported by all web browsers by means of built-in JavaScript engine, thus majority of websites employ JavaScript. Furthermore, it has API for working with text, arrays, dates, regular expressions and basic manipulation of the DOM (Document Object Model).

XAMPP Server

XAMPP stands for Cross-Platform(X), Apache(A), MariaDB(M), PHP(P) and Perl(P). It is a simple, lightweight Apache Distribution that makes it extremely easy for developers to create a local web server for testing and deployment purposes. Everything needed to set up a web server-

server application(Apache), database(MariaDB) and scripting language(PHP) is included in an extractable file.

HTML

HTML is the standard markup language for creating web pages, which stands for Hyper Text Markup Language. It describes the structure of the web pages using markup. HTML elements are building blocks of HTML pages.

JQUERY

jQuery is a cross-platform JavaScript library designed to simplify the client-side scripting of HTML.

jQuery also provides capabilities for developers to create plug-ins on top of the JavaScript library. This enables developers to create abstractions for low-level interaction and animation, advanced effects and high-level, themeable widgets. The modular approach to the jQuery library allows the creation of powerful dynamic web pages and Web applications.

Bootstrap

This is the most popular HTML, CSS and JS framework for developing responsive, mobile first projects on the web. It is faster and easier for web development. The embedded HTML and CSS are based design templates for typography forms, buttons, tables, navigation, modals, image carousels and many other, as well as optional JavaScript plugins. This framework gives the ability to easily create responsive designs.

The Bootstrap frameworks helps to:

- Prevent repetition between projects
- Utilize responsive design to allow website to adapt to various screen sizes- mobile, desktop and everything in between
- Add consistency to design and code between projects and between developers

- Quickly and easily prototype new designs
- Ensure cross-browser compatibility

Bootstrap has many advantages, and it includes:

- Ease of use: Anybody with just basic knowledge of HTML and CSS can start using Bootstrap.
- Responsive features: Bootstrap's responsive CSS makes it adjusts to phones, tablets and desktops.
- Mobile-first approach: It's mobile -first styles are part of the core framework.
- Browser compatibility: Bootstrap is compatible with all modern browsers (Chrome, Firefox, Internet Explorer, Safari, and Opera).

CHAPTER THREE – REQUIREMENT SPECIFICATION

3.1 Overview

The intent of this chapter is to present in precision a detail description of the WAEC-ERP software. This section further explicates the features and purpose of the software, the software interfaces, the operations as well as the constraints of the software. All functional, non-functional requirements and UML diagram of the system will be projected in this chapter to give a well-rounded view of the system.

3.2 Functional and Non-Functional Requirements

Functional requirements of the system refer to statements of services the system should render, how the system should react to a peculiar input, and how the system should act in a particular situation. In simple terms, it defines the services the system is expected to provide.

Non-functional requirements are the constraints on the functions offered by the system and they may relate to emergent system properties reliability, response time etc. Failure to meet the non-functional requirement of the system means the whole system is unusable because the non-functional requirement is concerned with the whole system rather than individual system.

3.2.1 Functional Requirements

The function requirement of the system are as follows:

- Unique identification for each user accessing the system.
  As the first point security measure, the WAEC ERP system provides unique identification for each user accessing the system; login credentials such as username and password are the keys to the system in order to identify a specific student or user. WAEC administrator can generate a default code. The code helps identify the school in which the student belongs to. A form with the school's code, first name, last name and other names are being filled in order for the username and password to be generated.

The information security is critical since any individual student with a username and password is considered to be authorized to access the system to begin the registration process.

- The system will be able to authenticate the user and display the appropriate section based on the identified user.

  There are three interfaces to be accessed by users from various interfaces. Users to the system can either:

  - Be a student who has sole access to the student portal page of the WAEC ERP system.
  - Be a registrar of a school who is in charge of registering student for WAEC examination.
  - The system administrator who manages the system in general.

- Enabling user to add required details pertaining to registration procedure

  The registration process for student is in phases, it comprises of taking in the personal details of each student, the parent or guardian information, agreeing to the terms and condition for school selection, attachment or taking a passport photo size picture and declaring that the information provided is genuine.

  In the course of doing either of these if the user(registrar) realizes that he or she has a mistake in the data typed he can go back to the previous stages and make the necessary changes before the form is submitted.

- Allowing user(Student) to preview their details and access results.

  WAEC administrator create room for the student to have access to the preview of the form submitted via their student portal. The student can send a report to the registrar of the school, who can update the students record before the final deadline of verification.

- The capability of generating summary report.

  The report in the WAEC ERP system represents the output of all the data manipulated within the system. They represent physical facts that are simplified and make data

meaningful. Reports are used to show the accumulated statics of candidate activities and other requirement that are critical to future projections, decision making and improvements.

3.2.2 Non-Functional Requirements

- Reliability
    - Data is stored in an organized database schema.
    - Lower risk of loss of data.
    - Querying for data yields accurate result.

- Performance
    - Optimized database leads to increase in the system's throughput.

- Security
    - Ensuring that only authorized user have access
    - Using unique identification for each user

- Usability
    - There is a clear understanding for the requirement of each page
    - There is easy to use navigation to visit any page of choice upon successful login
    - There is consistency and continuous flow in modules and webpages

- Supportability
    - The system is well built to be supported on diverse web browsers
    - It is very easy to maintain the system
    - All accessed results can easily be reference from the user's portal.

- ❖ Maintainability
    - The documentation attached to the development of the web-application makes it easy for programmers who were not involved in the initial design able to maintain it. New features can thus be incorporated without difficulty.

- ❖ Availability
    - The system is available at all times via smart phones or PCs.

3.3 User and System Requirements

User requirements are abstract statements of the system requirements for the customer and end-user of the system such as what activities the users must perform; system requirements are a more detailed description of the functionality to be provided and often the building blocks developers use.

User Groups

This consist of three types of user in the system. WAEC System Administrator's, School's Registrar and the Candidate.

The system administrators have the authorization to confirm new registrar and students. Registrar are authorized to review students' information, approved before the deadline is due. Students can access the system in order to provide accurate and reliable information.

USER	ACCESS	AUTHORIZATION	LIMITATION
Administrator	To the administrator page	Can view all data in the system	All right granted
Registrar	To the student page	Can review and assist student in relation to providing details for the registration process.	Cannot access other schools' student details
Student	To the student page	Can provide accurate and reliable information	Can only access and provide information on the student page.

Fig 3.1 Table User Groups

3.3.1 User Requirements

User requirements are as follows:

- Administrator can assign unique identification to each user.
- Administrator can add newly registered schools
- User(School) can add and edit registration requirement.
- User (Student) can access result
- Users require interconnection to use application

3.3.2 System Requirements

Web Application Requirements

- Any computing device that can run a web browser and has internet access.
- Working internet access to enable communication with servers

- A web browser (Mozilla Firefox, Google Chrome, etc.)
- MySQL Database to store all information on users and index to make efficient retrieval of all information queried for by the users.

3.4 UML Diagrams

UML which stands for Unified Modeling Language is a standard visual modeling language intended to be used for analysis, design, and implementation of software-based systems' diagram is analogous to the blueprints used in other fields, and consists of different types of diagrams. In the aggregate, UML diagrams describe the boundary, structure, and the behavior of the system and the object within it.

The WAEC-ERP will be simplified in this unit using few UML diagrams, including Class diagrams, Use-case diagram, Sequence diagram and Activity diagram.

3.4.1 Class Diagram

Class Diagram which is the main building block of object-oriented modelling, describing the structure of a system by showing the system's classes, their attributes, operations and the relationship among objects.

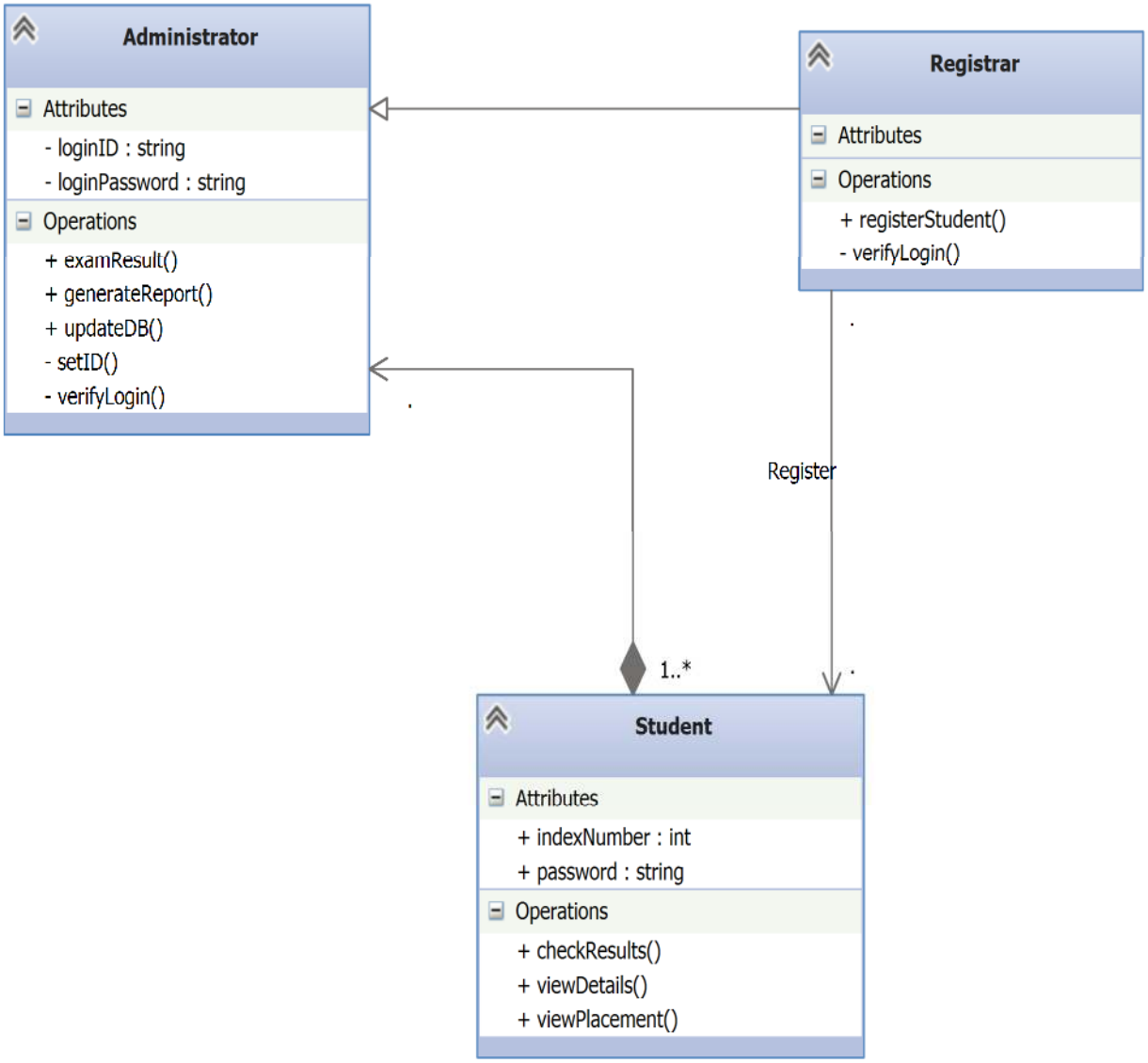

Fig 3.4 Class Diagram for WAEC ERP system

3.4.2 Use case Diagrams

Use case diagram, shows the interaction between a system and its environment. Use case modelling in simple terms describes as the simplest scenario that describes what a user expects from a system.

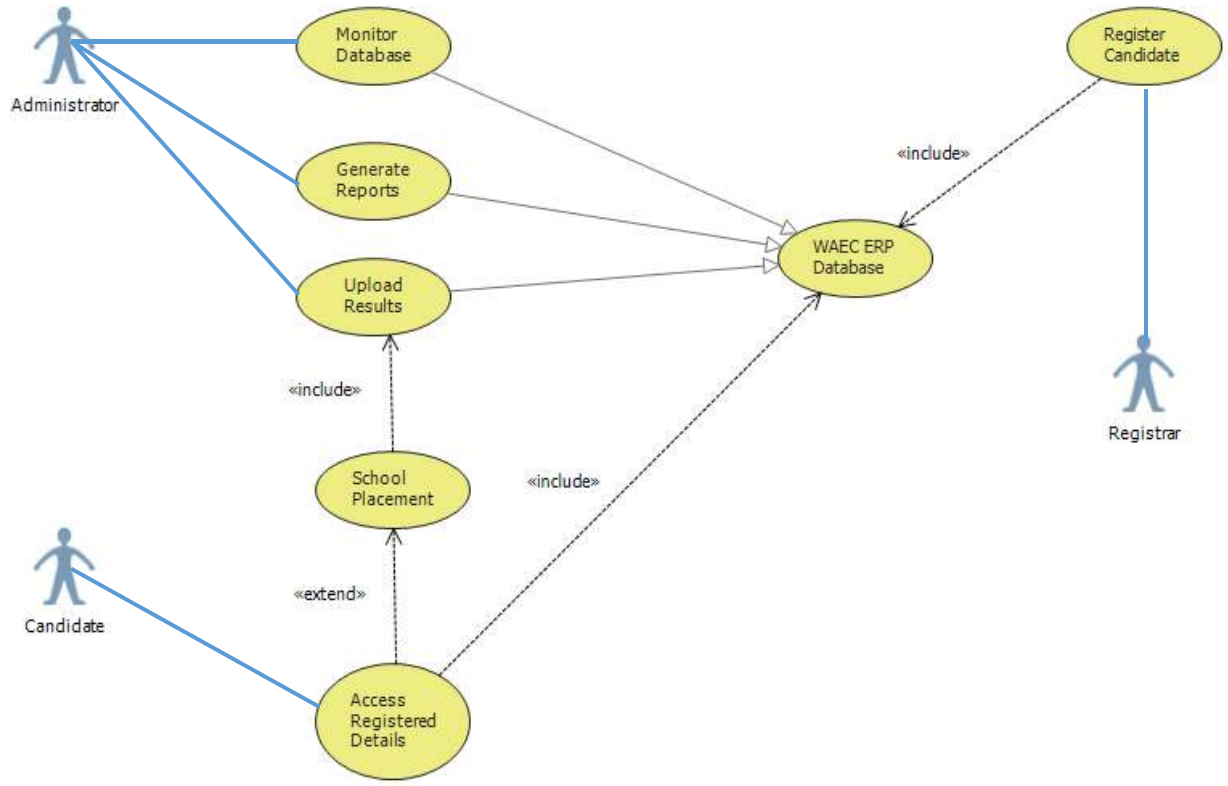

Fig 3.5 Use Case Diagram for WAEC ERP system

3.4.3 Sequence Diagram

Sequence diagram, shows interactions between actors and the system and between system components. Sequence diagram will be used to construct a message sequence chart for the WAEC-ERP.

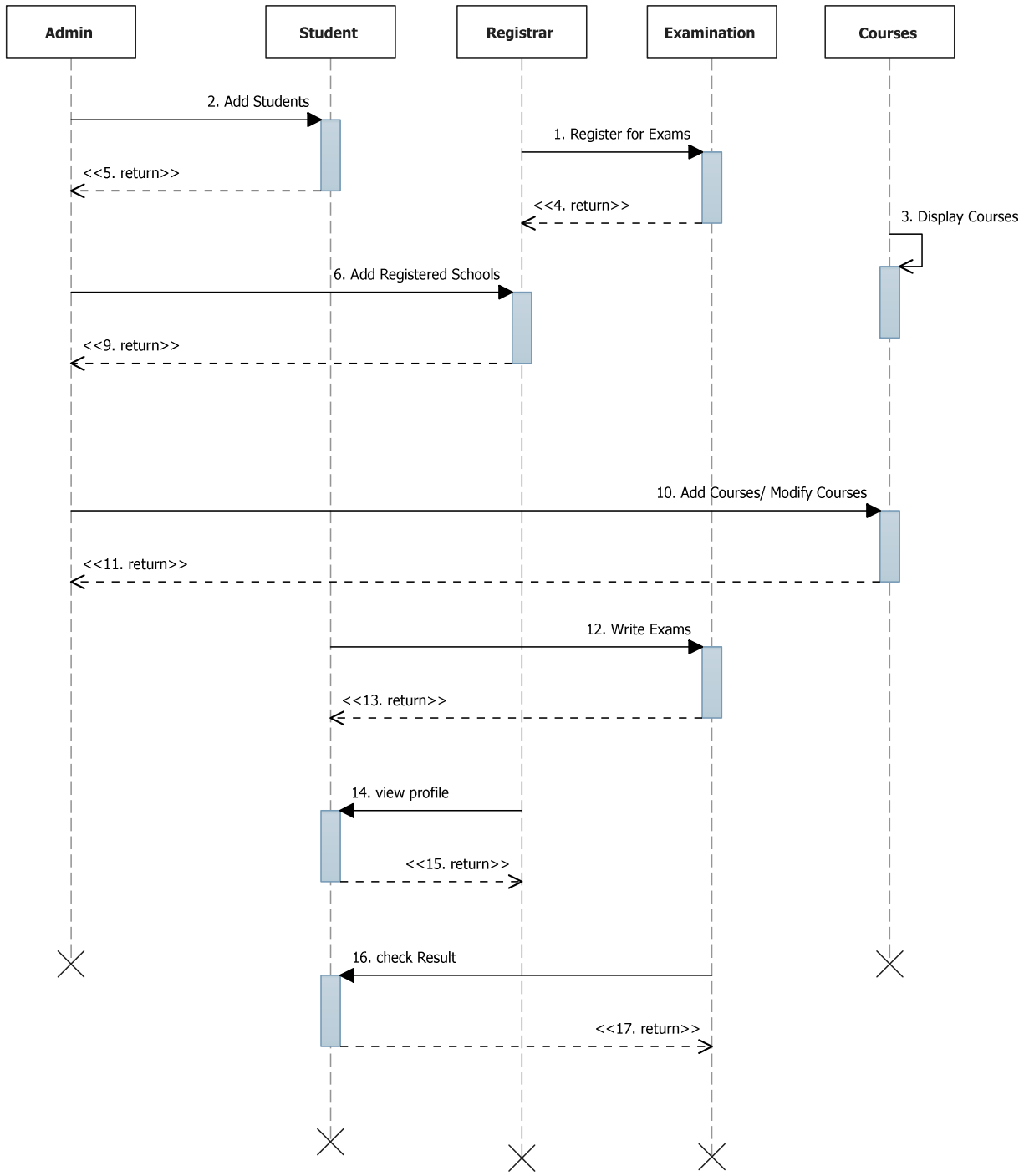

Fig 3.6 Sequence Diagram for WAEC ERP system.

3.4.4 Activity Diagrams

Activity diagram shows the flow control or object flow with emphasis on the sequence and condition of the flow. The actions coordinated by activity models can be initiated because other actions finished executing.

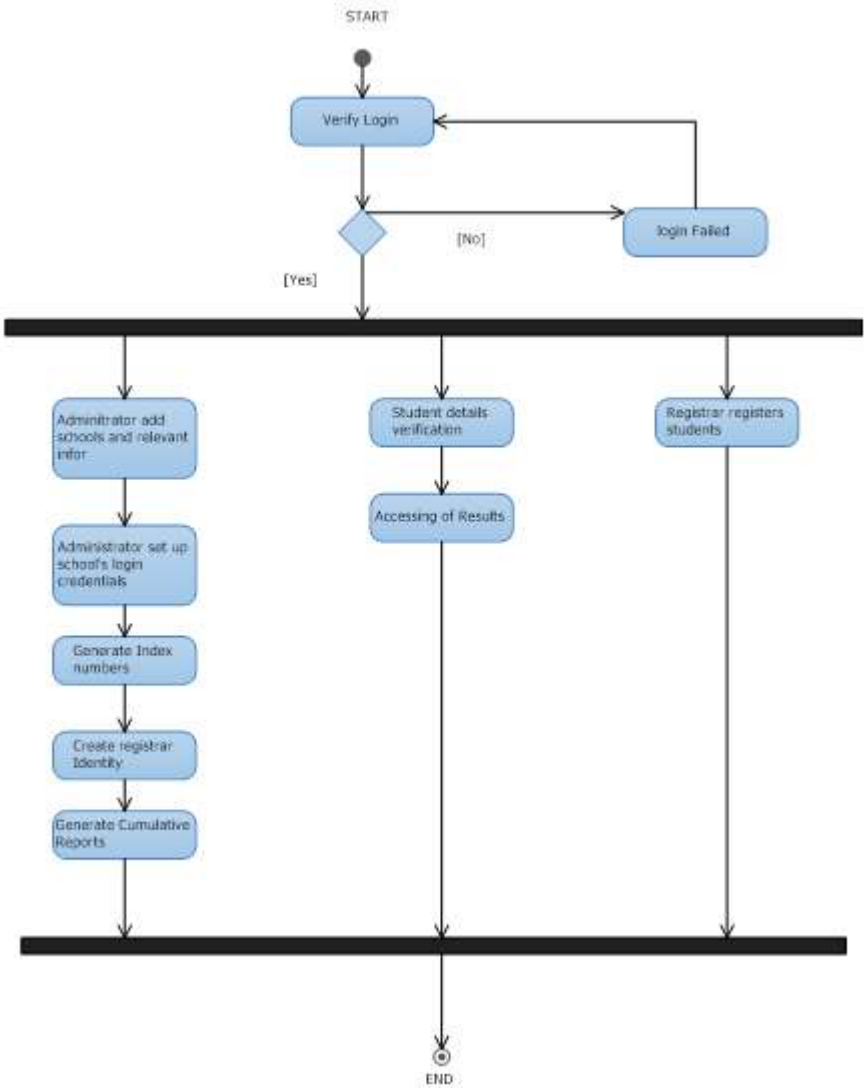

Fig 3.7 Activity Diagram for WAEC ERP system

CHAPTER FOUR-METHODOLOGY

4.1 Project Method

A software process is a set of related activities that leads to the production of the software product. Software processes are usually categorized as either agile or plan-driven processes.

A plan-driven processes refers to a process that ensures that all of the process activities are planned in advance and progress is measured against this plan.

For the agile process however, the planning is incremental, and it is easier to change the process to reflect changing the customer's requirements.

As a matter of fact, different types of system need different software processes.

4.1.1 Incremental Model

The incremental model approach to software development interleaves the activities of specification, development and validation. As a result, systems are developed as series of versions (i.e. increments), with each version adding functionality to the previous version.

Incremental Model Figure 4.0

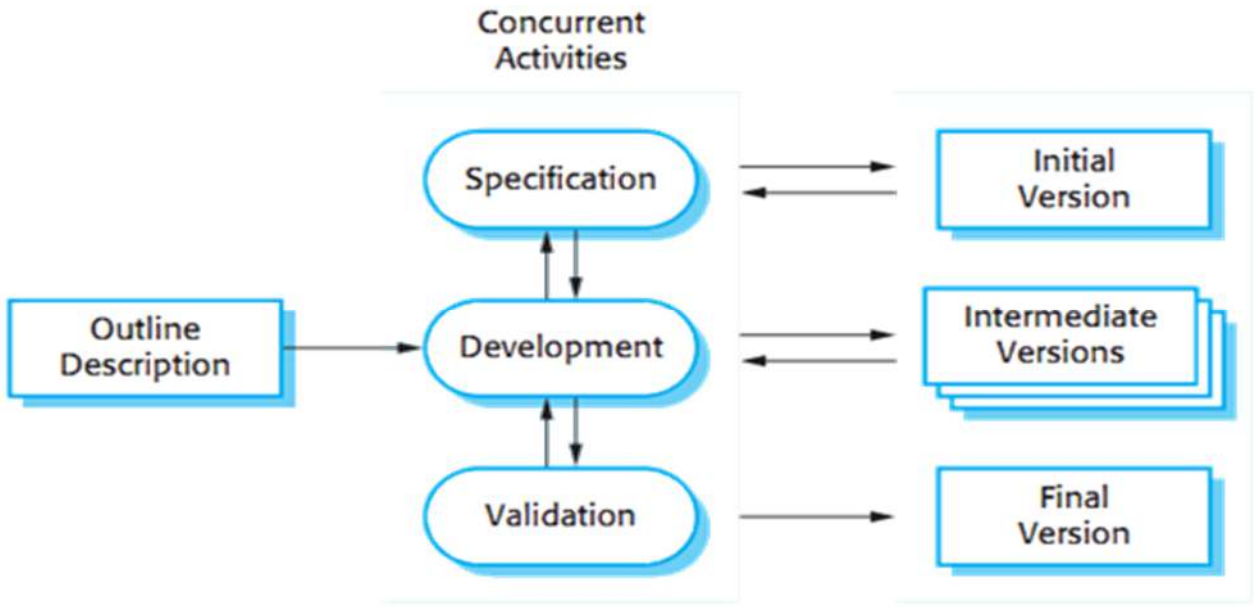

Fig 4.0 The Incremental Model Figure

4.1.2 Waterfall Model

The waterfall model is a linear sequential (non-iterative) design approach for software development, in which progress flows in one direction downwards (like a waterfall) through the phases of conception, initiation, analysis, design, construction, testing, deployment and maintenance.

Waterfall Model 4.1

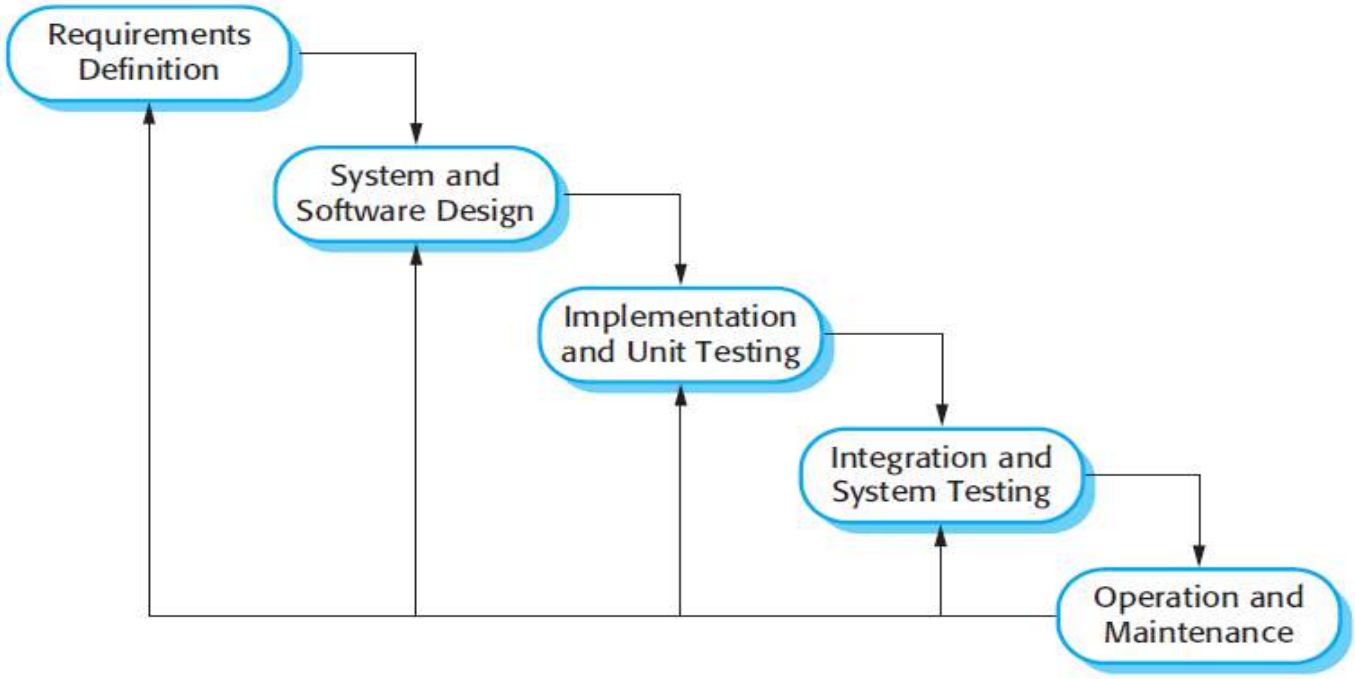

Fig 4.1 The Waterfall Model figure

4.1.3 Spiral Model

Spiral Model is a software process represented in a spiral, rather than sequence of activities with some backtracking from one activity to another. Each loop in the spiral represents a phase of the software process. Thus, the innermost loop might be concerned with system feasibility, the next loop with requirement definition, the next loop with system design and so on.

The spiral model combines change avoidance with change tolerance. It assumes that changes are as a result of project risk and includes explicit risk management activities to reduce these risks.

The four sectors of each loop in the spiral model are Objective setting, Risk assessment and reduction, Development and validation and Planning.

Spiral Model 4.2

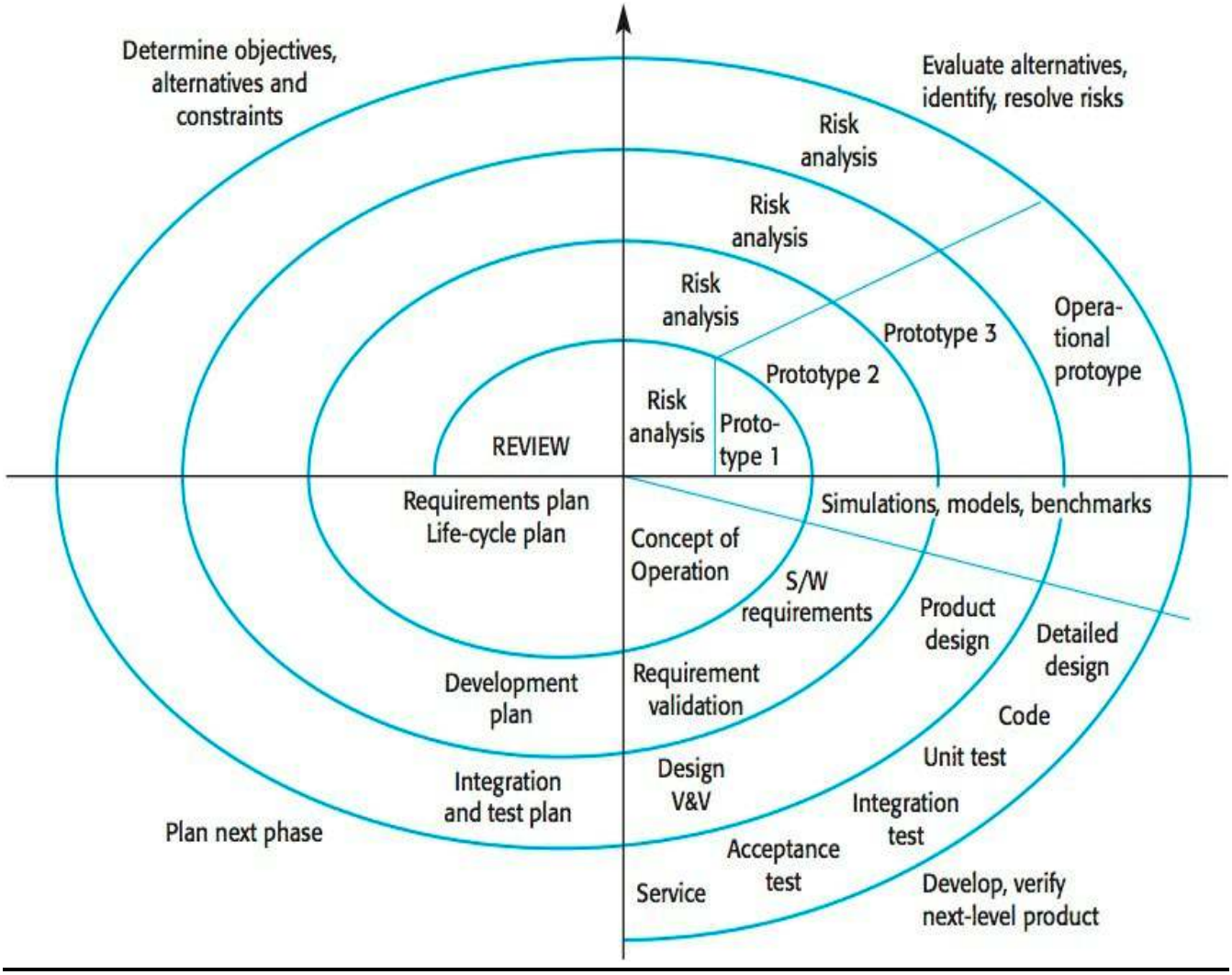

Fig 4.2 Spiral Model Figure

4.1.4 Model Adapted and Justification

We will be developing this application incrementally, without attempting to specify everything in advance before we start coding. But instead, we will work out enough of a specification to help us start and then immediately create some functionalities. We will further try ideas, gather feedback

and continue with another cycle of mini-design and development. It was our core mandate to develop and deliver this WAEC- ERP system incrementally, hence the model adapted to was the **Incremental Model.**

The Incremental model is a fundamental part of agile approach and was adopted for the WAEC-ERP because it is better than the waterfall approach for most system development. In addition, the incremental model makes it easier to adapt to changes in the software as it is being developed.

Incremental development is based on the idea of developing an initial implementation, exposing this to user comment and evolving it through several versions until an adequate system has been developed. Specification, development and validation activities are interleaved rather than separate, with rapid feedback across activities.

4.2 Project Design

The software design is a description of the structure of the software to be implemented, the data models and structures used by the system, the interface between system components and, the algorithms used. The stages of the software design process are sequential. In fact, design process activities are interleaved, thus feedback from one stage to another and consequent design rework is unavoidable in all design processes.

4.2.1 User Interface Design

The user interface design is the space where interaction between humans and the system occurs. A poorly designed user interface is prone to catastrophic user errors.

The user interface design for WAEC-ERP is such that users are easy to learn to use the system, users can switch quickly from one task to another and full screen interactions is possible with immediate access to anywhere on the screen.

The user interfaces to be accessed by the administrator, registrar and candidate will be described further in this section.

- Administrator Login Page

  The administrator interface requires that the administrator provides credentials of username and password to authenticate and verify access to the Administrator page. On successful login the administrator is directed to the WAEC administrator's page.

  Fig 4.3 shows the graphical view of the user interface for an administrative login.

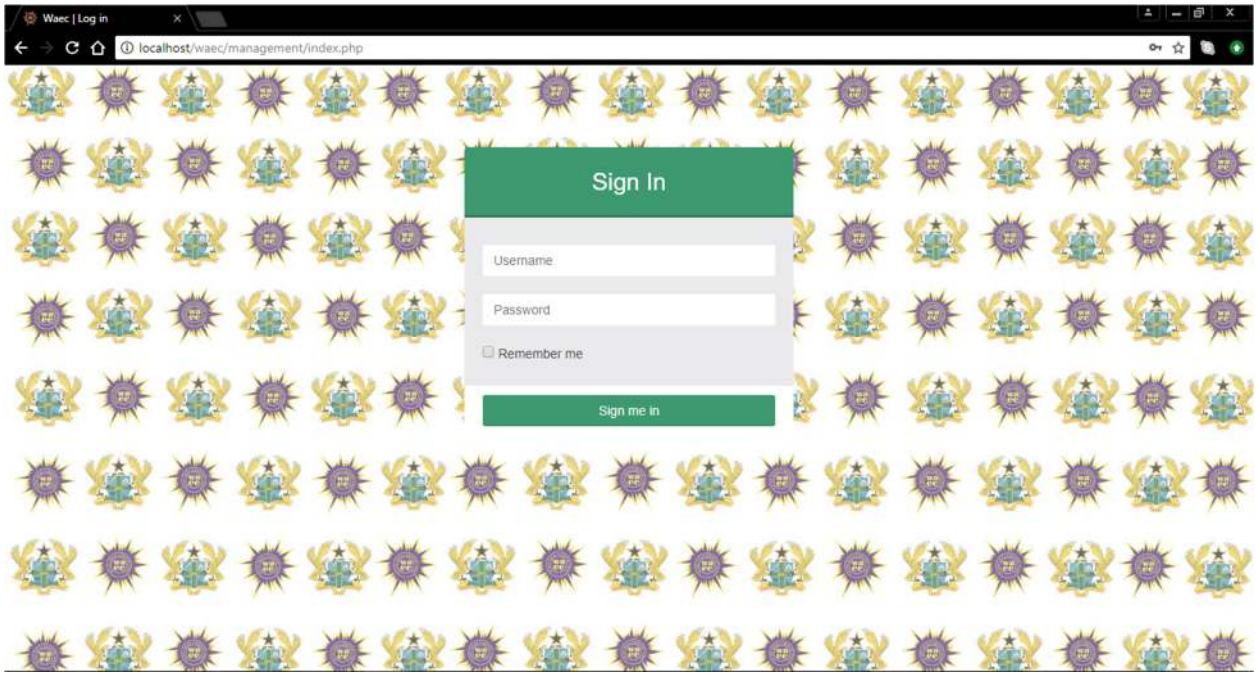

Fig 4.3 The User interface for the WAEC Administrative Login.

- Administrator Homepage (WAEC)

The Administrators opens to the main WAEC dashboard. The WAEC dashboard contains information on the overall reported summaries of the Basic Education Certificate Examination (B.E.C.E) registration process. The summaries at random display reports such as the total number of candidates registered, total number of registered candidates who are males or total number of registered candidates who are females. The number of candidates who selected schools from certain regions and total number of student who registered for a particular course. In addition to the dashboard, there is the log section that monitors the different administrators who access the system, keeping track of their names, activities as well as the date and time of system usage.

Also on the WAEC administrator page allows the administrator to view and add schools as well as view the students profile of registered candidates.

Fig 4.4 below gives the graphical view of the WAEC administrator's homepage.

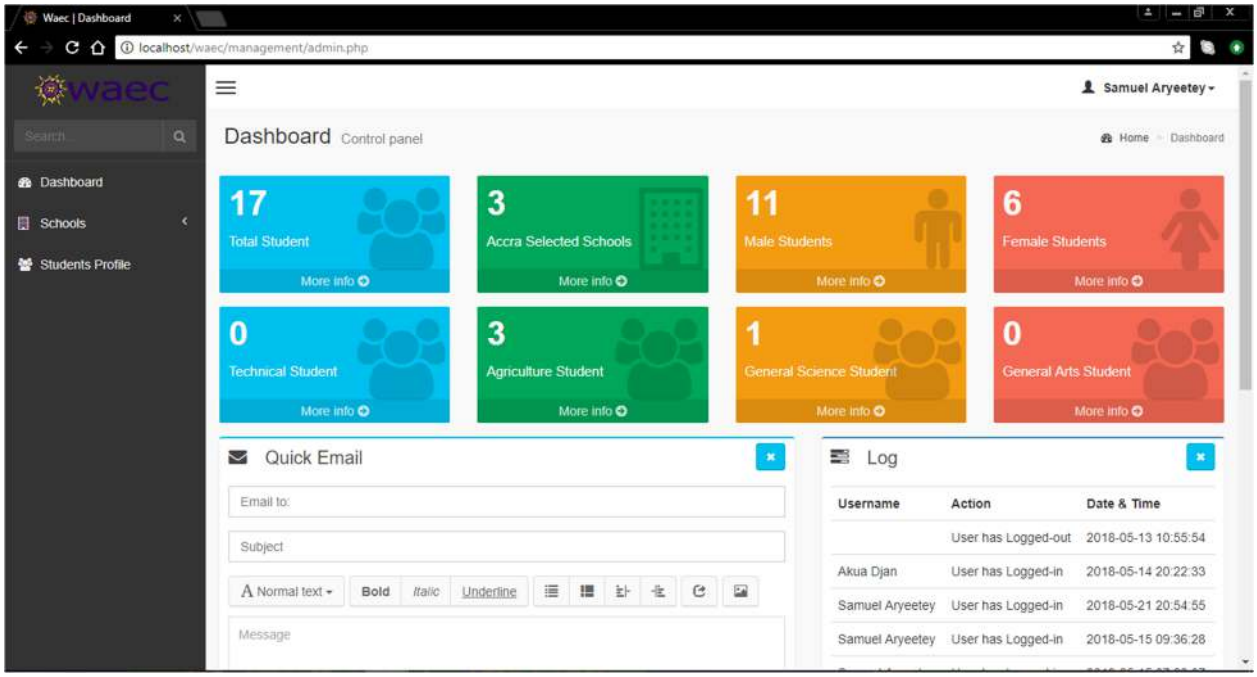

Fig 4.4 Summarized Report on Registration

- Student Profile.

  Student profile keeps the details of students per registrar login and accumulate the candidates profile based on the school code of the registrar's school. These allow index numbers to be assigned to candidate on school code basis. That is, school code assigned to the school's registrar is used to generate the index numbers for the candidate.

  Fig 4.5 gives the pictorial view of an accumulated candidates profile.

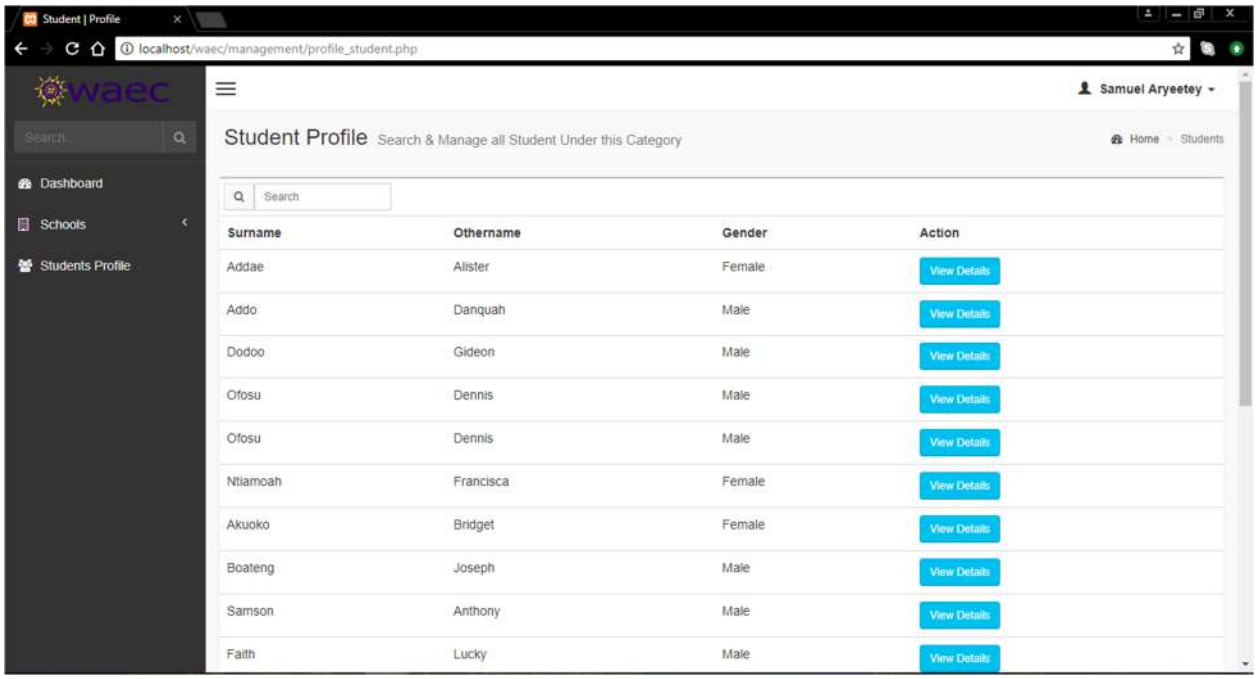

Fig 4.5 Registered Students Profile.

- Student Registration Details

  To give the system users a concise view of the student profile the details of registration pertaining to school selection is condensed in the view details button. The administrator will have a full view of the list of four schools that the candidate has applied for, together with their respective programmes of study and accommodation options, which appears as a pop-up box.

  Fig 4.6 below gives the graphical view of the registration details.

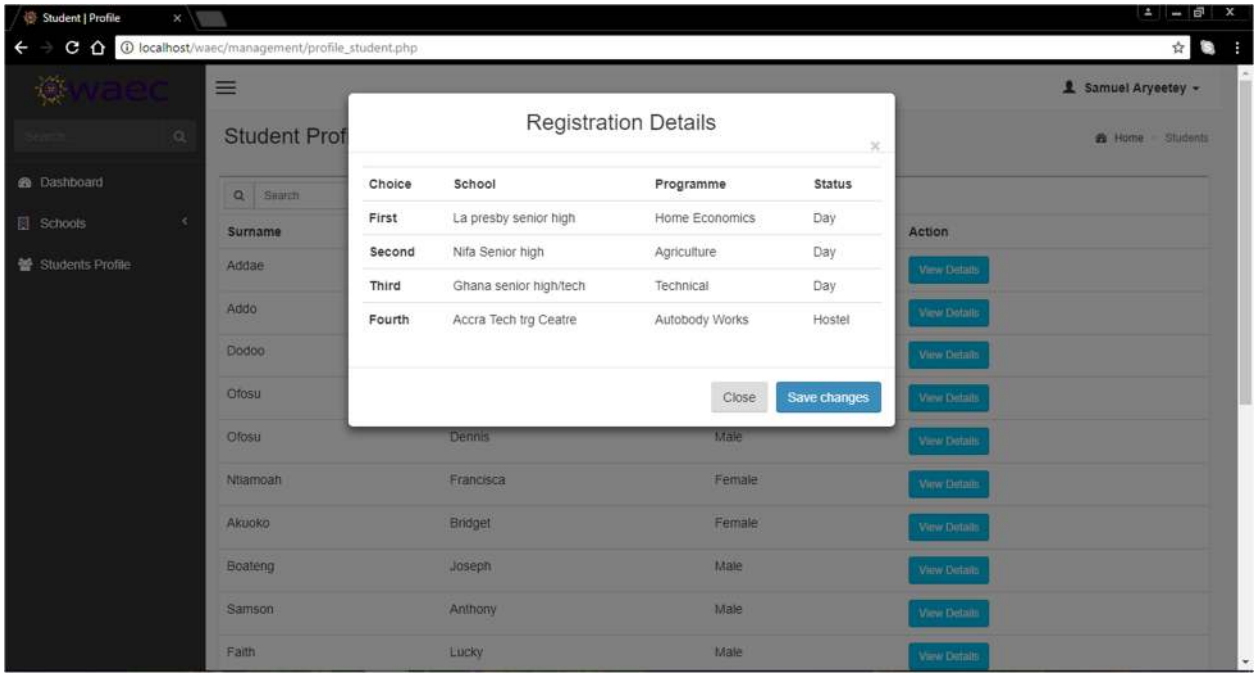

Fig 4.6 A Detailed View of Registered Candidate's Selected Schools.

➢ Administrator Log View

As a security measure the system display an unerasable and unedited log of the various administrators who access the system, keeping track of the users, their activities and the date and time the system is being accessed. In the occurrence of any undesirable event in the system the administrator will be held responsible.

Fig 4.7 shows a pictorial view of the log at the bottom right corner of the administrator's homepage.

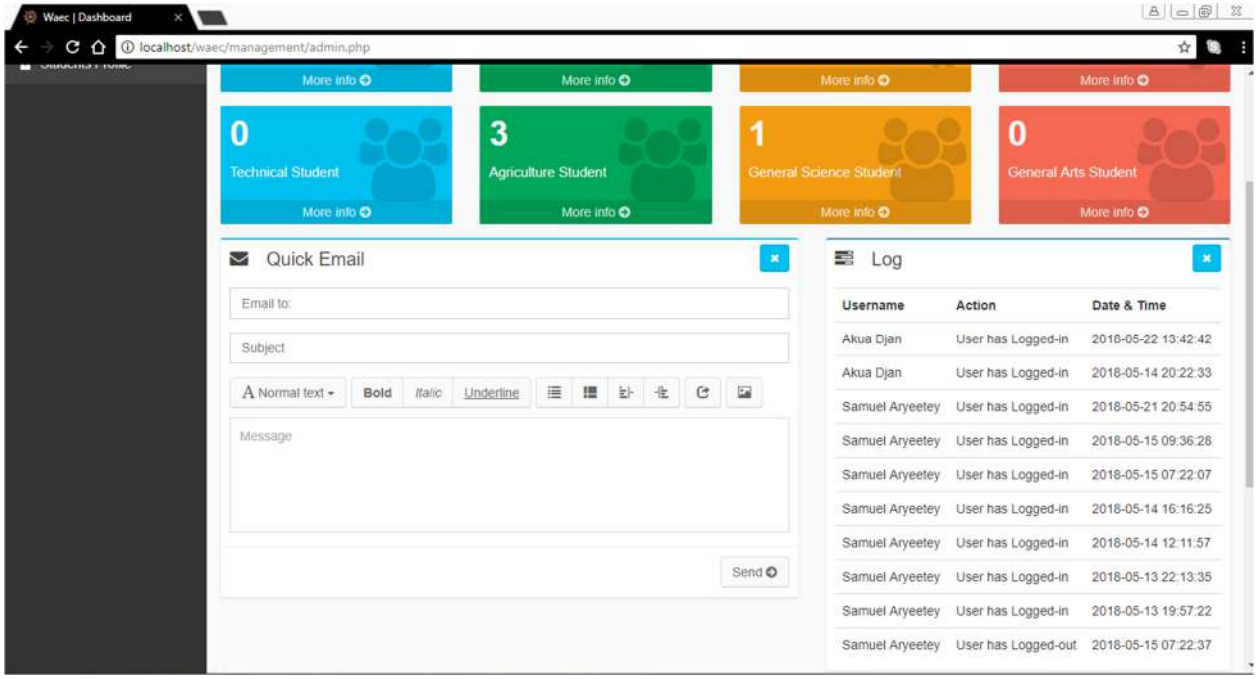

Fig 4.7 Log of Administrative Access to Administrator Page.

- School Registrar Login Page

  The School registrar's login page verifies and authenticate a registrar by entering the credentials of the school code and password. On successful login the registrar is redirected to the student registration page to register the candidate.

  Fig 4.8 shows the school registrar's login page.

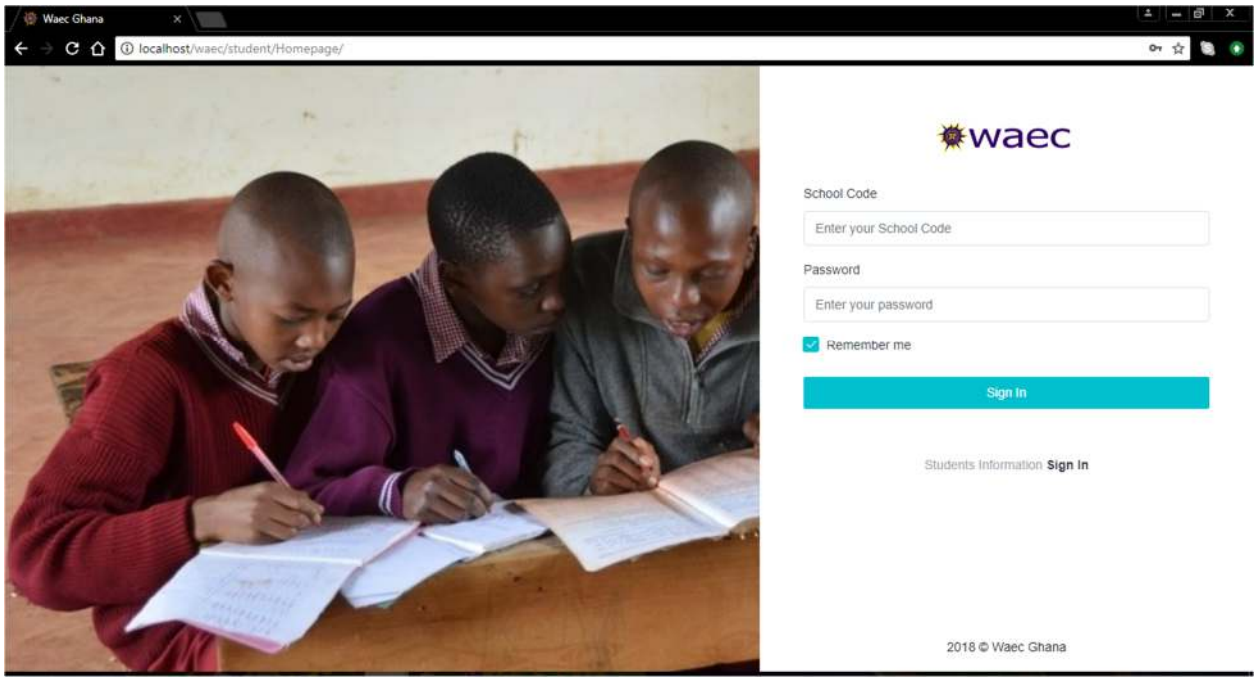

Fig 4.8 School's Registrar Login Page.

- Candidate Registration Form

  Fig 4.9 to Fig 4.15 covers the registration form for the B.E.C.E candidate. A passport sized photograph of the candidate is taken and uploaded then the personal details of the candidate is next captured including the name, date of birth, address, and contact.
  Next the parent or guardian details are captured and saved. The registrar proceeds to aid the student in school selection process, which is categorized into four comprising of categorizes A, B, C and then technical or vocational studies. Selection can be done with ease since the selection process is computerized such that a student can select based on this criteria without having to worry about how it works:

  - One school cannot be chosen twice
  - All four school can be selected from "Category A"
  - Not more than two schools can be selected from "Category B"
  - Only one school can be selected from "Category C"
  - A maximum of two schools can be selected from "Technical / Vocational Institution"
  - Candidates who desire to pursue purely Technical Programmes may select all 1st - 4th schools from Technical/Vocational Option.

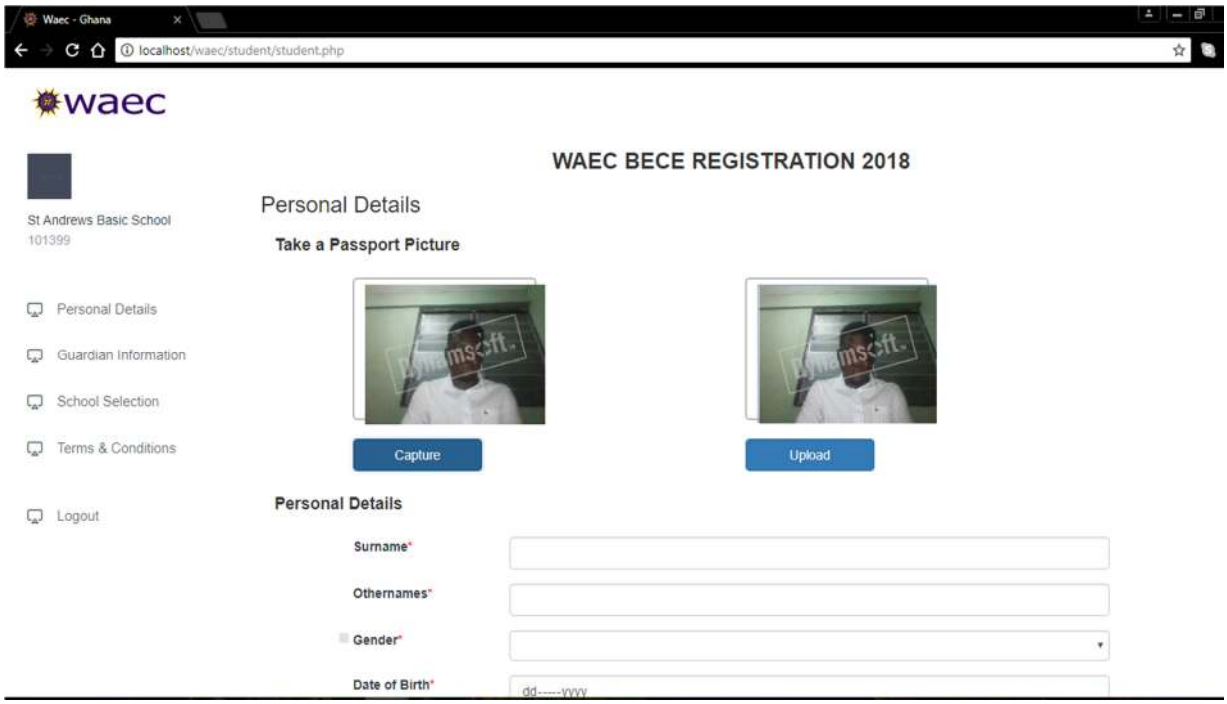

Fig 4.9 Capturing Candidate's Passport Photo and Personal Details.

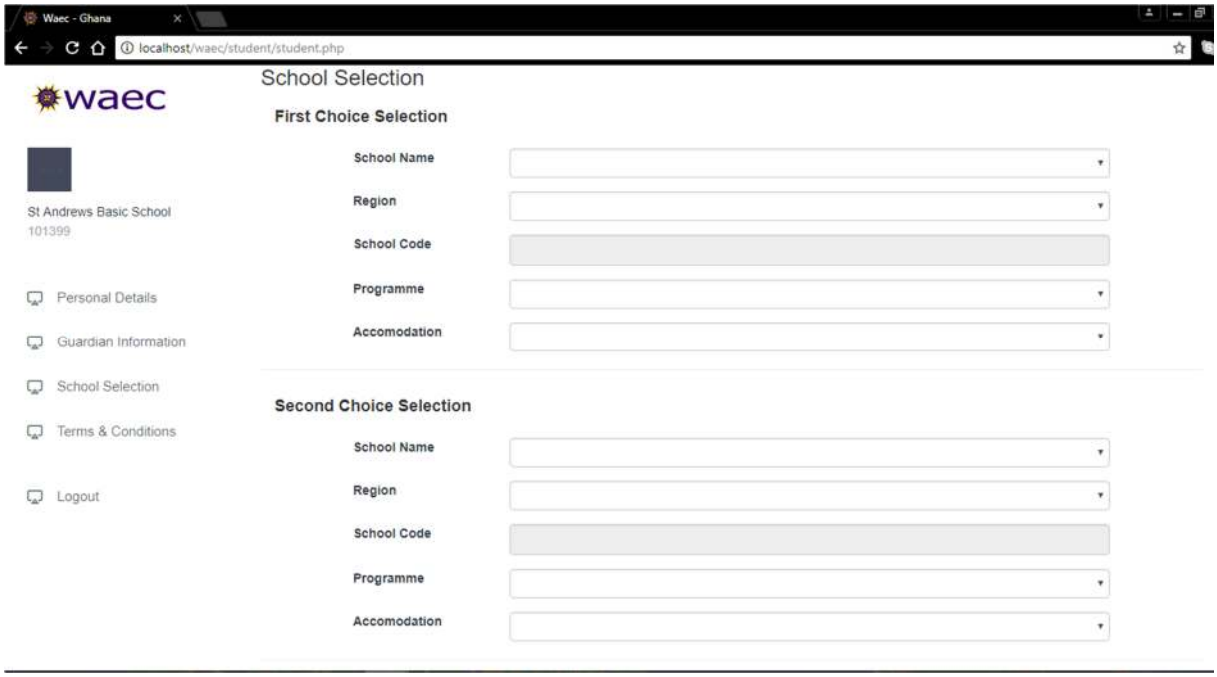

Fig 4.10 Senior High School Selection (First and Second Choice Selection).

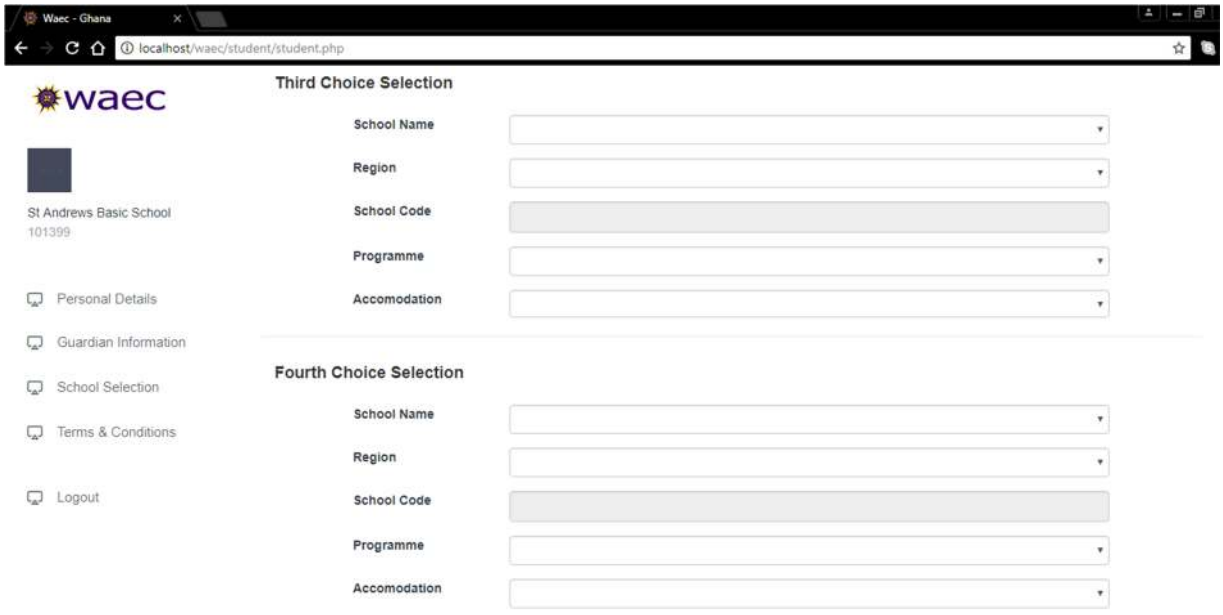

Fig 4.11 Senior High School Selection (Third and Fourth Choice Selection).

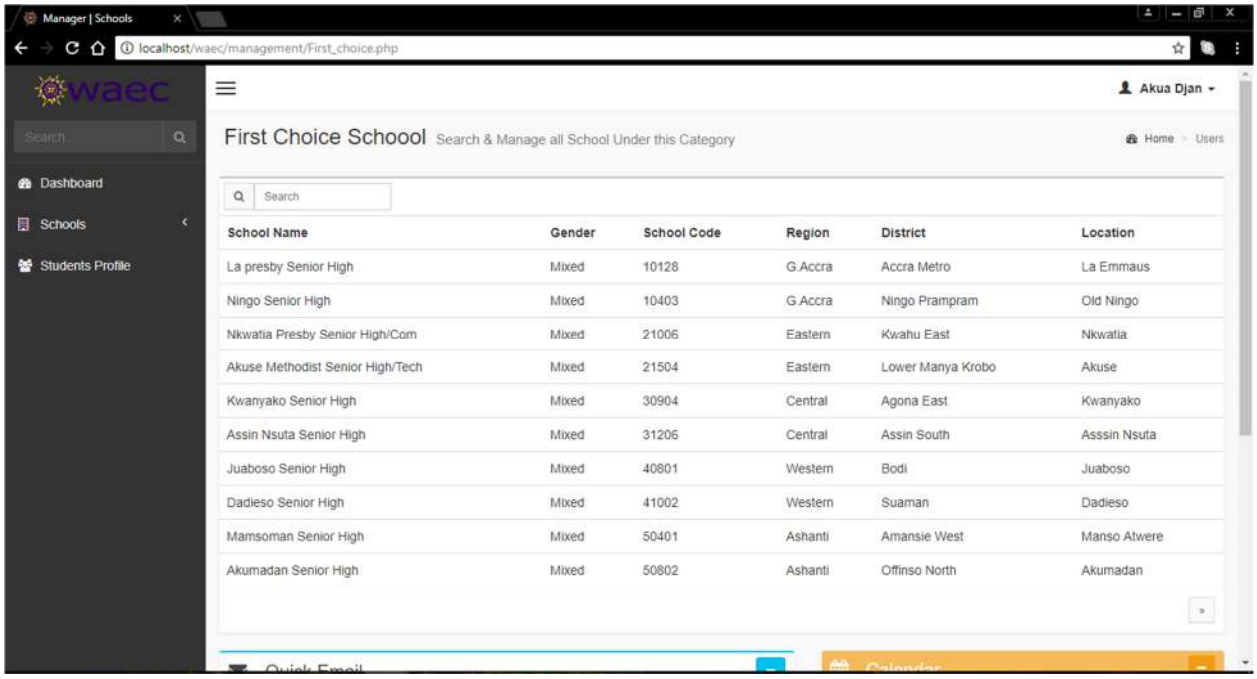

Fig 4.12 Category A Senior High School.

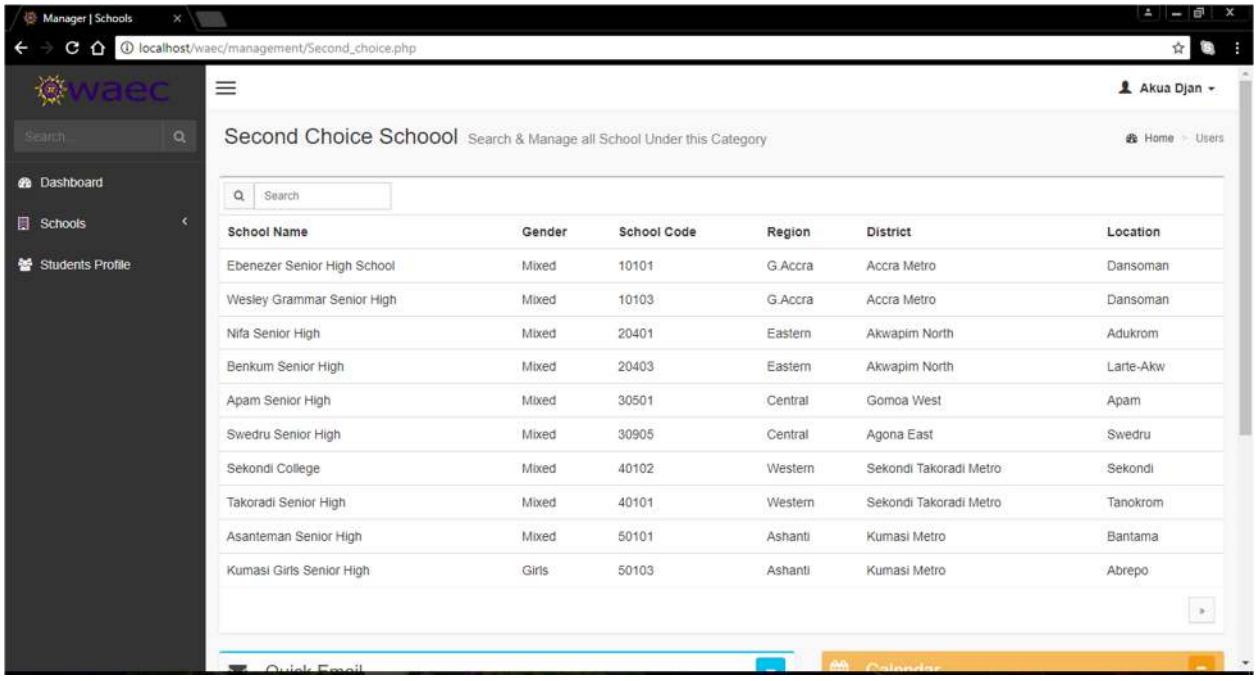

Fig 4.13 Category B Senior High School.

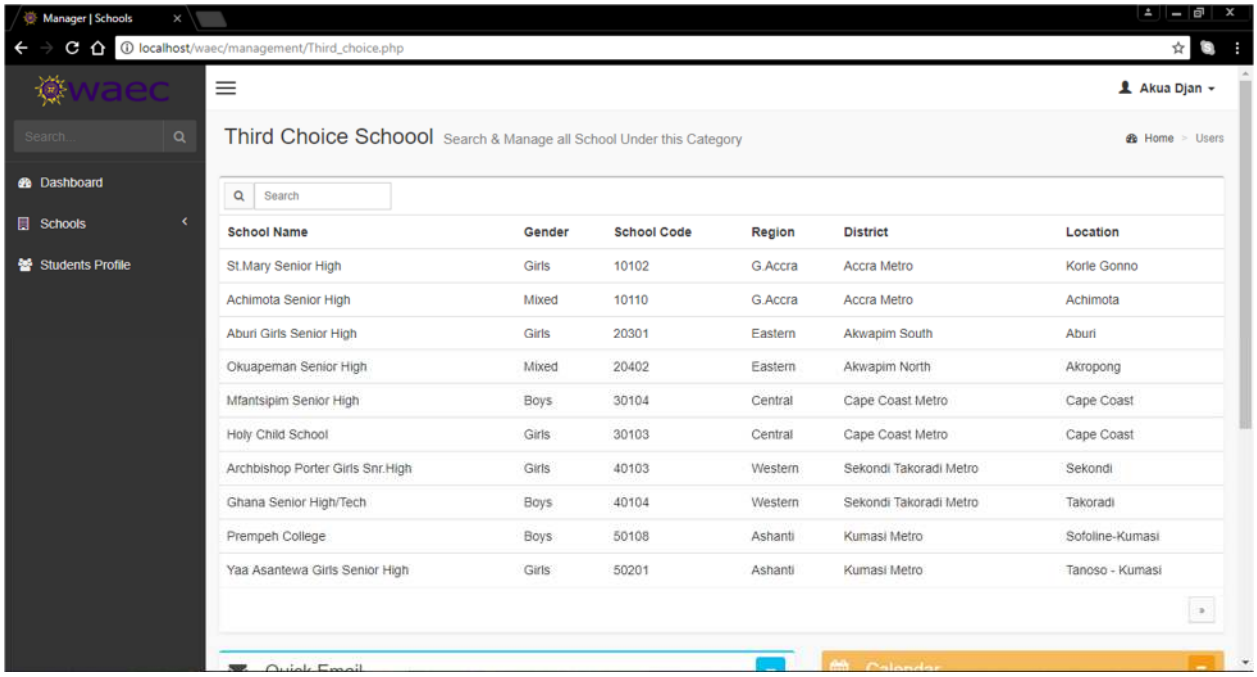

Fig 4.14 Category C Senior High School.

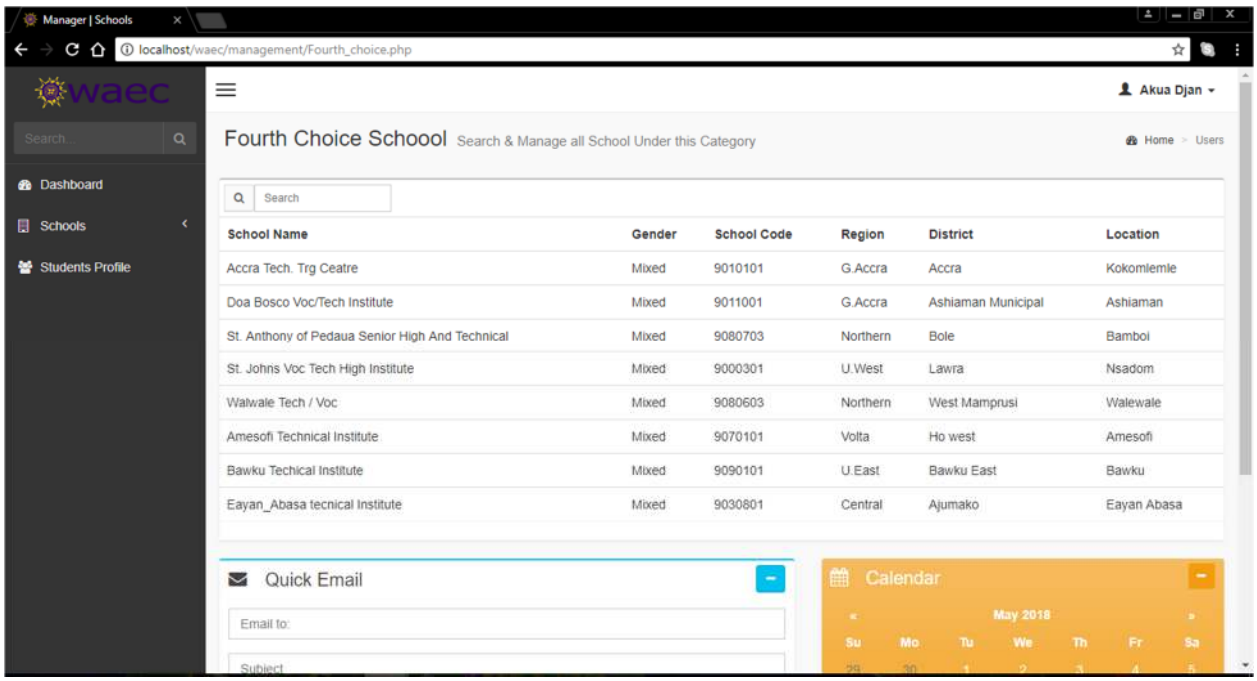

Fig 4.15 Technical and Vocational Schools.

- Candidate Login Page

Fig 4.16 is the pictorial representation of the registered candidate's login page, that logs a candidate on to the student portal. Each candidate accesses the portal with valid credentials, consisting of the index number assigned to the student.

The canddidate on successful login is redirected to the homepage of the student portal where he or she can download a pdf format of the registration completed by the school's registrar.

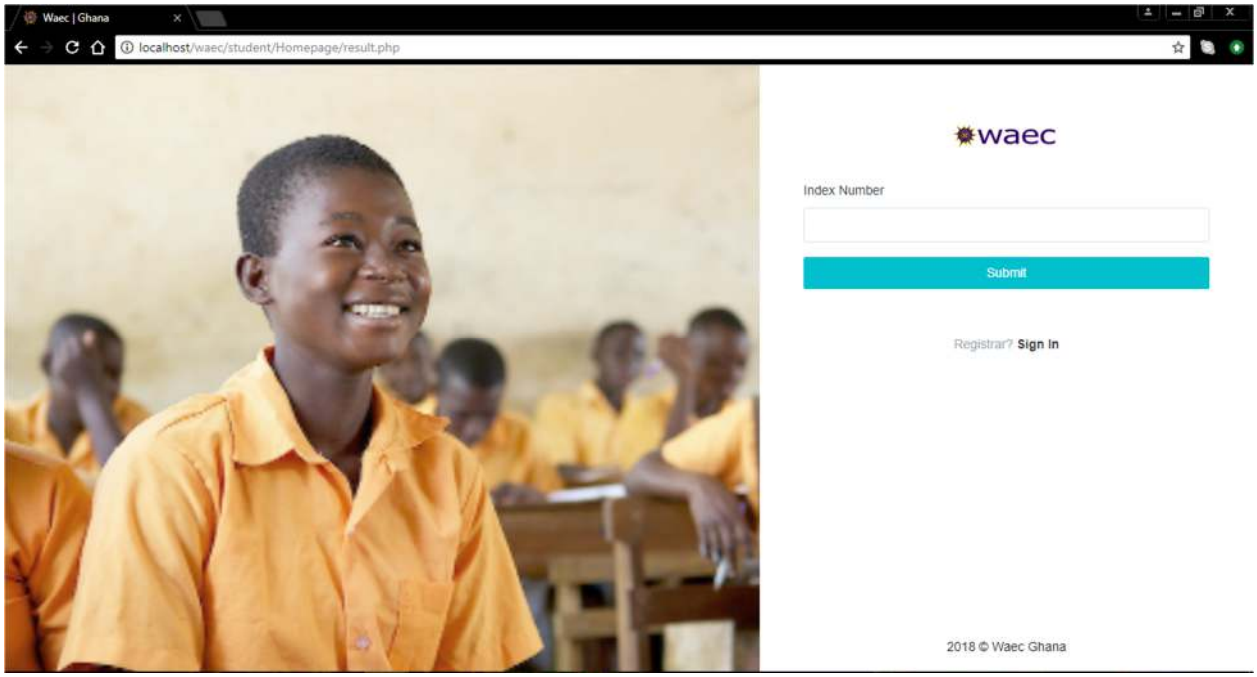

Fig 4.16 Candidate Login page.

4.2.2 Database Design

The database design primarily is a collection of processes that facilitates designing development, implementation and maintenance of the database management system (DBMS). It helps to produce database system that meets the requirement of users and have high performance.

The database design help to reduce errors, remove redundant data and incorrect data.

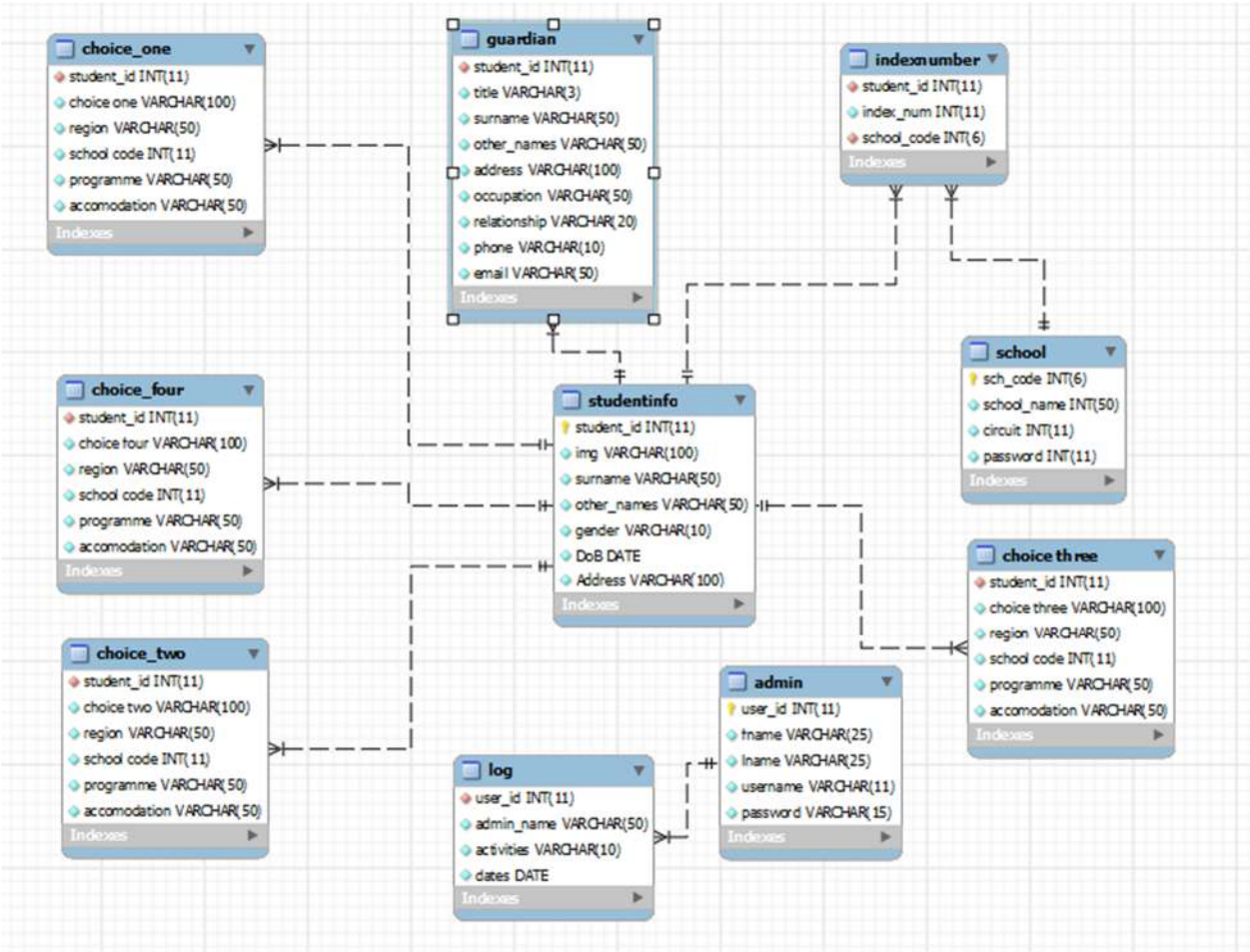

Fig 4.11 Normalized database for WAEC ERP System.

CHAPTER FIVE- SYSTEM IMPLEMENTATION AND TESTING

5.1 Introduction

In the implementation and testing phase of the WAEC-ERP system the components in the system are implemented and structured into implementation sub-systems. All requirement specifications are transformed into an executable software. The process is accelerated by the design models and the completion of the implementation is testing phase of the design cycle. When testing is completed, the software is made available for use by the customer

5.2 Construction

By using the wireframe design the design process is created for the content structure for each page.

The sublime text editor allowed in the creation and editing of codes for HTML 5, CSS, JavaScript and the PHP. It's simplistic and does not overcrowd the screen, alongside possessing lots of customizability with packages/ themes. The existence of multiple cursors to select multiple lines, words and columns, and the features of the autocomplete provided much ease of use for most codes written. Included are device compatibility to increase accessibility.

The local database created for the web application was MySQL.

5.3 Testing

In this stage of the software development we desire to show that the software does what it is intended to do and discover program defects before it is put into use to satisfy all specification of customer. By using artificial (dummy) data, the software is tested for accuracy.

The WAEC-ERP was tested as a single, monolithic unit. Testing was first done in units to ensure that each component meet it requirement. This helped to reduce the difficulty of locating the source of an error if the system is integrated. When unit testing has been ascertained to produce valid results, the integrated components was tested. However, when an error is encounter, the program was debugged, and testing process and other processes repeated, sine the testing process in the model designed is an iterative one.

Thus, the result of tests was checked for run errors, anomalies, and they were immediately rectified to ensure the effectiveness of the developed systems.

5.3.1 Test plan

The three stages involved in testing process was employed in the WAEC-ERP test plan. They are:

1. Development testing
2. System testing
3. Acceptance testing

In development testing stage, we tested each component making up the WAEC-ERP system using test data. Without other components of other system, the individual components were individually tested.

The individual components are integrated to form the computer system. For holism, the system testing aims at finding errors that result from unanticipated interactions between components and components interface issues. System testing is an integral process in the test plan because it is concerned with showing that the system meets its functional and non-functional requirement, and testing the emergent system properties.

The final stage of the test plan is the acceptance testing: where the system is accepted for operational use. Because real data is used at this stage, acceptance testing reveals errors and omissions in the system requirement definition. Requirement problems where the system's facilities do not really meet the user's needs or system performance is unacceptable.

5.3.2 System validation

The process of checking that all initial requirements actually define the system is exactly what the customer really anticipated is the system's validation stage. Should a problem be discovered during development or after the system is in service then the errors in the requirement document will lead to extensive rework cost, hence requirement validation is very important.

During the requirement validation, different types of checks are carried out. The checks we performed included: Consistency checks and completeness checks. Consistency check ensures

that the requirement in the documents does not conflict. That is to say that, there should not be contradictory constraints or different description of the same system function. The completeness checks ensure that the requirements document should include requirements that define all functions and the constraints intended by the system user.

5.3.3 System Verification

The verification of the software is the confirmation, through the provision of objective evidence, that specified requirements have been fulfilled. As such verification is purported to identifying the defects introduced at the time of any transformation of the inputs into outputs.

Regardless of whether or not one thinks potential errors will occur, the verification stage should not be neglected. The user's requirements, system's requirement, function system elements, documents among others are elements that were verified.

CHAPTETR SIX- RECOMMENDATION AND CONCLUSION

6.1 Conclusion

The advancement in Ghana educational system and the current advent of free senior high schooling in our country has brought the West African Examination Council (WAEC) as an organization into the spotlight.

WAEC has became an unavoidable ladder to climb as far as education is concerned in Ghana and student progress from one level of studies to the other through the WAEC examination procedures.

In this project, a web application has been developed to assist in the registration process preceding the Basic Education Certificate Examination.

The future objective is to integrate the existing WAEC School Checker System and WAEC Online Results Checker System.

6.2 Recommendation

This project recommends that WAEC uses a computerized registration system to facilitate the registration process and reduce the errors and data loss.

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