IS PROJECT 2.

SCHOOL EXAM RESULTS INFORMATION MANAGEMENT SYSTEM.

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Declaration and Approval

I declare that this work has not been previously submitted and approved for the award of a bachelor's degree by this or any other University. To the best of my knowledge and belief, the work contains no material previously published or written by another person except where due reference is made in the work itself.

Student's signature:

…….…….. [*Signature*]

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Approval

The work of ***89404*** was reviewed and approved *(for examination)* by:

Supervisor's signature:

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…….…….. [*Date*]

Abstract

The proposed system will monitor student academic progress by automating results processing and analysis of exams while maintaining a database of student scores. Currently, schools use multiple software to achieve the basic task of analysing student performance; that is a spreadsheet software for handling student's scores and a different tool for preparing student reports. Use of these systems require knowledge on how to use them such as knowledge of spreadsheet formulas.

The proposed system will be developed using Rapid Application Development (RAD) model because of its suitability for projects with fewer people and a short development time.

The proposed system will store a database of students' performance from the beginning of their academic journey, making it easier to track the trends in an individual student's. This in turn leads to informed and efficient student mentoring. By automating the results analysis, time wasted in manual computation of the results will be reclaimed and harnessed in dispensing quality education by increasing contact hours between learners and teachers, hence boosting student's morale.

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Chapter 1: Introduction

1.1 Background

The move by the government to equip Kenyan schools with tablets and laptops to enhance computer literacy among pupils has necessitated the connection of all public schools in Kenya to the electricity grid. Kenya has 20,000 plus Schools and 99% of them have been connected to the grid(Kipsang', Kamande, & Baheta, 2017). Therefore all Kenyan schools can host computer systems to be used in results processing and storage of exam results for future analyses. The ministry of education does not offer a standard software to be used by schools in Kenya for the processing of pupils results. In an effort to automate results processing, most schools use spreadsheet software such as excel to analyse pupil's results and a different software to prepare pupils' reports. Use of these software requires prior knowledge on how to use them such as a strong foundation in exam formulas a skill which most school teachers lack. Using multiple software to achieve a basic task is not effective and degrades the performance of teachers. Goodhue (2013) posits that task technology fit leads to utilization thus utilization and fit leads to performance impact. School pupils sit for at least three exams per term which takes at least three days to complete a set of exams. Marking and analysis takes almost a week before the results are released to the pupils. This evaluation forms the basis of determining whether a student is fit to progress to the next class.

Valuable education is attained by constant evaluation of students to determine their learning progress. Exam systems provide information and various reports from the database in order to make decisions in line with the aims of the school and facilitate controlling of the activities to achieve the aims (Telem & Buvitski, 2017). Analysis of this exams at the end of every term and year is usually time consuming and often lead to teachers missing classes to meet deadlines of exam analysis and reports (Omolewa, 2016). Data analysis procedures supported by educational technologies are not only faster and more efficient, but are also

considered more precise, reliable and accurate. They yield less messy data and illustrate phenomena without unwanted variables and human error (Hitch, 2012).

1.2 Problem Statement

Schools which exclusively use Microsoft excel to analyse pupils exam results expose the exam results data to many risk factors. Many users are able to access services and execute business functions at a higher level than what they are authorized to. This is a serious authorization risk (Agarwal, 2013). Apart from that, the integrity of this data is not ensured because it is susceptible to both accidental and intentional manipulation by any one capable of accessing this data preventing the accuracy of pupil's performance. When original data is different from the retrieved data in a system, integrity is breeched (Huansheng, 2013). This could mislead judgement of pupil's performance and consequentially reduce the morale of affected pupils.

Confidentiality of the data is also at risk since teachers may leak information to unauthorized people. This is a critical issue because it undermines the rights of pupils. The risk for management information systems is that the information in the system may be used for purposes different than the original cloud service intention (Agarwal, 2013).

These excel files are locally stored on computer hard drives and in some cases without proper backup plans. In the event that these files are corrupted or the drive crashes all these information is lost. It is also a cumbersome process to track a pupil's performance since the day the pupil joined the school or during a certain time frame. This makes it hard for teachers to know precisely the weakness of a specific student. Too much time is spent on analysis of pupil's performance thus

the pupils are left unattended. This correlates to increased cases of indiscipline among students (Hendrickson & Joe, 2015).

1.3 Aim

The aim of this project is to develop a school exam results management information System that will be used to organize, display, monitor, evaluate and understand students' academic progress.

1.4 Specific Objectives

i. To evaluate the challenges faced by the existing exam results management information systems.
ii. To review existing school exam results management information systems.
iii. To design and develop a primary school exam results information system that manages exam results of primary school pupils.
iv. To test the developed primary school exam results management information system.

1.5 Justification

One of the most widely studied theories of Information technology use is the Task Technology Fit theory (McCarthy et al, 2014). Goodhue and Thompson (2012) posit that information technology is more likely to have a positive impact on individual performance if the capabilities of the information technology match the tasks that the user must perform. Tasks carried out by teachers include calculation of student scores, analysis of subject performance and individual student performance and present the data in form of graphs and tables using complex software tools such as Microsoft excel. The proposed information system integrates all these tasks and makes it easier to perform the tasks without knowledge of complex spreadsheet commands.

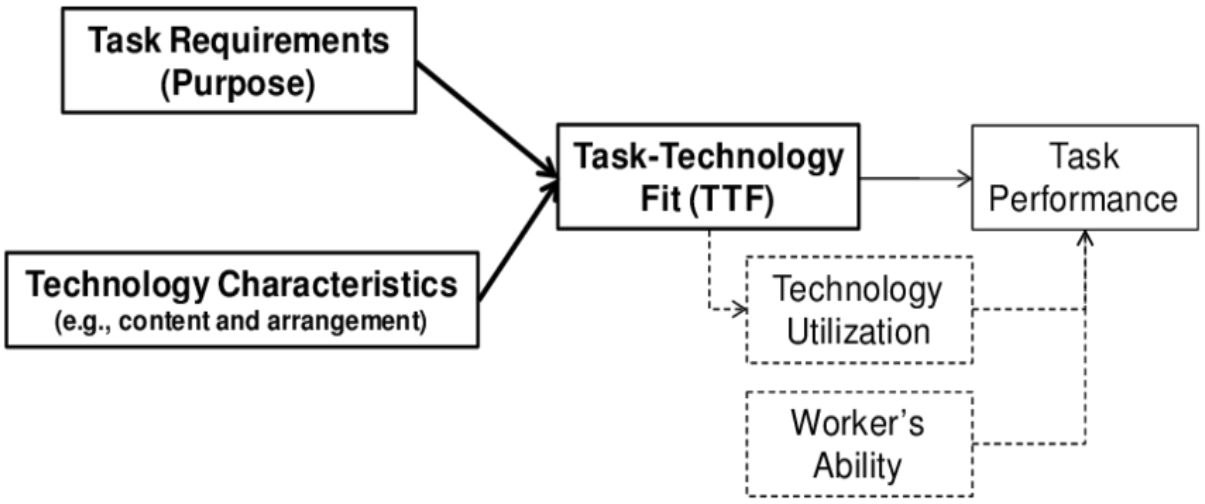

Figure 1.1 Main constructs in task-technology fit (TTF) theory (Adapted from Shaw and Giles, 2016)

McCarthy (2014) points out that ease of use, accessibility, reliability, compatibility and right information are the characteristics of a technology that identify a strong fit to tasks. Ease of use characteristic of the proposed exam management information system can be demonstrated by simple mouse clicks to achieve complex functions such as generation of graphs based on student performance. The proposed exam management information system will be web based and therefore accessible from any device and location. User restrictions based on tasks performed by users and segregation of duties as an internal control to minimize fraud and errors in the system make the proposed exam management information system reliable. Due to its low system requirements the system is compatible with most computer systems owned by schools.

Claffey (2013), points out that a technology that supports the required tasks to be performed by staff results in positive performance impact of organizational staff. Measurement components of the suitability of a system to its users include among others, authorized access to data, training and ease of use of the system, production timelines and information systems relation to its users (Straub, 2014). McCarthy (2015), has shown that task technology fit leads to utilization and utilization leads to performance impact.

1.6 Scope and Limitations

Scope

This project is due to solve the problem of other school exam results management information systems that exist in the Kenyan market. The system will deal with data manipulation either accidental or intentional manipulation by adding proper features to the information system.

Limitations

The challenge the project anticipates is getting permission to analyse the challenges that are faced by the existing exams results management information systems that are available in Kenya. But we shall use analysed and available data to study and learn the problems faced by this information systems and draw conclusions to them. The project will also draw reference to systems I can get access to like the AMS for Strathmore University and others.

Chapter 2: Literature Review

2.1 Introduction

This chapter reviews on the existing literature on the current school exam monitoring situation in both private and public schools in Kenya and the trends in technology. It begins by reviewing some of the software products that exist, exploring the gaps and challenges faced by the users of the system and it finally shows various technologies used in web application development.

2.2 Current Exam management systems

Data use is central to the school improvement process (Earl & Katz, 2012), and there are many case studies available describing the variety of ways in which data has supported educational decisions (Lanchat, 2012). School data analysis systems should provide accurate and efficient storage and retrieval along with useful and intuitive presentation (Wayman et al., 2014).

Software products available in the Kenyan market include among others, ELCEN and ShulePro management systems. These systems provide the means for teacher to view and understand student trends in academic performance. University of Geneva et al (2013) points out that we are experiencing a paradigm change in schools – from teacher centred to learner centred. Teachers in schools experiencing the paradigm will be able to make informed decisions about students' academic results.

2.2.1 ELCEN Exam management software

ELCEN software was developed in 2012 by Prime-Soft solutions. It is a management system that can work in a networked environment. It is available for both primary and secondary schools. The ELCEN software has various features to enable the school management run its operations. Among the features are: class management library management, fee management, data imports and exports,

inventory management, ledger accounting, budget accounting, ledger reports and school reports (Lelgo, 2019).

Of all these features only the class management is close in relevant in monitoring students' academic progress. The data imports and exports feature is useful in allowing a teacher to use pre-existing lists from a different source in the system.

A user is required to register before using the system. At registration the user is required to provide their first, middle and last names as they appear on the staff identity card, their employment number, their email address, a password. The users then select their role as the users of the system as a teacher, accountant, librarian, or manager. The teacher role has additional sign up information required. They need to specify the class in which they are the class teacher, and subjects they teach. The users can then log in using their employment number and password for them to access the system and view the dashboard which is customized according to their role. Users with the teachers can view or edit a student's profile as well as add the students to a specific class. The teachers can also key in already processed students exam results in to the system.

The manager can view and print the profile of a student as well as their class list and class teacher details. The manager can also view and manage teachers by adding or removing subjects they teach and view their detail.

The software is also compatible with MS Access database. Reports are produced using crystal report writer which is done by the class teachers. The reports can be sent to parents on request through emails as attachments. Security in the system is ensured by use of passwords and restricting users to their specific user groups. Access to data is also restricted to user groups and profiles (Kevuywa, 2019).

ELCEN is only limited to class management only and therefore cannot track students' performance nor generate a comprehensive analysis of students' performance.

2.2.2 ShulePro Exam Management Software

ShulePro was developed in 2011 by Prisma Solutions Company. It is a school management system that can work in both online and offline modes. This software application was developed using C# programming language and dot net framework to be used on the windows platform only(Ng'ang'a, 2019). This software is characterized by its features that ease the work of teachers and management of the school hence teachers are able to concentrate more on their primary objective – facilitating the learning process of learners.

Relevant features in the review of existing systems for exam results monitoring include: students' list management, teacher performance comparison, data imports and exports, time table management, information distribution via SMS to key stakeholders such as parents and teachers, and exam results entry. User generated data from the application can be uploaded to a school's website and backed up on servers on the cloud. Details such as a student's entry marks into the school are also captured in the system (Ngua, 2019).

When a user with the teacher profile logs in, they are able to view the class attendance of the students belonging to their respective classes if they are class teachers; otherwise an ordinary teacher will view exam results of the latest exams. Class teachers can add an exam and capture students' marks. Users can also view the results of the exams and filter the results by a student entry marks, rank or average marks. The class teachers can also update students' attendance from the class attendance list. From the menu they can access functions to add students to their classes either manually by keying in their details or by importing data from excel files. Users can also export the data to excel files for further processing.

An administrator user is capable of adding teachers into the system and assigning them respective classes and subjects. They can also send a student's exam results to their parents as well as compare teachers by the performance of their students (Ng'ang'a, 2019).

Security is handled by use of passwords and encryption as well as user profile restrictions such as allowing only the administrator to create and delete accounts. However, when a user forgets their password, a new profile will have to be created for them (Kipng'etich, 2019).

ShulePro does not keep a log file of the transactions made by the users of the system. This could lead to various security issues such as repudiation of users after an error with a significant impact on the processes of the school.

2.3 Gaps in the current exam monitoring systems

Both ShulePro and ELCEN management system do not provide tools for advanced analysis since they only focus on raking students according to performance. Because the programs have been designed as desktop applications, users have to meet various system and hardware requirements in order to use the system. If the systems were developed as web applications, the only requirement would be a browser. Also over the years, there have been various automated examination systems that have been developed with one or more limitation for example; Result integrity, Lack of security, Computer crashes occur, Un-authorized access. The loss of data is also one major factor in most of the examination systems both traditional and modern.

2.4 Possible Development Technologies

The current most useful technology to reduce loss of data is the use of cloud storage. The advantages of using cloud computing in online examination management include; optimum utilization of existing infrastructure, cost reduction, reduces effort in managing technology, powerful computing and storage capacity, virtualization, resource pooling, rapid deployment and reusability, maintainability and scalability. The technologies available for examination security are ; username and password authentication schemes,

cryptographic schemes, integrity and monitoring schemes, biometric authentication schemes.

2.5 Conceptual Framework

The proposed system will have two modules; an administrator module, a data entry module and an external user module. External users will include: parents and school board members and other relevant stakeholders in the academic performance of the students in the school. These users will be able to access the general school performance reports, class academic reports relevant to them and student-specific reports. The data entry module will be the role that will be assigned to most teachers. The teachers will be responsible for student registration, exam marks entry and student promotion. The Administrator module will be able to manage users, printing or viewing transaction logs and initializing a backup of the system to the cloud.

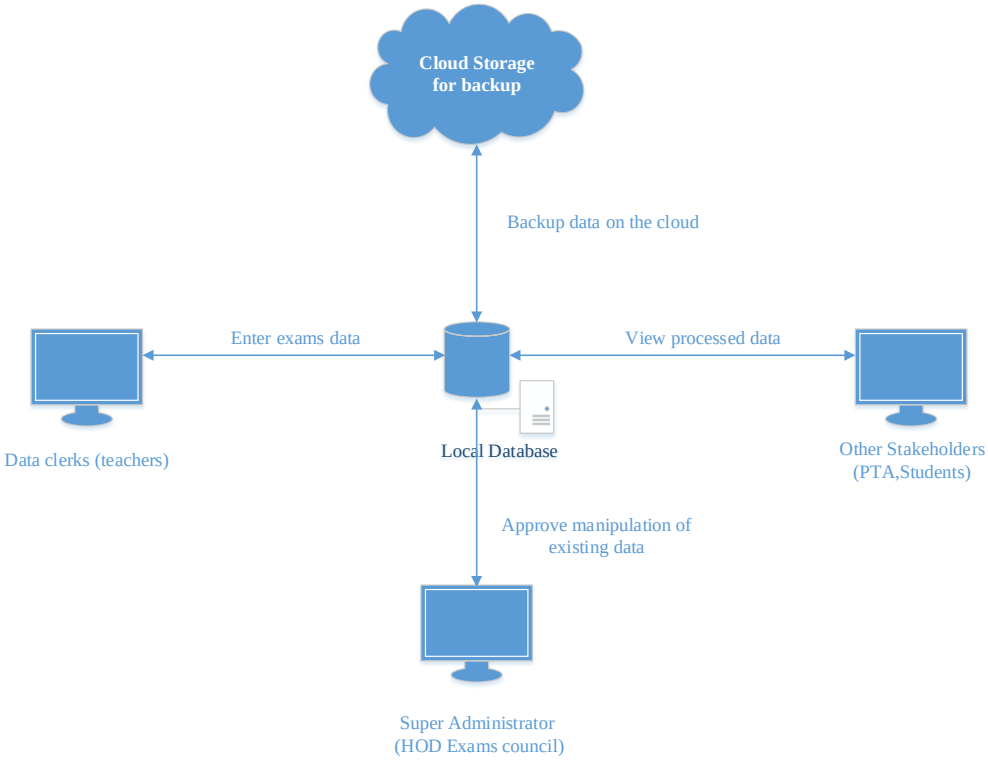

Figure 2.1: Conceptual framework of the assessment test monitoring system

Chapter 3: Development Methodology

3.1 Introduction

Rapid Application Development (RAD) is a software development methodology that focuses on building applications in a very short amount of time (Saxena, 2014).Rapid Application Development's primary advantage lies in an application's increased development speed and decreased delivery time (Bourova, 2016). RAD attempts to reduce development times and the difficulty in understanding a system from a paper-based description (Bourova, 2016). It also enhances productivity with fewer people in a short time as well as encourage for integration from the beginning thus minimizing integration issues durning the final stages.

The figure below illustrates the development lifecycle of an application developed using rapid application develoment methodology. Requirements planing is the initial stage that requires the definition of user requirements. In the user design stage, the architecture of the application is designed using various uml tools such as class diagrams, use case diagrams and sequence diagrams. The system's database schema is also designed at this stage. Construction refers to the actual development of the system by writing code using various tools such as integrated development environment (IDE) tools and computer aided software engineering tools (CASE tools).

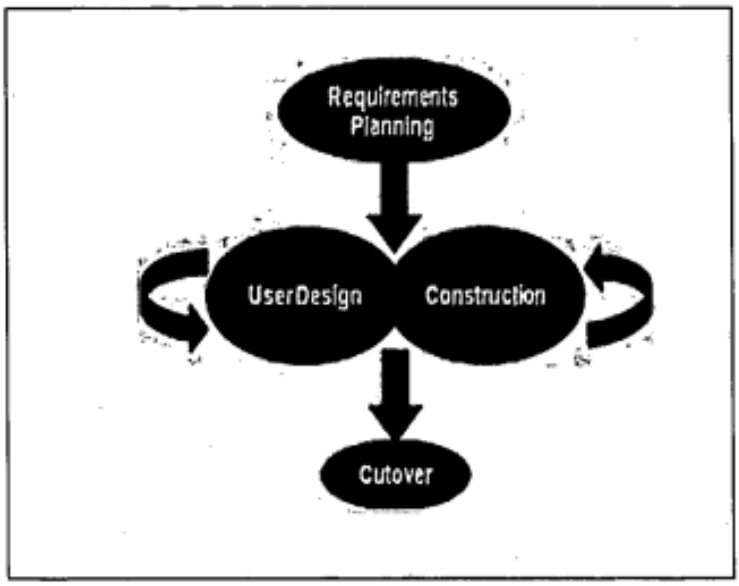

Figure 3.1: The Rapid Application Development Model (Adopted from Maldonado, 2012)

3.2 Requirements

New programs must be functionally identical to the existing program. That is to say, they must meet the requirements of the existing programs (Kathryn, 2015).

3.2.1 Functional requirements

The functionality of the proposed system will largely be dependent on the users input. The Assessment test monitoring system will perform the following functions:

i. Summing up the marks for every student
ii. Calculating the mean mark for all the subjects
iii. Grading all the subjects for each student and subject
iv. Ranking the students based on their performance
v. Highlighting students who have made significant changes from their previous assessment test.

3.2.2 Non-functional requirements

i. **Security**: - System logs will be documented and stored for future reference. Users of the system will be able to retrieve their passwords through their Emails.

ii. **Availability**: - The system is web based and therefore it is readily accessible to users through the browser as long as there is a network connection. The internet will be needed to provide backup and in instances of password recovery.

iii. **Scalability**: - The system will be able to grow and adapt to the ever changing demands of the users.

iv. **Portability**: - One of the reasons I decided to create a web application is because they are highly portable. As long as someone has access to the internet and has a computer/tablet/smart phone or any device which can access the internet they should be able to use it.

v. **Integrity**: - The system, through user restrictions and other security measures, will be able to ensure that the data is consistent and accurately stored in the database.

3.3 Analysis

System analysis will be conducted to ensure the assessment test monitoring system fills up the gaps that exist in the current system of assessment test analysis, and to verify that it delivers the proposed functional and non-functional requirements. An analysis will also be conducted to ensure that the proposed assessment test monitoring system addresses the top ten OWASP critical web application security risks.

3.4 Design

Design diagrams to be used in the design of the proposed system will include: a class diagram, a use case diagram, sequence diagrams and a database schema. The use case diagram will be used to represent the elements' interaction with the system and describe the set of actions that the assessment test monitoring system

can perform (Botting, 2016). The class diagram will be used to communicate the static structure of the object oriented assessment test monitoring system in terms of the constituent classes and their relations (Berardi et al., 2015).

3.5 Implementation

The proposed web application will be developed in an object oriented approach using Laravel for backend development. This is because OOP offers a path out of the abyss (Jones et al., 2014) that would have otherwise been experienced if procedural languages would have been used. Jones et al. (2014) points out that programs created in procedural languages tend to be difficult to manage, hard to maintain and impossible to extend. The user interfaces and security features which will be implemented in the system make the system complex hence the need to use OOP approach. Jones et al. (2014) agrees that graphical user interfaces, the internet and a host of new technologies have dramatically increased the complexity of our projects.

3.6 Testing

Testing of software is an important means of determining software quality. Luol (2012) contends that testing involves the configuration of proper inputs, execution of the software over the inputs, and analysis of the output. Various tests will be conducted to determine software quality. These will include:

i. Unit testing: - to determine the quality of each module.
ii. Integration testing: - to debug the errors after the integration of the different modules.
iii. System testing: - to affirm the end-to-end quality of the entire system.
iv. Performance testing: - to verify the response time and service availability.
v. Compatibility testing: - to uncover failures due to the different web browsers and their corresponding releases of configuration.
vi. Security testing: - to verify the web application defences against undesired access of unauthorized users, its capability to preserve system resources

from improper use, and granting authorized users access to authorized services and resources (Di Lucca et al., 2006).

vii. Acceptance testing: - to give confidence that the assessment test monitoring system is working.

viii. Grey-box testing will be the testing of technique used in testing and the test oracles shall include; requirements specification, hand calculated values and simulated results. Grey box testing is suitable for testing web applications because it factors in high-level design, environment and interoperability conditions Di Lucca et al. (2016).

3.7 System development tools and techniques

Educational technologies offer a range of different tools for use in schools including tools for data capture, processing and interpretation – data logging systems, databases graphical tools and modelling environments (Osborne and Hennessey, 2013). Various software development tools will be used in the development of the different parts of the proposed web application.

3.7.1 Database tools

The web application will use MySQL relational database management system to store all the data and SQL for querying the database. MySQL will be used for its scalability and its solid data security layers which protect sensitive data from intruders, and its encryption capabilities. MySQL is also inexpensive as it is freely downloadable from the MySQL website.

3.7.2 Programming tools

Notepad++ and Sublime text will be used in the development of the HTML and CSS files of the web application while PHPStorm will be used in writing PHP code for its advanced debugging features, syntax highlighting and error checking functionalities. These three platforms are light on the windows operating system, a platform I intend to use in developing the web application. Laravel framework

will also be used especially in the implementation of data logs, transaction trails, data exports and imports and downloading reports.

3.7.3 Documentation tools

Microsoft word will be used in preparing the proposal of the system, documentation of the web application and the user manual for the proposed system.

3.7.4 Diagramming tools

Microsoft Visio and star UML will be used in diagramming of class diagram, use case diagram and database schema.

3.7.5 Testing tools

IBM's App-Scan will be used to test the web application for vulnerability. App-Detective database scanner will be used for database testing to identify configuration mistakes, identification and access control issues, and any toxic combination of issues that could lead to escalation of privilege attacks, data leakage, DoS attacks, or the unauthorized modification of data held within data stores (Trustwave, 2018).

3.8 Proposed system modules

The web application will be split into modules to provide the different functionalities of the system. These modules include:

i. **Administration module: -**This module will include various tasks such as user registration which will be done by the super administrator. Apart from that, the module will carry out various tasks such as Logging of all processes performed by the system, approval of modified entries and access of the system through logging in and out of the system.

ii. **Data entry module: -** This module will perform various tasks such as keying in of student marks, committing the entry to the database and modification of entries.

iii. **Analysis module: -** This module will allow users to perform data analysis procedures and come up with graphs and a summary of the overall performance of the students in a specific assessment test. Data analysis shall also be done in comparison to previous assessment tests.

iv. **Reports module: -** This module will perform preparation of the reports of the exams in a presentable format that can be understood by all the stakeholders including students.

Chapter 4: System Analysis and Design

4.1 Overview

This chapter focuses on the database schema and functionalities of the system. It tries to explain how the overall system will function, its, architecture, modules, use cases and wireframes.

4.2 Analysis

The system was developed using object oriented analysis and design using laravel, a PHP framework. Laravel is a PHP framework that makes it easier to write object oriented code (Yilmaz, 2014). The system will be used to record student scores, analyzing student performance and printing the final report. The system will be used by Teachers, parents and the school board members. Their accounts will be created by the admin who will have an administrative account that will be included in the system.

4.2.1 Class Diagram

Figure 4.1 below is a conceptual model of the relationships between object attributes and data operations. The marks class carries out operations such as computing the total and average marks of students as well as ranking them according to their totals. The marks class has a many to many relationship with the student class. The student class has attributes such as *student_id* which is used to identify every student object distinctively. It has a one to many relationship with the exams and room class. The exam class has the *exam_id* attribute which is used to identify every exam object distinctively. It has a one to many relationship to the admin class. The user class has the clerk and admin subclass. The user class performs general user operations such as changing passwords, printing and viewing exam results. The admin subclass carries out administrative roles like deleting an exam and registering other users such as clerks. The clerk class can operate on student and exam class by modifying a student's exam marks.

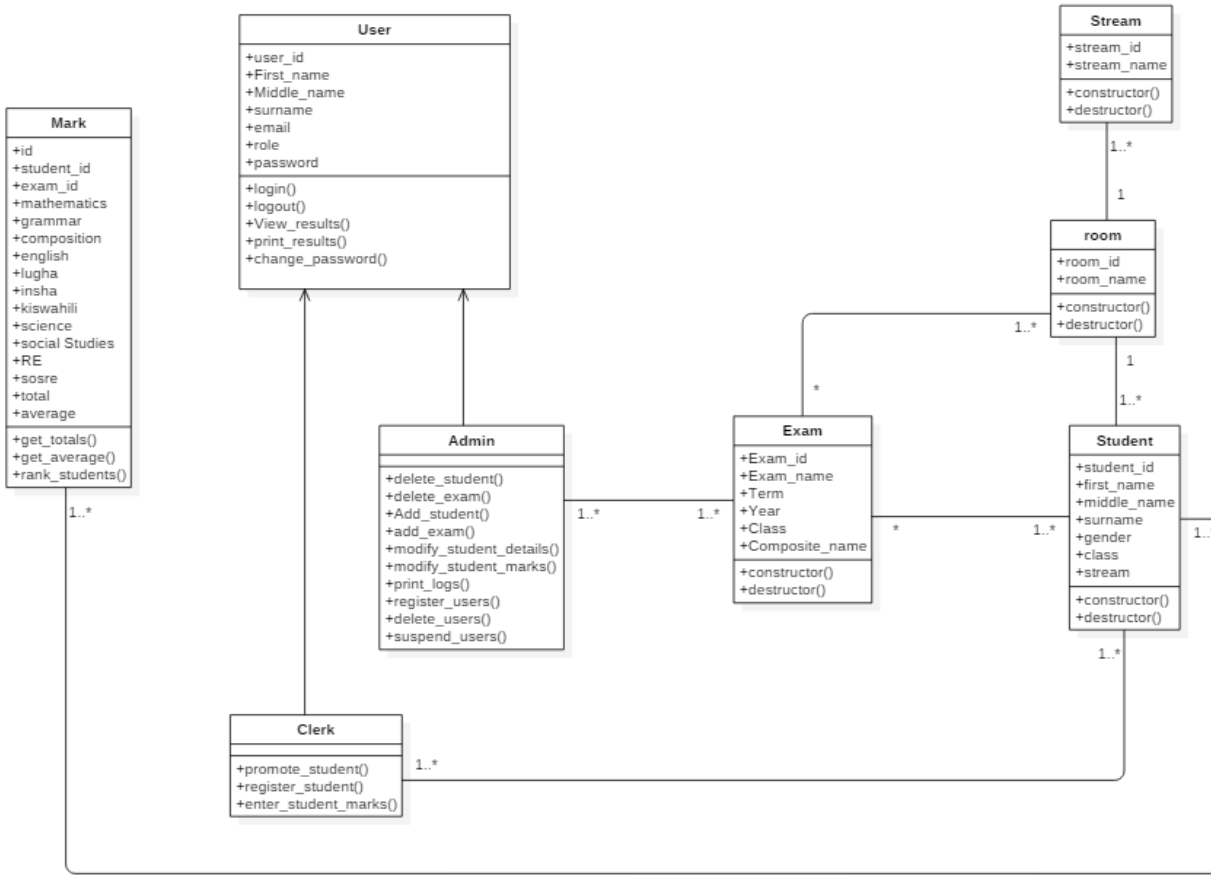

Figure 4.1: Class diagram

4.2.2 Use Case Diagram

Figure 4.2 below captures the high level requirements of an exam management information system in a use case diagram. Generally, users are able to login to the system using their email address and password. They can change their passwords and they can also view and print exam results. Users with the clerk role can register students to the system, modify their exam marks and promote students. The administrator role is capable of managing other users and exams. The administrator can add, delete or set a cut-off mark for an exam. Apart from that the administrator can add, suspend and delete users from the system as well as modify student details and remove students from the class lists (in cases of student transfer).

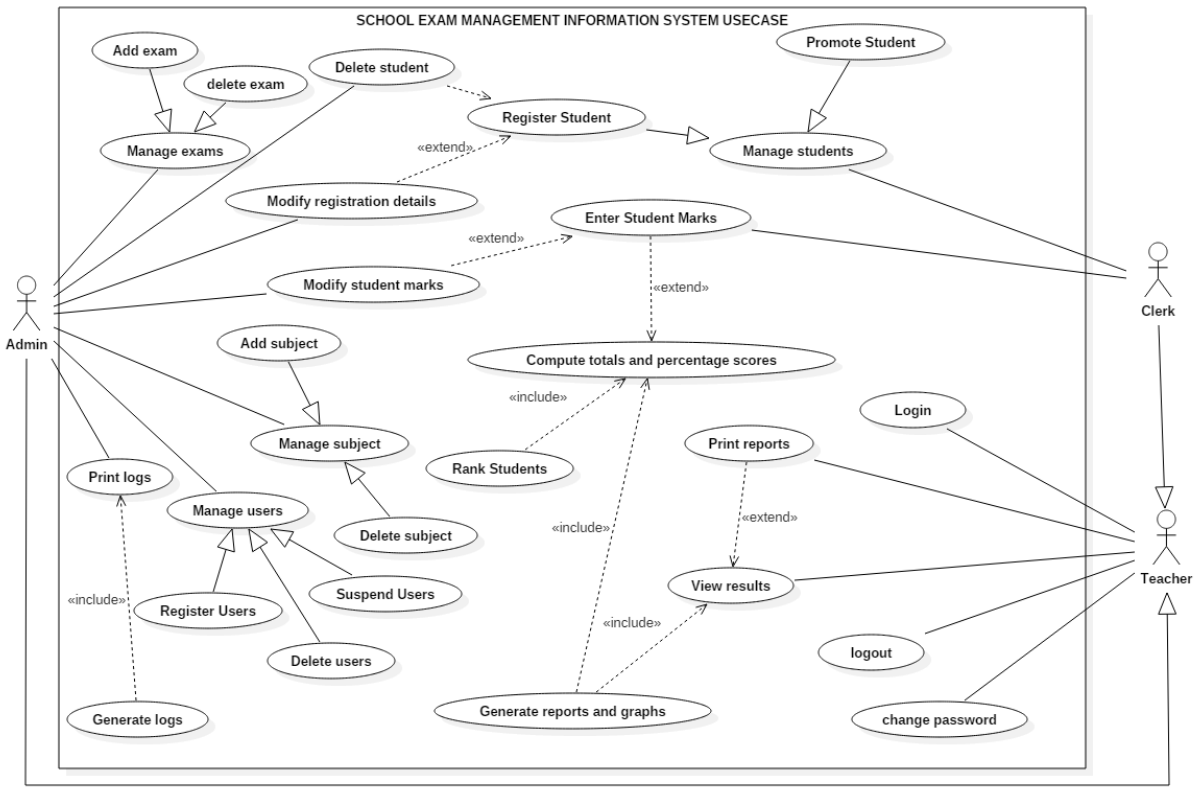

Figure 4.2: Use Case diagram

4.2.3 Sequence Diagram

Figure 4.3 below shows the admin object interactions in sequence. After successfully signing into the system the administrator can manage subjects by adding or deleting them. The administrator can also manage users by adding, suspending or deleting users. Apart from that the administrator can add or delete exams and add cut-off marks as well as modify student details.

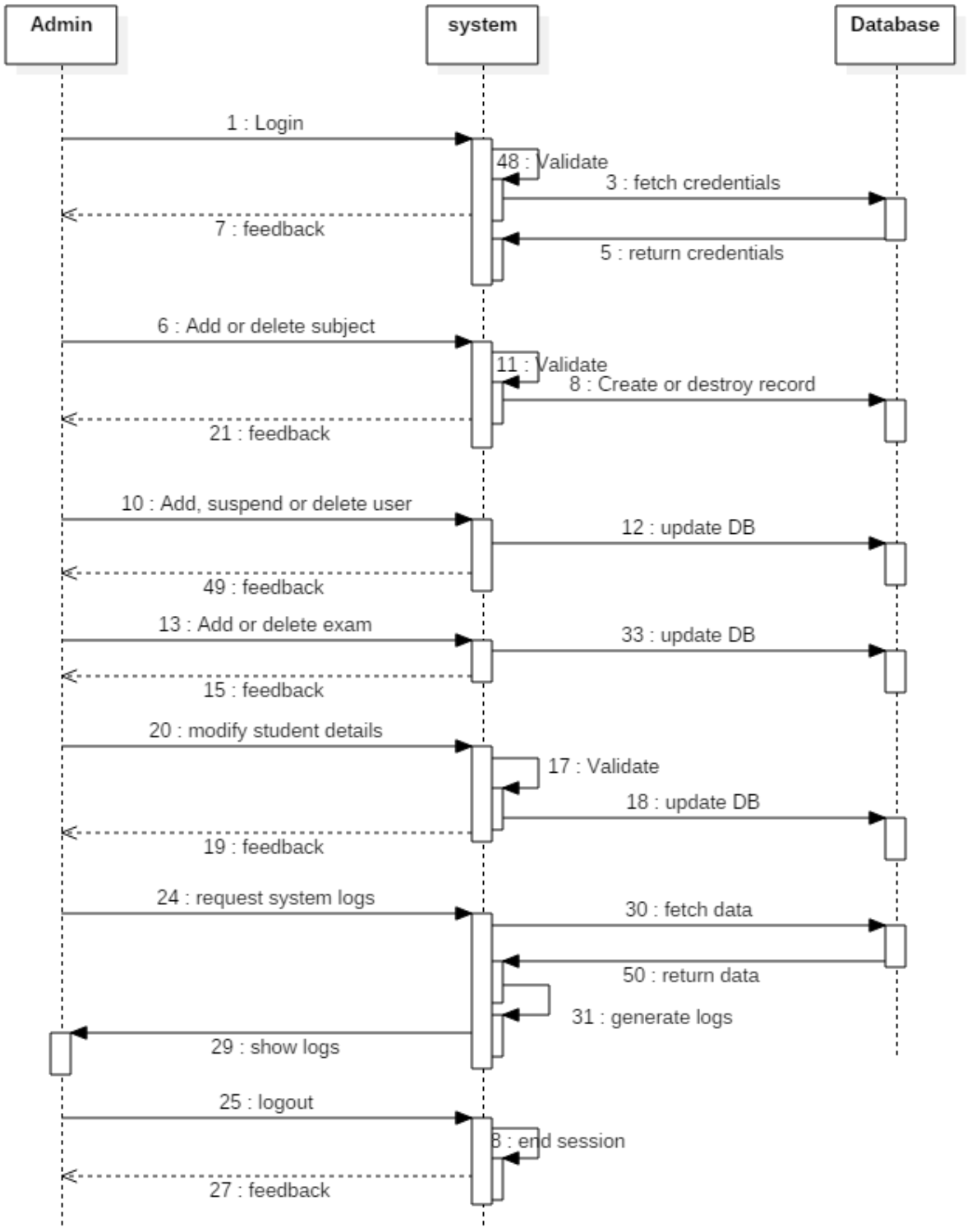

Figure 4.3: Sequence diagram (administrator)

Figure 4.4 below shows the clerk object interaction in sequence. After successfully signing in a user with the clerk role can register a student. All students must be registered in the system before their marks can be entered into the system. The clerk can promote students based on a preset cutoff mark set by the administrator.

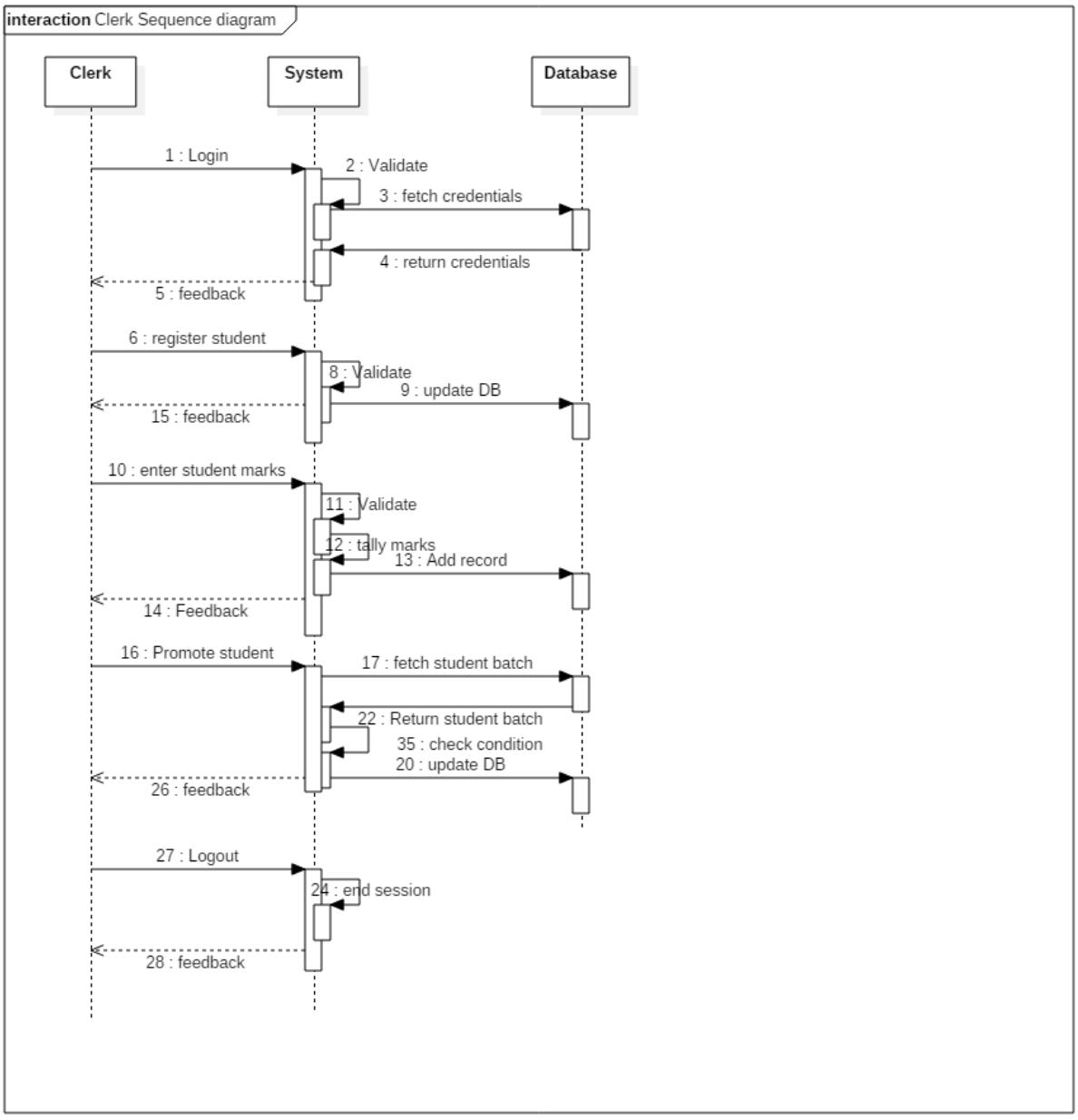

Figure 4.4: Sequence diagram (clerk)

Figure 4.5 below shows the viewer object interaction in sequence. After successfully signing in a user with the viewer role can view and print students results as well as change their password.

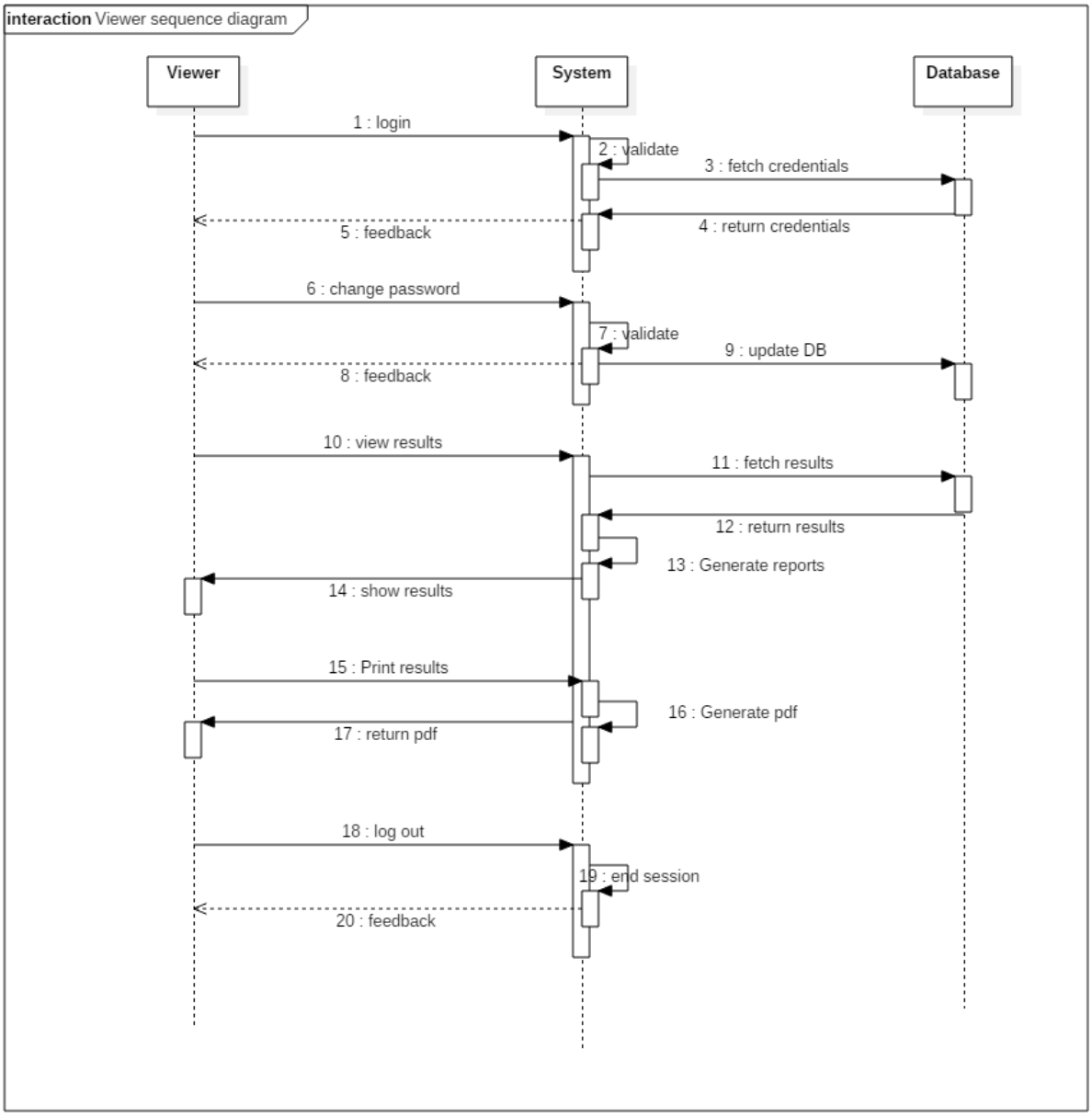

Figure 4.5: Sequence diagram (viewer)

4.2.4 Database Schema

Figure 4.6 below represents the database objects and their relationship to each other. The students table has an integer type primary key and the class and stream columns as foreign keys from the class and stream table respectively. The marks table has three foreign keys; the *student_id* refers to a column in the students table. The *exam_id* refers to the names column in the exam names table. The *clerk* column refers to the *surname* column from the users table. The users table has the *email* column as a unique key to restrict users from having identical email addresses. The *email column* is foreign on the password reset table. The *class* column is foreign on the exam names table from the classes table.

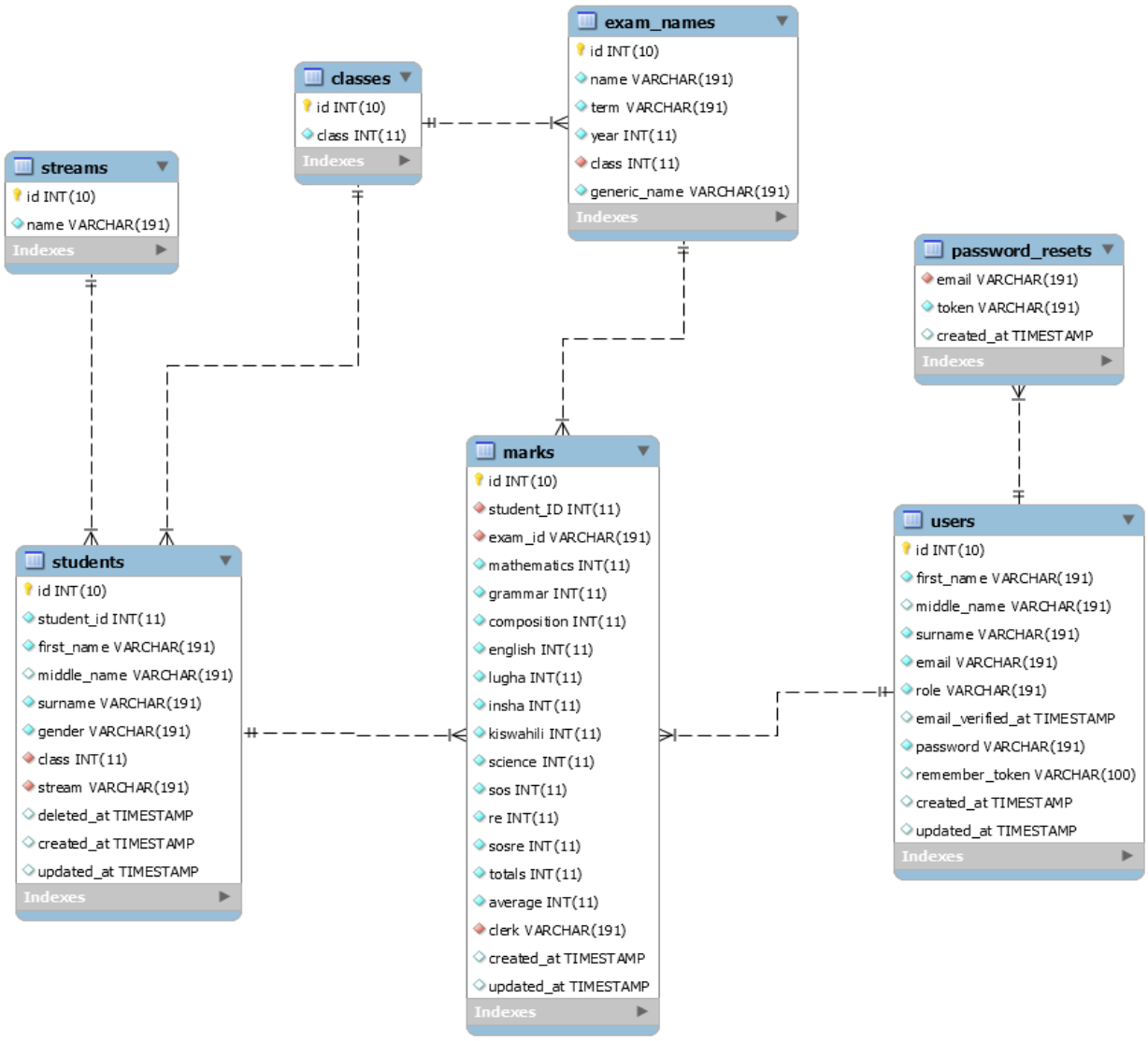

Figure 4.6: Database schema

Chapter 5: System Implementation and Design

5.1 Introduction

This chapter discusses the modules that have been implemented in the school exam management information system for student council elections. It also highlights the functionalities of each module and screenshots of the system outlook. Finally, the chapter discusses the system testing that has been carried out on each module.

5.2 The Administrator Module

The administrator upon logging in can create other users of the system with either a clerk role or a viewer role. This users will be able to log in with a default password and prompted to change upon logging in. The system administrator will be able to change the roles assigned to the users when necessary. The administrator will also be able to change the details of registered students as well as their marks in case of errors made by the clerks. Fundamentally, the admin will be able to create an exam and set a cutoff mark for promotion to the next class at the end of an academic year.

Figure 5.1 below shows the exam management section which can only be accessed by the administrator. The administrator can be able to change a user's role, deactivate and activate or delete users from the system.

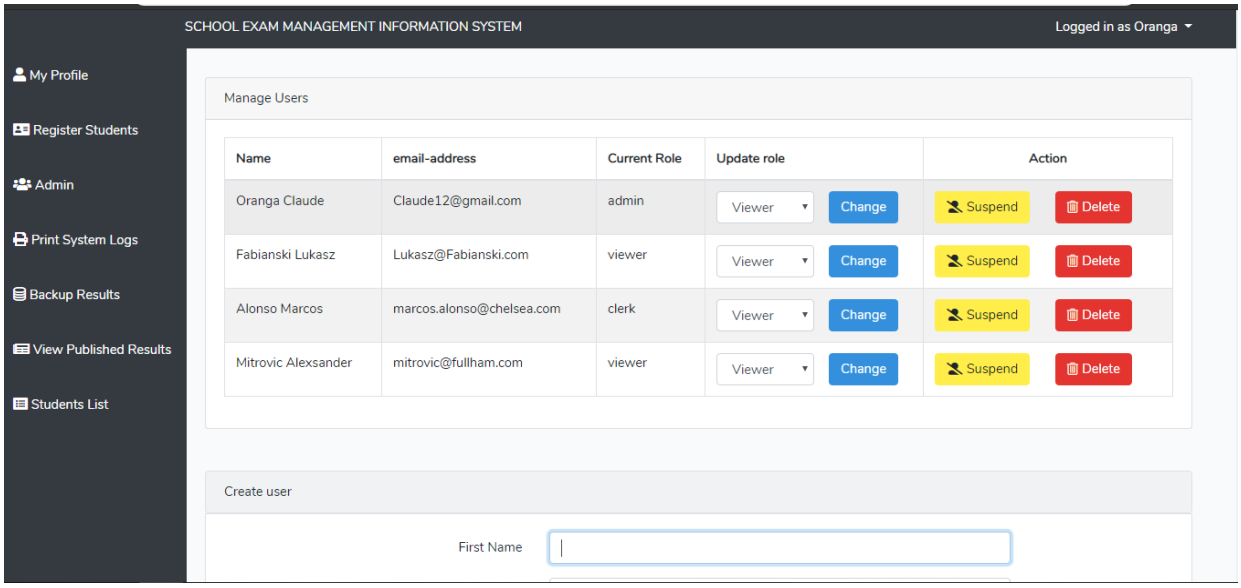

Figure 5.1: User management page

Figure 5.2 below shows the student management section. Here the administrator can modify a student's details or marks, transfer the student or promote them in case they failed to meet the promotion mark.

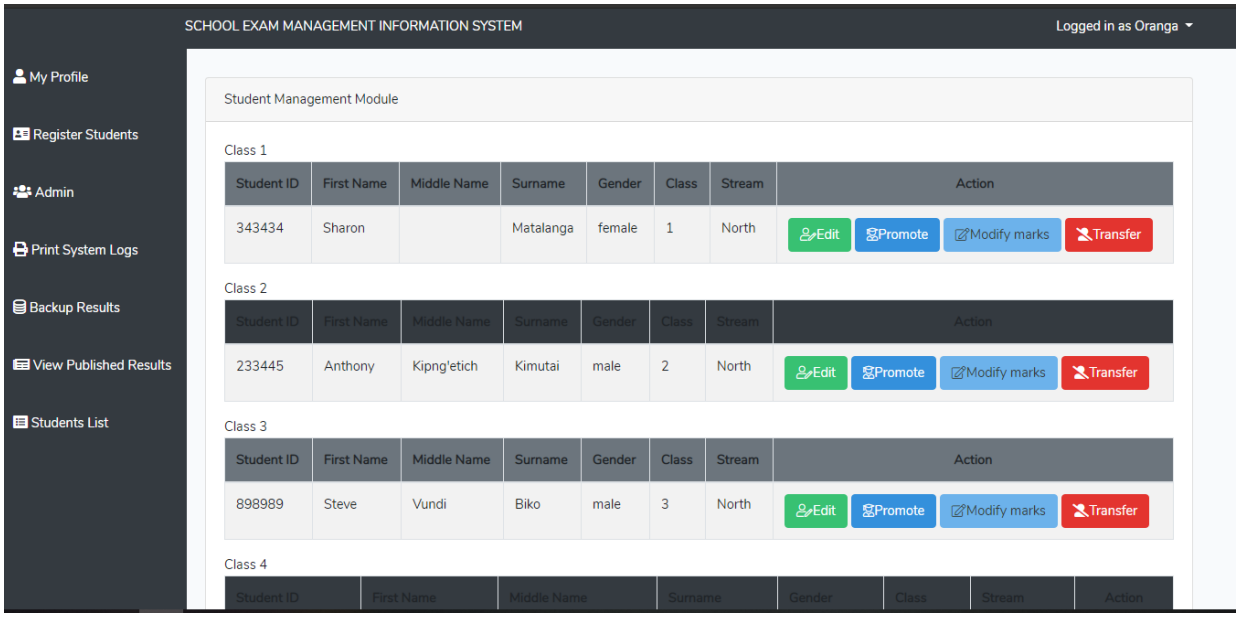

Figure 5.2: Student management section

5.3 The Clerk Module

Teacher who will be given the clerk role will be able to register students, feed student marks for exams that have been created by the administrator as well as print student lists for specific classes. The clerk will also be able to promote students at the end of the year after a cutoff mark has been set for promotion. When a student is promoted the system calculates the average marks for all exams done by a student and promotes the student if they have passed the cutoff mark.

As shown in figure 5.3 below, the clerk has a different view of the system. The clerk can only see menus that they have permissions to access. On the student registration form the clerk is able to register a student by giving them a registration number, feeding their registration details and assigning a class and stream to them.

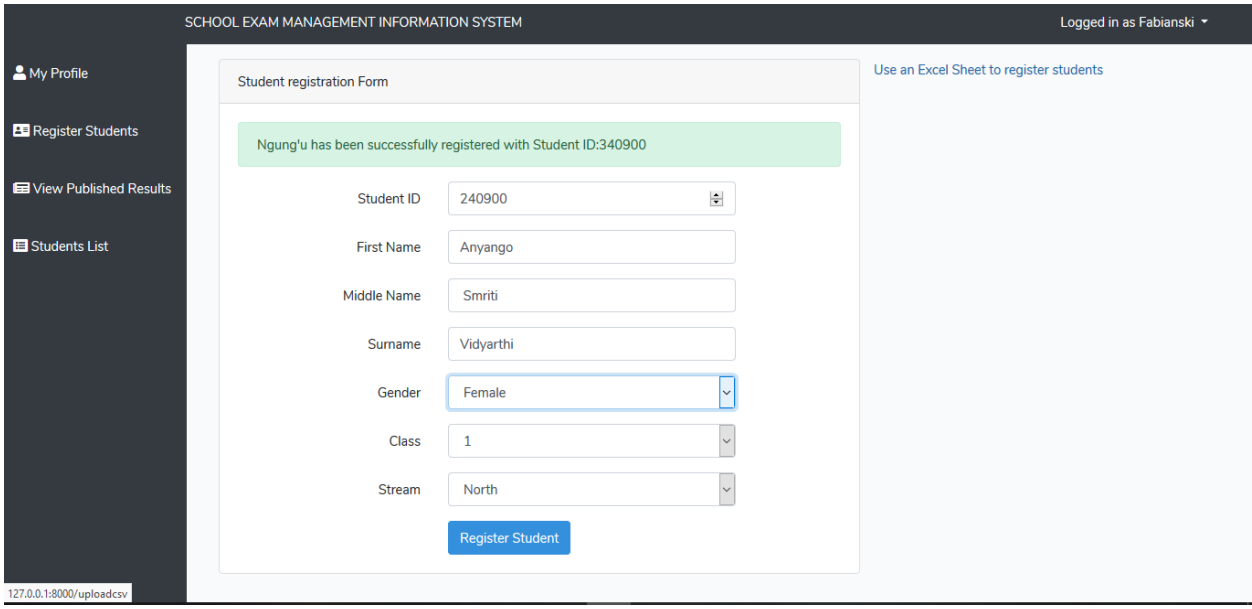

Figure 5.3: Student registration form

Figure 5.4 below shows a clerk's view of the student class lists. A user with the clerk role can be able to view and enter student marks, download the class lists based on the class streams and overall class list.

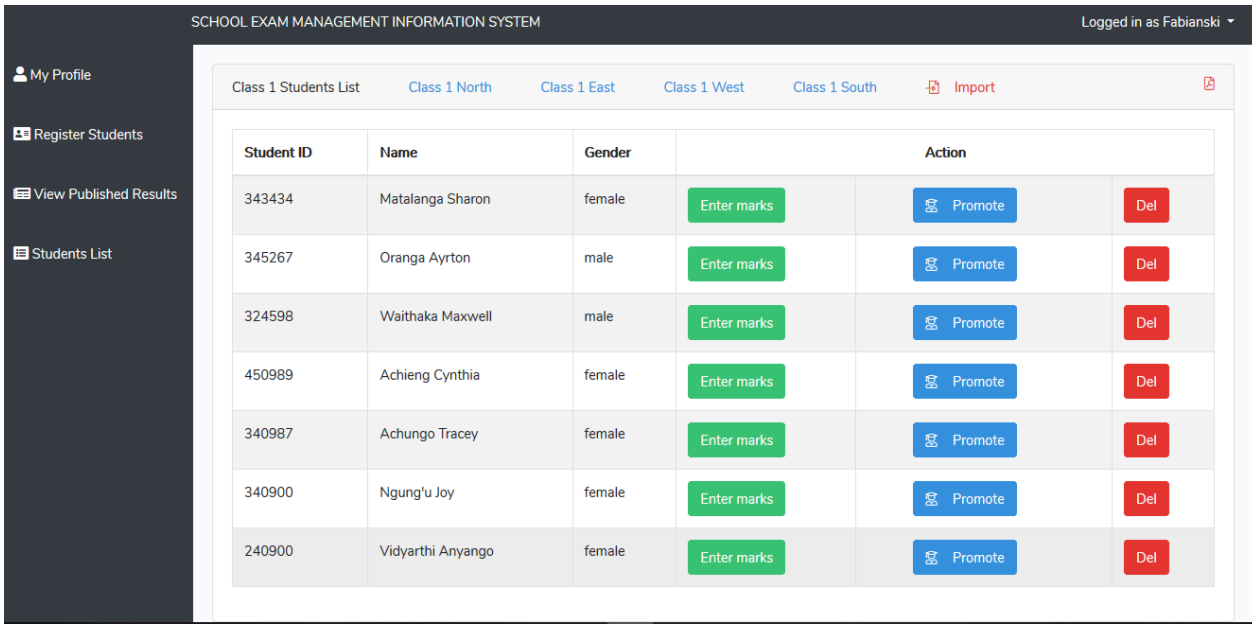

Figure 5.4: Student class list

In case a clerk tries to access specific modules that they are not authorized to, they are redirected to an access denied page. The clerks can access the student's list and view students by class or by their respective streams. Figure 5.5 below shows a user trying to access a restricted module.

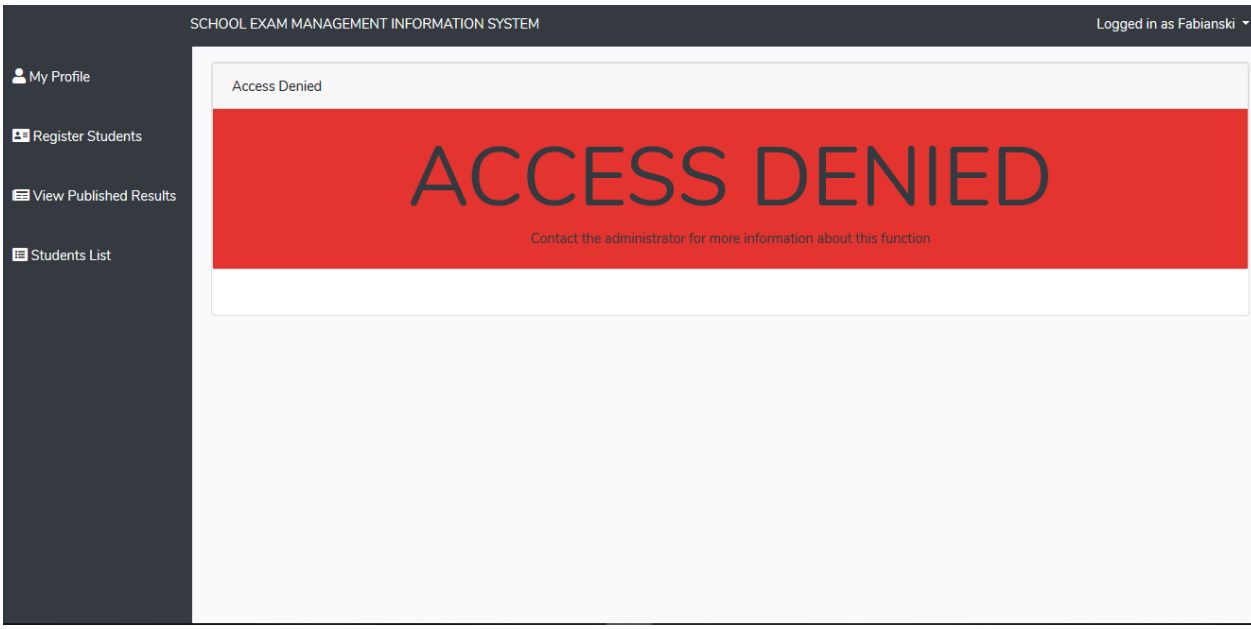

Figure 5.5: Access denied view

5.4 The Viewer module

This is a module with the lowest permissions. In this module a user is allowed to view the results of the exams only. They cannot access the clerks or administrator functions of the system. However they can download the results and see an overall performance of the latest exams from their "home" view.

Figure 5.6 below shows a user's home page once they log into the system. All users are able to view this page. It shows a summary of statistics of interest such as overall performance of students based on subjects, gender and age statistics and best students' performance.

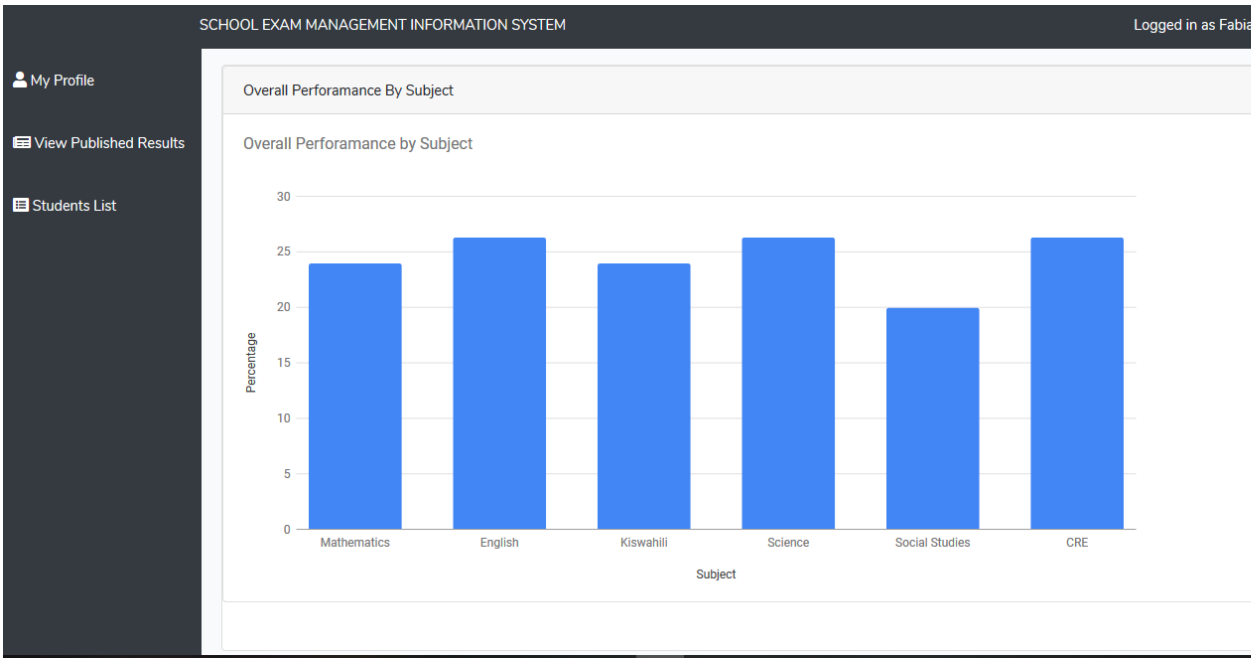

Figure 5.6: School performance graph by subject

Figure 5.7 below shows a users view of student performance. The list can be downloaded as a PDF file for local storage.

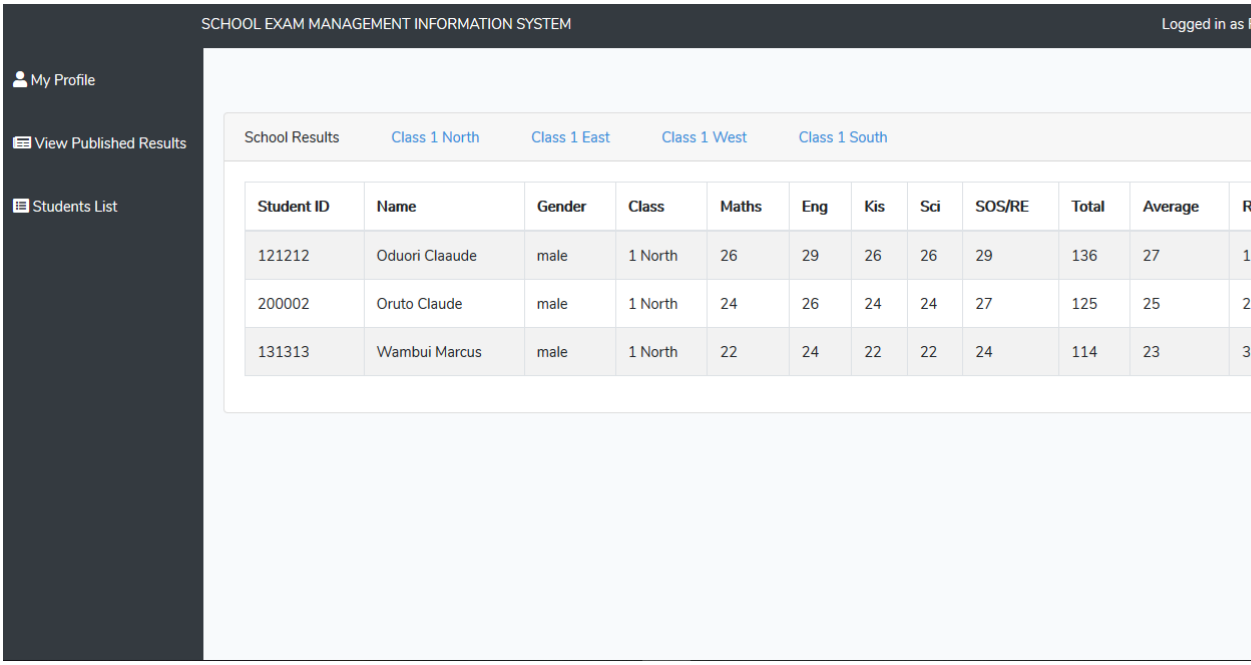

Figure 5.7: Student performance ranked by scores

5.5 Testing

The system was tested by performing unit tests on each individual module. Component testing was also performed to test each functionality. The entire system was integrated and tested using integration testing to ensure the different modules can work together. The table below shows the components tested and the results of the tests.

Table 5.1: System testing

Component	**Test**	**Status** Pass - performed as expected Fail - Didn't perform as expected
Sign in	Enter wrong credentials Sign in when suspended or not added by the admin	PASS
User management	Add user Suspend user Delete user Duplicate add user Wrong email format	PASS
Exam management	Create exam Delete exam Duplicate exam name Define cutoff marks Delete cutoff mark	PASS
Student management	Change Student details Change student marks Delete student Promote student	PASS

Student registration	Register student Double entry registration Missing first name or surname	PASS
Marks Entry	Enter student marks Double entry	PASS
Access restriction	Access restricted functions	PASS
Change password	Enter wrong current password	PASS

Chapter 6: Conclusion, recommendation and future works

6.1 Introduction

This chapter discusses the conclusions made after development of the system and the recommendations that can be made with regard to use of the system. It also highlights the future works that can be done on the system.

6.2 Conclusion

In this project, exams processing was highlighted as the main reason why the syllabus is not completed on time. It also affected the level if discipline among students because teachers were busy analyzing results when they were supposed to be spending time with learners. Previous records of student performance was also difficult to obtain. The system took this into account and implemented features that would solve these challenge. The project also examined existing applications such as ShulePro and ELCEN school management software and was able to determine its comparative advantage over them.

Finally, the project designed, developed and tested an application that could be used by schools to carry out exams analysis in an efficient way that promotes the green economy by minimizing use of paper to store exam reports.

6.3 Recommendations

I would like to recommend that research on factors that determine student performance in Kenya be carried out since existing literature on the topic is not conclusive.

6.4 Future Works

In future the system should be able to embed machine learning to enable advanced report generation such as student performance prediction. Block chain technology will also be used in storage of exam results to maintain the integrity of the system data.

Appendices

Appendix A: GANTT CHART.

	TASKS.	WEEKS TO COMPLITION.																Dates.	
		Duration	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	START.	FINISH.
`1	Diagrams.	2																	10/6/20	24/6/2
2	Requirements Gatherings.	1																	13/7/20	15/7/2
2	Develop Environment setup.	2																	13/7/20	27/7/2
3	Database Design.	2																	28/7/20	4/8/20
4	User Interface Design.	2																	5/8/20	20/8/2
5	Coding.	3																	5/8/20	3/9/20
6	Testing and Validation.	2																	7/9/20	21/9/2

7	System Demos.	2																	25/9/20	8/10/2
8	Follow Up.	1																	12/10/20	21/10/0
9	Deployment.	1																	22/10/20	2/11/2
10	Documentation.	1																	4/11/20	11/11/0

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