CENTRAL UNIVERSITY

FACULTY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF TECHNICAL SCIENCE

A STUDY ON

STUDENT RESULT MANAGEMENT SYSTEM

A DISSERTATION

submitted by

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DECLARATION

Ibrahim, Hassan and Yeaken, declare that we are the sole authors of this dissertation entitled "RESULT MANAGEMENT SYSTEM; with the case of CENTRAL UNIVERSITY, during the period of registered study, we have not been registered for other academic award or qualification, nor has any of this material been submitted wholly or partly for any other award. This Dissertation is a result of our own Research with the guidance and support of our supervisor **MR. OSMAN KANU** and where other people's work was used, they have been duly acknowledged.

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CERTIFICATION

This is to certify that this dissertation is the authentic work of Ibrahim Rahman Kamara, Yeaken Conteh, and Hassan Sesay, who are members of Group E, under the supervision of **Mr. Osman Kanu**. It is our original work except for those areas referenced, and no part of this work has been presented elsewhere for an award or any degree or certificate.

…… ……..

Mr. Osman Kanu Date:

(Project Supervisor)

DEDICATION

First and foremost, we are forever grateful to God Almighty for granting us the ability, health, and perseverance to complete this academy journey. It is by His divine grace that this work came to fruition.

We lovingly dedicate this dissertation to our beloved parents, your unwavering love and support throughout our life's journey has lifted us and inspired us to follow our dreams. Thank you for always believing in us.

To our wonderful siblings, your cheerful smiles and little gestures of encouragement kept us motivated on difficult days. we hope we've made you proud. Your patience and understanding did not go unnoticed. We are incredibly blessed to have such supportive and loving families.

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This dissertation stands as a testament to the guidance and support we have received from all those mentioned here. Our heartfelt appreciation to everyone who has contributed towards our academic journey.

Table of Contents

LIST OF TABLES & FIGURES

ABBREVIATIONS AND ACRONYMS

SRMS: Student Result Management System

CU: Central University

OpenSIS: Open Student Information System

HND: Higher National Diploma

AI: Artificial Intelligence

UX: User Experience

SD: Software Development

SDP: Software Development Paradigm

SDLC: Software Development Life Cycle

UML: Unified Modeling Language

ERD: Entity Relationship Diagram

DFD: Data Flow Diagram

TF: Technical Feasibility

UT: Unit Testing

UAT: User Acceptance Testing

PT: Performance Testing

ST: Security Testing

GUI: Graphical User Interface

UI: User Interface

BIT: Business Information Technology

CS: Computer Science

MC: Mass Communication

SGP: Semester Grade Point

CH: Credit Hours

SCH: Semester Credit Hours

CGP: Cumulative Grade Point

CGPA: Cumulative Grade Point Average

FCGP: Final Cumulative Grade Point

SGPA: Semester Grade Point Average

YTCH: Yearly Total Credit Hours

LMS: Learning Management System

ABSTRACT

In an era where information and technology are vital to every aspect of our lives, the education sector is no exception. Recognizing the need for efficiency, accuracy, and transparency in managing student results, we set out on a journey to create a robust and user-friendly system that caters to the diverse needs of educational institutions, students, as well as employment institutions.

The system is being developed using Python as the primary programming language and Django framework for web development. Leveraging the power and flexibility of these technologies, the developed system encompasses a range of features designed to meet the specific needs of Central University results system and potentially serve as a model for other academic institutions.

This study aims to design and develop a computerized Student Result management system that transforms the management, and verification of student results. The key objectives of the study are to design, develop, and deploy a comprehensive web-based Student Result Management System for Central University, to give students the possibility to search and access their unofficial results, as well as granting access to external institutions for the verification of students' results.

The software engineering methodology approach of the system is agile methodology. This software engineering approach is essential to the project because it can break down the project into different phases, which makes design, debugging and system modification easier and comprehensive and so doing, we resulted in creating accessibility and verification of students' results.

The research scope was limited on Central University and the development scope are management, storage, and retrieval of academic Results for students across universities. Result entry, verification, calculation, and publication processes. It also system enables exam administrators to upload, verify, and update student Results. It provides them with tools for result calculation, reporting, and analytics.

The system facilitates the verification of student results by providing authenticated and verifiable digital records, which aims to simplify the result verification process for employers or other institutions.

Base on the system the research team were limited to incorporating the system to existing systems like Opensis, and Google Classroom. The research team was unable to incorporate Block chain technologies, which strengthen data integrity and privacy.

As the researches were limited to certain functionalities, the following recommendations were made as future scope to this research are: This system should be incorporated with existing third-party applications like Opensis, Google Classroom etc. also; the use of block chain technology should be incorporated in the future to enhance data integrity and security. Finally, it is recommended that progressive results be accessible in the future, if students might want to check for their results by semester or yearly.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Result management systems have evolved significantly over the past decades from manual processes to automated software solutions. Early student results maintenance involved paper-based records and handwritten ledgers maintained by educational institutions. Consolidation and computation of results was done manually leading to very slow and error-prone processes. The first major advancement was the introduction of punch card machines which were used to process result tabulation by encoding student information and marks on punch cards that were then processed by electromechanical while this speed up totals and statistics computation, preparation of detailed mark sheets still had to be done manually. By the beginning of the mainframe era, computers were beginning to be used for examination management with the processing power to run custom built student management information systems. This enabled large-scale automation of result computation and publishing along with data storage and analytics features. (Chinedu Udeze et al. 2019).

As the Student Result Management System (SRMS) being an online platform, is used to manage and store student results, grades, and academic records, provides an efficient way for Lecturers, University administrators, and students to view, manage, and track student academic progress. The system is designed to simplify the process of managing student data and reduce the time and effort required to generate reports. It enables lecturers to input and update student grades and attendance records and allows university administrators to manage student information, generate reports, and monitor academic progress (suman & Amutha, 2023).

In the dynamic landscape of higher education and professional opportunities, the validation of academic qualifications has emerged as a critical side in the journey of a student from the classroom to the workforce. Employment institutions, encompassing corporations, interview panels, and organizations offering scholarships or international travel opportunities, depend significantly on the authenticity and accuracy of academic transcripts when evaluating potential candidates. However, the conventional processes of verifying student results are plagued by inherent inefficiencies, often relying on time-consuming manual methods susceptible to human error and manipulation.

Sometime ago in Sierra Leone (SL), it was challenging for employers, organizations as well as educational institutions to confirm the credentials of Students from different Universities and Colleges across the country until recently (26th March, 2022) when the issuance of bogus degrees by the DOMINION CHRISTIAN UNIVERSITY in Freetown and the AFRICAN GRADUATE UNIVERSITY in Uganda came to light. Therefore, having a thorough result management system in place for all of their admitted students from the beginning of their academic programs to the end stage is thought to be important by institutions around the nation (Abu Shaw. 2022).

If we are to look at the case of Central University (CU), other result management systems have helped the institution as well as students in handling result processes, but to an extensive point, there are key features that are not being addressed such as student's accessibility of online transcripts, faster verification of student's transcripts by potential employers to name but few. At the inception of the institution, result processing and student information have been managed without the involvement of computerized systems, and as such there were discrepancies in handling students' information, but the institution has worked very hard to see that they handled the student's result process amicably.

Over the years, Central University as a reputable institution, has been using computerized systems that encompass the management of student's information as well as result processing which are Open Student Information System (openSIS) and the Google Classroom. These educational platforms have helped in shaping the examination and management of student information over the years and students were able to access their grades as well as their academic information. Even though the institution has worked tirelessly in regard to result management, they are still not able to work with a computerized system that will create an avenue for external institutions to verify students' results, they still have to go through the traditional means of result verification process.

In this regard, the Result Management System (RMS) that will be designed for a Central University should play a pivotal role in the academic ecosystem for managing and verifying student results. Its primary objectives will encompass enhancing efficiency, transparency, and accessibility of academic results for students, faculty, and external institutions. This software solution encompasses critical functionalities such as comprehensive student information management and verification process.

1.2 Statement of the problem

The current result management system at Central University, while incorporating computerized platforms like Open Student Information System (openSIS) and Google Classroom, exhibits notable shortages, particularly in the accessibility of online transcripts for students and the quick verification of transcripts by external institutions. Despite the institution's commendable efforts to digitize internal processes, the absence of a dedicated and comprehensive Result Management System (RMS) hinders transparency, efficiency, and accessibility in handling and verifying student results. This gap is further underscored by recent challenges in Sierra Leone, where the lack of a robust system for confirming student credentials has been exposed. Therefore, the study seeks to address these critical issues by developing an advanced RMS that not only enhances internal result management but also facilitates continuous external verification, ultimately contributing to the institution's commitment to excellence and technological innovation in academic processes.

1.3 Aim

This study aims to design and develop a computerized Result management system that transforms the management, and verification of student results.

1.4 Objectives

i. To design, develop, and deploy a comprehensive web-based Student Result Management System at Central University.
ii. To give students the possibility to search and access their unofficial results
iii. To grant access to external institutions for the verification of students results.

1.5 Significant of the Study

The significance of this study is deeply rooted in its attempt to bridge critical gaps within the existing result management system at Central University, paving the way for a transformative shift in the handling and verification of student results. The current system, although utilizing computerized platforms such as Open Student Information System (openSIS) and Google Classroom, falls short in key areas, notably the accessibility of online transcripts for students and the expeditious verification of transcripts by external institutions. These limitations impede the institution's pursuit of transparency, efficiency, and accessibility in managing and verifying academic records, creating a pressing need for a dedicated and comprehensive Result Management System (RMS). Below are some of the significant of such study:

Computerized manual processes - A key benefit is computerization of the tedious and error-prone manual processes of result preparation through computerized procedure and algorithms.

Enables instant access to results data – RMS provides easy access to historical results data for verification, transcripts preparation and analysis which is difficult through physical records maintenance.

Analytics and business intelligence - Modern systems generate interactive analytics dashboards for visualizing trends and insights from results data aiding data-driven decision making for institution.

Enhanced security - Automated access controls, encryption and activity logs provide data security which is difficult in manual systems prone to tampering or physical damage.

Cost and productivity benefits - SRMS enables significant cost savings by reducing manual efforts through process automation while speeding up result processing cycle time.

1.6 Scope of the Study

This research work is limited to providing a Result Management System within the confines of Sierra Leone and with a case study of Central University at Mile 91. As a result of that, the system possesses the following software engineering scopes:

The system encompasses the management, storage, and retrieval of academic Results for students across universities. It includes result entry, verification, calculation, and publication processes.

The system enables exams administrators to upload, verify, and update student Results. It provides them with tools for result calculation, reporting, and analytics.

The system incorporates robust security measures to ensure the confidentiality, integrity, and privacy of student data. It includes access controls, encryption protocols, and data backup mechanisms to protect against unauthorized access or data breaches.

The system facilitates the verification of student results by providing authenticated and verifiable digital records, which aims to simplify the result verification process for employers or other institutions.

1.7 Research Questions

i. How does the design and development of the web-based Student Result Management System at Central University impact the efficiency and accuracy of result processing?

ii. What are the user experience and satisfaction levels among students in terms of searching and accessing their results through the implemented web-based system?

iii. To what extent does providing external institutions with access to the Student Result Management System contribute to the ease of result verification processes and the overall credibility of academic records from Central University?

1.8 Limitations of the Study

This research is subject to certain limitations:

Due to the inability to acquire, integration APIs, the system is unable to be integrated with existing result management systems.

The research team was unable to incorporate Blockchain technology, which provides additional security features for data integrity and privacy

Due to the limited time frame, the system will only capture students who are offering undergraduate programs thereby excluding certificates, diplomas, HND, or postgraduate students. Moreover, as such, the incorporation of all qualifications within the system can regarded as a future scope.

1.9 Definition of Terms

Transcript ID(Code): An Assign Numeric data added to each transcript to uniquely identify each transcript.

Transcript: A transcript is a verified record of a student's academic progress that includes all of the courses they have taken and their grades.

Result: In the context of academia, a "result" typically refers to the outcome or score achieved by a student in an academic assessment or examination.

Management: It is the coordination of all the resources of an organization through the process of planning, Organization, directing and controlling

System: Physical component of a computer that is used to perform certain task.

Data: Numbers, Text or image which is in the form suitable for Storage in or processing by a computer, or incomplete information.

Information: A meaning full material derived from computer data by organizing it and interpreting it in a specified way.

Input: Data entered into a computer for storage or processing.

Output: Information produced from a computer after processing.

Information System: A set of interrelated components that collect (or retrieve), process, store and distribute information to support decision making and control in an organization.

Software: Software is set of related programs that are designed by the manufacturer to control the hardware and to enable the computer perform a given task.

Hardware: Hardware is a physical part of a computer that can be touched, seen, feel which are been control by the software to perform a given task.

Database: Database is the collection of related data in an organized form.

Programming: programming is a set of coded instruction which the computers understand and obey.

Technology: Technology is the branch of knowledge that deals with the creation and use technical and their interrelation with life, society and the environment, drawing upon such as industrial art, engineering, applied science and pure science.

Algorithm: A set of logic rules determined during the design phase of a data matching application. The 'blueprint' used to turn logic rules into computer instructions that detail what step to perform in what order.

Application: The final combination of software and hardware which performs the data matching.

Data integrity: The quality of correctness, completeness and complain with the intention of the creators of the data i.e 'fit for purpose'

Certificate: A document serving as evidence or as a written testimony, as a status of qualifications, privileges, or the truth of something.

Verification: Evidence that establishes or confirms the accuracy or truth of something.

CHAPTER TWO

LITERATURE REVIEW

2.1 Develop a computerized Student Result Management System

A computerized student result management system refers to a software application designed to electronically record, process, manage, and analyze students' academic scores and performance data (Mohammad Gulam Lorgat, 2020).

A review of current research reveals that several universities have adopted customized result management systems to restructure processes and strengthen data integrity. These processes are largely limited to the management of students results, but are not giving the accessibility to students in order to view their results online, external institutions do not also have the access to these results. Some key aspects of a computerized result management system include: The concept of result, the history of result, result management, result management system and the benefits of result (Akpasam J, et al. 2020).

2.1.1 Concept of Result

The term "result" in academic contexts denotes the conclusion or evaluation of a student's academic achievement in a particular course or examination. It serves as a quantitative or qualitative indicator of a student's knowledge, competence, and success in a given field of study. Academic assessment, grading, progress tracking, transcripts and records, degree requirements, comments for course development, etc. are only a few of the significant features that the term "result" incorporates.

2.1.2 History of Result

The history of results can be comprehensively traced from the concept of exams. Exams was invented in the late 19th century by an American businessman named **Henry Fischel**. The first-ever exam was conducted in China and it was the first country to adopt the concept of exams.

According to (Tim, 2021). The first exam conducted by China was known as the Imperial Examination. Examination means to observe, assess, inspect or study a subject. These are conducted by scholars of a particular subject or by scientists or researchers. In today’s world, we know exams as a test to assess a people’s understanding of a particular subject. After Sui, the testing technique was used in England in 1806. The test was created to assess applicants for employment in Her Majesty's Civil Service. A common

university exam for Oxford and Cambridge was implemented in the late 19th century. The Cambridge Assessment was first designed with male college-bound pupils in mind.

On December 14, 1958, the first Cambridge Assessment was administered, covering topics like English, mathematics, Latin, history, French, and geography. According to legend, Socrates utilized an oral exam to gauge his students' philosophical knowledge and comprehension in Greece. One may argue that the examination, which started from many sects of individuals throughout the world, was successful based on the outcome that developed and is now known as "Result."

2.1.3 Result Management

Student result management encompasses the end-to-end processes for recording, processing, analyzing, and communicating student examination results within educational institutions. Comprehensive result management is enabled by robust systems that ensure efficiency, transparency, confidentiality, and analytical insights.

In order to manage and administer the evaluation, grading, and recording of student academic outcomes, educational institutions, notably universities, employ several methods and systems. It includes a variety of initiatives and processes meant to guarantee the timely, secure, and correct processing of academic information and grades for students. Assessment and Grading, Grade Recording, Transcript Generation, and Result Verification are only a few examples of important elements of university result management system (Chinedu Udeze et al. 2019).

2.1.4 Result Management System

Student Result Management System is a web-based application that mainly focuses on providing the

results to the student and the faculty. The student checks their respective results using their university

registered recognition id’s along with their grades and percentage of that particular semester.

RMS serves as a comprehensive software or information technology solution designed to computerized and restructure the processes associated with managing and maintaining academic results and records within educational institutions, such as schools, colleges, universities, and training centers. It plays a critical role in ensuring the accuracy, efficiency, and security of result-related data (Varun Ramesh et al. 2021).

Result Processing System forms the key activities in the life span of a student. The demand for effective and efficient result computation and output presents the need to automate existing manual result processing system. The digitized process provides capabilities such as a centralized repository for storage, management

and dissemination of result information to those concerned. A requirement gathering exercise based on the assessment of the existing manual process reveals that it is inefficient and rigorous in nature. Result Management System as a web-based application that mainly focuses on providing the results to the student and the faculty. The student checks their respective results using their university registered recognition id's along with their grades and percentage of that particular semester. Result management system (RMS) is a technological opportunity for the school, college, university and coaching center institutions searching for a secure, simple and alternative solution to the conventional paper-based exam results evaluation, reporting and distribution (Bernard & Oluwadamilare, 2020).

2.1.5 Benefits of Result Management System

Since using a result management system makes computing results and monitoring student performance more efficient. These student result management systems frequently place a strong emphasis on user friendliness, data security and integrity, and the ability to handle the intricate computation of outcomes. In addition to all of these, the following positive aspects of the Result Management System are underlined (Varun Ramesh et al. 2021).

Improving Result Management Processes: Implementing a result management system in institutions has this as a major advantage. In the past, maintaining student outcomes was a time-consuming procedure. However, a student outcome management system makes the procedure easier and quicker.

Data Accuracy and Security: Utilizing a student outcome management system reduces the possibility of mistakes and discrepancies. The reputation of your organization might be damaged by mistakes and discrepancies. It may also affect how a pupil is regarded to be performing.

Transparency and Accountability: Ensures that the grading process is transparent, enabling instructors and students to examine and validate grades. maintains a transparent audit trail of all grading and record-keeping processes, which improves accountability.

Accessibility and Convenience: Allows students to access their academic records, including transcripts and grade reports, conveniently through a secure online portal. Facilitates easy retrieval of academic information for administrative purposes.

Student Satisfaction: Enhances the entire educational experience of students by making academic records easily accessible and promptly offering performance feedback. strengthens the institution's standing for effective and open academic procedures.

2.1.6 Transcript and Certificate

A transcript is a verified record of a student's academic progress that includes all of the courses they have taken and their grades. It is a document that serves as evidence of education and contains a thorough list of all the topics or modules you have completed together with your grades, which were expressed in the form of marks or grades by the educational institution (Rai et. al 2020).

The "PNCA's Hallie Ford School of Graduate Studies" describes the dimensions of a transcript as being official and unauthorized transcript.

An official transcript is a complete representation of a student's academic record. It includes all courses attempted at their undergraduate institution, including those withdrawn from and those repeated. It also includes a summary of all transfer credits accepted by their undergraduate institution. It must state the degree received and the degree-conferred date. An official transcript is one that has been received directly from the institution that conferred the student's undergraduate degree.

On official transcript paper, official transcripts are printed. The Registrar's signature, the date, and the college seal must be on it. Official undergraduate transcripts should be sent in sealed, branded envelopes with the sender institution's address. Transcripts that the student has in their possession or that they have obtained themselves from a website or portal run by the university (such as student copies or unofficial transcripts) are not regarded as official. Additionally, official transcripts transmitted electronically through application portals cannot be accepted as official by transmission.

An academic certificate is a record that attests to a certain person's receipt of a degree in education or passing of a set of exams. Only students who successfully finish a certain education are awarded the academic certificate. Academic credentials can be obtained through a variety of organizations and range in difficulty (Rai et. al 2020).

2.1.7 Technological advancement associated with Result Management System

According to "Mohammad Gulam Lorgat 2018", Technological advancements have greatly influenced and improved Result Management Systems in the education sector. These developments have given result management procedures additional features, capacities, and efficiency. These technical developments related to the Result Management System are listed below.

Online and Cloud-Based Systems: The transition from conventional, on-premises systems to online and cloud-based RMS is one of the most important developments. Scalability, accessibility, and lower

infrastructure costs are all features of these systems. Authorized users may securely access result data using cloud-based RMS from any location with an internet connection.

Mobile Accessibility: Many RMS now have responsive online interfaces or mobile applications, allowing users to view and manage results using smartphones and tablets. Both students and professors will appreciate how convenient this tool is.

Data Analytics and Reporting: The data analytics and reporting capabilities of RMS have advanced. They may produce in-depth data and insights regarding trends, program efficacy, and student success. To recognize pupils who may experience academic difficulties, predictive analytics may be employed.

Machine Learning and Artificial Intelligence (AI): AI and machine learning algorithms are increasingly being used to automate grading and assessment processes in RMS. These technologies can provide intelligent insights into student performance and recommend personalized interventions.

Blockchain for Credential Verification: Some RMS are looking at using blockchain technology to improve the security and transparency of academic credential verification. Academic records may now be quickly and permanently verified thanks to blockchain technology.

User Experience (UX) Design: User interfaces have been upgraded with more user-friendly, modern designs, making it simpler for users to interact with the RMS and navigate. User experience improvements aid in user happiness and adoption.

2.2 Giving the possibility for Students to search and access their unofficial results.

Empowering students with the ability to search and access their academic results represents a pivotal step towards modernizing educational practices. Traditionally, the dissemination of results has been a cumbersome process, often characterized by delays and administrative bottlenecks. The introduction of online access not only streamlines this process but also ensures that students can promptly retrieve their grades, fostering a culture of timely feedback. This immediacy allows students to engage in reflective practices, understanding their strengths and weaknesses promptly, and adjusting their learning strategies accordingly. Furthermore, it promotes a proactive approach to academic performance, as students can take timely corrective measures, thereby contributing to a continuous improvement cycle (Varun Ramesh et al. 2021).

According to (Ekanem, et al. 2017) Transparency is a cornerstone of effective education, and providing students with the opportunity to search and access their results online enhances this transparency significantly. The traditional model of result distribution, involving printed documents or closed-door consultations, often leads to communication gaps and misunderstandings. Online access, on the other hand, creates a transparent and accountable system. Students can independently verify their grades, reducing the likelihood of errors and fostering a sense of trust between students, educators, and institutions. This transparency not only serves as a confidence-building measure but also reduces disputes related to grades, allowing educational institutions to focus on fostering a positive learning environment.

Beyond the immediate benefits of timely feedback and increased transparency, the provision of online result access contributes to heightened student engagement. When students have convenient and direct access to their academic performance data, they are more likely to take an active interest in their learning journey. This engagement is multifaceted, extending beyond the mere retrieval of grades to a deeper involvement in the educational process. Students become more attuned to their academic progress, setting the stage for a sense of ownership and responsibility in their learning endeavors. Ultimately, the empowerment derived from online result access nurtures a positive and collaborative educational ecosystem, where students are active participants in their educational journey rather than passive recipients of information (A.A. Eludire, 2011).

2.3 Providing access to external institutions for verification of students result

According to (Madhu & Prakhar Dev, 2023), enabling external institutions and organizations to verify the academic credentials of students seeking employment, grants, scholarships, and other opportunities is a pivotal evolution in the realm of educational administration. By integrating a robust Student Result Management System, educational institutions can provide external entities with direct access to relevant academic records. This integration ensures a seamless and efficient verification process, benefitting both students and external organizations. Prospective employers, scholarship providers, and other entities can promptly authenticate students' qualifications, streamlining the application and decision-making processes. This technological advancement not only expedites access to opportunities but also enhances the overall credibility and reliability of academic credentials.

Customized access permissions are instrumental in tailoring the verification process to meet the specific needs of external institutions. Different organizations may require varying levels of detail in the verification process. For instance, a potential employer might need a comprehensive overview of academic

achievements, while a scholarship committee may focus on specific qualifications. The RMS, equipped with flexible access permissions, allows educational institutions to grant precisely the level of access needed for verification. This adaptive approach not only ensures the privacy and security of student data but also fosters a more collaborative and effective partnership between academic institutions and external organizations (Dhruv & Harshit, 2022).

Enabling external institutions and organizations to verify students applying for jobs, grants, scholarships, and other opportunities through a Student Result Management System is a transformative step towards creating a more transparent and efficient educational landscape. Firstly, by integrating the SRMS with the systems commonly used by prospective employers, scholarship providers, and other organizations, educational institutions pave the way for seamless data exchange. This integration ensures that external entities can readily access and verify the academic credentials of students, reducing the administrative burden on both parties. It fosters a dynamic ecosystem where the verification process becomes a swift and transparent precursor to students' pursuit of various opportunities (Varun Ramesh et al. 2021).

CHAPTER THREE

METHODOLOGY AND DESIGN

3.1 Software Engineering Methodology

According to the regular development and changes that happens today, it's no doubt that new problems and requirements arise not even biologically and chemically but rapidly in technological developments and innovations. Software engineering methodology describes a framework for planning, executing, and managing the process of developing software systems. In the aspect of Software Development (SD), we can focus our software engineering methodology on Software Development Paradigm (SDP). The paradigm helps developer to select a strategy to develop the software. SDP has its own set of tools, methods and procedures, which are expressed clearly and defines Software Development Life Cycle (SDLC). In regards to this notion, one of the SDLC component which we are focusing on will be the AGILE Methodology.

3.1.1 Agile Methodology

Agile methodology is a project management framework that breaks projects down into several dynamic phases, commonly known as sprints. One of the main benefits of using agile processes in software development is the ability to shift strategies quickly, without disrupting the flow of a project. Because phases in the traditional waterfall method flow into one another, shifting strategies is challenging and can disrupt the rest of the project roadmap. Since software development is a much more adaptable field, project managing rapid changes in the traditional sense can be challenging. This is part of the reason why agile project management is favored in software development. In the aspect of RMS, the agile methodology will be a perfect selection for developing the software because when changes are to be made in system, other areas will not be disrupted or affected. Below is a diagrammatic representation of the agile methodology and what the different phases that are involved in it are:

Figure 1: Source: Taken from (asana articles, 2022)

Retrieved from: https://asana.com/resources/agile-methodology

3.1.2 Development Duration

The development of this student result management system is planned over a 14-week

Gantt chart showing project activities			Weeks													
No	Activity	Duration (weeks)	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Research/Plan	2														
2	Feasibility Study	1														
3	System Analysis	2														
4	System Design	3														
5	Development and Testing	4														
6	Release and Maintenance	2														
7	System Documentation	14														

Figure 2: Gantt chart

Source: Study activity (November 2023)

3.2 Current Result Systems

Result processing is a fundamental aspect of academic institutions, ensuring that students' academic performance is accurately recorded, assessed, and communicated. While many universities have embraced digital technologies, there are still common traditional methods and practices for handling results.

In many universities, the traditional method of result processing persists, often involving manual data entry of grades either through paper-based recording by professors or the use of Excel spreadsheets. Physical grade sheets are completed, submitted, and then manually entered by the Exams office into university databases. Verification and approval procedures follow, with transcripts and grade reports generated and disseminated physically. Result announcements are made through traditional means, such as posting printed grade sheets on notice boards or in university newspapers. Also, when results are to be verified by potential employers for instance, there is a whole process that come into play where by the student's institution needs to approve the result of the student which cannot be done in a flash, it has to take some time to process it and for some organizations, the delay can cause a recipe for the student not to be employed. These problems can be diminished by making use of a computer-based processing system or an electronic Result management system. These methods are associated with challenges including data entry errors, time-consuming processes, limited accessibility, resource-intensiveness, and security concerns, highlighting the need for universities to transition to more efficient and technology-driven result processing approaches.

3.3 Proposed Result System

In contrast to traditional methods, many universities have embraced innovative and automated result management systems to streamline and enhance the academic evaluation process. These advanced systems leverage cutting-edge technologies such as cloud computing, database management software, and user-friendly interfaces. The proposed system is a computerized Result management system that transforms the management, and verification of student results by institutions and organizations.

They offer features like real-time grading, automated grade calculation, and immediate student access to results through secure online portals or mobile applications. Automated systems also provide robust data security measures to safeguard sensitive information, reducing the risk of data breaches. Moreover, they significantly reduce the administrative burden by automating data entry and result verification, enabling academic authorities to allocate their resources more efficiently. These innovative result management

systems foster transparency, accelerate result processing, and empower students with timely access to their academic performance data, contributing to a more effective and student-centric educational environment.

3.4 System Design

System Design refers to the process of creating an architecture for different components, interfaces, and modules of the system and providing corresponding data helpful in implementing such elements in systems. The architecture of systems can be models with the concept of Unified Modeling Language (UML). The UML is a methodology for creating diagrams for communicating the various aspect of a system's design. The design of a system can be segmented to both structural and behavioral diagrams. Structure diagrams depict the static structure of the elements in your system. i.e., how one object relates to another. It shows the things in the system – classes, objects, packages or modules, physical nodes, components, and interfaces. A typical example of a structural diagram would be the UML class diagram. Behavioral diagrams show how the system behaves and interacts with itself and other entities (users, other systems). They show how data moves through the system, how objects communicate with each other, how the passage of time affects the system, or what events cause the system to change internal states. Since behavior diagrams illustrate the behavior of a system, they are used extensively to describe the functionality of software systems. An example of behavioral diagrams will be: Use Case, Entity Relationship Diagrams (ERD), Activity Diagrams, Sequence Diagrams, and Data Flow Diagrams.

3.4.1 Use Case Diagram

Use Case diagram is a graphical representation of what a system must do. It models the functionality of the RMS by using actors and use cases. It further elaborates on how the external actors or users interact or use the system.

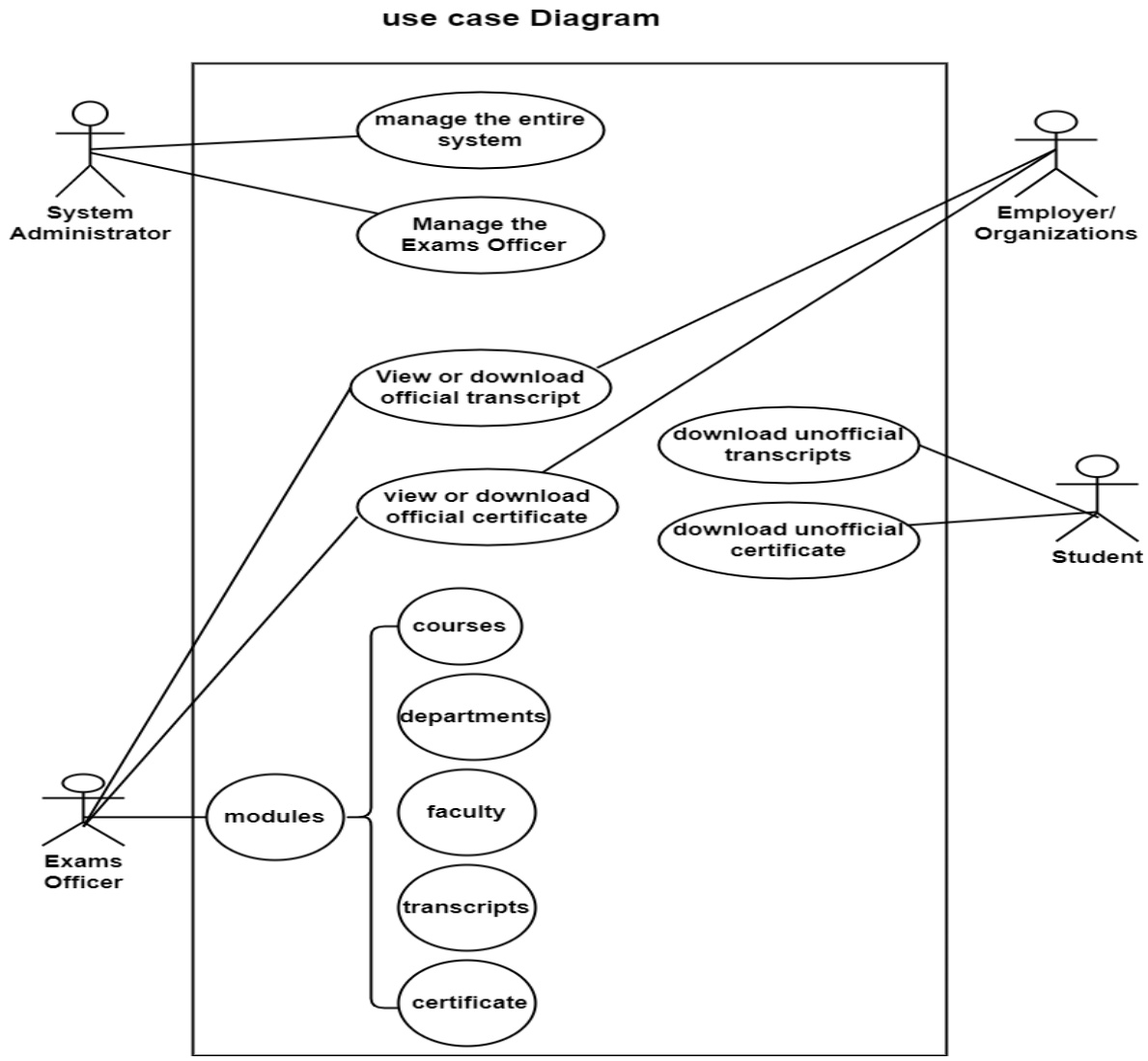


Figure 3: System use case diagram.

Source: Study activity (November 2023)

3.4.2 Sequence Diagram

Depicts how objects in a system interact with each other. Sequence diagrams are a popular dynamic modeling solution in UML because they specifically focus on lifelines, or the processes and objects that live simultaneously, and the messages exchanged between them to perform a function before the lifeline ends. The sequence diagram in the RMS, depict how the actors (system Administrator, Exams Officer, Employer or Organization and the Student) interact with different objects (modules and interfaces) of the system and how they can extract the full functionality of each interface.

3.4.2.1 Exams Officer's Sequence Diagram

This diagram depicts how the exams officer interact with certain modules and interfaces of the system which he/she has permission and access to. As he is in control of some major components of the system, he oversees the entire system and provide relevant data for the student and other organization to access.

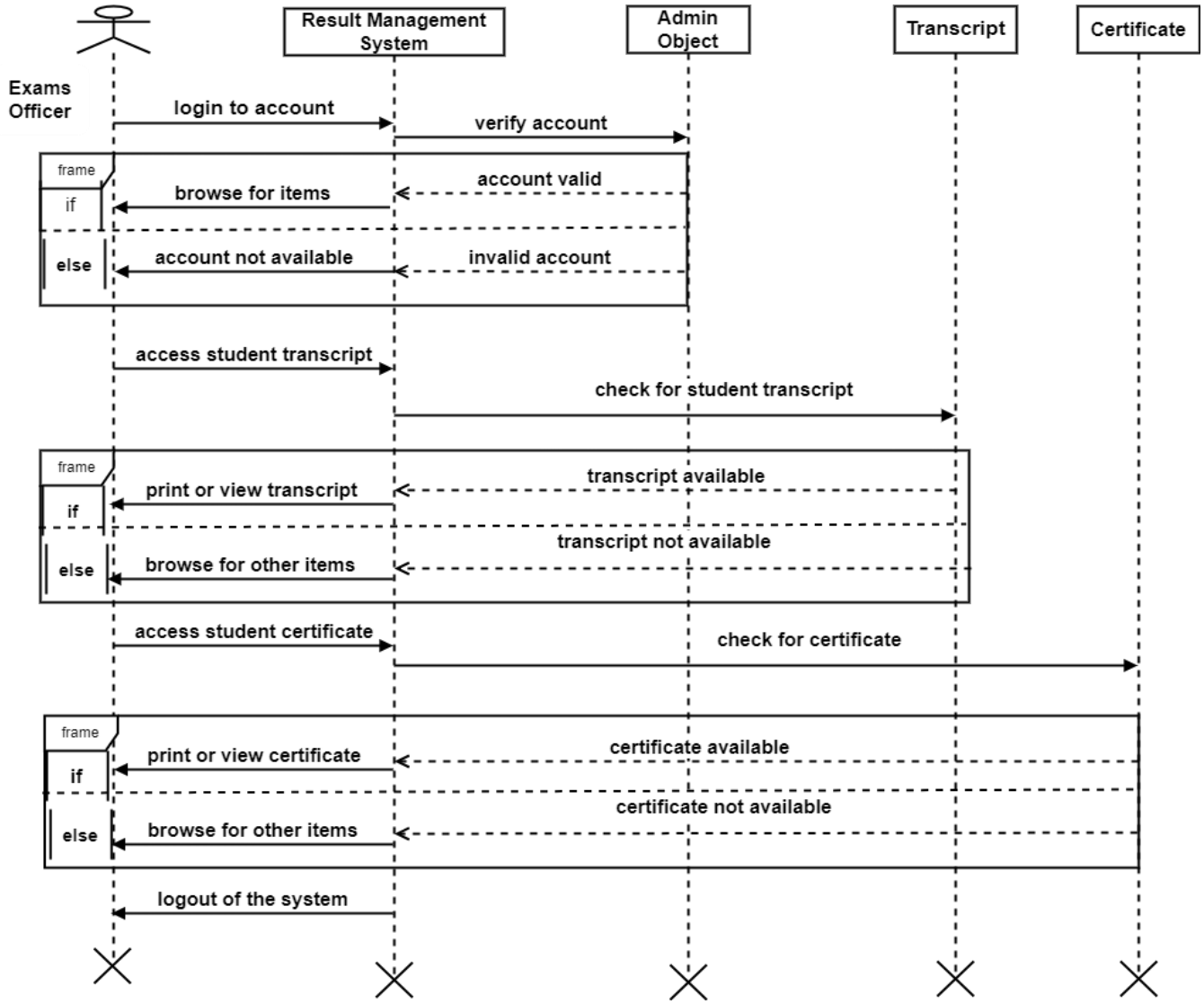


Figure Exams officer's use case diagram

Source: Study activity (November 2023)

3.4.2.2 Organization's Sequence Diagram

Unlike the Exams Officer, the organization or employer also has certain permissions and roles that are being granted to them by the exams officer or the system as a whole. They do not have much permissions in the system but to verify the student by accessing their official transcript and certificate that will be provided by the institution.

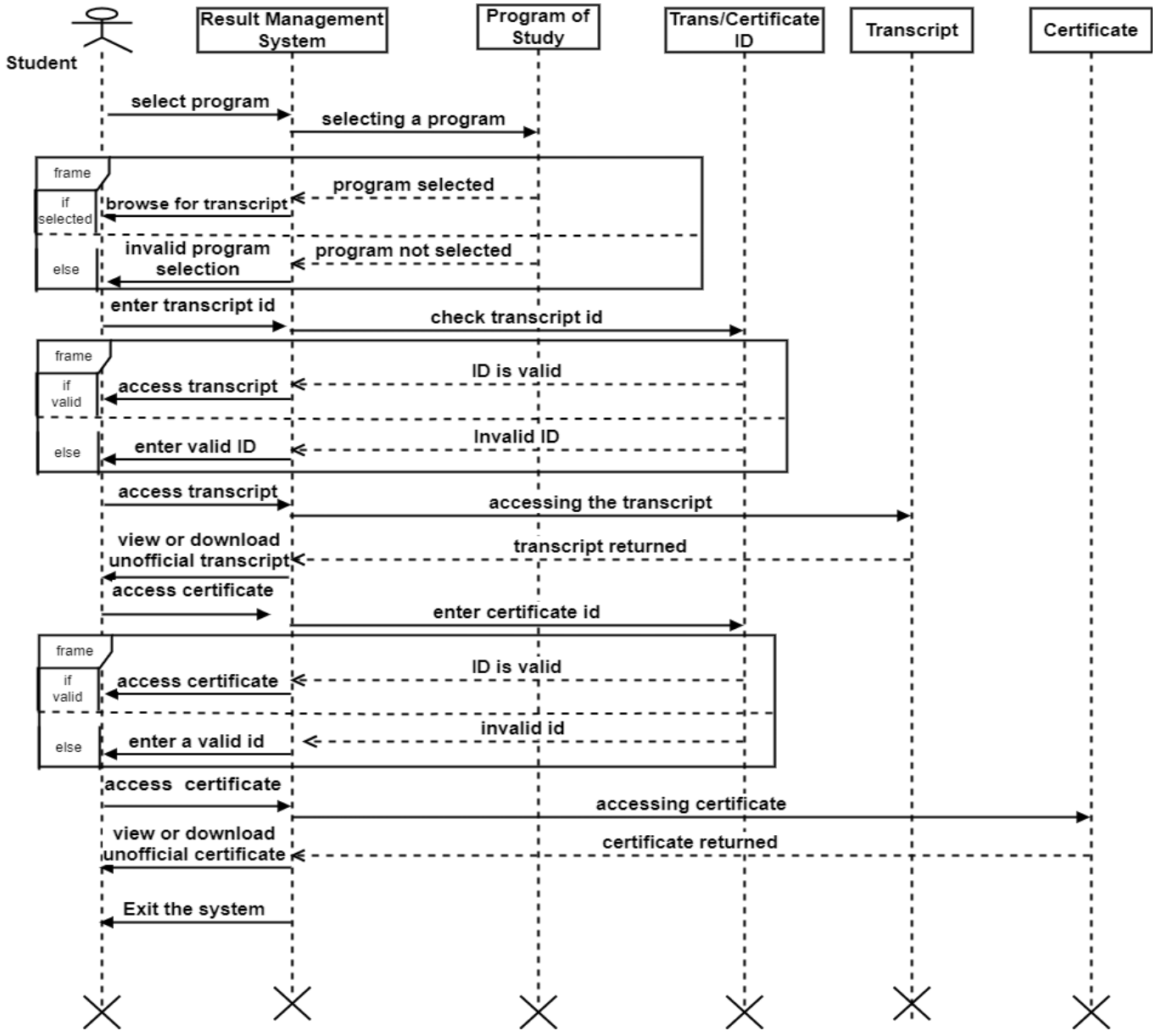


Figure 5: Organizations use case diagram

Source: Study activity (November 2023)

3.4.2.3 Student's Sequence Diagram

This diagram elaborates on how the student access the privileges that are given to them. By this I mean, the student will only be able to access limited functionalities in the system such as: accessing unofficial transcripts and certificates.

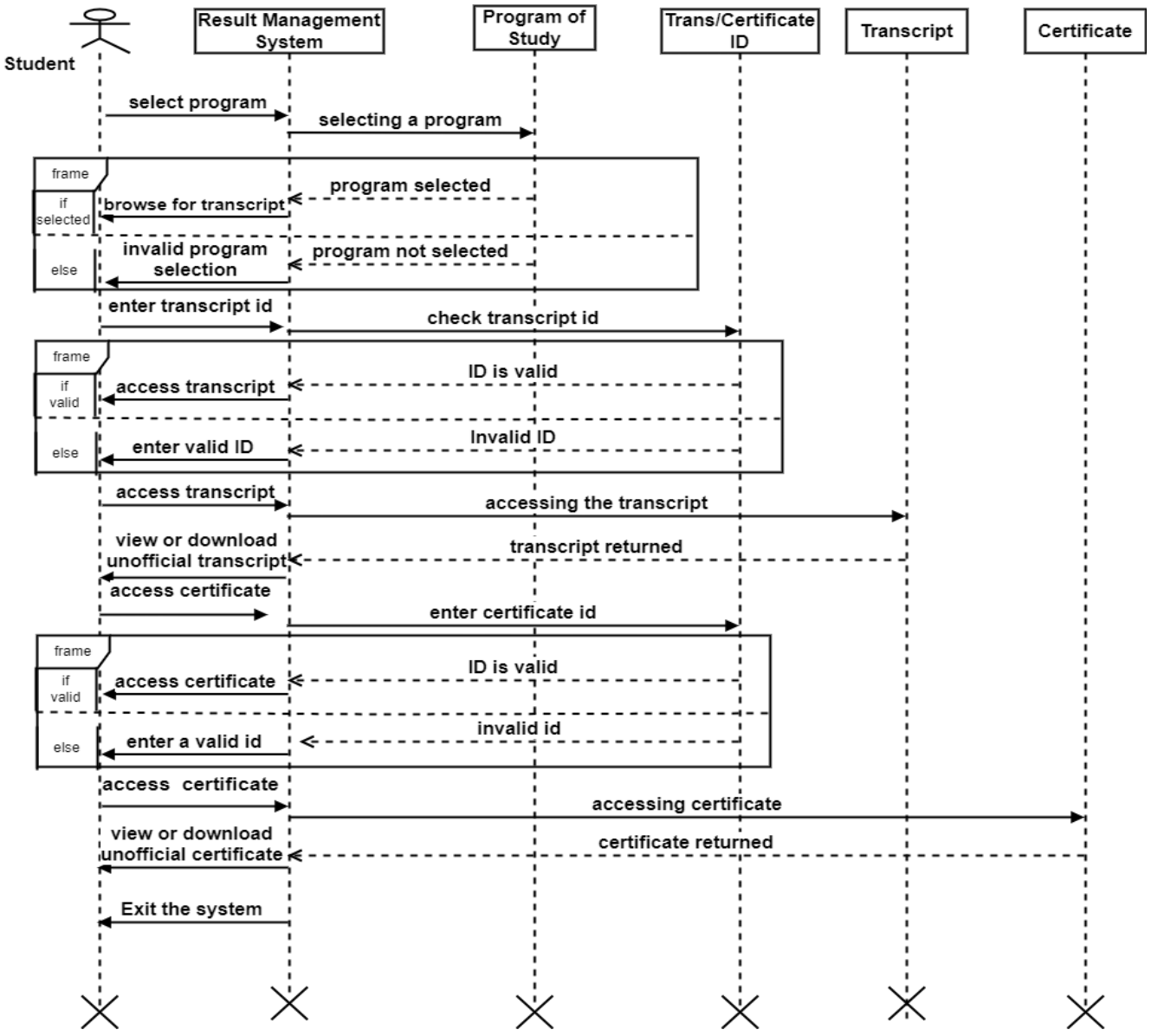


Figure 6: Students use case diagram

Source: Study activity (November 2023)

3.4.3 Class Diagram

Describes the structure of the classes, their attributes, their operations or methods and the relationship among these objects that are in the Result Management System. Class diagrams are one of the most useful types of diagrams in UML as they clearly map out the structure of a particular system by modeling its classes, attributes, operations, and relationships between objects. with the class diagram below, it depicts how classes such as the Department, Students, courses, faculties, programs etc. interact with one another and how are they related base on the attributes and methods the acquire.

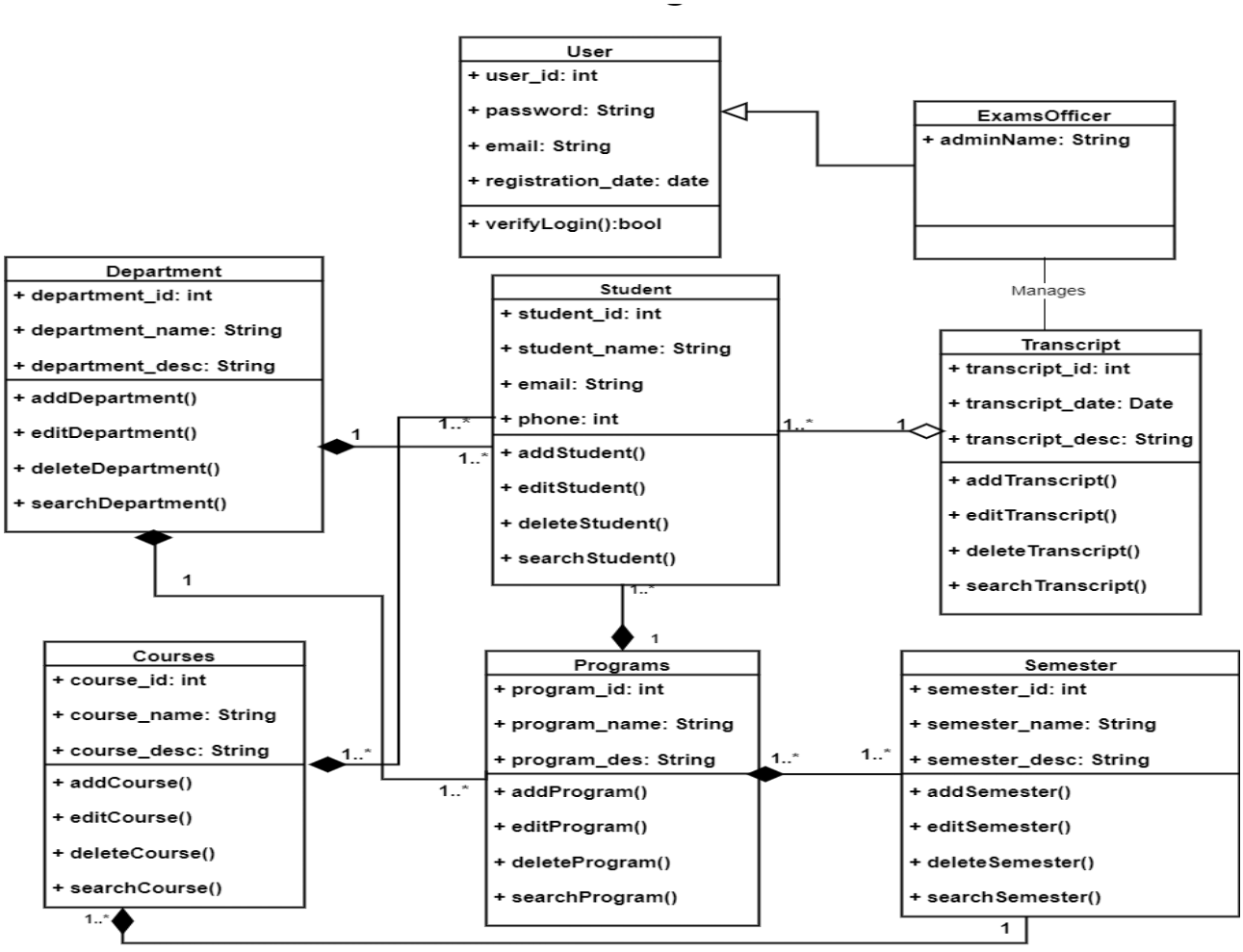


Figure 7: Class diagram

Source: Study activity (November 2023)

3.4.4 Entity Relationship Diagram (ERD)

Depicts how “entities” such as people, objects or concepts relate to each other within the system. ER Diagrams are most often used to design or debug relational databases in the fields of software engineering, business information systems, education and research. The ERD shows how the entities are interrelated and what are links they have in order to distribute the data that is being stored in the database.

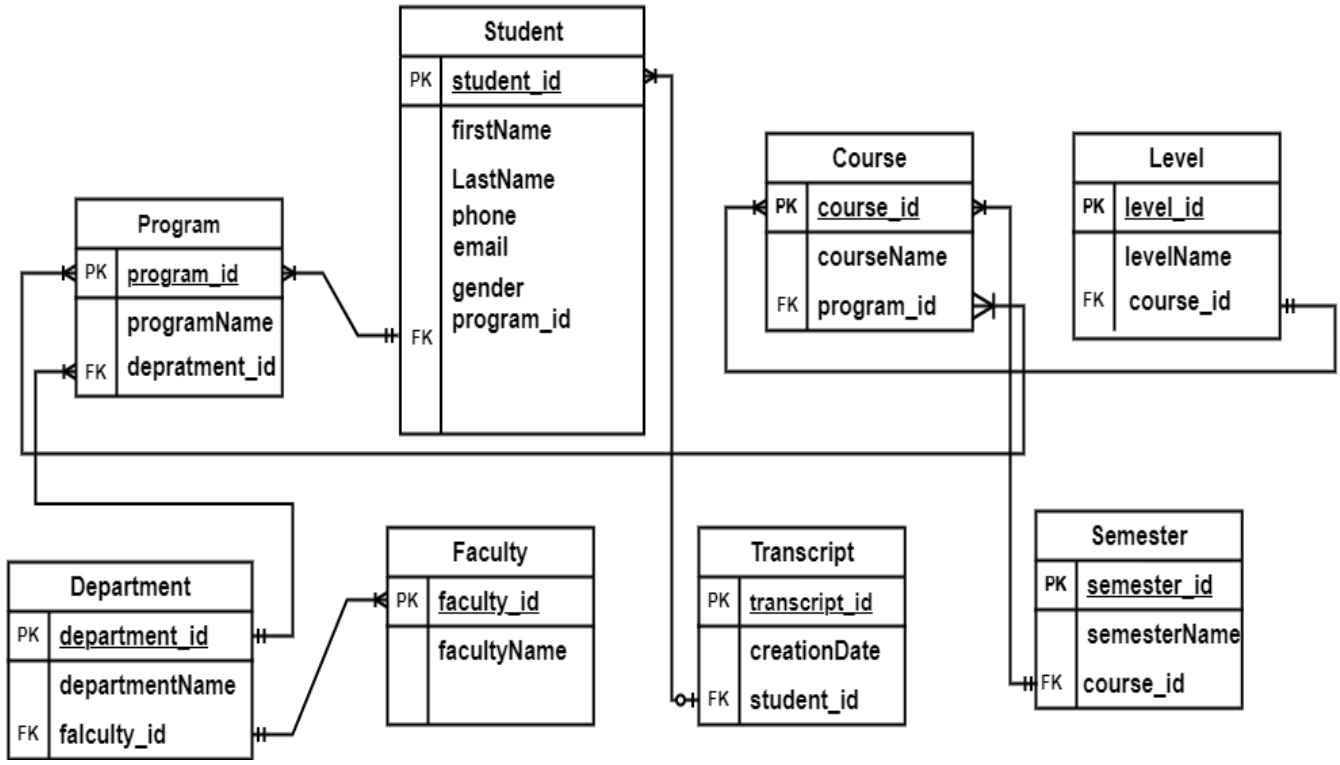


Figure 8: Entity Relationship diagram

Source: Study activity (November 2023)

3.4.5 Data Flow Diagram

Provide visual representation of the information flow through the system. A data flow diagram (DFD) maps out the flow of information for any process or system. It uses defined symbols like rectangles, circles and arrows, plus short text labels, to show data inputs, outputs, storage points and the routes between each destination. From the RMS the data flow diagram illustrates how the data travels from processing unto the external entities that are attached to the system. The entities can vividly represent the modules, interfaces and other functionalities in the system. Data flow diagram can be further segmented into three distinct stages which are Level 0, Level 1, Level 2 etc.

3.4.5.1 Level 0 Data Flow Diagram

DFD Level 0 is also called a Context Diagram. It's a basic overview of the whole system or process being analyzed or modeled. It's designed to be an at-a-glance view, showing the system as a single high-level process, with its relationship to external entities. The RMS level 0 elaborates on how the system is connected to external entities such as the actors and other functionalities and interfaces. This level depicts how data is being received and disseminated by the system.

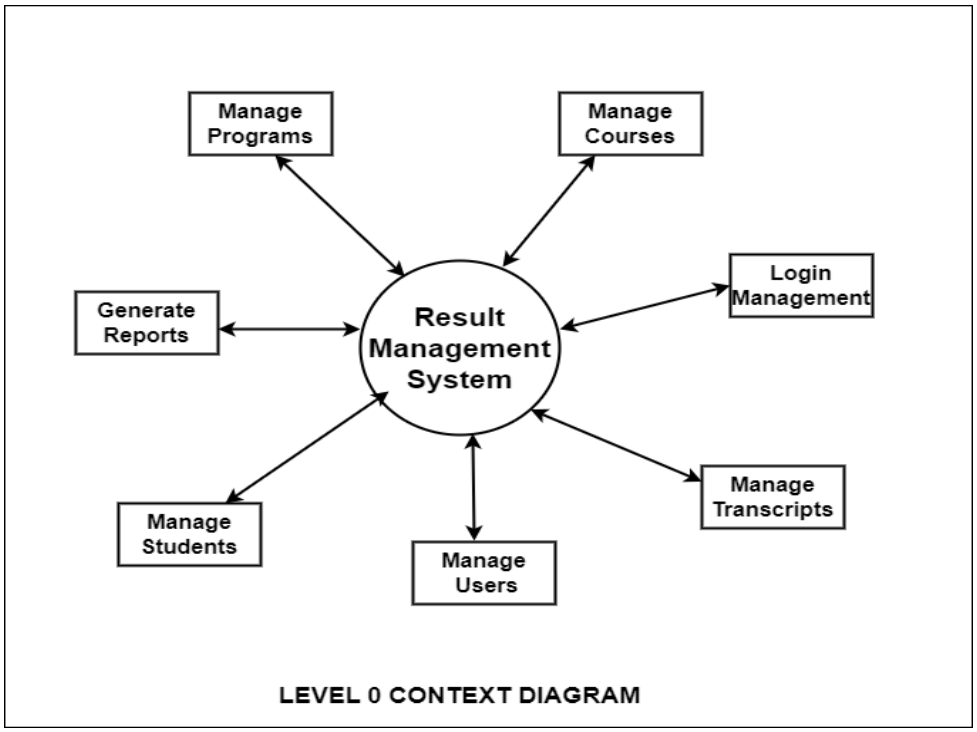


Figure 9: DFD Level 0

Source: Study activity (November 2023)

3.4.5.2 Level 1 Data Flow Diagram

DFD Level 1 provides a more detailed breakout of pieces of the Context Level Diagram. You will highlight the main functions carried out by the system, as you break down the high-level process of the Context Diagram into its sub processes. This level goes a step further in describing how data is being delivered into sub entities and how these entities correspond to other modules and interfaces of the system.

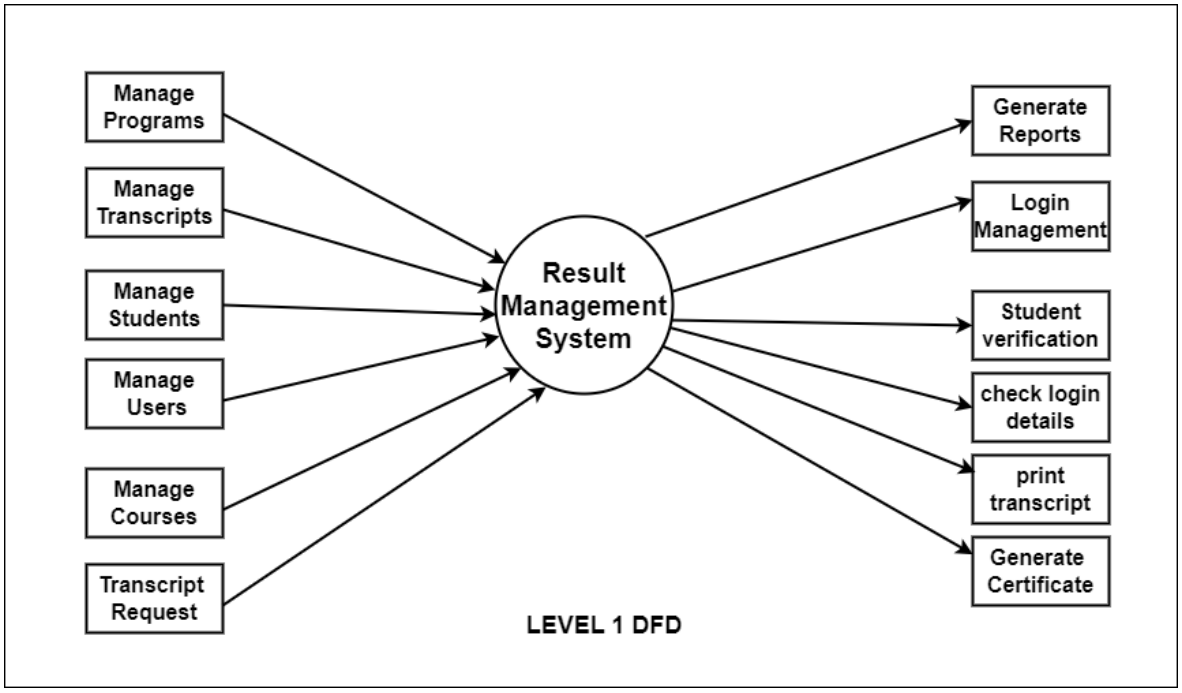


Figure 10: DFD Level 1

Source: Study activity (November 2023)

3.4.5.3 Level 2 Data Flow Diagram

DFD Level 2 then goes one step deeper into parts of Level 1. It may require more description to reach the necessary level of detail about the system's functioning. This level describes how each module or interface operates and the detail break down of these interfaces and how they interact with other interfaces in the RMS. Unlike level 0 and 1, level 2 explains the functionality of each module that is described or included into the system.

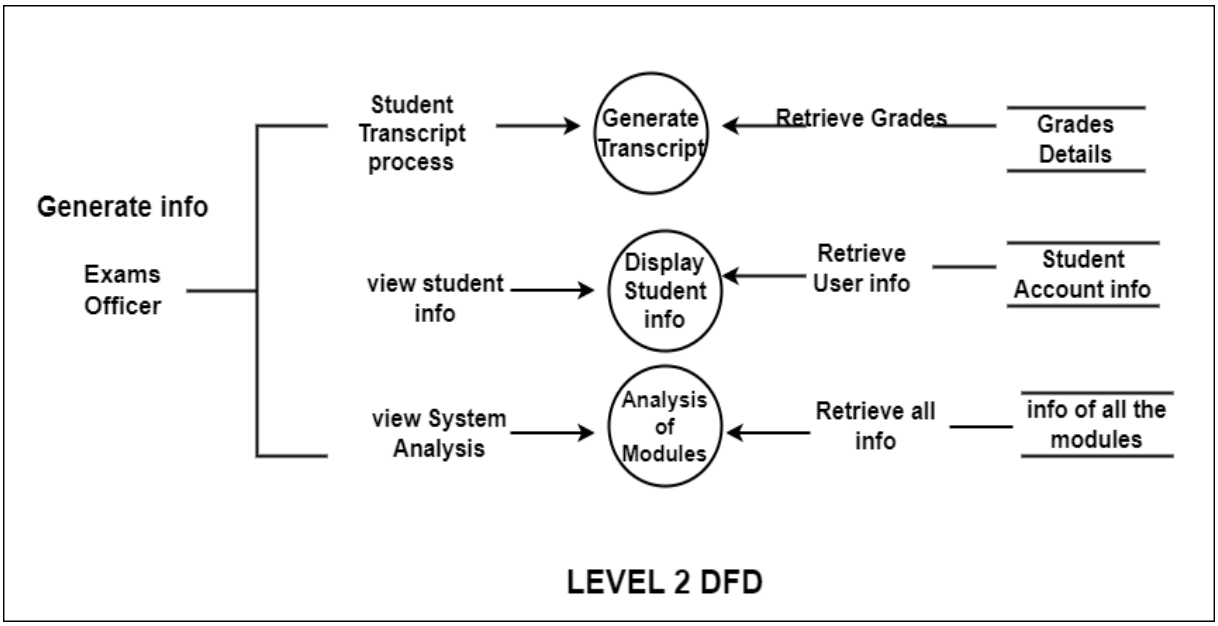


Figure 11: DFD Level 2

Source: Study activity (November 2023)

3.4.6 Activity Diagram

Activity diagram helps to visualize a certain use case at a more detailed level. It is a behavioral diagram that illustrates the flow of activities through a system. The activity diagram depicts flow of control or operation among the activities in the RMS. It shows how activities are being carried out and how certain decisions are being made to grand access to some modules in the system. The activity diagram of RMS can be divided into three sections, which indicates the activity level of the exams officer, the organization and the student.

3.4.6.1 Exams Officer's Activity Diagram

This activity diagram elaborates on how the exams officer interact with different activities in the system.

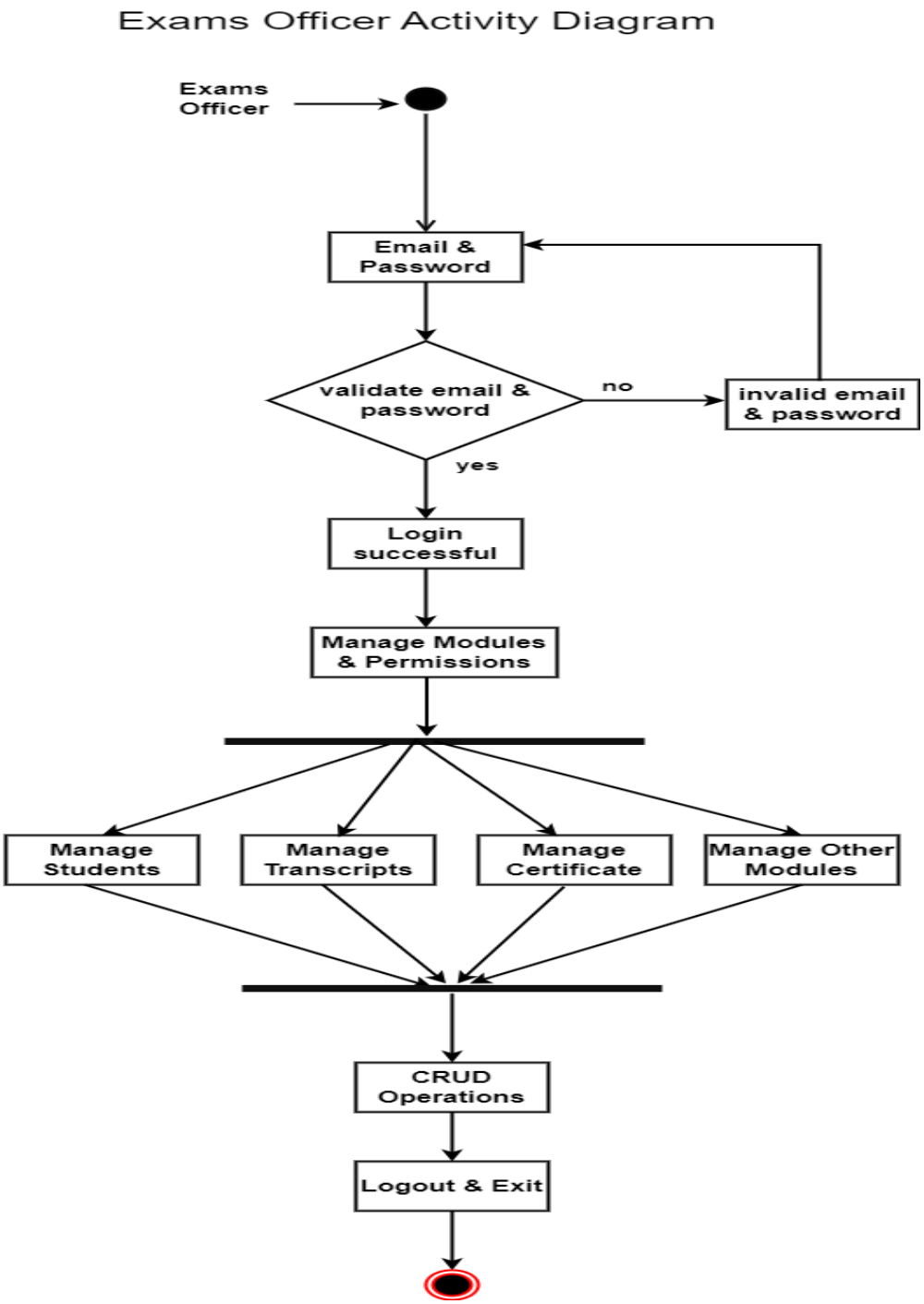


Figure 12: Exams officer activity diagram

Source: Study activity (November 2023)

3.4.6.2 Organization's Activity Diagram

This activity diagram elaborates on how organizations or employers interact with different activities in the system. Unlike the exams officer who is an administrator of the system, the organization or employer will not be granted many accesses or permissions to the system, they will only have limited permissions to verify student by viewing or downloading their certificate or transcripts.

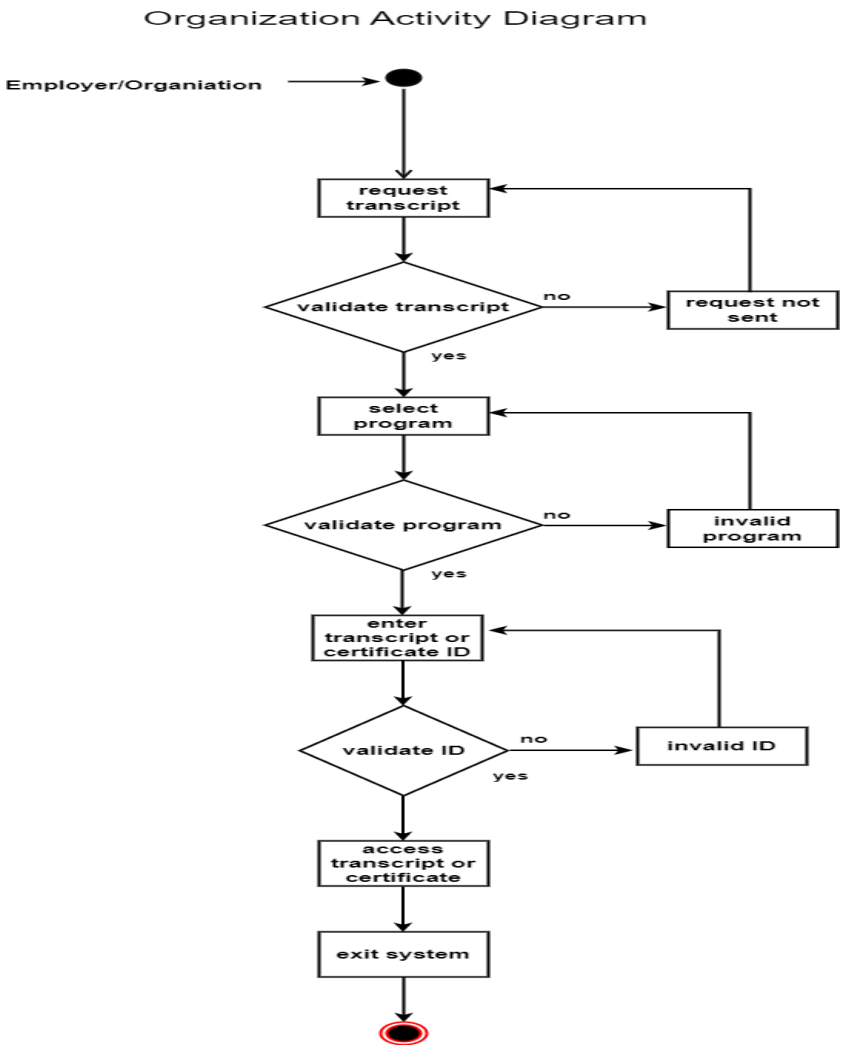


Figure 13: Organization's activity diagram

Source: Study activity (November 2023)

3.4.6.3 Students Activity Diagram

The student's activity diagram clearly explains how the student interact with their own activities in the system. This would be how they could access their unofficial transcripts and certificates.

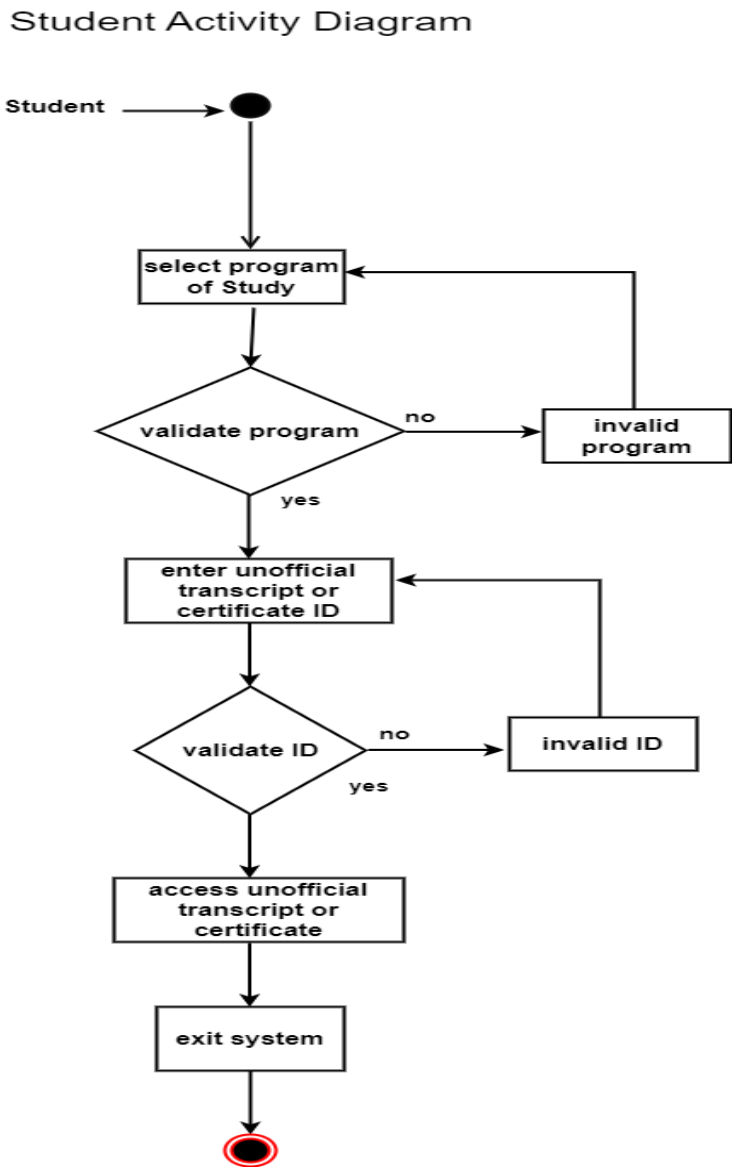


Figure 14: Students' activity diagram

Source: Study activity (November 2023)

CHAPTER FOUR

IMPLEMENTATION AND TESTING

4.1 System Implementation

System implementation is the process of building and setting up a computer system or software to make it work in the real world, ensuring that it does what it's supposed to do according to the plans and designs created for it. In the context of RMS, it refers to the practical execution of the software development process, encompassing tasks such as coding the RMS, configuring the database, designing user interfaces, integrating system components, conducting thorough testing, deploying the system to the production environment, and providing user training. This phase translates the RMS design and specifications into a functional system, ready for use in educational institutions.

4.2 System Development

The system development aspect of the RMS has to do with the Technical Feasibility (TF) solution of the system. It focuses on both the Software and Technical requirement of the system. Each aspect has to do with what are the software specification as well as the hardware specification of the system.

4.2.1 Hardware Specification

The hardware specification of the system is the hardware requirement range of devices in which the system can the accessed ranging from Computers, Tablets, as well as Mobile devices. Some of the major hardware requirements or specification of the system are listed below:

Intel p4 processor with minimum 2GHz speed.

2) RAM: Minimum 1GB

3) Hard Disk: min 20GB

i. Intel or AMD processor with minimum 2GHz speed.
ii. RAM: 1GB and above
iii. Hard Disk: 20GB and above

4.2.2 Software Specification

The software specification of the system involves the software aspect of the system which range from development and medium of accessibility. This includes the following:

i. Python as a programming language

ii. Django as a framework for the development
iii. SQLite3 as a database tool for the system
iv. Html, CSS & JavaScript for the front-end development
v. A web browser for testing and accessing the application

4.3 System Testing

Software system testing is a critical phase in the software development process where a software application or system is thoroughly evaluated to ensure that it functions correctly and meets its specified requirements. It involves systematically executing the software, both manually and through automated testing tools, to identify and rectify defects or issues.

In the context of a Result Management System (RMS), software system testing refers to the comprehensive evaluation of the RMS software to confirm that it operates accurately and efficiently in managing student results. This testing phase involves systematically examining the RMS for functionality, data accuracy, user interface usability, security, and performance, while also identifying and addressing any errors or issues that may arise. The primary objective is to ensure that the RMS reliably and precisely records, processes, and presents student results in accordance with the system's design and the educational institution's requirements, thus enabling effective result management.

4.3.1 Unit Testing

Unit testing (UT) in a Result Management System (RMS) refers to the practice of testing individual units or components of the RMS software in isolation to ensure their correctness and reliability. Each unit could be a specific function, method, or module within the RMS. Unit testing involves providing input data to the unit and verifying that the unit produces the expected output or behavior. In the RMS context, unit testing might include testing functions responsible for calculating grades, validating user inputs, or interacting with the database. The primary goal is to identify and fix any issues or bugs at the smallest functional level of the software, ensuring that each unit performs its intended task accurately, which contributes to the overall reliability and stability of the RMS.

4.3.2 Integration Testing

Integration testing is a phase of software testing that focuses on verifying the interactions and data flow between different components or modules of the RMS. The primary goal of integration testing is to ensure

that these components, which may have been developed and tested independently, work together harmoniously when integrated into the complete RMS. This testing phase assesses how well data is exchanged between various parts of the system, checks for compatibility issues, and identifies any potential bottlenecks or errors that may arise when different components interact. For example, in an RMS, integration testing might involve testing the connection between the user interface, the database, and the grading calculation module to ensure that student results are accurately recorded and displayed. Successful integration testing helps ensure that the RMS functions seamlessly as a whole, rather than as isolated pieces.

4.3.3 User Acceptance Testing

User Acceptance Testing (UAT) is the phase of testing where the RMS is evaluated by end-users, such as students, administrators, or other stakeholders, to ensure that it meets their specific needs and requirements. UAT aims to validate that the RMS functions as intended in a real-world environment and aligns with the user's expectations. During this phase, users typically perform tasks and scenarios that they would encounter in their daily use of the system, checking for usability, data accuracy, and overall satisfaction. Any discrepancies or issues identified during UAT

are documented and addressed before the RMS is considered ready for production deployment. UAT plays a crucial role in ensuring that the RMS meets the practical needs of the educational institution and its users, ultimately ensuring its effectiveness and user-friendliness.

4.3.4 Performance Testing

Performance Testing (PT) is a type of software testing that evaluates how well the system performs under different conditions and loads. The primary goal of performance testing is to assess the RMS's responsiveness, scalability, and stability, ensuring that it can handle the expected number of users and volume of data without degrading in performance. This type of testing involves various scenarios, including stress testing to determine the system's breaking point, load testing to gauge its performance under typical user loads, and scalability testing to assess its ability to handle increasing levels of data and users. For an RMS, performance testing helps identify and address bottlenecks or issues that could impact the speed and reliability of functions like result generation and reporting, ensuring that the system operates efficiently even during peak usage times.

4.3.5 Security Testing

Security Testing (ST) is a crucial phase in software development aimed at assessing and enhancing the security of a system, such as a Result Management System (RMS). It involves evaluating the system's defenses against potential security threats and vulnerabilities to ensure the protection of sensitive data. Key aspects of security testing include verifying user authentication and authorization, data encryption, input validation, and access control mechanisms. It also encompasses techniques like penetration testing and vulnerability scanning to identify and address security weaknesses. Overall, security testing is essential to safeguard against unauthorized access, data breaches, and compliance violations, ensuring the system's reliability and data protection.

4.5.16 Search and Display Transcript view

The search and display transcript view is responsible from the functionality of searching for transcript and displaying it to either the exam administrator or the employer

```
#**************************SEARCHING FOR MASSCOM TRANSCRIPT ************************
@login_required(login_url='login')
def search_masscomresult(request):
    transcript_id = request.GET.get('transcript_id')
    result = None

    if transcript_id:
        try:
            result = MasscomResult.objects.get(student__transcript_id=transcript_id)
        except Result.DoesNotExist:
            result = None

    context = {
        'result': result,
    }
    return render(request, 'result/view_masscomresult.html', context)


#***********DISPLAYING THE TRANSCRIPT*************
@login_required(login_url='login')
def view_masscomresult(request, transcript_id):
    try:
        result = MasscomResult.objects.get(student__transcript_id=transcript_id)
    except Result.DoesNotExist:
        result = None

    context = {
        'result': result,
    }
    return render(request, 'masscomresult.html', context)
```

Figure 30: Search and display transcript view

Source: Study activity (November 2023)

4.5.17 Search and Display Certificate view

The search and display certificate view are responsible from the functionality of searching for certificate and displaying it to either the exam administrator or the employer.

```
    # ========== certificate search==============
@login_required(login_url='login')
def search_student_certificate(request):
    transcript_id = request.GET.get('transcript_id')
    student = None
    message = None

    if transcript_id:
        try:
            student = Student.objects.get(transcript_id=transcript_id)
        except Student.DoesNotExist:
            student = None
            message = "The certificate does not exist."

    return render(request, 'result/search_student_certificate.html', {'student': student, 'message': message})
```

Figure 31: Search and display certificate view

Source: Study activity (November 2023)

4.5.18 Computer Science Unofficial Transcript View

This view is responsible for Computer Science Students to access their Unofficial Transcript and Certificate.

```python
#*************************SEARCHING FOR COMPUTER SCIENCE TRANSCRIPT ***********************
@login_required(login_url='login')
def search_result(request):
    email = request.GET.get('email')
    id_number = request.GET.get('id_number')
    result = None

    if email and id_number:
        try:
            result = Result.objects.get(student__email=email, student__student_id=id_number)
        except Result.DoesNotExist:
            result = None

    context = {
        'result': result,
    }
    return render(request, 'result/view_student_result.html', context)


#***********DISPLAYING THE TRANSCRIPT*************
@login_required(login_url='login')
def view_student_result(request, email, id_number):
    try:
        result = Result.objects.get(student__email=email, student__student_id=id_number)
    except Result.DoesNotExist:
        result = None

    context = {
        'result': result,
    }
    return render(request, 'result_display.html', context)
```

Figure 32: Computer science unofficial transcript view

Source: Study activity (November 2023)

4.5.19 BIT Unofficial Transcript View

This view is responsible for BIT Students to access their Unofficial Transcripts and Certificate.

```python
#*************************SEARCHING FOR BIT TRANSCRIPT ***********************
@login_required(login_url='login')
def search_bit_result(request):
    email = request.GET.get('email')
    id_number = request.GET.get('id_number')
    result = None

    if email and id_number:
        try:
            result = BitResult.objects.get(student__email=email, student__student_id=id_number)
        except BitResult.DoesNotExist:
            result = None

    context = {
        'result': result,
    }
    return render(request, 'result/view_bit_student_result.html', context)


#***********DISPLAYING THE TRANSCRIPT*************
@login_required(login_url='login')
def view_bit_student_result(request, email, id_number):
    try:
        result = BitResult.objects.get(student__email=email, student__student_id=id_number)
    except BitResult.DoesNotExist:
        result = None

    context = {
        'result': result,
    }
    return render(request, 'bit_result_display.html', context)
```

Figure 33: BIT unofficial transcript view

Source: Study activity (November 2023)

4.5.20 Mass Communication Unofficial Transcript View

This view is responsible for Mass communication Students to access their Unofficial Transcripts and Certificate.

```python
#**************************SEARCHING FOR MASSCOM TRANSCRIPT ************************
@login_required(login_url='login')
def search_masscom_result(request):
    email = request.GET.get('email')
    id_number = request.GET.get('id_number')
    result = None

    if email and id_number:
        try:
            result = MasscomResult.objects.get(student__email=email, student__student_id=id_number)
        except MasscomResult.DoesNotExist:
            result = None

    context = {
        'result': result,
    }
    return render(request, 'result/view_masscom_student_result.html', context)



#***********DISPLAYING THE TRANSCRIPT*************
@login_required(login_url='login')
def view_masscom_student_result(request, email, id_number):
    try:
        result = MasscomResult.objects.get(student__email=email, student__student_id=id_number)
    except MasscomResult.DoesNotExist:
        result = None

    context = {
        'result': result,
    }
    return render(request, 'masscom_result_display.html', context)
```

Figure 34: Mass communication unofficial transcript view

Source: Study activity (November 2023)

4.5.21 Exams Officer's Login View

This view is responsible for Exams administrator to login into the RMS and carry out different functionality.

```
def login_view(request):
    context={}
    if request.method=='POST':
        form=UserLoginForm(request.POST)
        if form.is_valid():
            email=request.POST['email']
            password=request.POST['password']
            user=authenticate(request,email=email,password=password)
            if user is not None:
                login(request, user)
                return redirect("admin1")
        else:
            context['login_form'] = form
    else:
        form=UserLoginForm()
        context['login_form'] = form
    return render(request, "result/login_register.html", context)
```

Figure 35: Exams officer's login view

Source: Study activity (November 2023)

4.5.22 System' Dashboard View

This view is responsible for providing system and comprehensive analysis of the RMS.

```
# ============================ADMIN INTERFACE==================
# **************ADMIN LOGIN**********************.
@login_required(login_url='login')
def admin1(request):
    faculty_count = Faculty.objects.all().count()
    student_count = Student.objects.all().count()
    department_count = Department.objects.all().count()
    program_count = Program.objects.all().count()
    result_count = Result.objects.all().count()
    context = {
        'faculty_count':faculty_count,
        'student_count':student_count,
        'department_count':department_count,
        'program_count':program_count,
        'result_count':result_count,
    }
    return render(request, 'result/admin1.html', context)
```

Figure 36: System Dashboard view

Source: Study activity (November 2023)

4.6 Process Design

The Process Design sometimes called Graphical User Interface (GUI) design phase in software development is a specific stage of the software development process that focuses on creating the visual and interactive elements of a software application that users interact with. It involves designing the user interface (UI) to

be user-friendly, intuitive, and visually appealing. The GUI design phase is crucial because the user interface is often the most visible and accessible part of the software, and it greatly influences the user's experience.

4.6.1 Home Page

The homepage of the result management system (RMS) is typically the main landing page or dashboard where users, such as students, administrators, or employers and organizations, access the system and find key information related to the results system and performance.

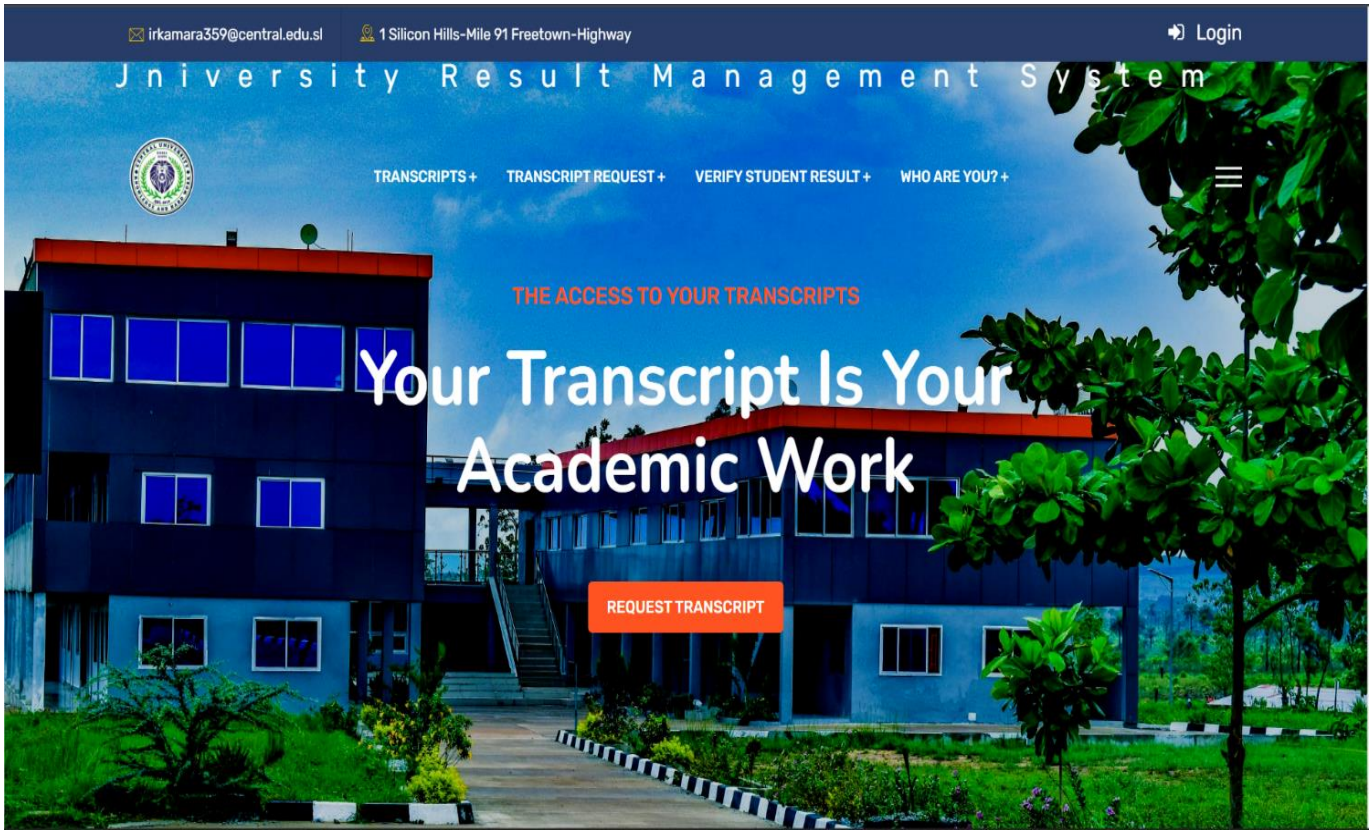


Figure 15: System's home page

Source: Study activity (November 2023)

4.6.2 Login Page

The login page of a Result Management System (RMS) is the initial interface that users encounter when they access the system. It is where the exams officer and the administrator provide their authentication credentials to log in and access their respective accounts.

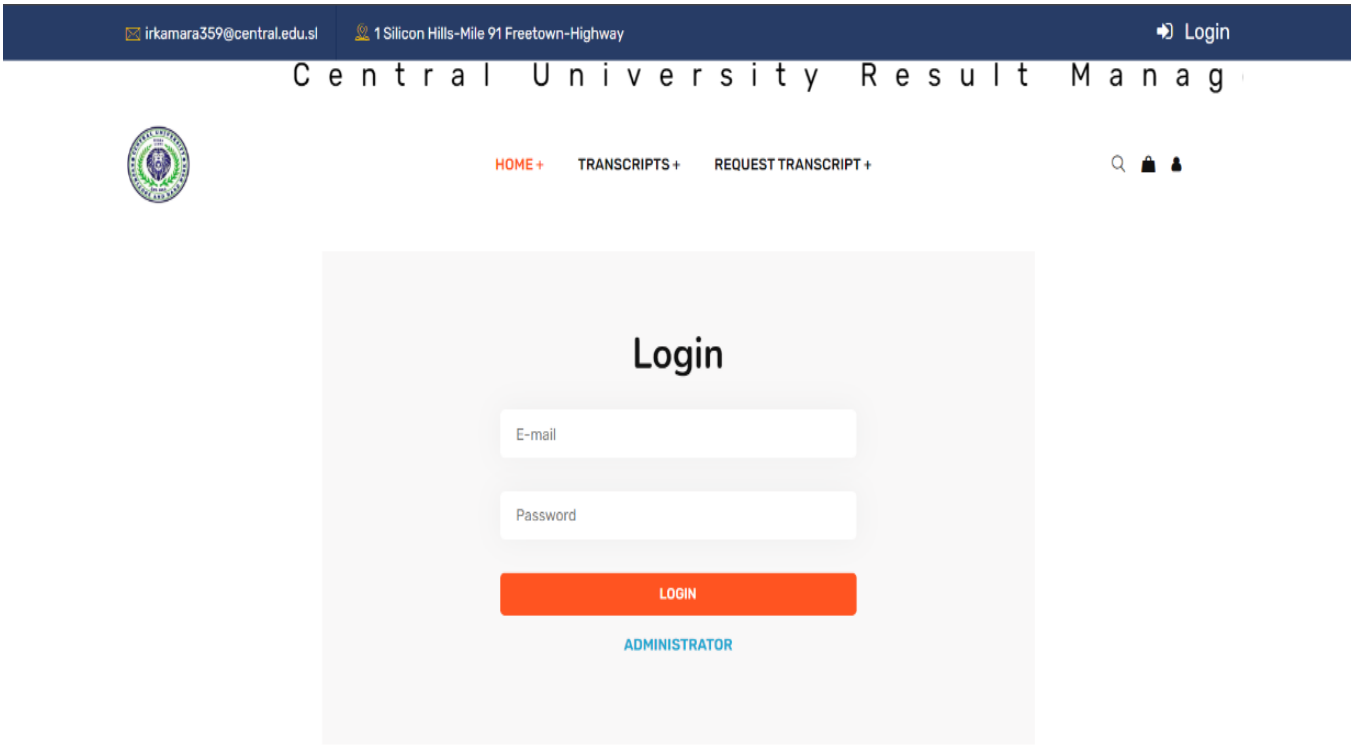


Figure 16: System's login page

Source: Study activity (November 2023)

4.6.3 Bit Unofficial Page

This page is available in order for Business Information Technology (BIT) Students to access their unofficial transcripts.

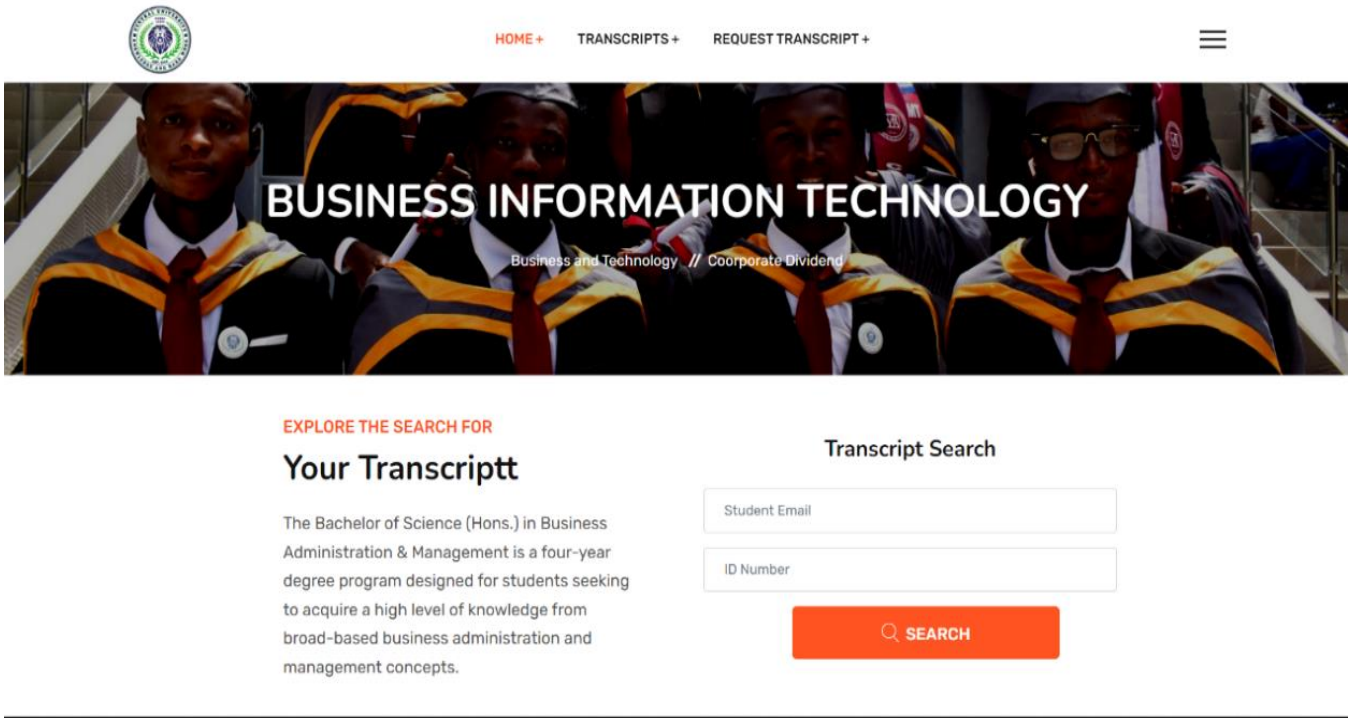


Figure 17: BIT transcript page

Source: Study activity (November 2023)

2.6.4 Computer Science Unofficial Transcript Page

This page is provided for Computer Science (CS) Students to access their unofficial transcript.

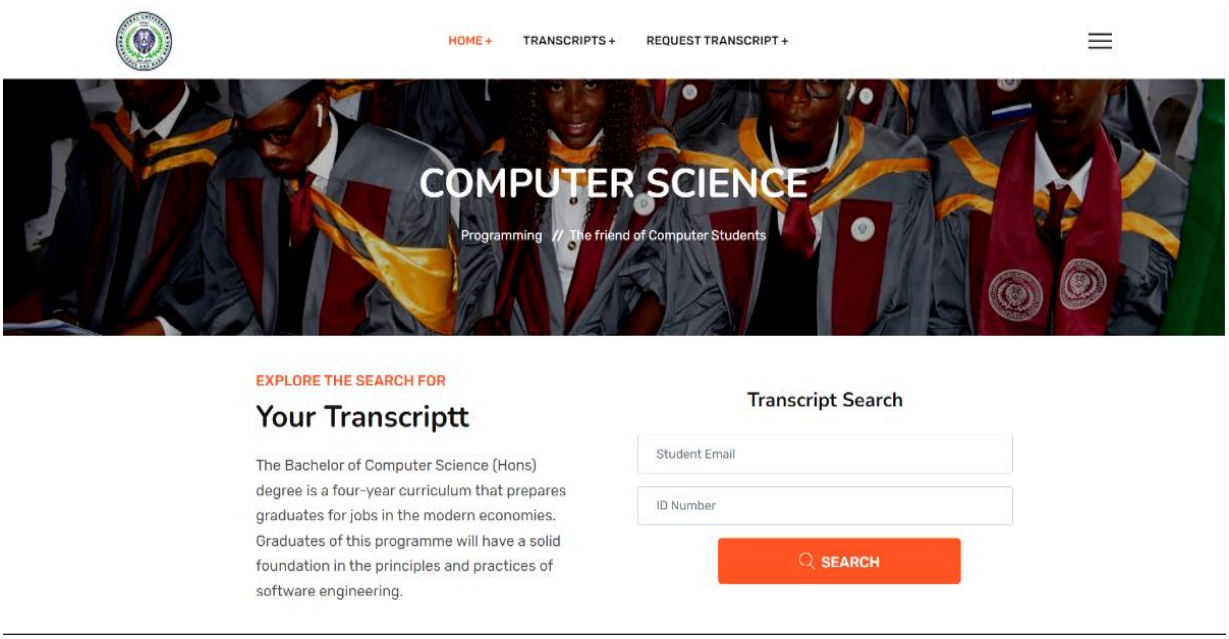


Figure 18: Computer science transcript page

Source: Study activity (November 2023)

4.6.5 Mass Communication Unofficial Transcript Page

This page is provided for Mass Communication (MC) Students to access their unofficial transcript.

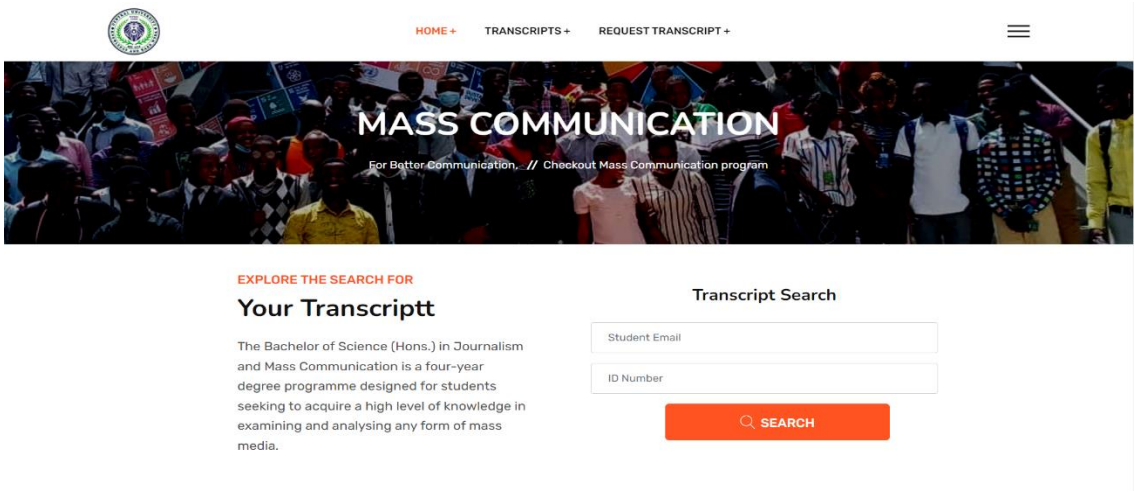


Figure 19: Mass communication transcript page

Source: Study activity (November 2023)

4.6.6 Transcript Request Page

The transcript request page is provided so that students would be able to request transcripts from the institution for processing.

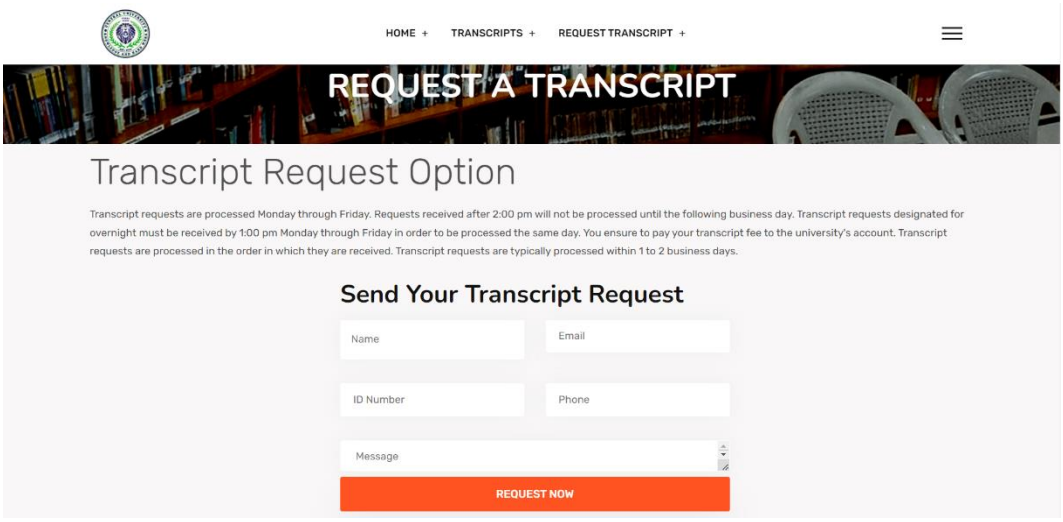


Figure 20: Transcript request page

Source: Study activity (November 2023)

4.6.7 Transcript Page

The transcript page is provided for organization and employers to verify students' transcripts.

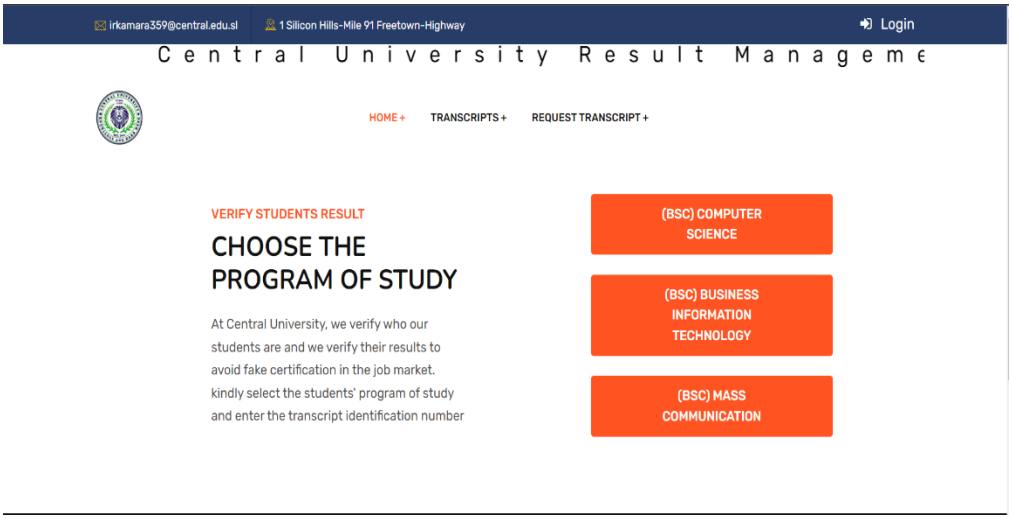


Figure 21: Transcript page

Source: Study activity (November 2023)

4.6.8 Certificate Page

The certificate page is provided for employers or organizations to verify student's certificate.

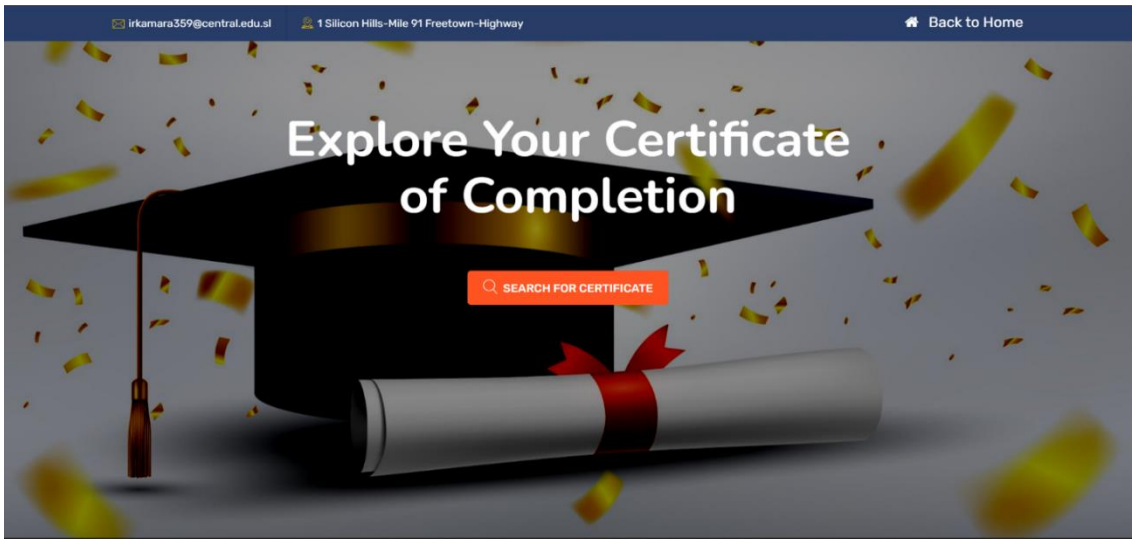


Figure 22: certificate page

Source: Study activity (November 2023)

4.6.9 Dashboard Page

Dashboards is designed to give users quick access to important data and actions, allowing them to make informed decisions and navigate the system efficiently.

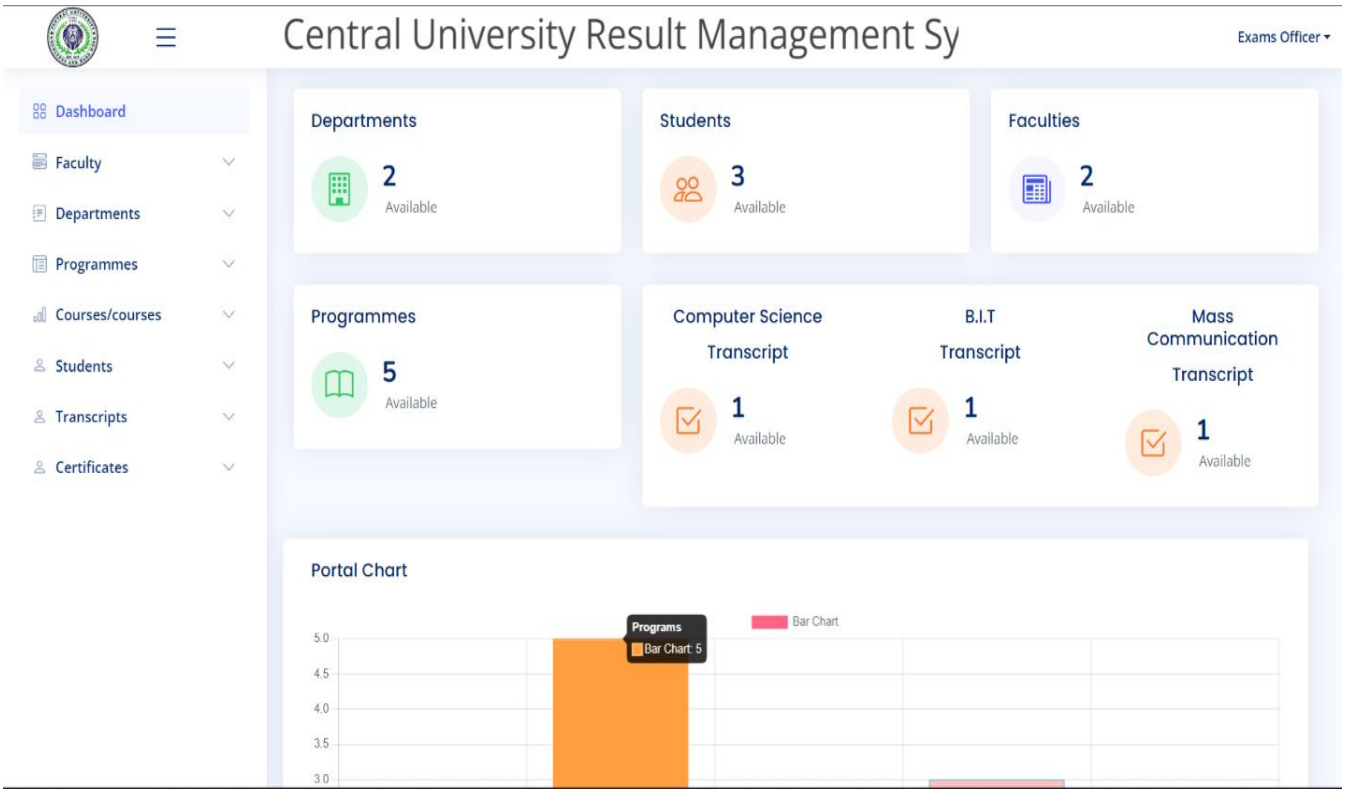


Figure 23: System dashboard page

Source: Study activity (November 2023)

4.6.10 Programs Page

The programs page provides a CRUD representation for the various programs in the system.

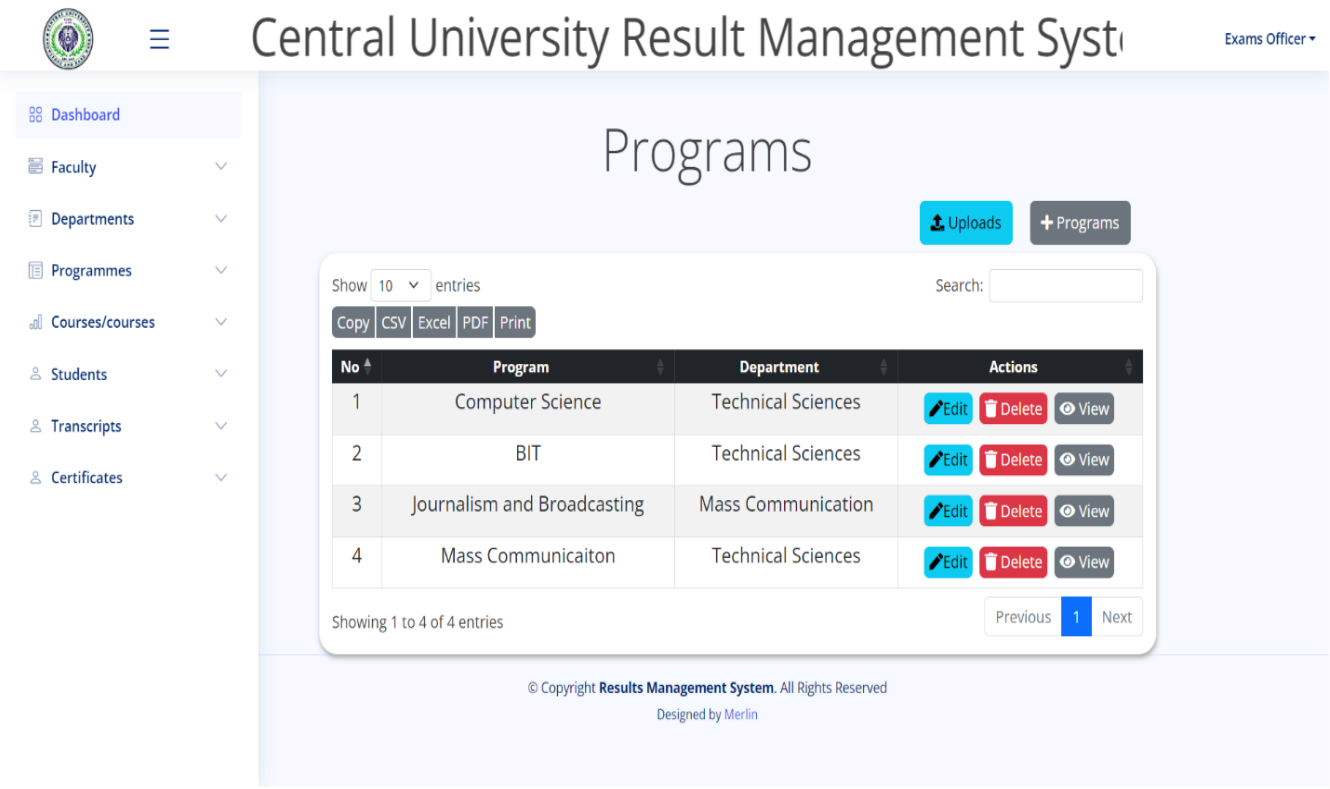


Figure 24: programs page

Source: Study activity (November 2023)

4.6.11 Departments Page

The department page provides a CRUD representation for the various departments in the system.

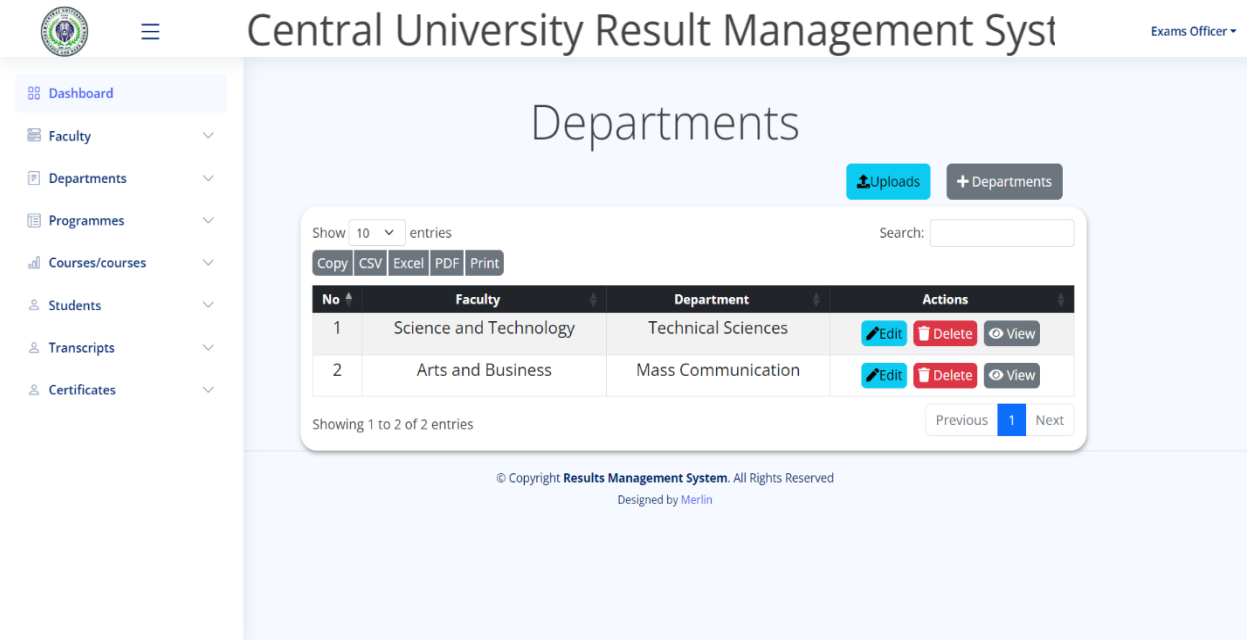


Figure 25: departments page

Source: Study activity (November 2023)

4.6.12 Students Page

The student's page provides a CRUD representation for all the students in the system.

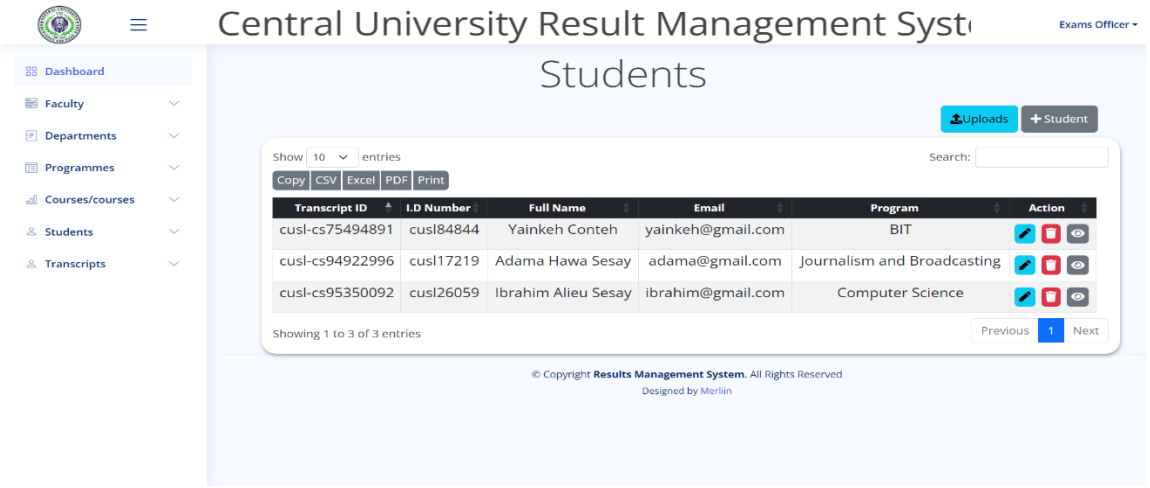


Figure 26: students page

Source: Study activity (November 2023)

4.6.13 Faculty Page

The faculty page provides CRUD functionalities for all the faculties in the system.

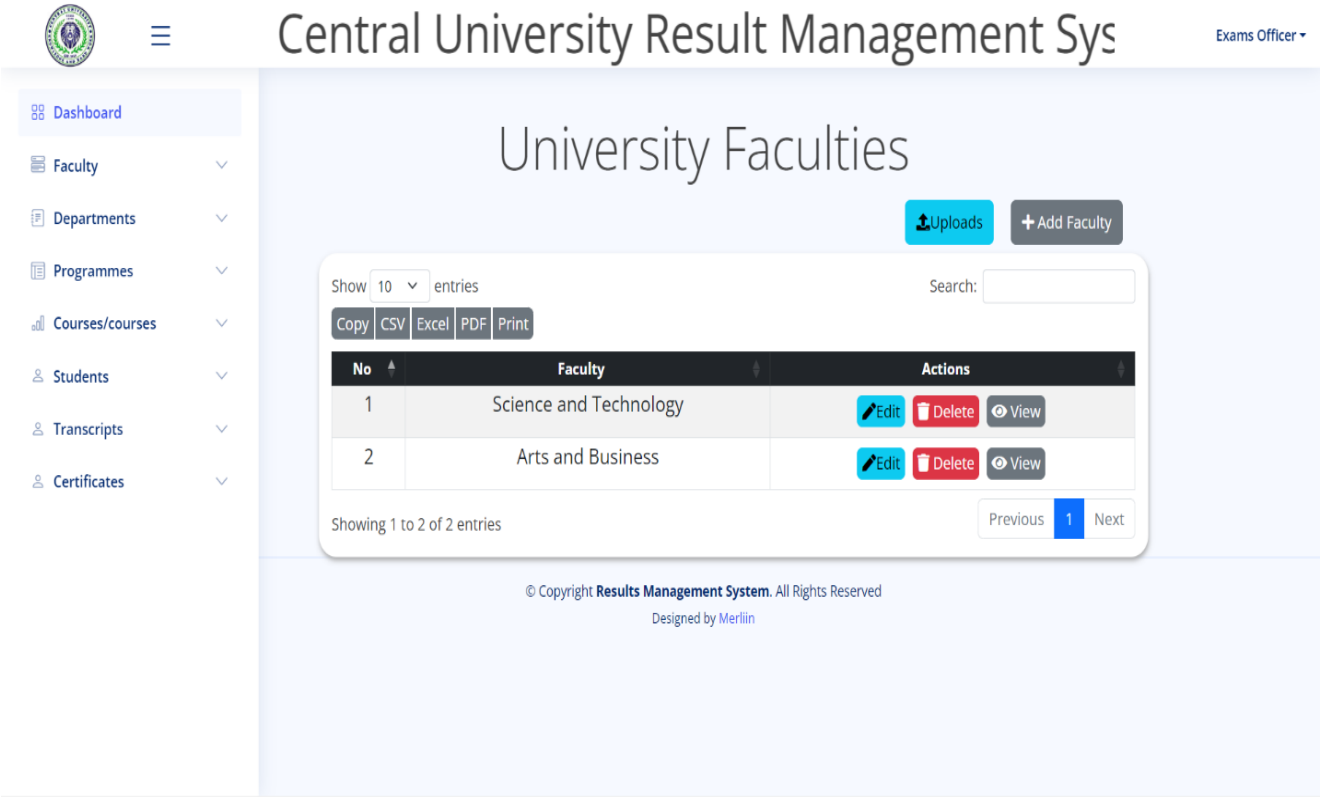
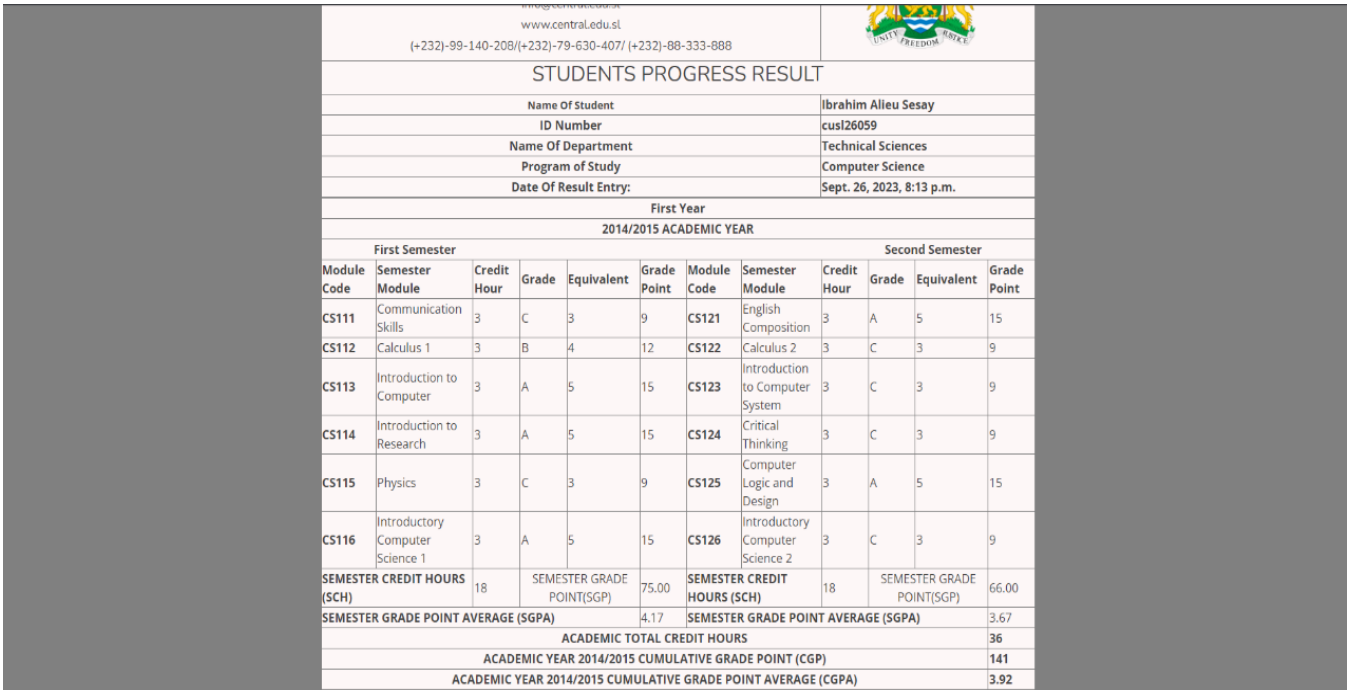


Figure 27: Faculty page

Source: Study activity (November 2023)

4.6.14 Transcript Page

The transcript page provides a view of a particular student transcript.



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STUDENTS PROGRESS RESULT

Name Of Student	Ibrahim Alieu Sesay
ID Number	cusl26059
Name Of Department	Technical Sciences
Program of Study	Computer Science
Date Of Result Entry:	Sept. 26, 2023, 8:13 p.m.

First Year
2014/2015 ACADEMIC YEAR

First Semester						Second Semester					
Module Code	Semester Module	Credit Hour	Grade	Equivalent	Grade Point	Module Code	Semester Module	Credit Hour	Grade	Equivalent	Grade Point
CS111	Communication Skills	3	C	3	9	CS121	English Composition	3	A	5	15
CS112	Calculus 1	3	B	4	12	CS122	Calculus 2	3	C	3	9
CS113	Introduction to Computer	3	A	5	15	CS123	Introduction to Computer System	3	C	3	9
CS114	Introduction to Research	3	A	5	15	CS124	Critical Thinking	3	C	3	9
CS115	Physics	3	C	3	9	CS125	Computer Logic and Design	3	A	5	15
CS116	Introductory Computer Science 1	3	A	5	15	CS126	Introductory Computer Science 2	3	C	3	9
SEMESTER CREDIT HOURS (SCH)		18	SEMESTER GRADE POINT(SGP)		75.00	SEMESTER CREDIT HOURS (SCH)		18	SEMESTER GRADE POINT(SGP)		66.00
SEMESTER GRADE POINT AVERAGE (SGPA)					4.17	SEMESTER GRADE POINT AVERAGE (SGPA)					3.67
ACADEMIC TOTAL CREDIT HOURS											36
ACADEMIC YEAR 2014/2015 CUMULATIVE GRADE POINT (CGP)											141
ACADEMIC YEAR 2014/2015 CUMULATIVE GRADE POINT AVERAGE (CGPA)											3.92

Figure 28: Transcript page

Source: Study activity (November 2023)

4.6.15 Certificate Page

This page is the end-result for the student certificate.

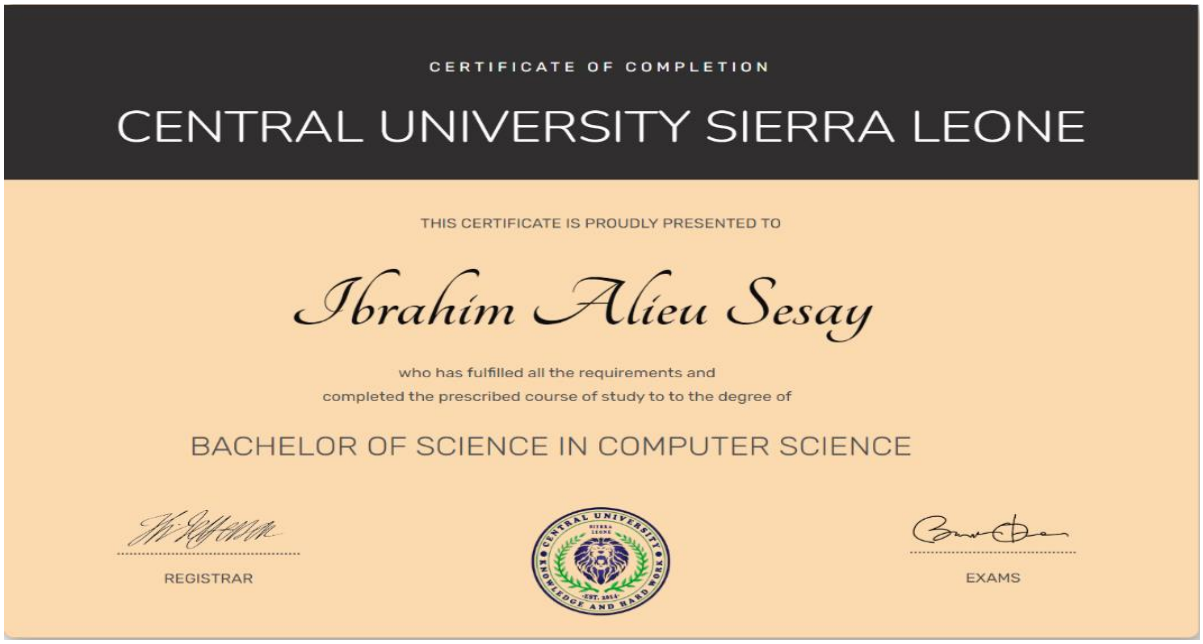

Figure 29: Student certificate page

Source: Study activity (November 2023)

CHAPTER FIVE

DISCUSSION, RECOMMENDATION AND CONCLUSION

5.1 Deployment

The deployment of a Result Management System (RMS) refers to the process of implementing and making the RMS operational within an educational institution or organizations. It involves taking the system from the development or testing phase and putting it into active use for managing academic results. It typically includes activities such as setting up the necessary hardware and software infrastructure, transferring existing data into the system, configuring user access, and providing training to staff and users. The goal of deployment is to ensure that the RMS is fully functional, accessible, and ready for use by students, faculty, administrators, and other relevant stakeholders.

5.2 Deliverables and Outcome

Deliverables are the concrete and specific outputs or items that are produced or provided as a result of developing and implementing the RMS. These are the physical or concrete components of the system or the documentation associated with it. In the context of an RMS, deliverables can include:

The software application itself, including the user interface and database structure.

Comprehensive documentation such as user manuals, technical guides, and training materials.

Hardware infrastructure if needed, which might include servers, storage devices, and networking equipment.

Data migration plans outlining strategies for transferring existing academic data into the RMS.

Security protocols and measures, including access controls and encryption methods.

Outcomes, on the other hand, refer to the expected effects, results, or benefits that the RMS is designed to achieve or provide once it is in active use within an educational institution. These are the broader, often intangible, consequences or improvements that the RMS is intended to bring about. In the context of an RMS, outcomes can include:

More efficient data management processes, leading to time and resource savings.

Enhanced data accuracy and consistency in academic records, reducing errors.

Improved accessibility for students, faculty, and administrators to academic results and related data.

Increased transparency in academic record management, fostering trust within the institution.

Enhanced security and compliance with data protection regulations.

Enhanced trust and credibility of the institution among stakeholders.

Higher user satisfaction as a result of a user-friendly and reliable system.

5.3 Future Enhancement

In the future, your Result Management System (RMS) is self-assured to be even more versatile and impactful, benefiting both educational institutions and employment organizations. For educational institutions, the RMS will introduce cutting-edge features such as blockchain-backed digital transcripts and certificates. This innovation will provide students with secure, tamper-proof academic records that can be easily shared with prospective employers or other institutions. Educational institutions will have the capability to quickly and reliably verify the authenticity of these digital credentials, reducing administrative burdens and ensuring data integrity.

On the employment front, organizations will benefit from a streamlined and trusted platform for verifying the academic qualifications of job applicants. The RMS will offer a convenient and efficient verification process, enabling employers to make informed hiring decisions with confidence. Moreover, the system may integrate with industry-standard credential verification services, enhancing its utility in various sectors.

These future enhancements will foster greater trust, efficiency, and convenience for all stakeholders involved. Students will have a secure and portable way to showcase their academic achievements, educational institutions will experience improved administrative efficiency, and employment organizations will have a reliable means of assessing candidate qualifications. This represents a significant step forward in simplifying the verification of academic results, benefiting both education and the job market.

5.4 Transcript Processing

Transcript processing is a comprehensive system because it incorporates a huge number of calculations based on defined terms. Calculations such as: Semester Grade Point (SGP), Credit Hours (CH), Semester Credit Hours (SCH), Grade Point Average (GPA), Cumulative Grade Point Average (CGPA), Yearly Total Credit Hours (YTCH), Grade, Equivalent, Grade Point, Cumulative Grade Point (CGP), Internal Assessment, Project Assessment, Final Cumulative Grade Point (FCGP), Division Class Range.

Result system at Central University is being segmented into two parts which are: Progress Report and Academic Transcript. Progress Report is a comprehensive report of student grades per semester or yearly basis. Academic transcript is a detail record of all the courses or modules that a student has studied with the scores in the form of marks or grades given to them by the institution.

5.4.1 Module Code

A module code is a unique identifier or alphanumeric code assigned to an academic course or module at an educational institution, such as a university or college. At Central University, this code helps students and administrators easily identify and reference specific courses when registering for classes, tracking progress, or managing academic records.

Module codes typically include information about the course, such as the department or subject area, the level or year of study, and a unique identifier for the specific course. For example, a module code might look like **"BIT315"** where **"BIT"** represents the Business Information Technology Program, and **"315"** could signify another thing. The **'3'**, signifies the level at which that module is offered, the **'1'** signifies the semester in which that module is offered, and finally the **'5'** signifies that it is the fifth module in the program of study for that particular semester.

5.4.2 Semester Module or Course

A semester module or course refers to an academic course or module that is typically taught and completed within a single semester or term in an educational institution, a typical example would be Central University. In many educational systems, a semester is a specific period of time, often lasting around three to four months, during which students take a set of courses that are related to their degree program. And example of Module would be: Cloud Computing, System Analysis and Design, Fundamentals of Cyber Security, to name but few.

5.4.3 Credit Hour

A credit hour, also known as a credit unit or semester credit hour, is a standard measure of the amount of academic coursework or instruction time that a student receives in a particular course. It is used by educational institutions, such as colleges and universities, to quantify and represent the workload and level of academic content in a course.

5.4.4 Grade

A grade is a symbol or mark assigned to assess and communicate the level of a student's performance or achievement in an academic course, examination, assignment, or other educational activity. Grades are commonly used in Central University like any other academic institution, to evaluate and report a student's progress and proficiency in a particular subject or course of study. The Grades can be a representation of a mark obtain in a particular course or module. For example, at central university there is a grade range for various modules.

Scale	Grade	Grade Description
75 – 100	A	Excellent
65 – 74	B	Good
50 – 64	C	Fair
40 – 49	D	Barely Passed
30 – 39	E	Failing Grade
0 – 29	F	Complete Fail

Table 1: Central university grading scale

Source: Study activity (November 2023)

5.4.5 Equivalent Grade

In the grading system you at Central University, the term **"equivalent"** refers to a numerical value assigned to each letter grade to represent the quality of a student's performance in a course. Specifically, A typical example of equivalent will be shown below:

Grade	Equivalent
A	5
B	4
C	3
D	2
E	1
F	0

Table 2: Central university Equivalent scale

Source: Study activity (November 2023)

5.4.6 Grade Point

A grade point, often referred to as a "grade point" or simply "point," is a numerical value assigned to each letter grade earned by a student in an academic course. The grade point is used to assess and quantify the quality of a student's performance in that course and is an essential component for calculating a student's Grade Point Average (GPA). The Grade Point is derived by multiplying the Credit Hours by the Equivalent Grade.

$$\boldsymbol{Grade\ Point = Credit\ Hour \times Equivalent\ Grade}$$

5.4.7 Semester Grade Point (SGP)

A Semester Grade Point refers to the numerical value that represents a student's academic performance for a specific semester or term within an academic semester. It is often used as a way to evaluate and summarize how well a student performed in their courses during a particular academic period. Semester Grade Points are typically calculated based on the grades earned in individual courses during that specific term, and it can be calculated by finding the summation of equivalent grades:

$$SGP = \sum Equivalent\ grades$$

5.4.8 Semester Grade Point Average (SGPA)

A Semester Grade Point Average (SGPA) is a numerical representation of a student's overall academic performance in their coursework either throughout the semester or by an academic year. It's calculated by assigning grade points to individual letter grades and then averaging those grade points. The GPA provides a standardized way to assess and compare the academic achievement of students. The Grade Point Average can be calculated as the summation of all the equivalent grades and the illustration is as shown below:

$$SGPA = \sum \frac{Equivalent}{Total\ Credit\ Hours}$$

5.4.9 Semester Credit Hours (SCH)

Semester credit hours, often simply referred to as "credit hours" or "credit units," are a measure of the academic workload associated with a particular course in Central University as well as other academic institution, during a single semester or term. These credit hours quantify the amount of instructional time, coursework, and academic effort expected from students in that course. Here are some key points about semester credit hours.

$$SCH = \sum all\ credit\ hours$$

5.4.10 Yearly Total Credit Hours (YTCH)

Yearly total credit hours, also known as annual credit hours or total credit hours per year, is the sum of all the credit hours earned by a student over the course of an academic year. An academic year typically spans one full year of coursework and is divided into two semesters or terms in many educational systems. To calculate yearly total credit hours, you would add up the credit hours from all the courses taken by a student during that academic year. Each course is typically associated with a specific number of credit hours, which reflects the amount of instructional time and coursework required for that course. In simple terms, one will calculate the Yearly Total Credit Hours as the summation of both semesters one Credit hours as well as semester two.

$$YTCH = \sum SCH + SCH$$

5.4.11 Cumulative Grade Point (CGP)

A Cumulative Grade Point Average (CGP), sometimes referred to simply as a cumulative GPA, is a calculation that represents the overall academic performance of a student over a period of time, typically their entire academic career or a specific portion of it, for instance an academic year. It's a way to measure and summarize a student's average grade point across all courses and semesters they have completed. CGP can be calculated by finding the summation of both semesters one SGPA and semester two SGPA.

$$CGP = \sum semester\ one\ (SGP) + semester\ two\ (SGP)$$

5.4.12 Cumulative Grade Point Average (CGPA)

A Cumulative Grade Point Average (CGPA), is a numerical representation of a student's overall academic performance throughout their entire academic career. It takes into account all the courses and semesters the student has completed up to a certain point in time. The CGPA provides a comprehensive and cumulative assessment of a student's academic achievements. CGPA can be calculated by finding the quotient of CGP to that of the YTCH:

$$CGPA = \frac{CGP}{YTCH}$$

5.4.13 Credit Hours for the Entire Program

Credit hours for the entire program" refers to the sum of all the academic credits or units that a student must successfully complete in order to graduate from a specific educational program. This concept is commonly used in Central University, so as other universities in Sierra Leone, to quantify the amount of coursework required to earn a degree or certification.

$$Credit\ Hour\ for\ Entire\ Program = \sum All\ credit\ hours$$

5.4.14 Cumulative Grade Point for the Entire Program

The Cumulative Grade Point for the entire program is a measure of a student's overall academic performance throughout their entire educational program. It is calculated by taking into account the grade points earned

in all the courses a student has completed over the duration of their program. It can be derived by summing all the Cumulative Grade Point (CGP).

$$CGP\ for\ the\ entiry\ program = \sum all\ CGP$$

5.4.15 Cumulative Grade Point Average for the Entire Program

The Cumulative Grade Point Average (CGPA) for the entire program represents the average of all the grade points you've earned throughout your entire academic program. This calculation includes all the courses you've taken from the beginning of your program until your current point of assessment divided by the total number of credit hours throughout you program of study.

$$Entire\ Program\ CGPA = \frac{entire\ program\ cgp}{entire\ program\ credit\ hours}$$

5.4.16 Transcript Assessment

Transcript assessment is the process by which result or transcript process is being calculated in Central University. Unlike other result assessment process, the transcript assessment is being calculated using two different approaches which are: Internal assessment and Project or dissertation assessment. The summation of these two approaches can be equal to **100%,** which will be 70% for internal assessment and 30% for the project assessment.

5.4.16.1 Internal Assessment

The internal assessment is a comprehensive calculation of the student's CGPA from the initial point of their program of study, i.e., CGPA from first year to the end of your program. Internal assessment at Central University will be calculated by **70%.** The internal assessment would be 70% of the CGPA for the entire program.

$$Internal\ Assessment = 70\% \times Entire\ Program\ CGPA$$

5.4.16.2 Project or Dissertation Assessment

The external assessment is also a comprehensive calculation of the student's final Project or dissertation grade. At Central University, the Project calculation is calculated over **30%** of the Equivalent grade**.** The project's grade will be equivalent to letter grades such as A, B, C, D, E, F.

Scale	Letter Grade	Equivalent Grade
75 – 100	A	5
65 – 74	B	4
50 – 64	C	3
40 – 49	D	2
30 – 39	E	1
0 – 29	F	0

Table 3: Central university Project assessment grading scale

Source: Study activity (November 2023)

$$Project\ Assessment = 30\% \times Equivalent\ Grade$$

5.4.17 Final Grade Point Average (FGPA)

The Final Grade Point Average (FGPA) is a numerical representation of a student's overall academic performance in a specific academic program or institution. It is calculated by taking into account the grades or grade points earned by the student in all the courses or subjects completed during their academic career in that particular program or institution. FGPA is calculated by adding both the internal assessment grade and the project assessment grade.

5.4.18 Classification of Degrees

A degree division, also known as degree classification or degree classification system, is a way of categorizing and recognizing the academic performance and achievements of students who have completed an undergraduate degree program, typically at a university or college. The purpose of a degree division at Central University like any other University is to provide a summary of a student's overall performance and

to help potential employers or further educational institutions understand the student's qualifications. Degree divisions are usually based on the student's cumulative academic performance, which includes grades earned in courses, examinations, and sometimes other factors like the quality of a dissertation or thesis. The specific criteria and terminology for degree divisions can vary from one educational system to another, but for Central University these categories include**:** First Class First Division (1:1), Second Class Upper i.e. Second Class First Division (2:1), Second Class Lower i.e. Second Class Second Division (2:2), and Third Class

5.4.18.1 First Class First Division (1:1)

This division is typically reserved for students who have achieved the highest level of academic excellence. In many systems, it represents the top rank of degree classification and is awarded to students with exceptionally high grades, often above a certain grade point average (GPA) threshold. At Central University, the range of FGPA for a First-Class Division is from 4.30 to 5.00.

5.4.18.2 Second Class Upper i.e. Second Class First Division (2:1)

This division recognizes students who have performed well academically but did not reach the highest level of achievement. It is often awarded to students whose grades fall within a certain FGPA range. At Central University, the range of FGPA for Second Class Upper is from 4.00 to 4.20.

5.4.18.3 Second Class Lower i.e. Second Class Second Division (2:2)

This division acknowledges students who have met the minimum requirements for a degree but did not perform as strongly as those in the upper division. Grades for this category typically fall within a specific FGPA range. The range of FGPA for Second Class Lower is from 3.60 to 3.99.

5.4.18.4 Third Class

This division is awarded to students who met the minimum requirements for a degree but did not achieve grades that would place them in the second-class category. The specific FGPA range for this classification can range from 3.00 to 3.59.

Final Grade Point Average	Division
4.30 – 5.00	First Class (1:1)
4.00 – 4.29	Second Class Upper (2:1)
3.60 – 3.99	Second Class Lower (2:2)
3.00 – 3.59	Third Class

Table 4: Central University degree classification scale

Source: Study activity (November 2023)

5.5 Recommendations

Integration and Synergy with Learning Management Systems (LMS):

Explore opportunities for seamless integration with existing Learning Management Systems (LMS) such as Google Classroom or OpenSis. This integration would create a unified educational ecosystem, allowing for a holistic approach to academic management. By aligning result processing with the broader learning environment, the system can contribute to a more cohesive and efficient educational experience for both students and administrators.

Block chain Technology for Enhanced Result Verification:

Consider incorporating block chain technology to fortify the system's result verification process. Block chain offers a decentralized and tamper-proof ledger, ensuring the immutability and authenticity of academic records. This not only enhances the security and credibility of the system but also establishes a cutting-edge solution for external institutions seeking to verify student results. The implementation of block chain can provide a robust foundation for secure and transparent academic credential verification.

Mobile Application Development for Increased Accessibility:

Develop a dedicated mobile application to enhance accessibility and user engagement. In an era dominated by mobile devices, a well-designed application can offer students real-time access to their results, push notifications for important updates, and a user-friendly interface. The mobile application should be crafted to provide a seamless and responsive experience, catering to the on-the-go lifestyle of

students. This step not only aligns with modern expectations but also contributes to increased satisfaction and participation among the student community.

5.6 Conclusion

This project visualizes a groundbreaking shift in how academic results are accessed, managed, and verified within the education sector. This innovative system places a strong emphasis on user empowerment, data security, and seamless connectivity to meet the multifaceted needs of students, educational institutions, as well as employment organizations, and other academic institutions. At its core, the RMS aims to offer students a seamless experience, allowing them to effortlessly access their academic records, track their progress, accessing and verifying of results by other institutions, and take an active role in shaping their educational journey. The RMS's integration of blockchain technology for result verification represents a paradigm shift in trust and reliability. Academic credentials are transformed into unalterable, trustworthy assets, streamlining the verification process for institutions, employers, and other academic organizations. As this RMS journey continues, it symbolizes a committed dedication to excellence in academic record management and verification, exceeding traditional boundaries. It stands as a testament to the education community's solid commitment to enhancing the learning experience, fostering transparency, and facilitating trust not only between educational institutions but also with the organizations that rely on them. With these comprehensive recommendations and a forward-looking vision, the future of this RMS is undeniably promising, controlled to redefine the educational landscape by bridging the needs of students, institutions, employment organizations, and academic peers alike.

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