THE COPPERBELT UNIVERSITY

SCHOOL OF INFORMATION AND COMMUNICATION TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE

STUDENT PROJECT MANAGEMENT SYSTEM

PROGRESS REPORT

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This project report is submitted in partial fulfillment of the requirements for the award of a Bachelor of Science Degree in Computer Science

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PROPOSAL

INTRODUCTION

According to Projects guidelines final submission (2021) all undergraduate students studying the various degree programs of School of Information and Communication Technology (SICT) at the Copperbelt University (CBU) should complete independent projects as part of their studies. Apart from SICT, other schools such as the School of Business has programs that require student to do projects in order for them to graduate from the Copperbelt University. These projects are managed manually from all the schools, this manual management of the project is cumbersome and tiresome. Not only is the manual management of projects the only problem, the other problem is that students tend to do the same project that has already been done because the projects are not published but stored in the supervisors' office, different projects are supervised by different supervisors due to the two supervisors' not being aware if the projects that were already done by the other supervisor.

One of the recent advances in the world of information technology is the rapid development of communication which has turned the world into a global village, we can send mails electronically (email), search for information (www), buy goods online (e-commerce), withdraw/ transfer money (e-banking), school online (e-learning); this has affected the society positively to a great extent, as a result, computerization of project management should not be exempted in this revolution (Taylor, 2020). The advancement of the world of information has also led to a lot of student resorting to copying and pasting of information when writing their projects without them critically thinking and producing their original work.

Background

Long before there was an institute for project management, or updated knowledge books and guides on how to manage projects, or even before the existence of Gantt charts, history offers several examples of colossal projects successfully completed. The Pyramids of Giza, Great Wall of China, and Coliseum are all good examples of such projects (Seymour & Hussein, 2014). This shows that project management has been practiced for many years. According to (Managementstudyguide.com, n.d.) Project Management is the art of managing all the aspects of a project from inception to closure using a scientific and structured methodology. Thousands of different projects have been completed and some have been started. Project becomes cumbersome when more people join in projects, resource management and project management became more important as well. There are many ways in which projects can be managed, for a very long-time

project have been managed using the traditional way of using paper. The situation has been the same at the Copperbelt University where student project management is managed using the traditional paper way. This traditional management of project has proven to be difficult and hard over the long run because student tend to chose the same topics, the percentage of plagiarism in the students' projects are high. But in the 21st century project management has been made easier using computers to store, access and analyze projects. The computerized management of project make it easy to manage project because it is easy to store, search, document and carry out a project.

Problem statement

Most of the final year students from different schools at the Copperbelt University (CBU) do their projects each and every year. Some schools like the school of information and Communication Technology (SICT) students start doing their project from third year. These projects are not easily accessible by other students other than the owners of the projects and other people who would like to have access to them. There is no system that provide information about the projects that were done in an organized and easy to access way. The projects are stored using the old manual filling system where documents are piled on top of the other in the supervisors' office. The completed thesis by students are submitted in physical form meaning the mostly escape being checked for plagiarism using software.

Proposed system

To solve the stated problems a web-based application called student project management system (SPROMAS) is proposed that will ensure that no two or more students are doing the same project nor repeating the same project that was already done. The proposed system will enable students, lecturers, supervisors and any interested party to search, view and cite the stored projects. SPROMAS will ensure that students are submitting their original work through an integrated plagiarism checker.

Objectives

The following are the objectives of the Student Project Management System are:

- Adding a plagiarism checker to ensure that students are submitting original work.
- Expanding the application so that it includes all students doing projects instead of the final years alone.

- Expanding the application so that this form of project management is possible for other schools as well.

Scope of the Study

The coverage of the project management system is constrained to the Copperbelt University only. The stated scope will be achieved by:

- Keeping track of all students' projects completed or approved
- The project management system's functionality is constrained is to storing projects, reading projects, updating and editing projects and
- Ensuring that the students original work is published on the site

RESEARCH DESIGN AND METHODOLOGY

Research Methodology

The following are the selected ways in which data will be collected:

Interviews

Information about how different schools manage project will be needed. This information will be collected through carrying out interviews with the relevant stakeholders from different schools. This is the best way to collect information because information will be received directly from the relevant stakeholders such as supervisors, students and lecturers.

Observation

This is a very good research methodology that will also be used to collect data. The reason is because it is easy to observe how the project is being managed by both the lecturers and the students.

Data Analysis

After the collection of the required data, this data will be analyzed to get relevant information out of it. This information is used to make decision on what the system should include and how it should function.

System Methodology

According to Sommerville, (2015), rapid software development became known as agile development or agile methods. These agile methods are designed to produce useful software quickly. The processes of specification, design and implementation are interleaved. There is no detailed system specification, and design documentation is minimized or generated automatically by the programming environrsrment used to implement the system. The user requirements document is an outline definition of the most important characteristics of the system. The system is developed in a series of increments. End-users and other system stakeholders are involved in specifying and evaluating each increment

SIGNIFICANCE OF YOUR STUDY

The significance of this study is to migrate from the manual documentation of students' projects to the computerized documentation of students' projects so as to make it easy to retrieval, store and secure and also to ensure that students are submitting their original work. The Project Management System will offer the following advantages to the various Schools in the Copperbelt University.

University reputation

The reputation of the university is enhanced when students submit and are graded on their original work. The plagiarism checker will ensure that the Copperbelt University maintains a good reputation of just like its motto state "Knowledge and Service" (*About Us | The Copperbelt University*, n.d.)

Reduced Storage

Most of the departments at the Copperbelt are occupied with people and there is no enough space to accommodate any more project thesis from students. Converting these projects into an electronic form can greatly reduce the space that these projects take up.

Easy to search for project

Improved, faster and more flexible search: Project Management Systems can retrieve files by any word or phrase in the document – known as full text search – a capability that is impossible with paper.

Disaster Recovery

With a project management system, it is easy to back-up projects on offsite storage and disaster recovery comparing to the traditional manual management of projects, paper is expensive and bulky when it comes to backing up records also it is vulnerable to fire, flood, vandalism and theft.

EXPECTED CONTRIBUTION AND IMPLICATIONS

One of the ways to be recognized as a hardworking institution and country is through the producing our own original works. This is done through critical analysis and thinking. Knowing that there is a system that checks for plagiarism, most of the student will make sure to do their research for their projects. This will build their knowledge. Knowledgeable student will be able to build and develop systems that enable the advancement of the ICT profession and the country at large.

ETHICAL ISSUES IN COMPUTER SCIENCE

According to Berzai, (2019)it seems that there are four big areas of computer ethics. They are "(1) computer crime; (2) responsibility for computer failure; (3) protection of computer property, records, and software; and (4) privacy of the company, workers, and customers". The following is how each area will be addressed;

Computer Crime

The proposed system will ensure that the students' data is secure from anyone who might want to change the contents of the submitted projects. Once the project is submitted, only the systems administrator can delete or remove it.

Responsibility for Computer Failure

It is hard to determine whether to take the blame for the failure of the computer due to the proposed system because the user can be as much responsible as the developer. At the moment the proposed system's developer cannot clearly state whether he will take responsibility for the computer failure of the user.

Protection of Computer Property

The system will at no point cause harm or damage to the user. The system will not in any way collects information without the users concerns in the background or foreground.

Privacy

The system will not store sensitive information about the user that can be used against them. For the information that the system will require, a privacy policy for the users will be provided for which they have to agree to before they can use the system.

CHAPTER TWO

LITERATURE REVIEW

INTRODUCTION

Research papers include literature review to show that the author of the paper has an understating of the topic being discussed. University of Edinburgh (2021), defines a literature review as a piece of academic writing demonstrating knowledge and understanding of the academic literature on a specific topic placed in context. The University also states that a literature review also includes a critical evaluation of the material; this is why it is called a literature review rather than a literature report. According to Western Sydney University (2017), the purpose of a literature review is to gain an understanding of the existing research and debates relevant to a particular topic or area of study, and to present that knowledge in the form of a written report. This chapter deals with the related works that have been done on student project management system in order to understand and enhance the already existing knowledge on the state topic. The literature reviewed in this chapter was obtained from various sources including journals, websites and books. This reviewed literature was obtained through searching online, analyzing references of the used literatures to obtain more literature and downloading books which contain information about the subject matter which is project management. The table below shows most of the literature that were reviewed.

Table 1: **List of Literatures reviewed**

	Author	**Title**
1	Adebola et al., 2019;	*Design and Implementation of Undergraduate Degree Projects Monitoring System*. *3*, 129–135
2	Bakar et al., 2011	*Final year supervision management system as a tool for monitoring Computer Science projects*
3	Bouki, 2007	*Undergraduate computer science projects in UK: What is the point?*
4	Soyemi & Isinkaye, 2017	*A web-based final year Students Project Duplication Detection System*
5	Gopinath, 2021	*Cloud-based Project Management System*.
6	Halak & El-Hajjar, 2019	*Design and evaluation of plagiarism prevention and detection techniques in engineering education*
7	Nandasara & Pradeepa, 2014	*Web Based Project Collaboration, Monitoring and Management System*
8	Njele & Ngoma, 2021	*Final year project management*
9	Ramnarain-Seetohul et al., 2012	*A Case Study of an Online Assignment Submission System at UOM*
10	Soms et al., 2021	*Student Project Management System*.
11	Taylor, 2020	*Design and Implementation of Inventory Management System Project*

RELATED WORKS

It is very tedious to manage and control student's final year projects using manual or classical processes (Soms et al., 2021). In their article titled “Student Project Management System”, Soms et al. continues to state in the world of today, nobody holds an initiative to check for notices on the notification boards. Many students skip details on some relevant news and updates about their projects for their final year. Students are therefore unable to track their project activities. Soyemi & Isinkaye, (2017) carried out a study and found that it is a common phenomenon in higher institutions of learning that final year student’s projects are often managed in paper-pen system where most of these students lay their hands on already completed projects, and present the same to their supervisors without the knowledge of the same. Similarly, Bakar et al. (2011), also found out that the Universiti Kebangsaan Malaysia uses a log book to document meetings and discussions between supervisors and students.

Soyemi and Isinkaye together with Bakar et al. censures the use of the old traditional manual management of project due to its inefficiency. In their study Soyemi and Isnkaye found that the use of log books had caused so many duplications of projects words for words, year in, year out and laziness on the part of the students replicating work without originality. They continue to talk about the effect of this trend which contributes to poor technological skills of undergraduates that are produced by different institutions. Similarly, with regards to the usage of the log book Bakar et a. states the shortcoming of the log book that it only focuses on the progress of report writing. Furthermore, they found that there is no indicator for students to fill up information on the progress of their software development, hence neglecting the process of monitoring software development progress. According to them, students usually end up with semi-finished dissertation with very little information pertaining to implementation and testing of the system, software or algorithm since the students have not actually finished the software development.

According to Bouki (2007), the final year undergraduate project is a crucial component of a Computer Science (CS) degree in UK. Bouki writes as if a Computer Science degree is not crucial anywhere else other than UK which is not the case. Additionally, Bouki states that the learning outcomes of the project include critical thinking, creativity, time management and communication skills. Although it is apparent that the project plays a major role in the curriculum of a CS degree,

many students (and some supervisors) fail to appreciate its significance. While Bakar et al., (2011) states that in Computer Science Program run offered by Universiti Kebangsaan Malaysia, students are required to develop a software prototype and write a dissertation for their final year project. This is one of the partial requirements for students studying Bachelor of Science Degree in Computer Science to complete their studies.

In the study carried out by Bouki, (2007) he found out that the project is the epitome not only of the knowledge students acquire during their studies but also of what they are able to do as 'computer scientists'. This goes further than the mere knowledge of 'programming'. Bouki has a valid point on project not being all about programming because other programs in different institutions do not do programming in their projects. Bouki emphasized that a project includes critical thinking, creativity, time management and communication skills. According to Bakar et al., project management plays an important role in coordinating the planning, design and development processes of a software project. They further state that detailed planning and monitoring from the early stage throughout the end would ensure that a project could be completed within the allocated time, while at the same time achieved its objectives. According to Bouki the project is a non-taught module. Hence, the student has to organize it and decide any 'personal', intermediate deadlines. The project is based on regular meetings with the supervisor. Most of these meetings are expected to be 'student-drive'. As a result, the regular meetings with the supervisor play a crucial role for students' progress and success.

To improve project monitoring and supervision, Bakar et al. designed and developed a prototype of a web-based supervision management system. The initial prototype consists of three modules, namely user profile, project monitoring (of software development and report writing) and appointment setting. Student's and lecturer's profiles module display the latest information on the students and lecturers. The schedule monitoring module is used to support the monitoring process and detect whether a project is delayed or on time. Schedules are provided as Gantt charts and can be accessed according to the category of the tasks. Each project's schedule consists of two parts: system development and report writing. This module also provides mechanisms to trigger important deadlines determined for every stage in the system development process.

Similarly, Soyemi & Isinkaye also developed a web based student project duplication detection application software to monitor projects that had been implemented before to enable supervisors

detect repetitive projects and guide the student to conduct original and unique projects that will advance the technological skill of the student as well as improve technological advancement. To avoid inconsistent project management procedures which leads to duplication of efforts that affect the project goals as well as organizations goals as a whole (Nandasara & D, 2014) proposed a web base project Collaboration, Monitoring and Management System provides a solution by automating project management functionalities which covers all the aspects of project management process including document management, resource management and team collaboration.

In an article titled Cloud-based Project Management System, Gopinath (202!), proposed a cloud-based application that aims to eliminate similar difficulties stated by Soyemi & Isinkaye(2017) by providing a platform to read, store, and manage projects' details with high optimization algorithms and user-friendly/minimalist UI/UX with more security levels. Gopinath emphasized the importance of the proposed system because of the optimization algorithm. He further added on to state that by using the proposed system, it will be easier to plan projects while taking previous track records into account. Additionally, his proposed system ensures that people are working on the right things at the right time, he states.

Gopinath, (2021), continues to explain the different functionalities of his proposed system, stating that the application can be accessed by two levels of users - Manager, and resource. The manager is the one who has the ability to edit the project details such as the name of the project, duration of the project, add/remove clients to/from the project, add skills needed for the project, assign/remove resources to/from the project, and delete the project. Allocation of resources to a project can be done based on the skill-set that a resource possesses and the skills required by the project. While the proposed system by Nandasara & D (2014) allows developers to share project status, collaborate with their supervisors and team members. The system facilitates project managers to monitor overall project progress. Nandasara & D's proposed system provides a dashboard interface to clients which allow project progress monitoring. Meanwhile Gopinath's explains that in his system, manager can easily identify the suitable resource for a project based on the skills required by the project. Managers can also be able to view the resource information such as his /her names, availability of the resource, years of experience, and the resume of the resources, remove/add projects to the resource. With respect to clients, managers can also be able to add/remove clients

to a project (single client per project), edit the name of the client, toggle the client status among active/inactive, and remove the client. When it comes to skill-set, managers can add a new skill, update existing skills, approve/reject skill requests from resources and delete a skill.

PREVIOUS SYSTEMS

This subsection reviews the already existing, closely related system that have been implemented. Each of the reviewed systems under this subsection has a screenshot and the link where the system can be found. Some of these subsystems were found by searching the internet using terns such as student project management system, learning management system, project management system etc. The following are the system that have been implemented and considered to be related to the student project management system (SPROMAS).

Final Year Student Project Management System

This is a web application that was developed to record final year projects with student information to enable both students and lecturers to search and view the projects using either the project title or key words. According to Njele & Ngoma, (2021) the application enables lecturers to asses and grade students project, it also automatically calculates the final grade of each students' project. This application was never uploaded to make it online, hence, there is no URL for the system but it is stored at the School of Information and Communication Technology. The application was made to be used for free by the institution therefore, there is no trial period for its usage.

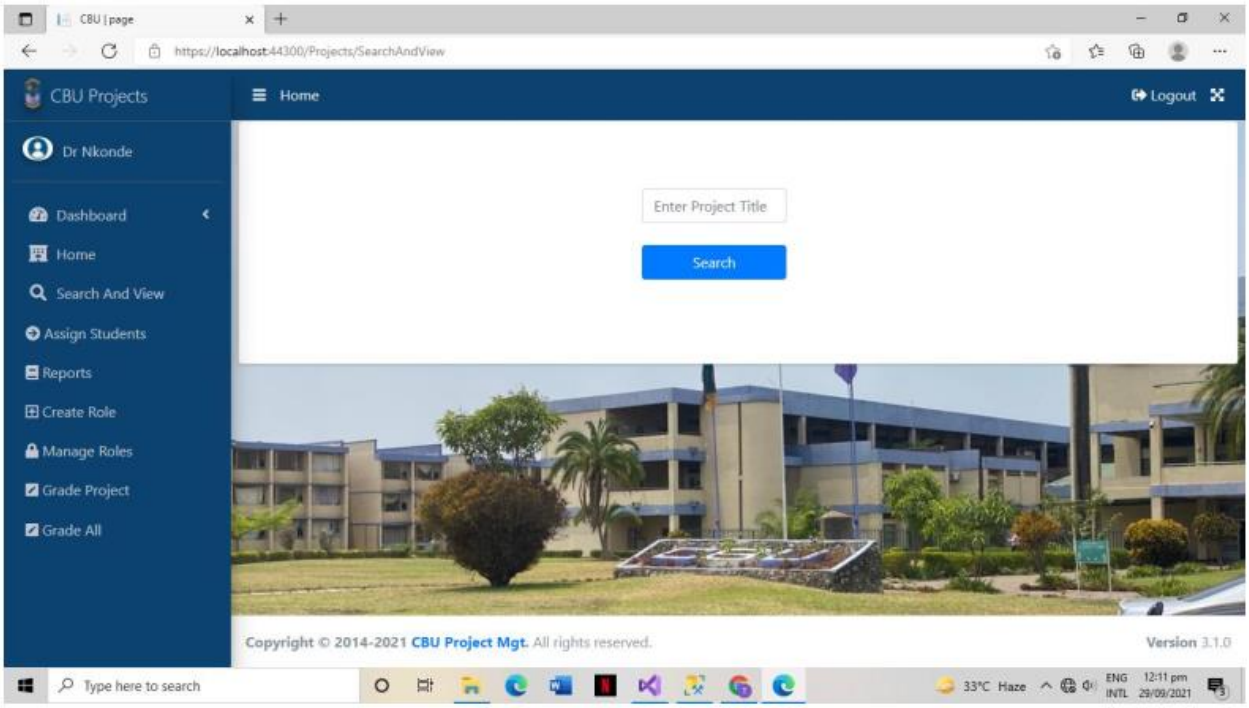


Figure 1. CBU Final Year Student Project Management System

Moodle Learning Management System

Moodle is a learning platform designed to provide educators, administrators and learners with a single robust, secure and integrated system to create personalized learning environments (Moodle, 2020). Moodle is learning management web application which runs on a web browser, the link to access the Moodle platform is https://moodle.org . It is usually integrated into student management systems for different institutions. Moodle has a grading system which shows the grades of a particular course as marked by the lecturer(s) of that particular course. Moodle has a calendar integration also that displays the upcoming events and due dates of assignments. The target users of the Moodle learning management system are the instructors and students. The image below is a screenshot form the Copperbelt University (CBU) Moodle integration and the link is this https://www.cbu.ac.zm/opus/moodle/my/# but to be used a user is supposed to log in.

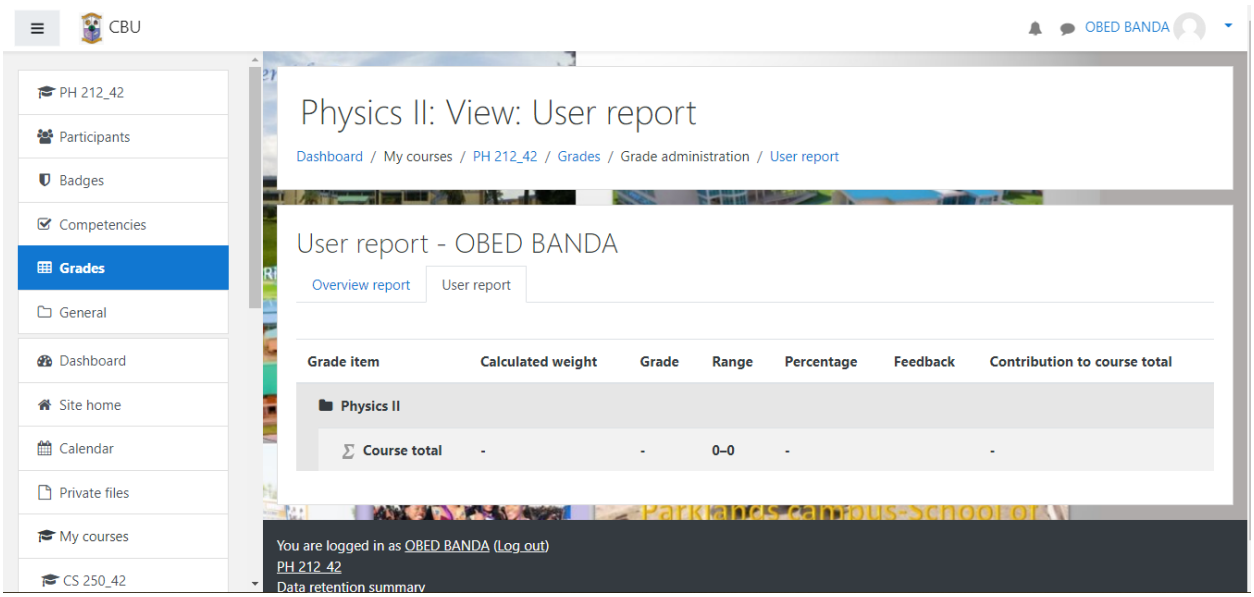


Figure 2 Moodle Learning Management System

PapersOwl

PapersOwl is a dedicated paper writing service for students the world over (PaperOwl, 2022). PapersOwl has got a plagiarism checker that allows a user to upload or paste documents and texts respectively. Its intended users are the students. PapersOwl's plagiarism checker is free to use. The student project management system will have a similar but unique plagiarism checker which will enable both students and lecturers to check for plagiarism in the students' report.

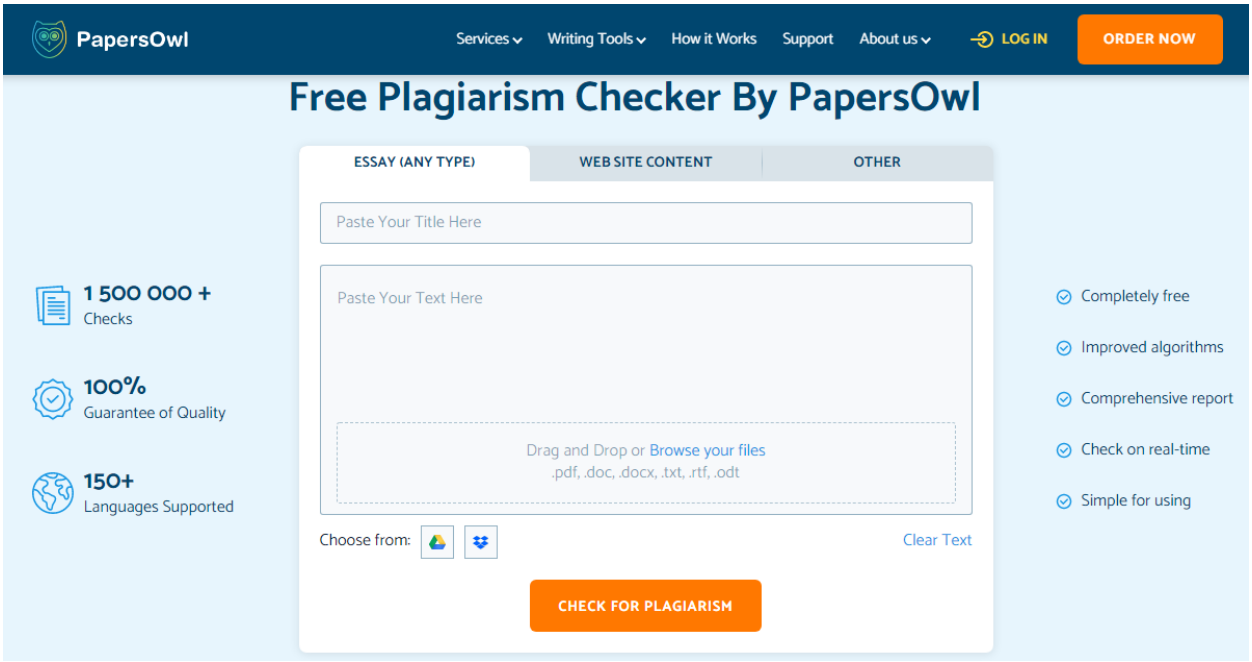


Figure 3 Plagiarism Checker by PapersOwl

Scoro Project Management System

Scoro is a project management web application according to Scoro, (n.d.), it enables businesses to create, manage, and track an unlimited number of projects, assign and delegate tasks within the team. It allows teams to See everyone's schedule in a shared team calendar and know what they're working on. Scoro also adds on to say that it provides real-time Gantt charts which enable a user to see the impact logged hours, unexpected changes, or delays have on your planned timeline and resource availability. The URL for Scoro is https://www.scoro.com/project-management-system/

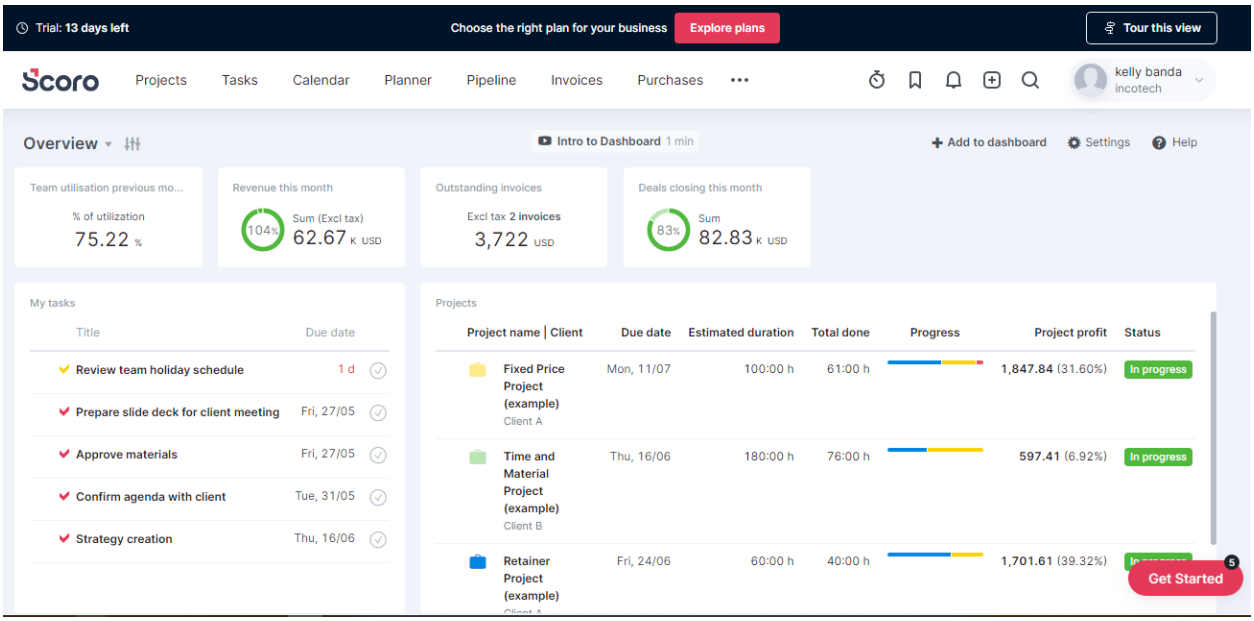


Figure 4. Scoro Project Management System

LESSONS LEARNT FROM THE REVIEW

Different authors used different methods and approach in tackling the same problem of traditional manual management of project. In addition to the manual management of project management, Soyemi & Isinkaye also recognized another problem of project duplication by student. This is also caused by the manual management of students' projects. It was a good idea by how Soms et al., decided to add a view that shows the development progress chart using WBS (Work Breakdown Structure). Nandasara & Pradeepa's also in their proposed system stated of providing a dashboard interface to clients which allow project progress monitoring. This great lesson leant because it will show and enable students, project coordinator and supervisors to see the progress of the project.

Scoro project management enables a team to work on a project, this will come in handy when implementing the student project management system (SPROMAS) because some students' projects are done in group hence SPROMAS must be able to accommodate such. When compare to the Moodle platform, SPROMAS as well will have to have a grading system where supervisors will be able to allocate marks from. It is worth noting that SPROMAS will contain almost all the features of the Final Year Students Project Management System. But SPOMAS will enable include not only final year students but all the students who are doing projects, it will also contain a plagiarism checkers integrated in it to make it easy for supervisors to check for plagiarism.

A CRITIQUE OF THE REVIEW

Under this sub section a critique is given on the reviewed related and existing systems. This is done by carefully analyzing the flaws and or the strengths in relations to the Student Project Management System (SPROMAS). According to Collins Dictionary (n.d.), a critique is a written examination and judgment of a situation or of a person's work or ideas.

Gopinath proposed of developing a system in which resources will be allocated based on the skill set of the user. This is not ideal for student project management, because the main reason of the project is to ensure that students who do not know learn and develop skills. Gopinath approach can be applied in industry in which different individuals have different skill levels.

In proposed system by Soyemi and Isinkaye, the system only detects the systems that have been done at the institution where the project is used and they guide the student to conduct original work. Instead, a I believe that a project that has been done before can be extended with new features without having to reinvert the wheel. The system should prevent student from doing the exact project without alterations and the system should make available the projects that have been done previously.

Bakar et al. web-based supervision management system has a schedule monitoring module which seem to be underrated. I think this module is very important if students are to finish their projects on time. This module contains the Gantt chart which a system uses to notify the student of the upcoming and due events.

CONCLUSION

In this chapter, a literature review was conducted on the related works to SPROMAS and the previous systems. It was found out that different authors have got different approaches in solving the problem of the traditional manual management of projects. Despite the different approaches all managed to solve the problem and came up with very good compelling solutions. Different methods and designs features were learnt from the reviewed literatures and this will make SPROMAS a better system when integrated.

CHAPTER THREE

RESEARCH METHODOLOGY

INTRODUCTION

From the proposed problem statement of not having a system that provide information about the projects that were done in an organized and easy to access way. And also, the problem of storing project using the old manual filling system where documents are piled on top of the other in the supervisors' office. A research problem was devised which stated what are the techniques that can be used to store and provide information about students' project in a computerized system? This research problem is what was used in the selection of a research methodology.

METHODOLOGY

According to Benzzine (2002), a methodology as a method that describes the activities involved in defining, building, and implementing a system; a method is a framework. Since a method is a logical process for constructing systems (process), it is known as a metaprocess (a process for modeling processes). From the definition of (Benzzine, 2002), it is worth noting that there are several different methodologies available for defining and implementing a system. Hence after carefully analyzing and scrutinizing different methodologies of system development, agile development was chosen as the methodology to be used for the development of the student project management system.

Sommerville (2015), stated that rapid software development became known as agile development or agile methods. These agile methods are designed to produce useful software quickly. The processes of specification, design and implementation are interleaved. There is no detailed system specification, and design documentation is minimized or generated automatically by the programming environment used to implement the system. The user requirements document is an outline definition of the most important characteristics of the system. The system is developed in a series of increments. End-users and other system stakeholders are involved in specifying and evaluating each increment. Agile methods have been chosen as the methodology of development because it enables requirements to be added to the development process from time to time, and this will ensure that all the requirements from different schools at the Copperbelt University (CBU) be captured and catered for.

The approach that will be used in the software development life cycle with agile methods is the object-oriented analysis approach. According to Tutorialspoint (n.d.), in object-oriented analysis phase of software development, the system requirements are determined, the classes are identified and the relationships among classes are identified. The three analysis techniques that are used in

conjunction with each other for object-oriented analysis are object modelling, dynamic modelling, and functional modelling. More details about each of the analysis techniques will be given in the specification chapter.

INFORMATION GATHERING AND ANALYSIS

To come up with the requirement specification for the system, data had to be collected from different schools which will be using the system and different students from the same various schools. The following are the ways in which data was collected:

Interviews

According to Pressbooks (n.d.), in social science, interviews are a method of data collection that involves two or more people exchanging information through a series of questions and answers. The questions are designed by a researcher to elicit information from interview participants on a specific topic or set of topics. Hence the reason why interview was selected as a method of collection is because it enables extensive collection of data.

Interviews were conducted with different supervisors from different schools. It was found that different schools manage student projects differently and also despite the different management of projects, they also have some similarities. During the interviews questions such how are the student projects manage? How is the grading of the project done? How many students are allowed on a single project? And many other questions where asked. The answers obtained were of very much help order to understand how the student project management system is to be developed.

Ethnography (Observations)

Observation research is a qualitative research technique where researchers observe participants' ongoing behavior in a natural situation (Fuelcycle, n.d.). Observation was chosen as one of the methods of collecting data to because it is easy and confirms if the data collected from interviews is accurate. Observation also increases the sources of data that is needed to come up with requirements in the requirements elicitation. Apart from observing the project management process, data was also collected from the literature review that was conducted. Agile methods were selected to ensure that data that is captured later on after the initial capture of data is considered and integrated into the system.

Data analysis

According University of Pretoria, (n.d.), the data analysis is the most crucial part of any research. Data analysis summarizes collected data. It involves the interpretation of data gathered through the use of analytical and logical reasoning to determine patterns, relationships or trends. Since data analysis is the most crucial part of any research, this project cannot proceed without analyzing all the collected data because the collected and analyzed data is needed for requirement elicitation.

The process of managing projects involves three parties namely students, supervisors and the projects coordinator. The projects coordinator is responsible for assigning students to supervisors. The supervisors ensures that the students are guided and taught how to carry out a project, they also ensure that the students are completed before an academic year ends. The projects coordinator sets a timeline and milestones that are supposed to be met within the stipulated period.

From the collected data, before the student starts their projects, there are assigned to supervisors. A student is assigned to one supervisor and some student work as a group supervised by one or two supervisors. The student engaging in projects are either given project research problem or are required to come up with one which is then accepted or rejected by the supervisor. When a supervisor approves a research problem, a student(s) is required to write a project proposal which is to be presented to the supervisor or a panel of supervisors in the case some schools and the year of study. The panel of supervisors can reject a project proposal if its not viable or for some reason which they will communicate to the student. The panel can also alter some contents of the presented projects such as the project objectives, scope, problem statement etc.

An accepted project proposal means that the student should continue with the project and can start writing the project report as guided by the supervisor. During this phase the student is supposed to communicate with the supervisor and submit the progress of the project from which the supervisor will assist if there is need be. Each school has a specific number of times a student is supposed to meet with the supervisor and this is enforced with the attendance registers which student and supervisor are supposed to sign after meeting. In term two, in the case of the School of Information and Communication Technology the projects coordinator organizes a day where each student is supposed to present a progress report in front of a panel of supervisors. Depending on the presentation and the project progress, a student is graded by each lecturer and the total averaged.

Before the academic year elapses, all the students are supposed to present their final project in front of the panel of supervisors. This final presentation will determine the total marks assigned to each student. The supervisor uses a grading sheet when grading project which thy counter check when the students are presenting. This whole process is managed and processed using the traditional manual way of pen and paper. The students' projects management system is to be developed to eliminate this challenge.

The collected data was analyzed and important information related to the project was extracted and used in the proceeding section.

REQUIREMENT SPECIFICATION

Requirements specification is the process of writing down the user and system requirements in a requirements document (Sommerville, 2015). These requirements include the functional and non-functional requirements of the system. The students' projects management system shall and is supposed to ensure that students finish their projects and to ensure this, students have to be communicating with their supervisor and meeting their milestones.

Purpose

This section of chapter three specifies the Requirements Specification for the Students Project Management System (SPROMAS). It describes scope of the system, both functional and non-functional requirements for the system, design constraints and system interfaces.

User Profiles

SPROMAS is intended to be used by various users. All these users are divided into four profiles or types, each with own responsibility and role.

Table 2: User Profiles

User	**Functions and Responsibility**
Coordinator	Responsible for the batch of the projects and controls overall development flow. Assigns projects to the project team leader and controls fulfilment of the project team leader's tasks.
Project Supervisor	Responsible for a particular project. Guides students on projects. Accepts, rejects or assigns a project to students and controls their fulfilment.
Student	Responsible for a particular projects or part of a project if in a group. Comes up with project or is assigned one. Reports to the Project Supervisor.
System Administrator	Responsible for the installation, maintenance, security and troubleshooting of the productive system. Manage users of the PMS. Reports to the Manager

Functional-Requirements

Sommerville defines functional requirements as statements of services the system should provide, how the system should react to particular inputs, and how the system should behave in particular situations. He also included that the requirements should explicitly state what the system should not do. The following are the functional requirements of the student project management system (SPROMAS):

1. User Profiles

- The system shall provide the concept of User Profile. The user profile contains the user-specific configurable parameters of the system. The user profile is associated with one and only one user that is registered in the system (has a user name and a password).
- The system shall store the list of all user profiles in the database. The system shall be able to store as much user profiles as the number of users.
- The user must be able to change his or her profile and save the changes

2. System Login

- The user must login to the system by specifying his or her username and password before he or she can work with the system. If the password is invalid or the username does not exist in the system, the user is not allowed to login and must enter the name and password again. After successful login the system shall associate the user with the user roles and configure appearance of GUI according the user profile. After the login the main functionality of the system according the user's permissions is available. After the login the user becomes the authenticated and authorized

3. Manage Project

- The system shall provide the concept of project. The project has properties and contains zero or more tasks. The project must belong to one and only one project profile if being undertaken by a single student else it must belong to the profiles of a group of students doing that particular project.
- The properties of the project are: Name, Description, Status, Creation Date, Start Date, Finish Date, Owner, Project Supervisor, Program, Department and School of Project.
- The system shall provide a set of additional project properties that are calculated or derived from the other project's attributes. The system shall perform this calculation every time the underlying properties have been changed. The derived requirements properties are:
  Project Duration: the length of the critical path. The critical path is the path that takes the longest to complete.
  Project Cost: the sum of costs of all tasks, containing in the project.

Project Progress: the percentage of completion, derived from the percentage of completion of project's tasks.

- The system shall provide the authorized user with permission "view project list" the ability to view and browse the list of all projects but not edit.
- The student user shall be granted permission "create project" and "edit project portfolio", the system shall provide this user the ability to create a new project within that user's profile and to specify all properties of the project. The user must provide at least the name of the project. The project name must be unique within the given portfolio. Otherwise, the project cannot be created and error message must be shown to user. The project must be empty (contains no tasks) after creation. The user is identified as the owner of this project. The system shall add the project to the current profile
- All the defined users must be able select any project from the list provided from the list of projects and to view the all properties of the selected project.

4. Reporting

- The system shall provide the authorized user with permission "generate report" the ability to generate a report for the selected project. The report must include:
  - Project's properties and derived properties
  - Project's timing information (start date, estimated finish date)
  - Project's progress

  The user must be able to set the level of report's details.

Non-Functional Requirements

Sommerville defines non-functional requirements as the constraints on the services or functions offered by the system. Non-functional requirements are not directly concerned with the specific services delivered by the system to its users. Since these are requirements the constraints on the services of the system, SPROMAS will inherit some of the non-functional requirements from the previous system which was developed by Njele & Ngoma and it will encompass a few new ones. The following are the non-functional requirements of SPROMAS:

1. System Maintenance Functionality

1.1. Manage Users and User Roles

- The system shall provide the authorized user with permissions "edit users" and "edit user roles" the ability to manage system users and user roles.
- The system shall provide the authorized user with permission "edit users" the ability to perform the following operations on users:
  - Browse the list of existing users and view properties of any user.
  - Create a new user.

- Edit an existing user.
- Delete a user.
- Assign and re-assign a user to a user role.

2. Reliability

2.1. Availability

- The system shall be available for use at 24 hours a day, 7 days a week. The data storage shall be available for use 24 hours a day, 7 days a week. The maintenance to the system are supposed to be announce a week before they can take place.
- The system shall not have any single point of failure. All critical services of the system (data storage, system logs) must be replicated.

2.2. Security

- The system shall protect the data and services from unauthorized access. The system shall also provide authentication and secure transaction.
- The system shall implement Role based access control model.

3. Hardware

Hardware requirements represent the minimum physical system configuration on which the SPROMAS runs and fulfils performance requirements.

3.1. Host System

- The server part of the SPROMAS shall be able to run and fulfill the performance requirements on:
  Dual Pentium 2.8 GHz, 2 GB RAM, 5 GB disk space. LAN bandwidth: 1Gbps19; WAN bandwidth: 2 Mbps.

3.2. Client System

- The client part of the SPROMAS shall be able to run and fulfill the performance requirements on:
- Single Pentium 1.8 GHz, 1 GB RAM, 1 GB disk space. LAN bandwidth: 1 Gbps; WAN bandwidth: 2 Mbps; mobile phones inclusive

4. Performance

4.1. Number of Concurrent Users

- Under the condition that the host system fulfils the hardware requirement, the system shall support concurrent work of at least 200 users that are logged the system..

4.2. Response Time

- Under the condition that the host system and client system hardware fulfill the minimal hardware requirements (particularly bandwidth), the system shall respond to user interaction with the system within 5 seconds. To ensure a great user experience, the response time should not exceed the stipulated response time.

4.3. Start Up Time

- Under the condition that the host system fulfils the hardware requirement, the time between initiation of the system startup and availability of full system functionality must not be longer than 10 minutes.

5. System

5.1. Supported Operating System

- The client part of the system shall run on all major and common operating systems such as Microsoft Windows (7,8 ,10 and 11), Linux System with kernel version 2.4 or higher, and Mac OS 9 or higher. There is no requirement for the host part of the system.

SYSTEM ANALYSIS

From the data collected during literature review and the defined system requirements an approach that was taken by Bakar et al., (2011) is to be adopted and altered to fit the in the development of SPROMAS. The approach is developing modules for each functionality that the system is supposed to support. The modules that are to be developed are:

a) Appointment module

- Appointment setting between the supervisor and the student.
- Supervisor can set weekly timeslot for the whole semester and also unplanned time slot.
- Student can request for appointment timeslot and the supervisor can verify the time.

b) User profile module

- Records the most updated user information such as the phone number and email address
- Users can update their information.
- Users can input academic information such as grade for certain subjects, list of enrolled subjects in that semester and description of projects completed during their industrial training.

c) Schedule monitoring module

- The coordinator can set a standard schedule for report writing activities. However, supervisors can modify the schedule based on the project requirements or personal preferences.
- Supervisor can monitor student’s progress whether it is on time or delayed. Color codes will be used to represent the early, on time or late process completion.
- Status of all students under a lecturer's supervision is displayed in a single screen so that the overall progress can be viewed.

- Notification messages are sent through email to remind students and lecturers on important dates. Students will be alarmed when the deadline is fast approaching, turned up or passed.
- Generates report that lists the overall student's status for supervisor reviewing and the coordinators viewing purpose.

d) Log book module
- Logs the discussion during meetings.
- Logs the attendance register
- Provides separate areas or layout for entries regarding system development process and writing.
- Is able to upload report documents for evaluation and reference.

e) Coordinator module
- Managed by the school coordinator.
- Uploads students details to the system.
- Is able to assign students to supervisors.
- Sets the projects schedule and chapters writing.
- Records the submissions of approved projects.
- Generate the report of approved projects reports.

f) Administrator module
- Managed by the system admin.
- Assigns the project coordinator to the school upon request from that particular school
- Maintenance of the system

CONCLUSION

In this chapter, data was collected using interviews and ethnography and the data was analyzed to come up with requirements for the system. These requirements were then separated into system functional, user functional and non-functional requirements. A methodology on how to develop the student projects management was chosen to be agile methodology which will take the approach of object-oriented analysis and programming.

CHAPTER FOUR

SYSTEM DESIGN

INTRODUCTION

This chapter presents different graphical models that are used to represent the student projects management system. These graphical models are abstract models with each of the model showing different perspectives of the system. This graphical representation where as a result of the chosen method of development of the system. The system is developed using the agile methods of development and the task are broken down into smaller iterations called splints. Object-Oriented Programming is the approach that is to be used to develop each of the defined splint stated earlier. Object-oriented programming (OOP) is way of viewing the system components and their relationship as objects. The agile methodology was chosen as the main method of development because it enables the continuous improvement of the system by allowing more requirements which might have not been captured during data collection. This is complemented by OOP as it enables the task to be broken down into small sizes and developed. The developed system will use MySQL database for its database management system, the choice was based on the research that most web application used MySQL and it is mostly found on many servers.

ANALYSIS OF THE SYSTEM

This sub-section shows what the system should do based on stipulated requirements stipulated in the requirement section. The system will have four different types of users namely the system admin, supervisors from which the coordinator will come from and the students. The types of users are interrelated, the system admin is responsible for registering coordinators by request from the school, the coordinator is responsible for assigning students to supervisors, the students come up with projects which are supposed to be approved by the supervisors during the proposal presentation. The system shall present each user with the with a dashboard from which they will be able to carry out their responsibilities as stipulated in the system requirements. The system admin will be able to select a coordinator by assigning him or her with coordinator roles. This will enable a coordinator to carry out his or her responsibility such as assigning students to supervisors, communicating with every student about project related matters such as the deadline of submission of a certain chapter and everything else articulated as the responsibility of the supervisor in the requirement specification.

After the supervisor assigns students to supervisors, the supervisors will be able to communicate with his or her student through his or her dashboard. The supervisor will also be able to schedule and approve meetings with the students. From the dash board, uploads made by the student can be

seen and comments can be made. The students will be able to make changes to their documents that have been commented by the supervisor. They will also be able to see the due dates for certain chapters and any evens or meetings that have been scheduled.

CONTEXT MODEL OF THE SYSTEM

A Software System Context Model is a type of system context model that explicitly depicts the boundary between the software system and its external environment: the hardware devices that the software system interacts with in order to engage with the environment (Johnston, 2021). This version of SPROMAS will not accept input from any external system but will provide an output that will be used by OPUS. This output is the grade of the project obtained by a student which is supposed to be recorded in the OPUS system for that particular student. The diagram below shows the context model of SPROMAS.

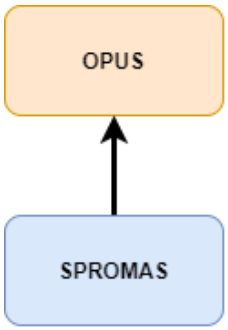


Figure 5: SPROMAS Context Model

DESIGN METHODS

The agile methodology was selected to be the design methodology of the SPROMAS and the development approach that is to be used with is the Object-Oriented Design approach. The following design methods explains more how this will be achieved.

Architectural design

Architectural design is the process of defining a collection of hardware and software components and their interfaces to establish the framework for the development of a computer system (Badugu). SPROMAS is a web application hence the underlying hardware it will be operating on

will not be discussed here. Instead the software components focus will be explained and how they link to form the SPROMAS system. The SPROMAS will store the user data in the database, this data will need to be accessed and processed by the user. A architectural design showing how all this was to be made possible was needed to be chosen. And the chosen architectural design was MVC which stand for Model View Controller. MVC is an architectural pattern that consists of three parts: Model, View, and Controller, or, to put it another way, it splits the application into three logical parts: the model, view, and controller. It was originally designed for desktop graphical user interfaces, but it is now also used to create mobile and online apps.

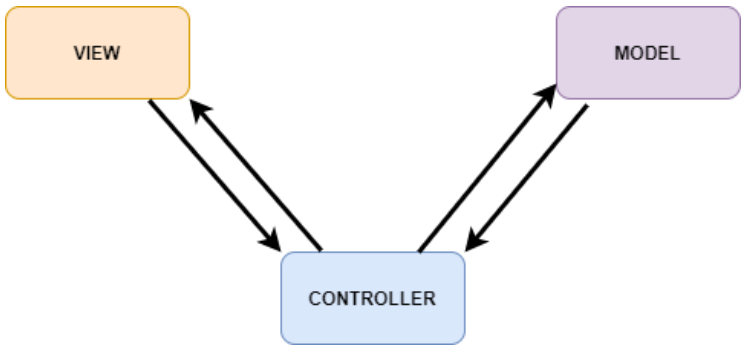


Figure 6: MCV Architectural Design Diagram

Detailed Design

As started in the design methods, the approach that will be used is the Object-oriented Analysis and Design which is a software engineering approach that models a system as a group of interacting objects. Each object represents some entity of interest in the system being modeled, and is characterized by its class, its state (data elements), and its behavior (Stroustrup, 1988). With this approach the SPROMAS can be represented in three different views which are functional, static and dynamic. Despite all these vies, the SPROMAS will focus on the functional and the static.

Functional View

The functional view consists of the use case diagram and the activity diagram. These designs model how the system is supposed to work. The use case will be used to show the features that SPROMAS will provide to the user and the activity diagram will show the logic by describing the processes including sequential tasks, conditional logic, and concurrency.

Used Case Diagram

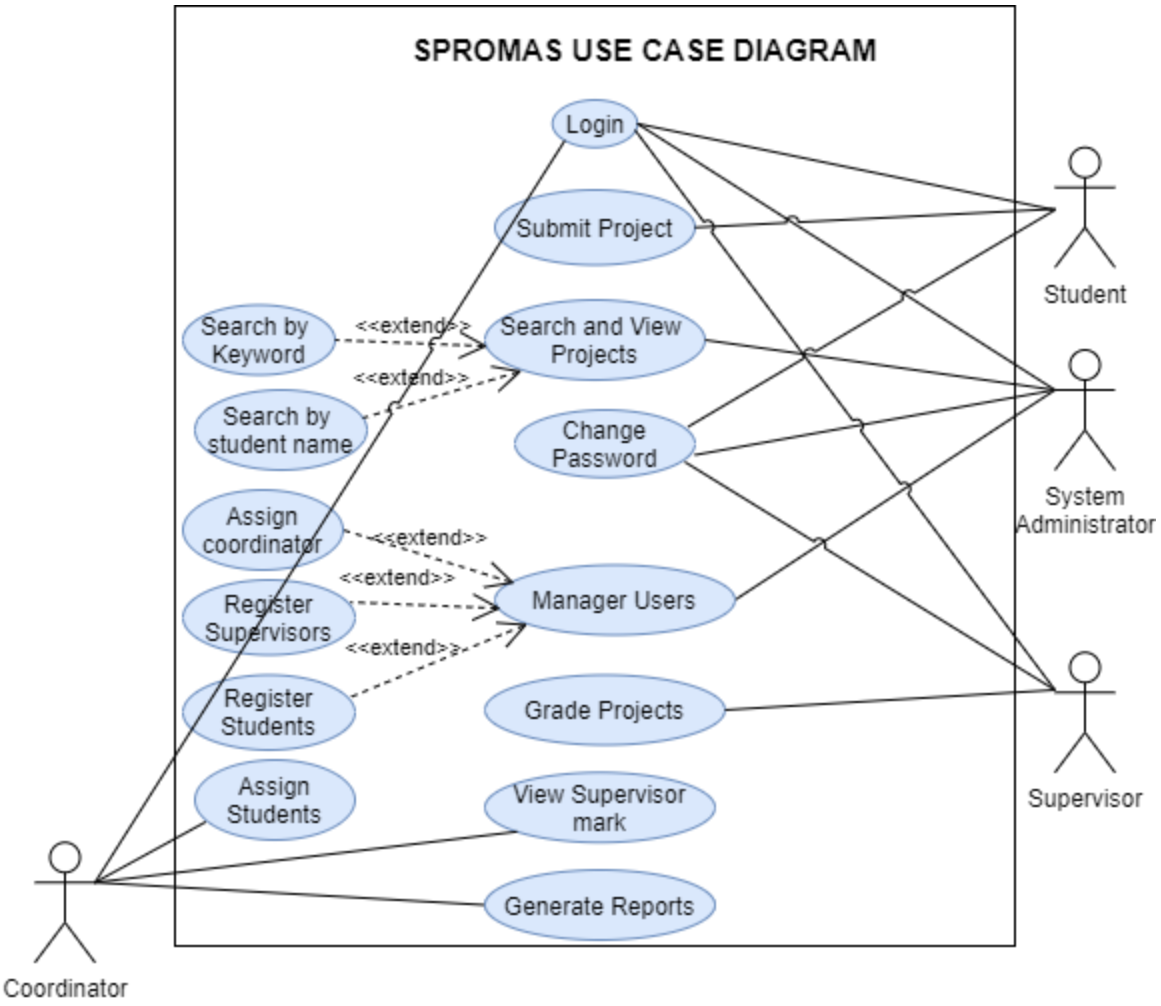


Figure 7: Use Case Diagram

Table 3: Submit Project Use Description

SYSTEM	Project Management
USE CASE	Submit Project
ACTORS	Student
DATA	The student uploads a pdf document
STIMULUS	The entered data and the document are then processed and recorded in the database.
RESPONSE	Once these are successfully stored, an email verification will be sent to both the student and the supervisor. The supervisor then carries an appropriate action.

Table 4: Grading Use Case Description

SYSTEM	Project Management
USE CASE	Grading
ACTORS	Lecturers and Coordinator
DATA	The supervisor and other lecturers will enter the marks the student scores from the presentation.
STIMULUS	The mathematical calculations are carried using the entered marks
RESPONSE	Then the system grades the project based on the calculations carried out and gives the grade between (D – A^{+}).

*Table 5:*Generate Report Use Case Description

SYSTEM	Project Management
USE CASE	Generate Report
ACTORS	Lecturers and Coordinator
DATA	The users click on the generate report option and specify the academic year.
STIMULUS	The request is processed and sent to the database.
RESPONSE	The requested data is generated in form of a bar chart, pdf document etc.

Table 6: VIEW PROJECTS USE CASE DESCRIPTION

SYSTEM	Project Management
USE CASE	View Completed Projects
ACTORS	Students, Lecturers and Coordinator
DATA	The users' clicks on the view completed project option and specify the academic year.
STIMULUS	The request is processed and sent to the database.
RESPONSE	The corresponding data is generated and displayed as per request.

Table 7: SEARCH PROJECTS USE CASE DESCRIPTION

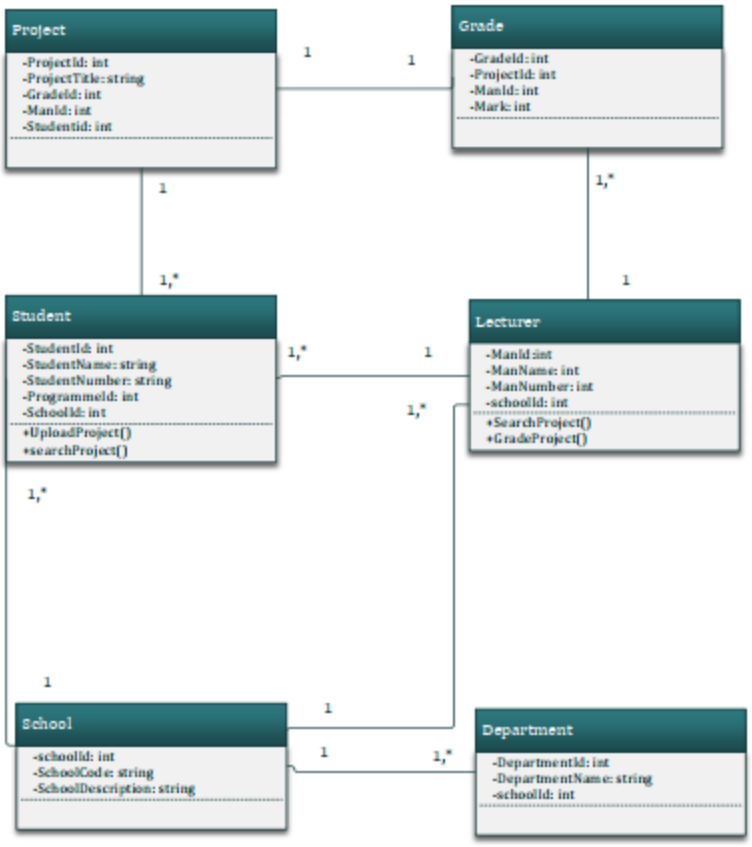
SYSTEM	Project Management
USE CASE	Search for projects
ACTORS	Students, Lecturers and Coordinator.
DATA	The users enters either the title of the project or key words.
STIMULUS	The request is processed and sent to the database.
RESPONSE	The corresponding data is generated and displayed as per request.

Table 6: DELETE PROJECT USE CASE DESCRIPTION

SYSTEM	Project Management
USE CASE	Delete Project
ACTORS	Lecturers and Coordinator
DATA	The actors will click on the delete feature
STIMULUS	The request is processed and sent to the database.
RESPONSE	The related data will be deleted once the it matches with what is in the database

Class Diagram

The class diagram represents the static view of the system. The class view is used to develop the system and can also be used to reverse engineer a system. This shows how important the class diagram is for the SPROMAS.


Project
-ProjectId: int
-ProjectTitle: string
-GradeId: int
-ManId: int
-StudentId: int
Grade
-GradeId: int
-ProjectId: int
-ManId: int
-Mark: int
Student
-StudentId: int
-StudentName: string
-StudentNumber: string
-ProgrammeId: int
-SchoolId: int
+UploadProject()
+searchProject()
Lecturer
-ManId: int
-ManName: int
-ManNumber: int
-schoolId: int
+SearchProject()
+GradeProject()
School
-schoolId: int
-SchoolCode: string
-SchoolDescription: string
Department
-DepartmentId: int
-DepartmentName: string
-schoolId: int
1
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