Virtual Learning Management System for SANASA University

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Virtual Learning Management System for SANASA University

A dissertation submitted for the Degree of Master of Information Technology

M.P.Senanayake
University of Colombo School of Computing
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Declaration

The thesis is my original work and has not been submitted previously for a degree at this or any other university/institute.

To the best of my knowledge it does not contain any material published or written by another person, except as acknowledged in the text.

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This is to certify that this thesis is based on the work of

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Under my supervision. The thesis has been prepared according to the format stipulated and is of acceptable standard.

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Supervisor Name: Dr. H.A.Caldera

_____

Signature: Date:

Abstract

SANASA university is one of Non-state higher education organisations in Sri Lanka, offering students from all over the world an idyllic podium to study and grow in a sustainable and inspiring environment. SANASA Campus is a part of the SANASA Group, which was established in 1978 and offers financial solutions, insurance, development finance, engineering, publishing, transportation and security and women's empowerment programmes, touching the lives of millions of Sri Lankans all over the country. SANASA university at present is full-fledge non-state degree awarding top institute which located in Kegalle District. Currently, SANASA awards special degrees in Banking and Finance, Insurance and Risk Management and Regional Science and Planning.

The aim of this thesis is to develop and assess a web-based Learning Management System which helps to improve the quality of the teaching and learning process. A Learning Management System does not only deliver content, but also handles administration activities such as registering courses, course administration, tracking, and reporting. Most LMSs are web based and used to improve classroom teaching, learning methodology, and company records. Some LMSs also include a performance management system which encompasses employee appraisal, competency management, and skill gap analysis.

So, based on those findings it was considered to develop a web-based application for learning management system which allows its users to handle teaching and learning process efficiently and effectively. This web-based system was developed using PHP, HTML5, CSS and intergraded with MYSQL. In order to develop this solution, object-oriented methodology was used as a general approach and rational unified process as the system development approach.

Acknowledgement

I would like to express my sincere gratitude to my supervisor, Dr H.A. Caldera, who supported me from the beginning of the project till the end. His guidance was a great strength throughout the project. I would also like to thank the project coordinator Dr H.N.D. Thilini and all the Lecturers at UCSC for the guidance and support given in last few years.

Next, I am thankful to the management and colleagues at my workplace, SANASA University PVT LTD, for valuable ideas and enormous support given throughout this project and brings this project a success with giving me friendly corporation.

Finally, and the most significantly I would like to give my gratitude to all my family members and all my colleagues, for their boundless support and inspiration offered, until the accomplishment of this project.

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List of Acronyms

LMS - Learning Management System

RUP - Rational Unified Process

VLE - Virtual Learning environment

API - Application Program Interface

OOA – Object Oriented Approach

Chapter 1 - Introduction

The goal of the virtual learning management system is to improve access to university educational involvements by allowing its students and academic staff to contribute in the distance learning using their own computer equipment and to enhance the quality and efficiency of education by using computers to support cooperative learning processes. Most universities in Sri-Lanka currently using customized LMSs according to their preferences to manage their teaching learning processes. (Demian & Morrice, 2015)

SANASA Campus was established in 1978 as a part of the SANASA Group, to offer monetary solutions, insurance, development finance, engineering, publishing, transportation and security and women's empowerment programs, touching the lives of millions of Sri Lankans all over the country. (SANASA Campus, 2021) SANASA Campus is a non-state degree awarding institute which located in Kegalle District. Currently, SANASA Campus uses a stand-alone system to conduct only the online lectures. (SANASA Campus, 2021) The proposed system has been developed to dominate the problems prevailing in the present practicing system and to convey institutes processes in a smooth and effective manner.

1.1. Statement of the Problem

At present SANASA university uses a LMS which can only deliver online lecturing programs. As a growing higher education centre SANASA campus try to adopt a fully automated LMS, which is a software that is designed exactly to produce, distribute, and manage the delivery of educational content. LMS can provide many benefits for the organizations. The eventual goal is to certify that all students are treated to an experience that their learning style and also as a whole, learning management systems help to update learning activities in any organization.

Though there are various type of existing LMS, it found many lacks of functionalities. The less interaction between the lecturer and students can be identified as the major issue of the current LMS software which are used in various universities in Sri Lanka. Currently LMSs offer only to upload lecture materials and also open some discussion forms. Through only those activities it is difficult to maintain a good interaction between lecturer and the student.

Furthermore, the issues of the existing LMS software are listed as follows;

- Students can’t evaluate their results by their own as the existing LMS doesn’t provide any way to calculate GPA of their results. Because of this reason students can’t appraise whether they eligible or not for the next academic year.
- Most students do not have a clear idea about the required credit value and eligible criteria to complete their courses. Currently there is no way to notify the students about their credit values and also the requirement needs to achieve to complete the course. Due to this reason some students do not eligible to graduate within their academic year.
- Knowledge sharing is limited as the LMS don’t provide a better interaction with lecturer and students.
- Currently it is difficult to evaluate overall evaluation of lecturer performances as the student feedback capturing is paper based. So, it required more time for the analysis.
- Inaccurate update of lecture materials.
- There is no way to provide notifications about the deadline of the assignments to the students.
- No way to do payments through LMS.

Due to the above-mentioned issues of the current LMS the students of the university face a lot of difficulties. So, to overcome those issues SANASA university try to adopt a customize LMS for their university to serve effective services for their students.

1.2. Aim of the Project

The aim of this project is to analyse, design, develop and evaluate a web-based VLE system to increase efficiency of learning and teaching environment to provide a better experience for the students as well as the academic staff while allowing system administrative to manage administrative work such as track students' performance, activity, and level of engagement.

1.3. Project Objectives

The main objective of LMS is to improve the teaching and learning process. A good LMS does not focus only on distribute lecture content, but also handles other administrative activities of the institute such as registering courses, course administration, tracking, and reporting. Most LMSs are web based as they used to improve classroom teaching, learning methodology, and

company records. LMSs additionally consist of performance management system which encompasses employee appraisal, competency management, and skill gap analysis.

The objectives of the proposed system can be listed down as follows;

- Improve accessibility
- For streamline lecturing process
- Provide real time information
- Improve analysis through LMS
- Information sharing/ knowledge sharing
- Transparency of the students results

1.4. Scope of the Project

In the given scenario, monitoring of proper study materials is pretty much important in student's perspective in regarding university environment. Furthermore, lecturer involvement in the lecturing process is important with frequent connectivity with the students to provide effective and productive learning environment because the given scenario mainly focuses on making an impact on lecturer and student involvement through the proposed system. Proposed system expected to overcome the weaknesses identified in the current manual system. Integration of lecture notes uploading, assignment declarations and uploading process and results of each subject evaluation is the main concerns in the proposed system.

- Semester results review process also embedded with the proposed system and which will help to evaluate individuals to clarify their semester GPA values with the eligibility for the next semester.
- The Proposed LMS will evaluate student's results according to their performances and identify the weak areas of a student and inform them what are the areas which they should pay more attention during the semester.
- The proposed system will notify the students about the already completed credit values and required credit value to complete the course. And also alert the students about the requirement needs to achieve to complete the course.
- Proposed system expected to facilitate schedule uploading of each and every lecture note.

- Students will notify through the system by sending notifications when lecturer place an assignment or upload lecture notes.
- In student perspective, they have to have ability to view lecture notes according to the relevant date or schedule.
- Proposed system facilitates analysing and evaluating of lecturer performance through student feedback which provided through the proposed system which help lecturers to align and re-evaluate lecturing process according to the student's expectations and requirements.
- Proposed LMS system enables the online real time chat option which help students to chat directly with their lecturers, tutors and demonstrators about the subject related issues.
- The system facilities a discussion desk which students can have online discussions with their batch mates about their subject matters.

Capture feedback and ideas of the past students to update the current syllabus align with the new technologies and the new trends.

1.5. Motivation

SANASA University has to face a stiff competition due to the fact that there are various comparable universities which use LMSs to provide learning facilities for their students within the country. Hence, the company focuses on providing effective and better learning experience for their students and as well as the staff made the decision of going for a web-based LMS as an alternative of the existing standalone system. Therefore, this motivates me to design an LMS which helps the SANSA University to overcome the complications it faces in a competitive environment.

1.6. Structure of the thesis

Chapter 2: Background - This chapter significantly evaluates the literature hat is relevant for the VLE and review the similar systems while identifying the impact of technology on LMS. This Chapter also includes a detailed description of the current process of the current system, requirement analysis and stakeholder analysis.

Chapter 3: Design - This chapter includes a detailed explanation about the structure of the overall system, design methodologies which were used to design the proposed system. Furthermore, this chapter contains use Case diagram, class diagram, entity diagram and as well as the implementation details of the proposed system.

Chapter 4: Implementation – This chapter provides a detailed description of the implementation details of the proposed system. It also describes about the tools and techniques which were used during the implementation stage of this project

Chapter 5: Testing and Evaluation – Testing and evaluation chapter discuss about the assessment of the proposed project. Furthermore, it discusses about the details of the testing approaches and testing methodologies that used during the development of the project

Chapter 6: Conclusion - This chapter delivers a detailed discussion about the overall proposed system and its outcomes and discuss about the lessons learnt through the development of this project and also the future recommendations.

Chapter 2 - Background

2.1. Chapter Overview

This chapter critically evaluates the literature that is relevant for the virtual learning system, its paybacks and it's positioning globally and locally. Moreover, this chapter will be discussed in detail with relatively to the problem domain which already defined in chapter one.

The analysis of the problem is more important to identify the key features and requirements of the proposed system. Therefore, the analysis is carried out to identify functionalities which need to include in the proposed new system.

2.2. Importance of a Virtual Learning Management System

There are numerous potentials for the interaction between students and lecturers to provide an effective learning environment. Distance learning methods, where courses are offered in one place and allow students to take courses in geographically different locations, are very popular method of active learning. (Demian and Morrice, 2012) This method is using video, fax, phone, and data interactions between students and teachers. In addition, due to the complex requirements of audio-visual equipment, students need to move to a specific location to follow these kinds of courses. To overcome the shortcomings of normal university environments and distance learning methods, existing internet and multimedia tools can be used to create a virtual learning environment to fill the gap between students' and lecturers' locations. However, students can obtain course content, such as lectures and materials, at their convenience and interact with faculty members as needed in physically or in an electronically while using this VLE.

A VLE is a set of software tools that support university management system to conduct academic administration, teaching and research with the use of internet facilities. As the technological evolvement, these systems became an essential part of the educational infrastructure of many higher education organizations since email, VLEs are provided services primarily to enhance existing academic practices.

Furthermore, the functionality of a VLE can be divided into five areas as follows,

- Information: This define the spreading of organizational news, notices, documents, data such as messages, guidelines, curriculums and schedules.

- Content: This functionality is for making accessibility of digital assets in variety of media, starting from study materials and analysing lists, through to video demonstrations and podcasts, links to outside content material presented on the internet

- Communication: This includes online tools which are enhancing face to face contact through facilities such as mailing lists, moderated discussion forms, messaging, and wikis.

- Assessment: This element focusses on assessments both formative and summative such as tests, surveys, and assignments. And also feedback for those assessments can be provided using marked scripts, video and voice notes.

- Management: VLEs provide management tools which support the preparation and distribution of courses across departments and registering and monitoring students, and the administration of marks.

The VLE has the ability to offer a dominant awareness for undergraduates and institutional staff, with regardless of their physical location, assisting steadiness in the teaching and learning processes. Lecturers can use this system to prepare study materials, store them safely, and refine them. VLEs allow students to download lecture materials in advance of a lectures as it offers scheduling facilities. The VLE can be used to collect its user feedback through survey tools for managerial decisions.

2.3. Objectives of a Virtual Learning Management System

The goal of the VLE is to enhance access to academic experience by permitting students and academic staff to take part with inside the distance learning community using their own computers and to expand the quality and productivity of teaching and learning process with the aid of using the computer systems to help collaborative studying processes. (Demian and Morrice, 2012) The explosion of the information era has transformed in the context of what to learn and how to learn. The idea of virtual teaching and learning space is a result of this knowledge revolution. Currently there are many virtual classroom systems and platforms

available for the users. Some of those platforms are Adobe Connect, WebEx, and Citrix Got Training.

Furthermore, the following explained the objectives of a VLE;

- Students can follow courses without the time and location constraints of like in a traditional teaching environment as VLE offers an online learning environment.
- As the access to VLE through internet, it allows any kind of students to join in the existing courses.
- Offer geologically widespread admission to numerous courses delivered through this learning environment as users can log into the system through internet.
- Provide a cost-effective learning environment for the students when comparing with the physical learning environment.
- Develop a learning environment where students can learn at their own place and also offer universities with an atmosphere in which they can enhance their enrolment through without concerning geographical locations of students and the university.
- Many universities do not have the ability to offer some course content as they do not have qualified staffs. Such universities can facilitate to offer those contents through VLEs with the support of resource person from that field.

2.4. Features of Virtual Learning Management System

VLEs are mostly text based, so they are using HTML, PowerPoint, or PDF documents and also various multimedia technologies are used. As the objectives of a VLE is to expand the access of innovative educational practices by allowing students and academic staff to contribute in distance learning by using their personal computer equipment and to improve the quality and efficiency of education by using the computer to support a collaborative learning process.

The following illustrates the key features that have in a VLE;

- Blended Learning - institutes can use blended learning to design teaching learning program through VLE by allowing learners to access their learning content whenever and wherever they are.
- Tracking and reporting - This feature allow to assesses the students' progress and publish immediate feedback to the students for their activities through LMS.

- Schedules - A digital option for following attendance and for sending invitations to class participants through VLE.
- Course calendars: Making and circulate of dates related to the course schedules, including assignments deadlines and tests.
- Student Engagement: Interaction between and among students, using discussion forums, instant messaging and emails.
- Assessment and testing: Formation of practise exercises using quizzes and short exams.
- Grading and Scoring: Advanced tracking and recording of student performance over time.
- Social engagement Learning - Users are accessible for social learning thorough LMS with the help of social elements as it improves student's communication and user engagement skills.
- Personalized user experience – VLE capable to provide content based on a student's registration role. This feature allows to create groups among the students according to their academic years.

2.5. Review of Similar Systems

2.5.1. Comparison of features of existing systems

The following table - 1 shows the comparison on some worldwide popular online learning platform based on their positive impact on the virtual learning environment. The determination of this comparison is to analyse the commonalities and changeability between VLE solutions.

	Tools	**LONCOPA Desire2 Learn 8.1**	**LONCOPA Desire2 Learn 8.1**	**TeleTOP VLE**	**The Blackboard Learning System**	**Scholar 360**	**Atutor 1.5.4**
Informative	Course Management	√	√	√	√	√	√
Situating	Authentic activities	-	-	-	-	-	-
Constructive	Discussion Forums	√	√	√	√	√	-

Supportive	Student Community Building	√	√	√	√	√	-
Communicative	E-Mail	√	-	√	√	√	√
Collaborative	Groupwork	√	√	√	√	√	-
Evaluative	Online Grading Tools	√	-	√	√	√	√

Table 1- Comparison of features of existing systems

2.5.2. Learning Management systems used in Sri-Lanka

Currently almost all Sri Lankan government universities and private universities are also using their own customized VLEs to handle their teaching learning processes. After having a close study about those solutions, I felt that some solutions generally focus on about distributing learning materials, capturing assignments and giving messages to the students. According to my point of view those solutions are not emphasis to process the university's teaching learning process fully in online mode. So, I listed down some common limitations in section 2.4.3.

2.5.3. Limitations of the existing systems

The issues of the existing LMS software are listed as follows;

- Students can't evaluate their results by their own as the existing LMS doesn't provide any way to calculate GPA of their results. Because of this reason students can't appraise whether they eligible or not for the next academic year.
- Most students do not have a clear idea about the required credit value and eligible criteria to complete their courses. Currently there is no way to notify the students about their credit values and also the requirement needs to achieve to complete the course. Due to this reason some students do not eligible to graduate within their academic year.
- Knowledge sharing is limited as the LMS don't provide a better interaction with lecturer and students.
- Currently it is difficult to evaluate overall evaluate lecturer performances as the student feedback capturing paper based. So, it required more time for the analysis.
- Inaccurate update of lecture materials.
- There is no way to provide notifications about the deadline of the assignments to the students

- No way to do payments through LMS

2.6. Requirement Analysis

Detailed analysis of the problem domain is crucial to find an appropriate solution for the problem. According to the statement of the problem which discussed in the chapter 01 the SANASA institute use a standalone system to do their online lectures and currently there is no proper LMS. Therefore, the analysis was carried out to functional and non-functional requirements of the proposed system.

2.6.1. Existing System

Figure 1- Existing LMS of SANAS Campus

At present SANASA institute uses LMS which can only deliver e-learning online lecturing programs as mentioned in figure-1. As a growing higher education centre SANASA campus try to adopt a fully automated LMS, which is a computer program mainly designed to create, distribute, and manage the delivery of lecture materials. Using LMS can offer many benefits for the institution as well. The eventual goal of an LMS is to certifying that all students are treated to practice that their studying style and also as a LMS help to update learning activities in educational institutions.

Though there are various type of existing LMS, it found many lacks of functionalities. The less interaction between the lecturer and students can be identified as the major issue of the current LMS software which are used in various universities in Sri Lanka. Currently LMSs offer only to upload lecture materials and also open some discussion forms. Through only those activities it is difficult to maintain a good interaction between lecturer and the student.
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2.6.2. Proposed System

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system expected to overcome the difficulties which are identified in the current manual system. Integration of lecture notes uploading, assignment declarations and uploading process and results of each subject evaluation is the main concerns in the proposed system.

- Semester results review process also embedded with the proposed system and which will help to evaluate individuals of their semester GPA values with the eligibility for the next semester.
- The Proposed LMS will evaluate results according to their performances and identify the weak areas of a student and inform them, what are the areas which they should pay more attention during the semester.
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- Proposed LMS system enables the online real time chat option which help students to chat directly with their lecturers, tutors and demonstrators about the subject related issues.
- The system facilities a discussion desk which students can have online discussions with their batch mates about their subject matters.
- Capture feedback and ideas of the past students to update the current syllabus align with the new technologies and the new trends.

Furthermore, the following diagrams illustrates the proposed system.

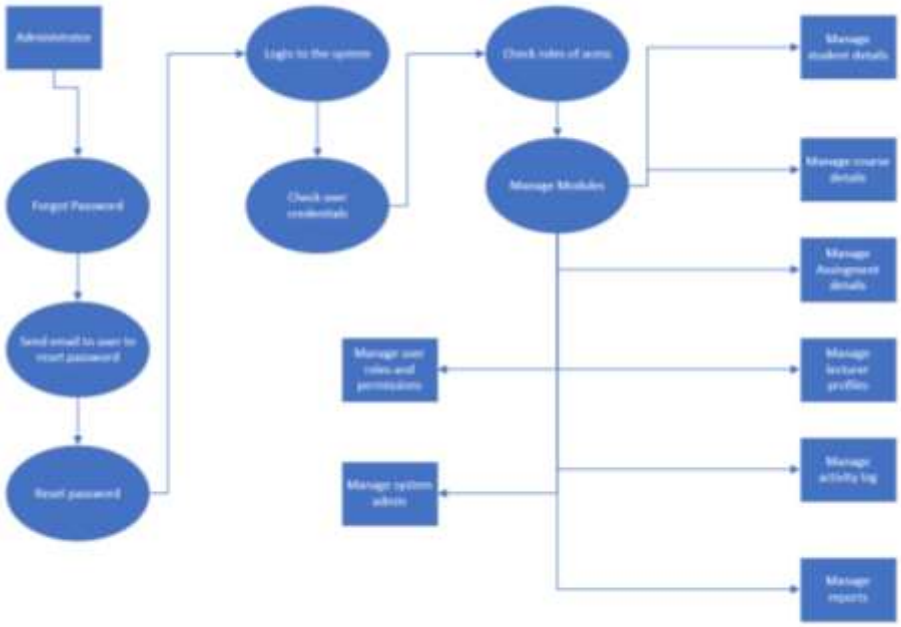

Figure 2 - Process of Admin login

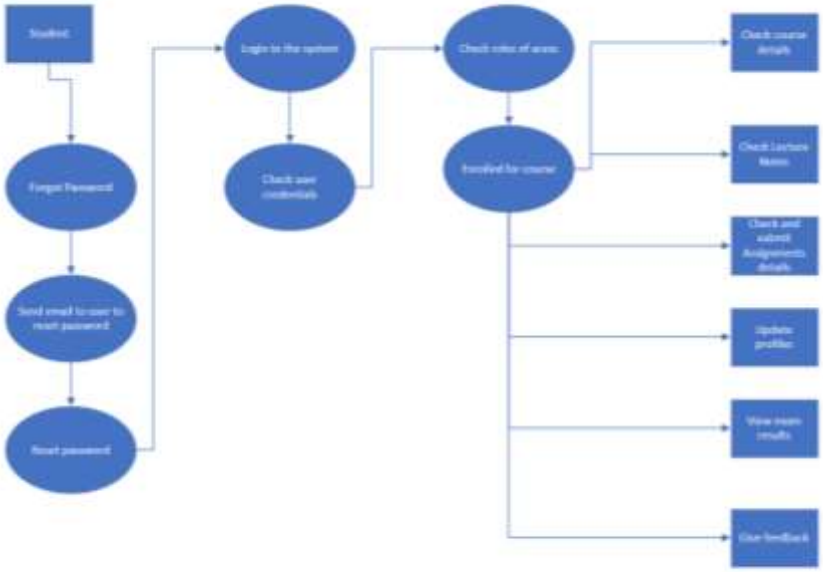

Figure 3 - Process of student login

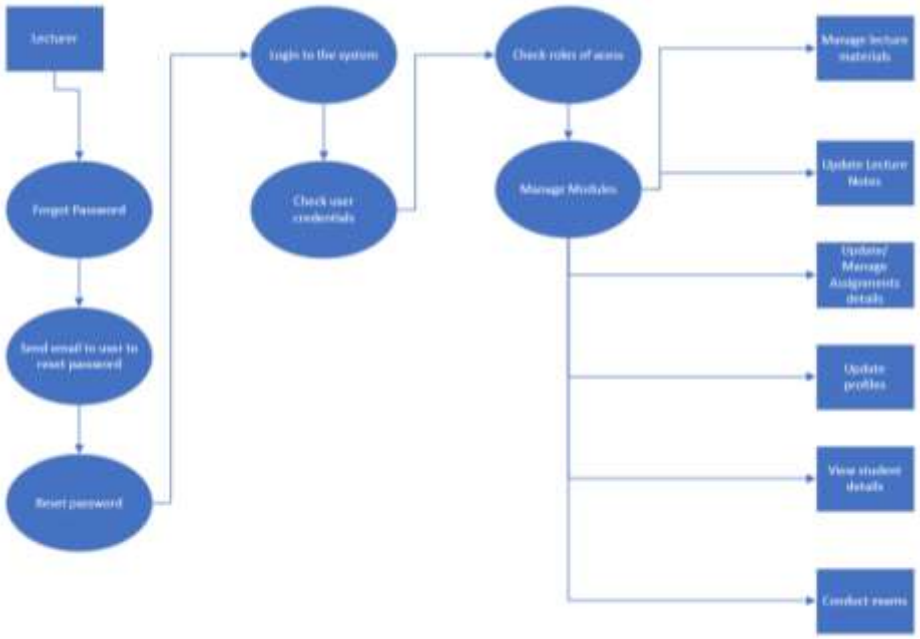

Figure 4 - Process of student login

2.7. Requirement Specification

2.7.1. Functional Requirements

The following table - 2 shows a brief discussion on the functional requirements for each user of the system has been carried out.

User	Requirement ID	Constraint
Students	FR 01	System should allow user to log into the system by providing the accurate username and password.
	FR 02	System should allow users to easily accessed dashboard and find necessary learning materials.
	FR 03	System should allow to view the total marks with the GPA values and notify students with their current credit values

	FR 04	System should also be able to create user groups according to their belonging category in the institution to cooperate, communicate and share content.
	FR 05	System should allow user to send their comments.
Academic Staff	FR 06	System must allow user to view students' information.
	FR 07	System should allow user to view lecture details.
	FR 08	System should permit user to publish lecture materials.
	FR 09	System should allow user to publish submission information of the assignments and allow to control upload details.
	FR 10	System should allow user to publish marks and feedback for the assignments and exams.
Management members	FR 11	System should allow user to track lecture details.
	FR12	System should allow users to view customized management reports related like lecturer performance evaluations, student attendance reports, finance reports.
Administrator	FR 13	System should allow user to manage user accounts.
	FR 14	System should permit user to accomplish backups of system.
	FR 15	System should allow user to keep records, update lecture calendar details.

Table 2 - Functional Requirements

2.7.2. Non-Functional Requirements

Non-functional requirements are mainly created with the system performance. Non-functional requirements can be illustrated as following table-3;

Requirement ID	Constraint	Description
NFR1	Accessibility	The system should be installed on one or more servers centrally and should be available to access over the Internet.
NFR2	Flexibility	The system should be able to extend and serve more simultaneous users, and to allow to consider extra settings.
NFR3	Compatibility	The system should be companionable with existing web ethics.
NFR4	Functionality and easy access	The system should allow people to adapted visual enhancements for ease of access and use.
NFR5	Stability	The system should assurance a secure and consistent learning process.
NFR6	Productivity	The system should have the capacity to serve a maximum session.

Table 3 -Non-Functional Requirements

2.8. Chapter Summary

In conclusion, the gathered requirements from analysing the existing system and reviewing similar systems, will be used as features of the proposed system. This proposed system will help to increase the efficiency of the institute and also add more value to its teaching process.

Chapter 3 – Design

3.1. Chapter Overview

This part of the thesis defines the project architecture of the planned VLE according to the requirements which were identified in the chapter - 2 and also associated with the problem domain and the factors which are describes in the literature review chapter.

3.2. Methodological Approach

3.2.1. General Approach

According to the requirements which are recognized, the project have a chance of change and there is more opportunity that new requirements many raise while developing the system. So iterative approach selected as it supports to associate those changes easily for the project during the development stages as iterative approach enables a construction of a working model of the proposed system at prior stages hence the compliance of the system to the user expectations can be tested and user feedback can be incorporated. (Yuan Tsai, Stobart, Parrington and Thompson, 2021) This approach also helps to create a prototype at its earlier stages so before deployment of the system, the user potentials can be tested and feedback can be incorporated during the development of the system. As iterative approach permits to absorb from previous experiences and apply those lessons learnt and experiences which gained from previous developing stages to next repetitions. The requirement for following extended planning and stable structure are not high significances since the VLE's prototype is a simple one which developed during a limited time period

3.2.2. Development Approach

Iterative approach selected as the general approach of this project. OOA is the development approach which is commonly used with iterative and incremental approaches than structured. Moreover, OOA enables for improved picturing of the system through real world modelling comparing with the structured approach. This approach supports to expansion for a better idea of the proposed application at the preliminary stage of the developing the prototype. Therefore, OOA is selected as the general development approach for the project.

3.2.3. Development Methodology

RUP is identified as the most developing methodology of this project, meanwhile “evolutionary prototyping acknowledges that we do not understand all the requirements and builds only those that are well understood” (Davis, 1992). Evolutionary prototyping is appropriate for the project since the system can be frequently developed and build again. Initially the clearly identified requirements were designed without occupied on the entire system at once. According to the comments of the users the uncertainties were illuminated and the new functions were incorporated. Because of this, the time and effort which put to develop was not wasted even though working on the uncleared structures of the proposed system. Since RUP uses a component-based architecture to visualized prototypical software it supports to design the planned system with proper use of internal operations and data relations of the system by using UML that assistance to interconnect visual concepts. On the other hand, RUP helps modification of the software and increases flexibility as it will be helpful in controlling, tracking and monitoring changes in the big data technology and to accommodate them to the application (Kruchten, 2015).

3.3. System Architecture

The system architecture for the proposed VLE system is designed using three-tier architecture. Database, application and user interface layers are the layers which used in this three-tier model as visualized in the following figure – 1. The top down approach is used, for the overall-design and workflows. The three layers are discussed in the bellow.

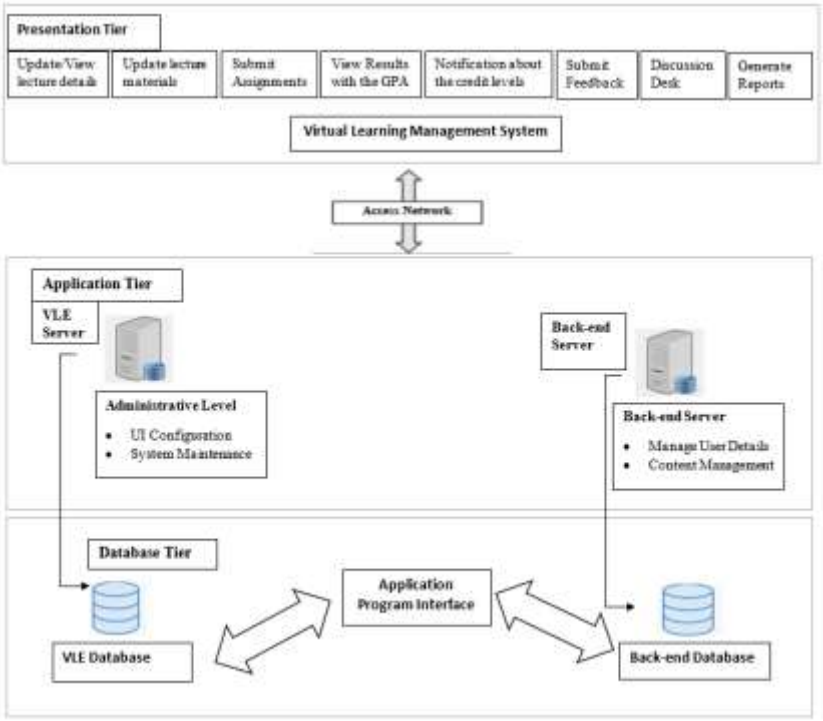

Figure 5 - System Architecture for the proposed system

3.3.1. Presentation tier

This layer includes the User Interface of the proposed VLE system, which its users will have interaction with. With the goal of making sure a suitable user interface that discourses the analysed problems, which mentioned in chapter 1. The highest importance functional requirements been executed at this layer.

3.3.2. Application tier

The application layer contracts with business logic and guidelines. This layer pedals the functionality of the planned application's presentation layer and contains the university's current back-end system functionalities where the SANASA university can control learning management activities. Additionally, the admin of the system can regulate the user interfaces and transmit the maintenance of the application.

3.3.3. Database tier

The database tier contains the database and the program which accomplish, read and write access to it. The purpose of having a different layer for the database, the data can save on that layer without depend on the application layer. This database layer contains VLE's database and the university registration database, which are linked via an API. At this layer, it is more

appropriate to link with two systems as it diminishes the number of modifications as data would need to be changed for use in both systems only once, which is not complex when comparing with others. On the other hand, with the contribution of vastly skilled employees, it may be possible to move the API link to the application layer.

Moreover, the following mechanisms are provided by the web application of the proposed system; Online exams, Assignments, Chat, Discussion forums, Quizzes, Surveys, Wikis, Virtual class rooms and Resources manager.

3.4. Use Case Model

Use case diagrams have been used in order to get a high-level design of the visualization of the proposed system as it provides a graphically summary of the functional requirements of the system.

Denote figure-6 for the use case model of the proposed system. Refer appendix A for modularized use cases.

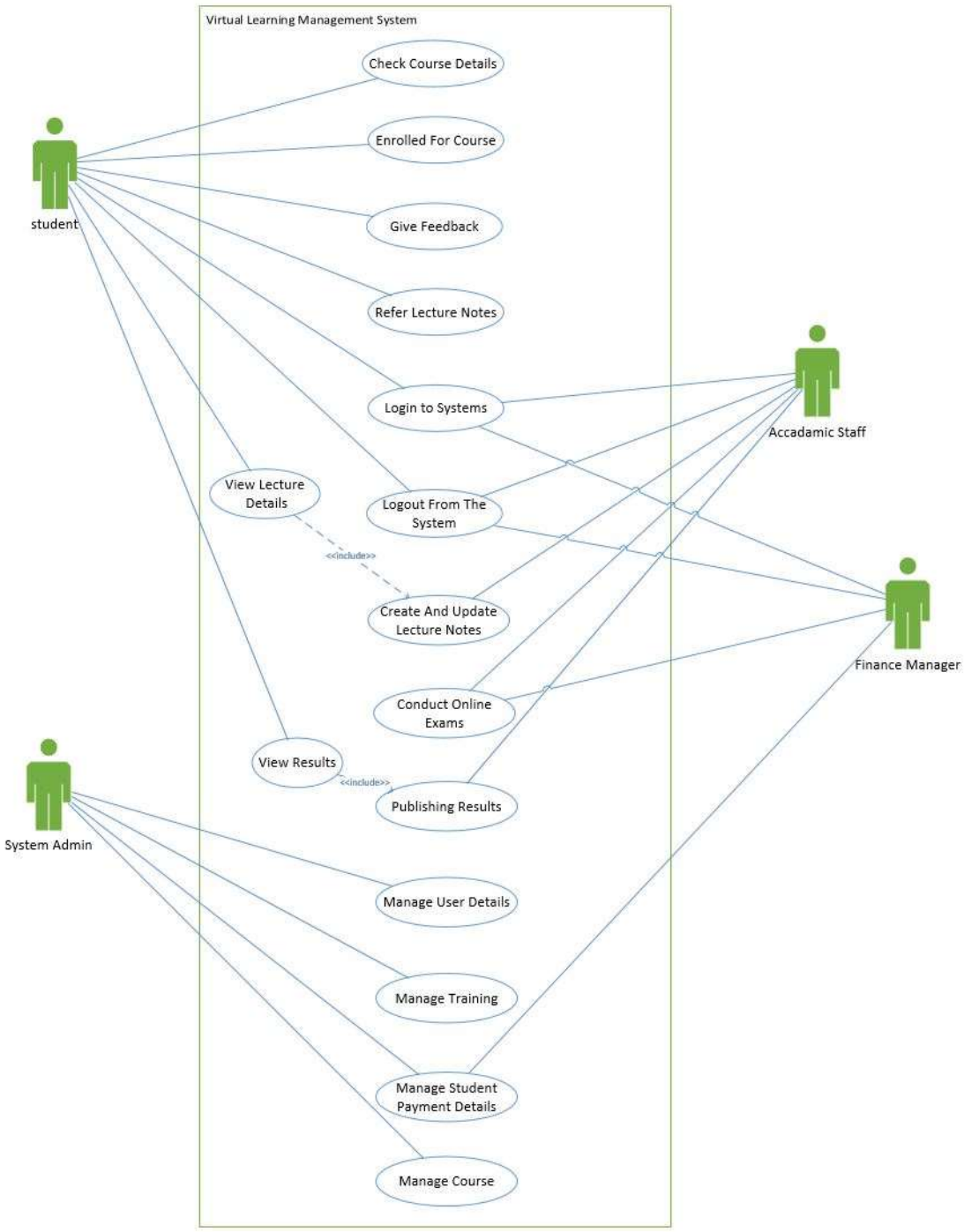

Figure 6 - Use case model

3.5. Use Case description

Use Case	Login to the system	
Actor	Student	
Brief Description	This use case describes how to login to the system	
Purpose	To ensure that student to login to the system to view details of lecture schedules, materials, etc.	
Pre-Condition	Student should be a registered and should have a valid student account with username and password	
Main Flow	Actor Action	System Response
	1. Student enter login button in the homepage	2. The system will display the login interface.
	3.Student enter the username and password.	4. The system validate the user details entered.
		5. Authorize the user to login to the system.
		6. Redirect the user to pages where the user has been granted permission for access.
Alternative Course	Step 3. If the student enters incorrect details an error message will be displayed requesting the user to re-enter the username and password	
Post-Conditions	The student will successfully login to the system.	

Table 4 - Student login

Use Case	View lecture details	
Actor	Student	
Brief Description	This use case describes how the student will be able to view the lecture details after it is published by the lecturer.	
Purpose	To ensure that student to view details of lecture schedules, materials, etc.	
Pre-Condition	Student should be a registered and should log into the system using student account.	
Main Flow	Actor Action	System Response
	1. Student search for the relevant course module using course Id.	2. The system will display Course details.
	3.Student access the view lecture details tab.	4. The system will display relevant details of the selected lecture.
	4.Student download the lecture materials.	5. Enable tea student to download materials.
Alternative Course	Step 1. If the student enters incorrect details an error message will be displayed requesting the user to re-enter course Id.	
Post-Conditions	The student will successfully view lecture details and download the lecture materials.	

Table 5 - View Lecture details

3.7. Class Diagram

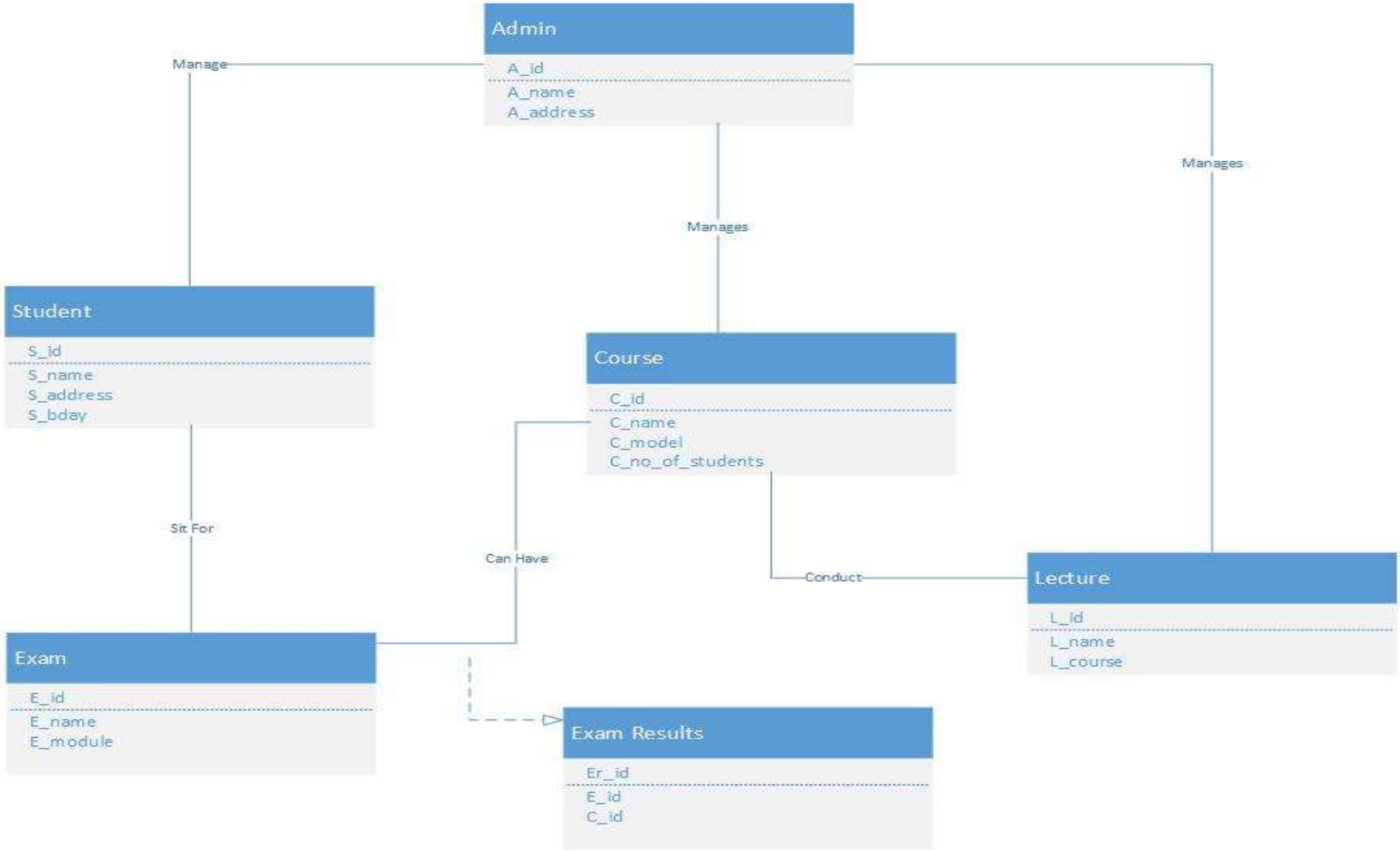

Figure 7- Class diagram

3.7. ER Diagram

An ERD illustrates the relationships of entity which stored in the proposed system's database. ERD created for proposed VLE System to identify the relationships between the entities of the projected databases.

Refer Appendix B for the ERD of the proposed system.

3.8. User Interface

This report includes few main screens of the proposed system as follows;

Home Page

Figure 8 - Home Page

Lecturer Main Screen

Figure 9 - Lecturer main screen

Admin Main Screen

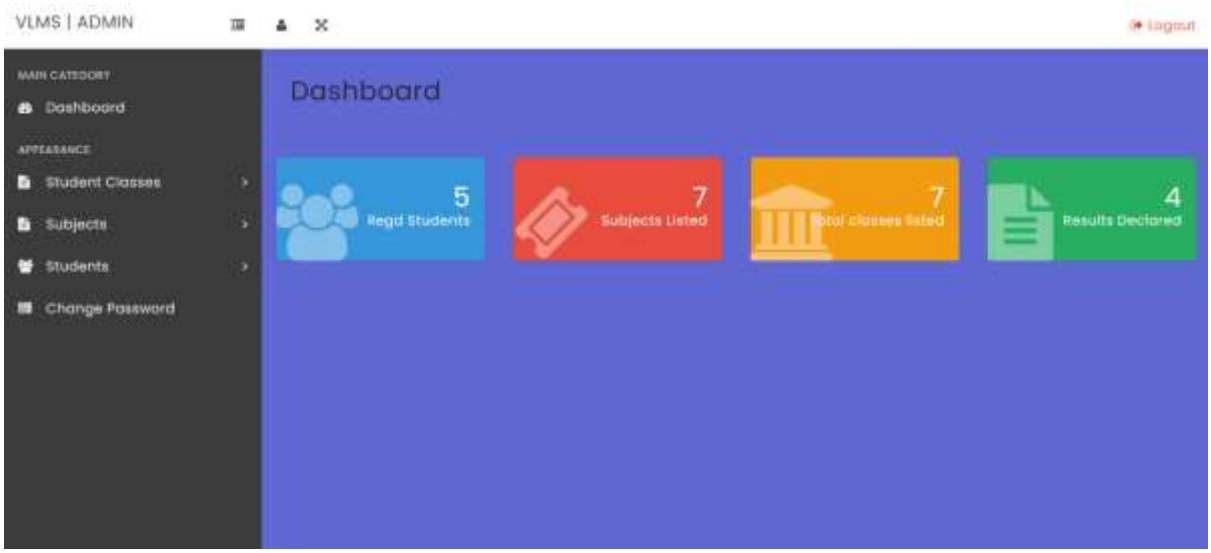

Figure 10 - Admin main screen

Student Main Screen

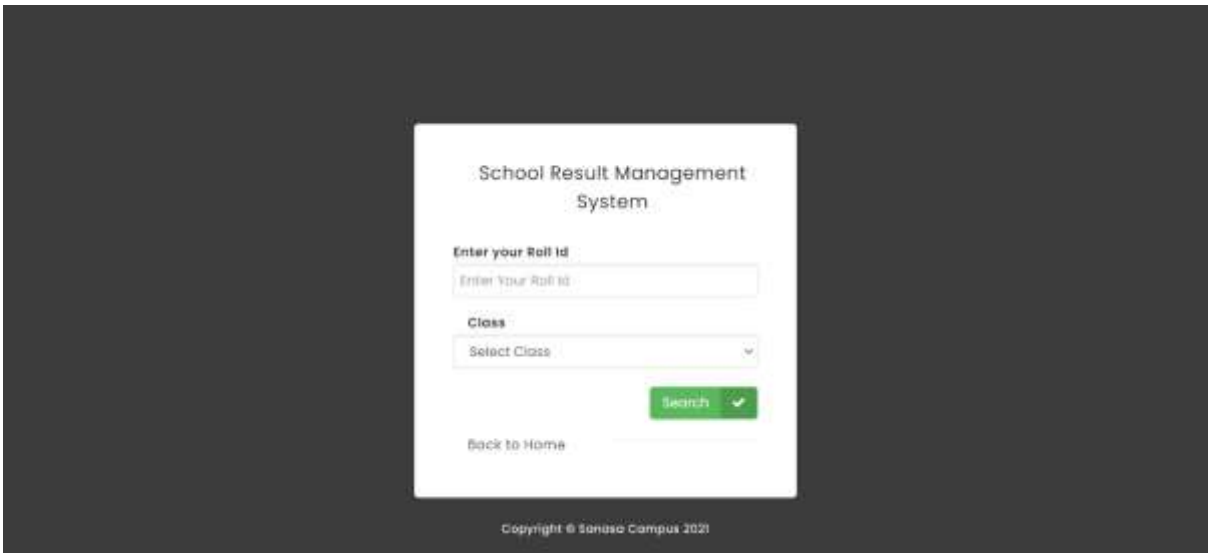

Figure 11 - Student main screen

3.7. Chapter Summary

The chapter discourses issues related to design and implementation stages of the project development lifecycle. Successful implementation was carried out using the local server with XWAMP and php, html, JavaScript, CSS, were used to develop the proposed system effectively.

Chapter 4 – Implementation

4.1. Chapter Overview

After analysing the requirements, web-based system was selected as the proposed system to fulfil the requirements the users. HTML, JavaScript and PHP were selected as the most appropriate languages to implement the system. JavaScript was selected as it is ease to use and also PHP language was selected as it can embed with HTML coding and load web pages in a short time period. The most significant reason to select PHP language is its browser compatibility since this system is a web-based solution. XAMPP selected as the localhost to develop the proposed system in local machine. Furthermore, PHP 7.3.12 version was used for developments while Apache 2.4.41 version was used as the server application. MYSQL 8.0.20 was used for the database.

For developing UI designing wireframe, javascript, JQuary, CSS3, HTML and Bootstap used as a scripting language. As the bootstrap facilitate desktop based developed web systems to convert to mobile version automatically since the proposed system expects to allow its users to access the system using mobile devices.

4.2. Development Environment and Tools

The following illustrates the development environment and tools used;

- The development language - PHP 7.3.12
- Database management system - MYSQL 8.0.20, phpMyAdmin 4.5.1
- Server application - Apache 2.4.41, Xampp Server 1.8.0
- Website development - wireframe, javascript, JQuary, CSS3, HTML and Bootstap
- Code development - Notepad++
- Image editing - Adobe Photoshop 7.0

4.3. Server-side implementation

The following steps need to be the followed after the deployment of the system.

- Windows OS will be installed as the operating system and MySQL 8.0.20 will be installed following phpMyAdmin for management interface.

- jQuery and JavaScript files will be imported into the server.
- CSS files will be imported into the server.

4.4. Client-side implementation

The following listed would be the implementation that would be carried out after the deployment of the system.

- Any operating system that supports a web browser.
- Any web browser (if possible, Google Chrome).

4.5 Hardware Environment

Server of this centralized system consist of 16Gb ram with Intel Core i7 3960x, Base clock speed 3.3Ghz, cache memory 15MB with memory support 4channel DDR3 1600. 1Tb SSD memory prefer as to improve quick accessing ability with 2Tb storage proffered as a requirement with high end hardware components.

4.6. Configurations

The basic configurations categorised into two sections, as client-side configurations and server-side configurations.

4.6.1. Server-side configuration

```
<?php
$user = 'root';
$password = '';
$database = 'srms';
$port = NULL;
$mysqli = new mysqli('127.0.0.1', $user, $password, $database, $port);
if($mysqli)
echo'connected successfully to srms db';
else echo ‘ERROR: Could not connect to database’;
}?>
```

4.6.2. Client-side configuration

The client should be in use the same VLAN as the server and also should be able to ping the server. The system used JavaScript and CSS 3.0 in client side. Recommended web browser to use for this project is Google chrome.

4.7. Database Implementation

MySQL with Apache was used to implement the database. Therefore, SQL queries were used to manage and to handle data in the database.

4.7.1. Creating the database

Database was created manually using phpMyAdmin as following figure – 12.

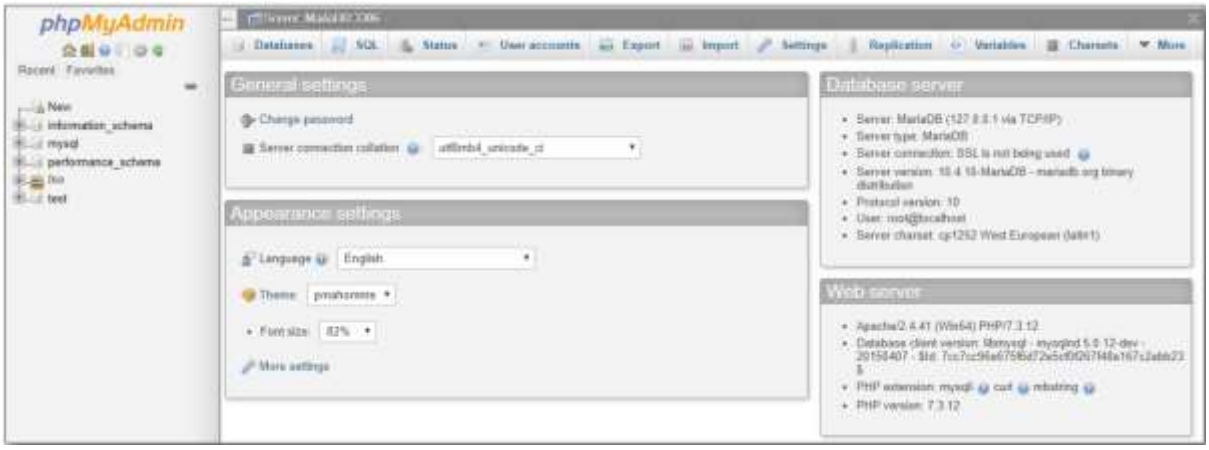

Figure 12 - Database created in phpMyAdmin

4.7.2. Creating a table in database.

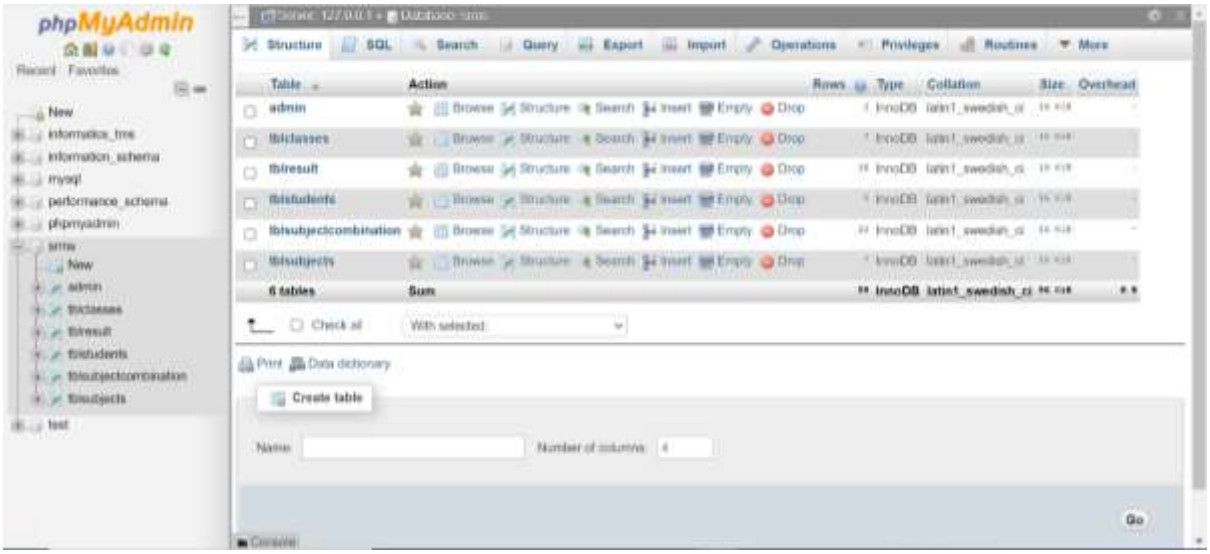

Figure 13- Tables in the database

4.8. Report Modules in the system

The MIS reports generated by the management information system, which is an information system used by most organizations to organize, control, and visualize data for better decision making. Those MIS reports provide business managers at all levels a summarizing and comprehensive view of business' daily activities and help them to evaluate these business processes, discover problems, and make decisions. Therefore, the following illustrates the MIS report modules which include in the Virtual Learning Management system for SANASA University.

Students' attendance report

The attendance of each students for every lecture will capture and the system will generate an attendance report for each and every scheduled lecture.

Lecturer performance evaluation reports

Based on the student feedback which are captured through the system create a lecturer performance evaluation report to evaluate each lecturer performances.

4.9. Chapter Summary

The implementation was carried out using the local server with Xampp installed. Software tools such as php, html, JavaScript, CSS used to develop the virtual learning management system effectively.

Chapter 5 – Testing and Evaluation

5.1. Chapter Overview

This chapter includes the explanation about the testing and evaluation carried out on the proposed system. The main purpose of testing is to identify whether the developed system meets its intended purpose and to identify defects. Furthermore, this describes the evaluation phase of project; as the expert, user evaluations conducted to identify the success of the project and also to conclude the project has been effective in addressing the problem which faced by the SANSA university as specified in the chapter 1.

5.2. Testing Approach

Black box testing selected as testing approach since it required only to connect with the developed system through its user interface by related inputs and examinis the outputs with real knowing how and where the inputs are being functioned and also this testing approach does not require any familiarity on its internal testing stages of the system and architecture. (Beizer and Wiley, 1996)

5.3. Testing Type

5.3.1. Regression Testing

This type of testing is performed to ensure that the modification is working as expected without harming to the existing modules to produce wrong outputs as regression testing is a software testing type which used to check whether the new program's code has affected to the current system's features. So, the following table illustrates the regression testing carried out on the system.

Test case ID	Description	Expected results	Actual Results	Status
TC1	Logging to the system using Windows Chrome	• Display the web interface • Successfully logged in	Same as expected	Pass

TC2	Logging in to the system using a tablet	• Display the web interface • Successfully logged in	Same as expected	Pass

Table 6 - Regression Testing

5.3.2. Stress Testing

Stress testing is used as a software testing which validates the consistency and dependability of the system. This test primarily measures the system on its robustness, availability and error handling abilities under tremendously heavy load circumstances. This testing is also assessed that the system would not be down under any emergency situations. Given below is the stress testing carried out on the virtual learning management system.

Test case ID	**Description**	**Expected results**	**Actual Results**	**Status**
TC1	Inserting 100 characters for the student name in user registrations	The student name saved up to 25 characters as the database space is given for 25 characters.	Same as expected	Pass
TC2	Logging in to the system through Chrome.	Successfully logs in as different sessions.	Same as expected	Pass

Table 7 - Stress Testing

5.3.3. Performance Testing

Performance testing is the process of defining the speed, responsiveness and steadiness of a computer, network, software program or device which used to login to the system under a workload. The following table explains the performance testing carried out on the system.

Test case ID	Description	Expected results	Actual Results	Status
TC1	Registered two students using two different web browsers.	Successfully saved	Same as expected	Pass

Table 8 - Performance Testing

5.3.4. Usability Testing

Usability testing discusses to evaluating the system by testing it with characteristic of system users. Typically, throughout a test, system users will try to complete typical tasks while observers watch, listen and takes notes. The goal of this testing is to find any usability issuess, collect qualitative and quantitative data and regulate the system user's approval with the product. The following table illustrates the usability testing carried out on the system.

Test case ID	Description	Expected results	Actual Results	Status
TC1	Logging to the system using Windows Chrome	• Display the web interface • Successfully logged in	Same as expected	Pass
TC2	Logging in to the system using a tablet	• Display the web interface • Successfully logged in	Same as expected	Pass

Table 9 - Usability Testing

5.3.5. Security Testing

Security testing helps to notice all possible security risks in the system. This is an important test to developers as this testing detect the potential vulnerabilities of the system before the deployment. The following illustrates the security testing carried out for the proposed system.

Test case ID	Description	Expected results	Actual Results	Status
TC1	User authentication and authorization	• If the correct username and passwords have been used, the system enable user to login successfully • Display only the related interfaces to users.	Same as expected	Pass
TC2	Click back button in the browser after logging out from the system	• Direct to login page	Same as expected	Pass

Table 10 - Security Testing

5.4. Test cases

5.4.1. Test cases for login

Test case ID	Description	Expected Result	Actual result	Status	Comment
TC 1	Lecturer Login	Successfully login to lecturer interface.	Same as expected	Pass	-
TC 2	Student Login	Successfully login to student interface.	Same as expected	Pass	-

Table 11 - Test cases for login

5.4.2. Test cases for student registration

Test case ID	Description	Expected Result	Actual result	Status	Comment
TC 1	New student registration.	• Display new record added. • Redirect to new student add tab.	Same as expected	Pass	-
TC 2	Student registration with without entering some fields	• Display massage "please fill mandatory details.''	Same as expected	Pass	-
TC3	Search for a student	• View student details	Same as expected	Pass	-

Table 12 - Test cases for student registration

5.5. Evaluation

5.5.1. User Evaluation

User evaluation emphases on how satisfied users are with the new process to achieve their goals. Furthermore, usability evaluation gives a better image of the system's functions better and also it helps to gather ideas about the current system's issues as it helps to reflect on their needs and experiences. Usability inquiry approach is used to evaluate this system. User evaluation was carried out by conducting some online interviews with the academic staff of the SANASA university and the students, which based on their experience with using the new system and its functionalities.

5.5.1.1. User evaluation using interview

When assessing the online interview results which I had with system users as per in the table - 13, the users have rated the user friendliness of the overall application. It was evaluated in two aspects specifically; ease of use and ease of navigation. It confirmed that 75% of users initiate

that the system is easy to use navigate and also users state that they understand how to use the proposed system without any training or guidance while 20% were very much satisfied. Therefore, more than 90% of the users were satisfied with the user friendliness of the system. The academic staff and students confirm that the stream of the system was similar to the existing system which the university previously use to manage their academic and administrative activities and it is also helps to find the system functions clearly and easily when comparing with the system they used. Moreover the 25% of the system users denotes that, they needed guidance and assistance before they used this new system as they were not capable with internet and language-usage. According to the staff members' view it was noticed that all the components in the proposed system were able to encounter their requirement which stated in chapter 01.

Interviewee	**Date**
Dr. P. A. Kiriwandeniya (The chairman of SANASA Campus)	05/07/2021
Dr. D. A. S. Kuruppuarachchi (The Dean of SANASA Campus)	05/07/2021
Mr. L.C.S. Subasinghe (The Manager - IT of SANASA Campus)	10/07/2021
Dr. E.N.C. Perera (The Senior Lecture – RSP Department of SANASA Campus)	10/07/2021
Ms. K. Gimhani (The Lecture – B&F Department of SANASA Campus)	10/07/2021
Mr.K. Senavirathne (Student representative – B&F Department of SANASA Campus	25/07/2021
Ms. A. Weerasinghe (Student representative – RSP Department of SANASA Campus	25/07/2021

Table 13- online interview schedule

Refer Appendix C for the summary of the interviews

5.5.1.2. User evaluation using SWOT Analysis

The following will illustrate the SWOT analysis which performed to evaluates the usability of a system to identified strengths, weaknesses, opportunities and threats helps the organization

optimize their service performance. Furthermore, Strengths and Weakness can be considered as internal factors of the system whereas opportunities and threats characterized as external features of the proposed system.

Strengths

- Online flexibility learning and technology navigational independence.
- Can customized and structural e-learning teaching sessions for targeted students.
- Better and faster communication towards Students.
- Use of appropriate, adequate-and modern service tools and technology

Weaknesses

- Accessibility of the system can vary from student to students due to unstable Internet connectivity
- Less interaction with students during Online Classes

Opportunities

- Possible to enhance the number of students and improve the quality of service through using this system.

Threats

- System based on complex process of managing students and academic staff details, so the adaptability to the system is difficult at initial stage.

5.6. Chapter Summary

This chapter mainly describes on testing of main functionalities of the proposed virtual learning system and how test plan is implemented accordance with to the system functions. furthermore, this section describes the system evaluation done by user adaptability to the system in measured by stakeholder feedback.

Chapter 6 – Conclusion

6.1. Conclusion

Though SANASA university currently uses a Learning management system which can only deliver e-learning online lecturing programs. As a growing higher education centre SANASA campus try to adopt a fully automated LMS, which is a software that is intended specifically to create, distribute, and manage the delivery of educational content.

As the main purpose of this project is to introduce a virtual learning management System to SANASA university to enhance its learning process with more effective features. The new features of proposed the system will solve the issues currently being experienced by the staff members and the students of the university and also this system manages course enrolments, course administrations, tracking, and reporting. Moreover, the overall efficiency of the teaching and learning process will be increased while the users get a positive experience from this system.

If the proposed system is implemented, it expected to overcome the drawbacks identified in the system which is currently use in SANASA university. Integration of lecture notes uploading, assignment declarations and uploading process and results of each subject evaluation is the main concerns in the proposed system since it provides better and effective experience its users as those features are important in teaching learning approach. Furthermore, the proposed system will provide students a clear awareness about the marks with the GPA value and also notify gap between the credit level they should achieved to pass a specific semester and the credit level they have already achieved.

Specially the situation arise with Covid-19 pandemic has made the opportunity to upgrade the current system with the proposed features as the ultimate goal of SANASA university is guaranteeing that all students are preserved to an involvement that their learning style and also as a whole, LMS help to modernize education activities within the institution.

6.2. Challenges Encountered

Various challenges were faced throughout the project. It was difficult to gather data from the system users as I conduct online interviews due to this pandemic situation. Because of that issue it was difficult to collect true responds and feedback from the users.

Furthermore, the other main challenge was sticking to the planned time frame as there were some interruptions in some tasks due to various technical difficulties awakened while coding of the system. The evaluation of the system could not be completed within the planned time period as it was unable to meet the relevant users to carry out the evaluation process due to the Covid-19 pandemic situation in the country

6.3. Future Work

Currently the system was developed to enhance teaching and learning process of the SANASA university. As a future development payment via the learning management system can be included in the system. According to the design chapter, the payment of students could also be connected to the system where the students could directly do their payments like semester payments and examination payments rather than doing payments using any third-party methods.

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Appendices

Appendix A – Modularized Version of Use Case Diagram

Figure 14 - Use case of Student

Figure 15 - Use case of Admin

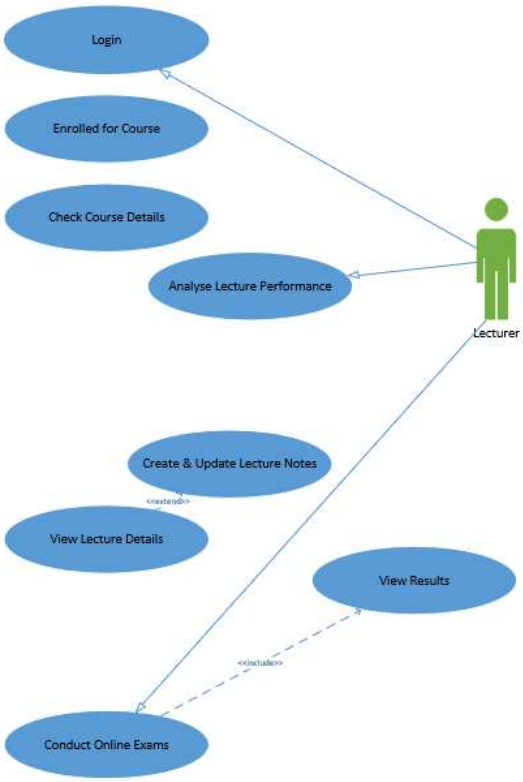

Figure 16 - Use case of Lecturer

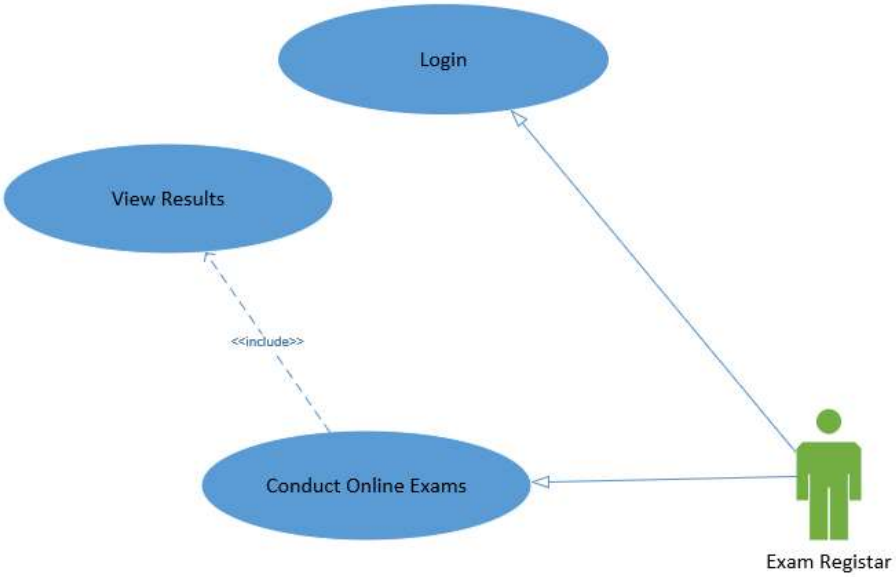

Figure 17 - Use case of Exam Registrar

Appendix B– ER Diagram

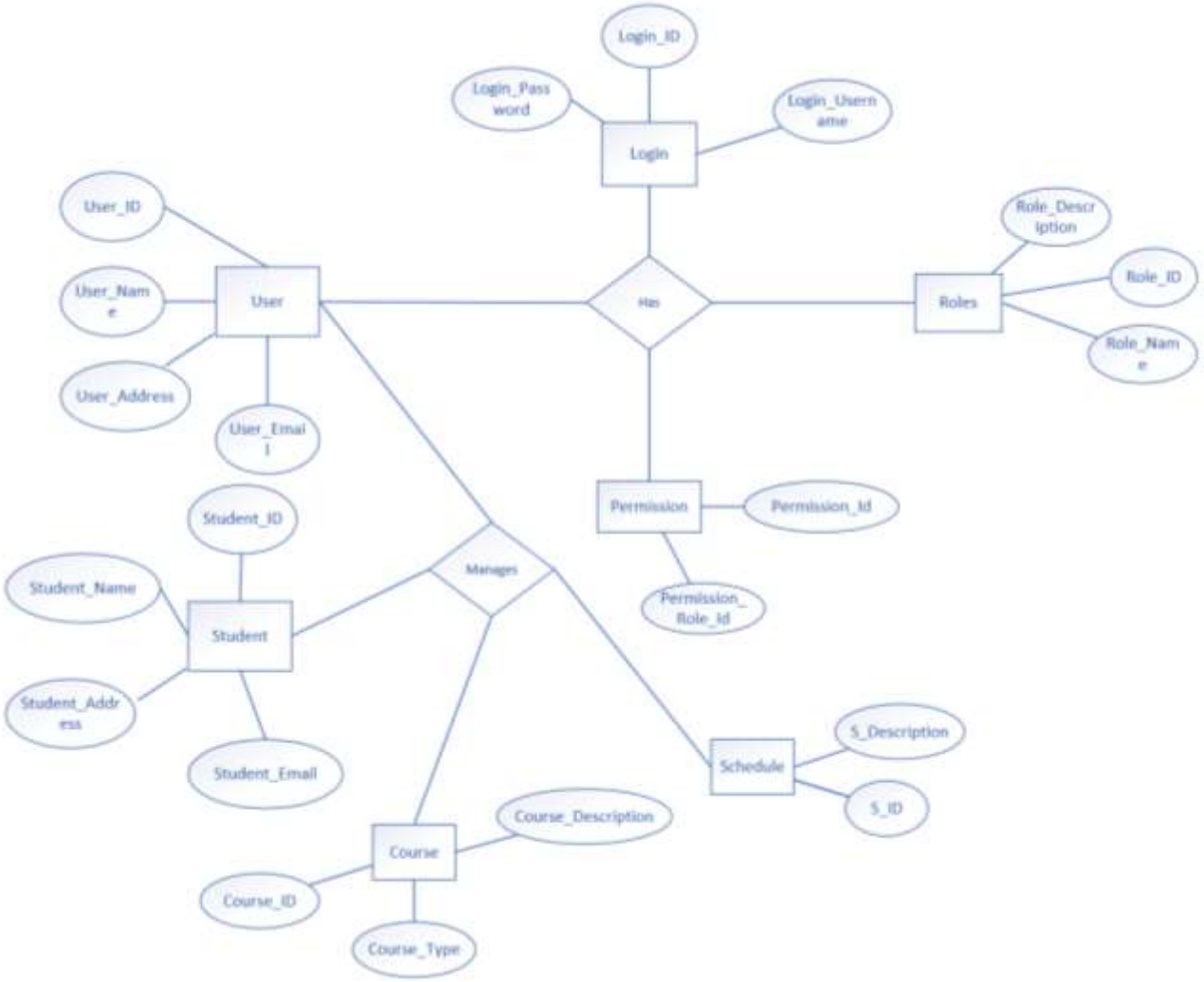

Figure 18 - ER Diagram

Appendix C – Interview Details

Interviewee	Summary of findings
Dr. P. A. Kiriwandeniya (The chairman of SANASA Campus)	Dr. Kiriwandeniya emphasised that the standards and usage of VLE and its importance in maintaining better relationships among the students as well as the staff off the university.
Dr. D. A. S. Kuruppuarachchi (The Dean of SANASA Campus)	The discussion focused on the importance of having VLE to manage all the institutional engagements easily and effectively.
Mr. L.C.S. Subasinghe (The Manager - IT of SANASA Campus)	Mr. Subasinghe stated newly developed system help to overcome the difficulties of the current system. Furthermore, he stated that this system is more user-friendly and easier to access its users without any guidance.
Dr. E.N.C. Perera (The Senior Lecture – RSP Department of SANASA Campus)	Dr. Perera highlighted about the complications that the system users experience at current system and also, he stressed on about the assignment submission module as well as it can manage the number of attempts by the lecturer.
Ms. K. Gimhani (The Lecture – B&F Department of SANASA Campus)	The discussion was focused on the importance of having a module to get student feedback for the staff evaluation purposes.
Mr.K. Senavirathne (Student representative – B&F Department of SANASA Campus	This interview was to get details about the user experience. He explained that the new system is user-friendly and manageable when it compares with the existing system.

Ms. A. Weerasinghe (Student representative – RSP Department of SANASA Campus	The interviewee describes the system as it is easy to access without any direction and also the system is accessible.

Table 14 - Summary of Interview findings

Recommendation of the Supervisor

9/8/21, 9:28 AM Gmail - feedback

Gmail

Mithila Senanayake <mithila.mps@gmail.com>

feedback

Amitha Caldera <hac@ucsc.cmb.ac.lk> Sun, Sep 5, 2021 at 12:55 PM
To: Mithila Senanayake <mithila.mps@gmail.com>

you may proceed with the submission once attended all my comments already given. no more new reviews.
[Quoted text hidden]