DOCUMENT MANAGEMENT SYSTEM FOR CENTRE FOR OPEN AND DISTANCE LEARNING UNIVERSITY OF COLOMBO

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2025

DOCUMENT MANAGEMENT SYSTEM FOR CENTRE FOR OPEN AND DISTANCE LEARNING UNIVERSITY OF COLOMBO

A thesis submitted for the Degree of Master of Information Technology

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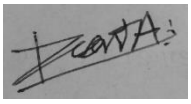	2025/06/23

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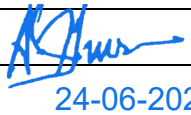
Signature			
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Abstract

This report details developing a Document Management System to provide a digital system for document management at CODL of University of Colombo instead of the manual processes they currently use, to save resources, time and optimize employee efforts in physical document managing process.

Building the system will improve managing documents, reduce paper-based documentation and save cost on resources, Improved tracking related documents and enable better access for needed users.

Project follows a SDLC (Software Development Life Cycle) approach, beginning with requirements analysis stage where interview was conducted with the staff of CODL of University of Colombo to gather information about user needs and system functionalities identifying the goal and objectives needed to be accomplished by the system and how it will help the current processes being followed.

In Design phase the requirements were transformed into system architecture MVC (Model-view-controller). Database was planned according to requirements and specifications of the users. Wireframes and mockups were created to visualize user interfaces to ensure usability.

Implementation phase used iterative development stages and continuously integrated the modules. Core system features and functionalities were implemented using PHP, JavaScript, Bootstrap and document details viewing, downloading, report generation, mailing were implemented using chart js, jQuery Datatables, PHPmailer.

In Testing phase includes unit testing, integration testing and user acceptance testing done to ensure system stability and compliance to requirements. Users participated in the process reported a positive user experience on the system and it's features.

The system provides features such as document storage, search capabilities, version tracking, user access control.

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1 INTRODUCTION

This chapter will include an overview of the project explaining the current situation and processes of the environment which the system will be applied to, the goal and the objectives that needs to be followed to achieve it and the scope of the intended system.

1.1 Project Overview

Centre for Open and Distance Learning, University of Colombo (Cyber Campus, University of Colombo, 2020), is established to create wider, affordable, and easy access to higher education through blended and student-centered learning opportunities. They facilitate mainly all the faculties in the university to run their external degree programs and extension courses conducted via distant learning mode. Therefore, CODL needs to maintain a large number of documents coming from different faculties and departments. They need to be organized properly in a systematic way for easy access and retrieval. In CODL, new documents are being added constantly, revised documents must be updated with comments and document results of meetings (minutes) must be organized with different versions with the comments received for them. The documents must be linked in a proper flow and the access levels to these files must be controlled.

The University of Colombo consists of eighteen major entities, including ten faculties, six institutes, eleven centers, one school, and one campus. The document flow between CODL and any other entity should be handled as required (Figure 1.1). The centers and units belonging to faculty have to go through faculty. Others can directly send documents directly to CODL.

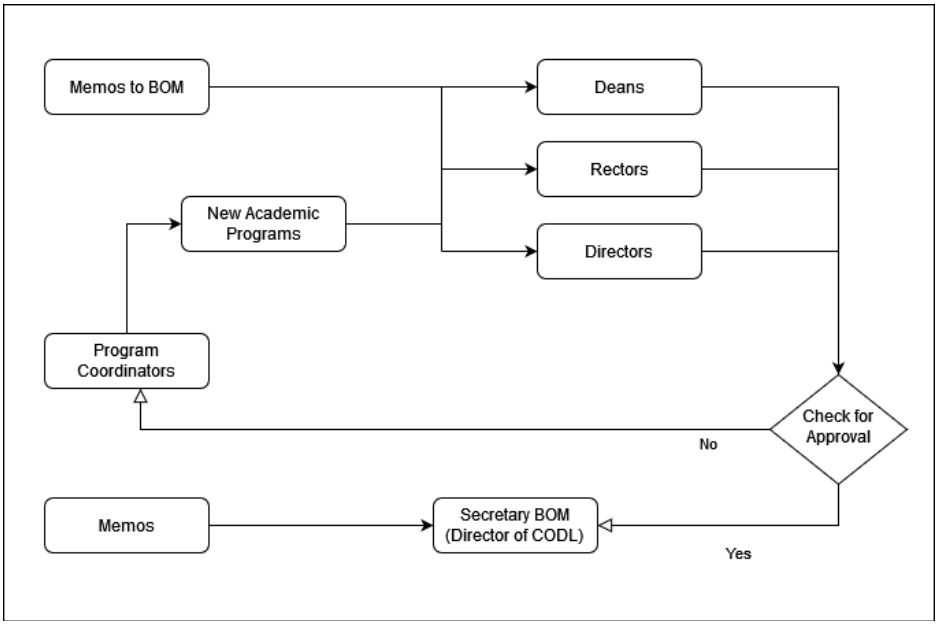


Figure 1.1 Document Flow

Upon receiving any formal document to CODL, they have to file and arrange them physically (Figure 1.2). Storing these documents requires physical space (cabinets, cupboards) and people to categorize and manage them. If people assigned are not working efficiently, there can be a lot of waste of resources. In the current context, stationary prices are increasing significantly, and with time, paper materials can get damaged or decayed. When retrieving certain documents and related other documents to observe previous decisions, the retrieval process can be exhausting and time-consuming. Some documents may not be linked properly to each other. This can be a huge problem when conducting meetings with the Board of Management and Internal Quality Assurance, which are very important decision-making processes.

There are different types of documents CODL needs to manage. They can be categorized as meeting minutes, new course applications, course administration related documents, students' personal files and related documents, certificates, Inquiries and complaints related documents, and internal staff administration related documents. Preparing, editing, storing, finding, sharing and related activities of these documents are done in different ways.

For example, finding related documents at a Board of Management meeting is supported by the management assistant and the assistant registrar as it is not an easy task for the centre director, who is the secretary while the vice chancellor of the university chairs the meeting.

Also, when sending the documents to other entities, the CODL has to note them and follow up on the actions the recipient entity took (Figure 1.3).

Document sending from CODL to other locations

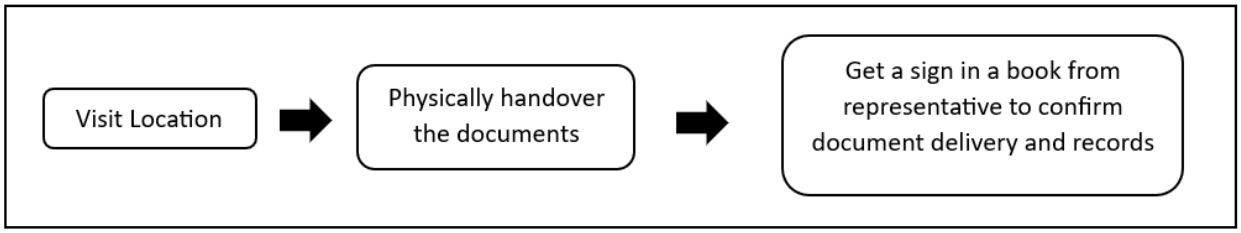


Figure 1.2 Document Sharing

Sending meeting details and documents from CODL to participants

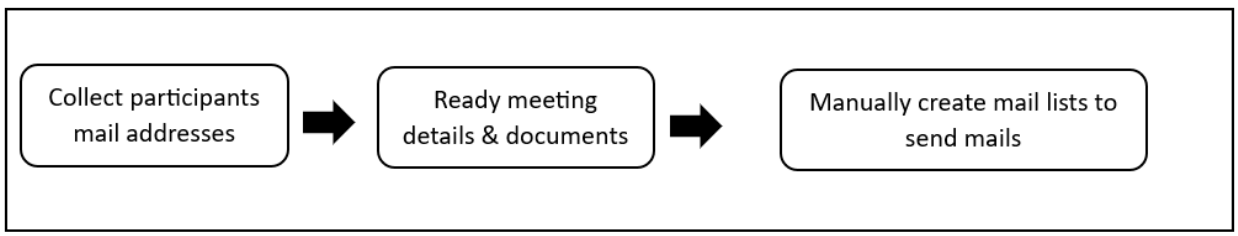


Figure 1.3 Planning Meeting Inviting

1.2 Motivation

Currently CODL uses a traditional paper-based system which bring many challenges and complications when handling operations. Managing physical documents includes storing sharing and protecting procedures which take up considerable resources and time. Paper costs have also become a considerable amount therefore converting to a digital medium would benefit a lot in saving cost on resources. Tracking the related documents is also on easy task since they have categorized and stored in different locations. A web-based system will be able to give solution to many of these problems providing a better experience for the stakeholders.

1.3 Goal

This project aims to build a Document Management System fitting for specific needs such as finding relevant documents based on topics being discussed in meetings, storing files according to the specific classification currently being used in CODL and concurrent access control on users based on situations.

1.4 Objectives

The above-stated goal intends to be achieved via the following objectives.

- Improve managing documents of the CODL
- Reduce paper-based documentation and save cost on resources
- Improve tracking related documents
- Enable better access to documentation for management for more efficient decision making
- Improve the satisfaction of stakeholders involving the activities with CODL
- Facilitate access or restrict access easily to respective parties

1.5 Scope

Currently, CODL follows a traditional paper-based document maintenance system. A web-based document managing system will be introduced to increase security, and maintainability and manage documents efficiently.

Current files need large space to store and managing the relations between physical files can be time-consuming. Since stationary prices are so high it is better to convert them into an electronic medium which will save money on them and the human resources needed to maintain the files. Paper material also decays with time. Therefore, special care must be taken to avoid loss of records which might cost more resources.

Physical files are tracked normally by writing relevant document identifiers on it but it does not allow much space to clarify what is the related content or detail that is related to those documents. But using a web-based system it is much easier to add comments, specify the details and simply provide a link to the document location in the system where it is stored (Figure 1.4). It provides much more clarity and saves time.

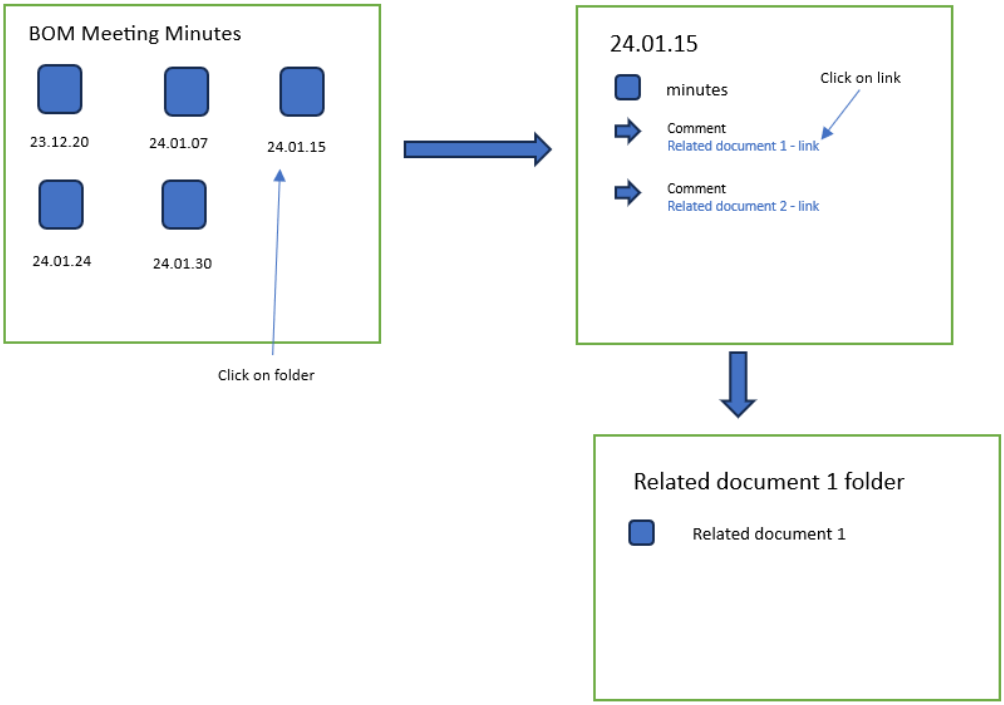


Figure 1.4 Search Documents

Especially in meetings such as BOM and quality assurance, the need arises to refer to past discussed topics or details. The system equipped with a keyword search facility (Figure 1.5) will provide needed documents very fast allowing the meetings to go smoothly without leaving the matter to a later time because of not being able to find the respective documents. Collaborative platform is needed with document sharing, receiving and commenting capabilities.

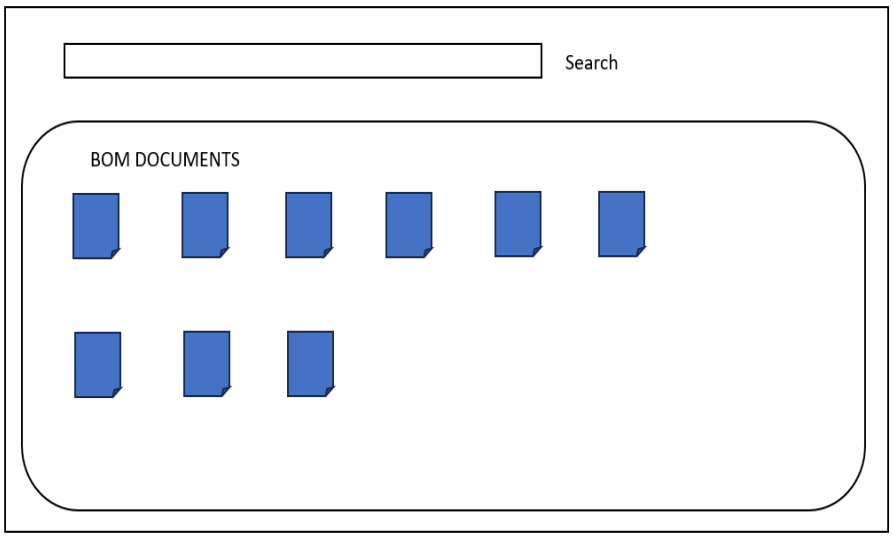


Figure 1.5 Locating Documents

The Current traditional physical document system has been troubling the stakeholders due to maintenance effort and cost needed to it. And when practically trying to use stored information, the process is exhausting and not very efficient. By building this system, the satisfaction of stakeholders and the efficiency of the related processes can be improved considerably.

In an environment of physical file management accessing files and finding information is exhausting and time-consuming. By using a system, respective parties can be given a link (Figure 1.6) to access the required resources and can easily control their capabilities by assigning or removing privileges accordingly.

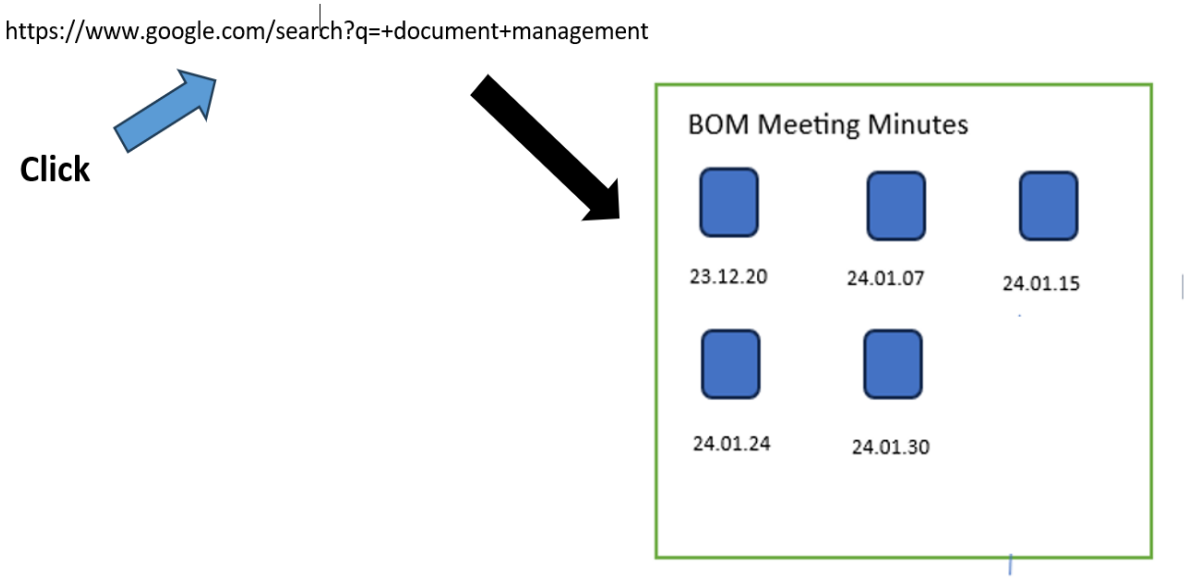


Figure 1.6 Document Navigation

The system will deal with documents of minutes, new course applications, course administration related documents, students' personal files and related documents, certificates, Inquiries and complaints related documents, and internal staff administration related documents. Users are provided with facilities to prepare and check these documents and verify them. A collaborative platform is needed to view and acknowledge the process happening in these documents (Figure 1.7). Preparing users will be provided with a template to complete the document and then documents can be sent for verification. The users checking documents can comment about papers and provide feedback.

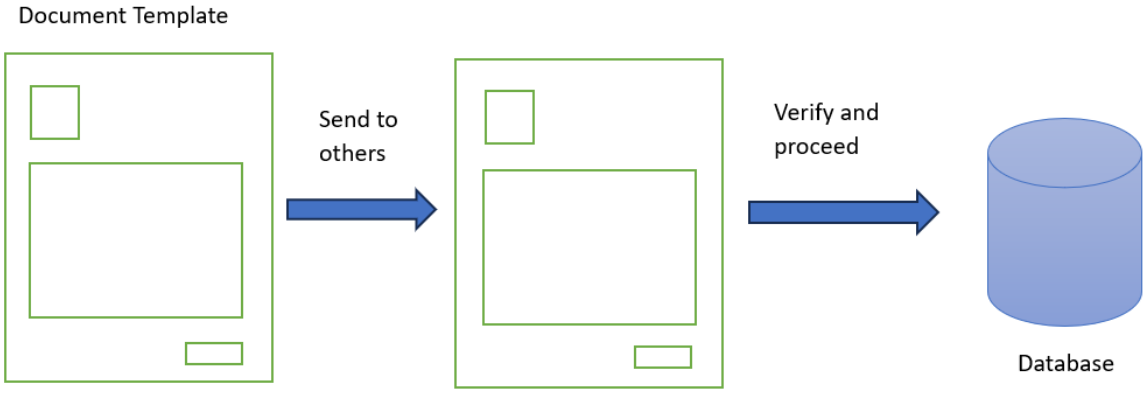


Figure 1.7 Handle Minutes

A centralized place to allow viewing of the application forms related to different departments providing different courses. This will allow users to view the corresponding department course details and their applications (Figure 1.8). Users will have the ability to fill out the application documents online and the facility to submit the completed applications to the relevant department.

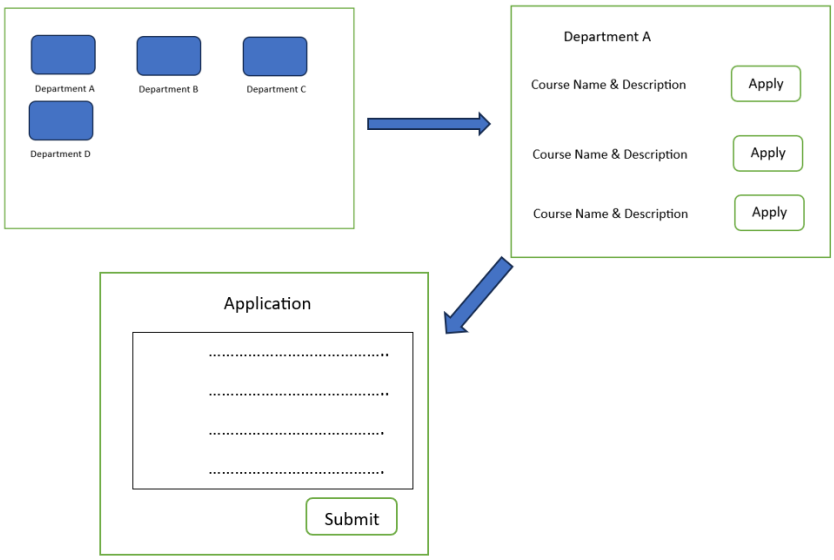


Figure 1.8 Application Download/ Submit

1.6 Out of Scope

- Optical Character Recognition feature

  OCR engines have issues such as limited language support, accuracy limitations and data security concerns when using outside OCR service

- Intelligent automated document classification

  This will require powerful AI and machine learning capabilities with training data specific to CODL document types. Require more Time and Expertise on the matter.

- Legacy system integration

  There is no legacy system to integrate into.

- External workflow automation

  It is difficult to implement due to different APIs and data formats.

- Biometric authentication for file access

  It is costly and requires more time to implement. Hence this cannot be completed within the time period allocated for the project

1.7 Structure of the Dissertation

Chapter 2 will contain details of the current processes following at the CODL to manage, search and other activities regarding the documents. It will take a look at similar systems being used in such a context and differentiate the proposed system with them. At the end, the development methodology and technologies used in designing and planning will be explained.

Chapter 3 will include the designing of the system explained in diagrams. Database and other information will be illustrated and explained using UML diagrams. System functionalities designing will be explained using use case narratives.

Chapter 4 will be the implementation where the frameworks and DBMS used for the project will be described.

Chapter 5 is the Evaluation chapter which discusses the testing and maintaining techniques and methods. The testing methods such as unit testing used in the project will be explained with test results.

And the final chapter will be the conclusion where the capable future improvements will be given and the lessons learned while doing the project.

2 ANALYSIS

This chapter includes the initial research and analysis done to identify existing problems and requirements of the required system.

2.1 Data Gathering Techniques

This project will develop a web-based Document Management System for CODL

To understand the needed requirements data must be gathered from the stakeholders who will be using and will be affected by the system. Following methods were used in the data gathering process.

Interviews

An interview was conducted with the staff of CODL in a group and questions were created prior to the interview in order to guide through the interview. Information was gathered on the user levels needed, repetitive operations, important functionalities that must be included and suggestions of ideas to be in the new system.

Observation

Observed the environment system will be implemented in and the document managing process currently happening and current methods of keeping records.

Document Analysis

The types of documents being managed and other important information needed to connect and map documents were seen in this stage.

2.2 Contextual Analysis

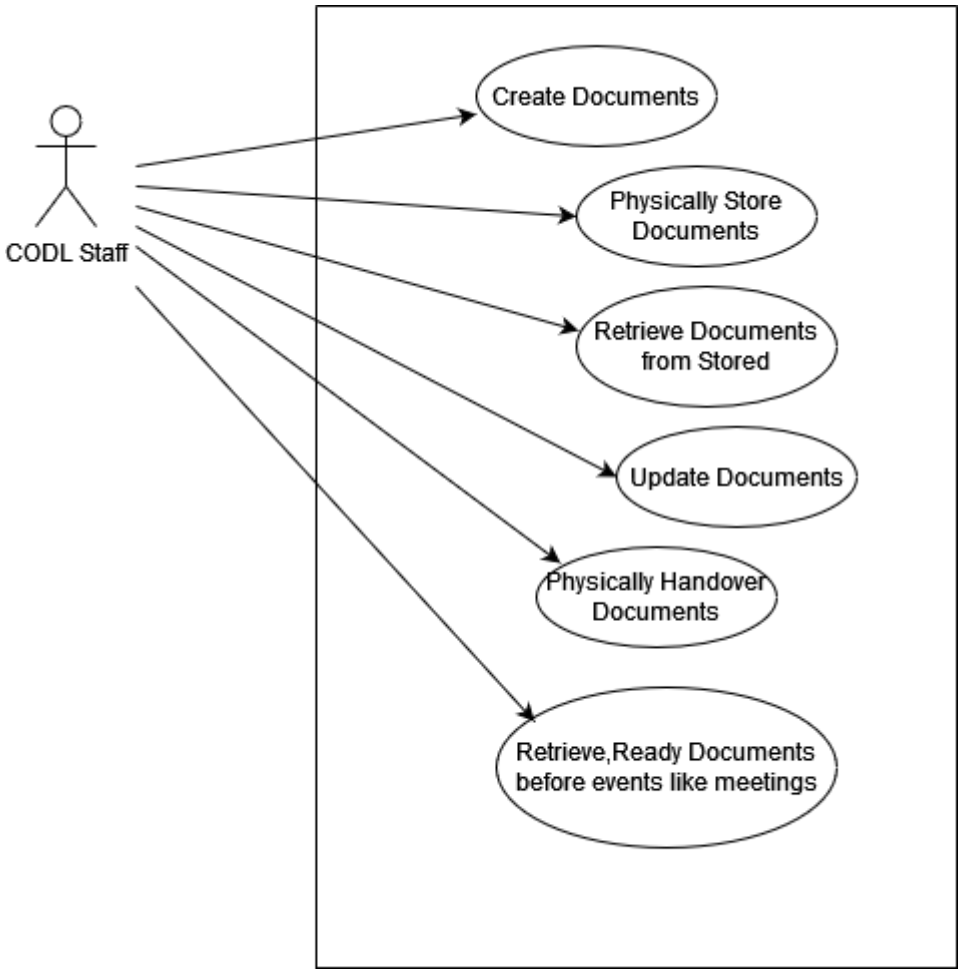


Figure 2.1 Existing System Use Case

The use case shows the manual procedure current CODL staff have to go through for document managing process. (Figure 2.1) Creating the documents require paper printers and other resources and time. Afterwards the documents must be classified as needed and stored physically in cupboards and they should be protected and maintained. When sharing with others someone has to made the journey to deliver the documents and verify personally.

2.3 Review of Similar Systems

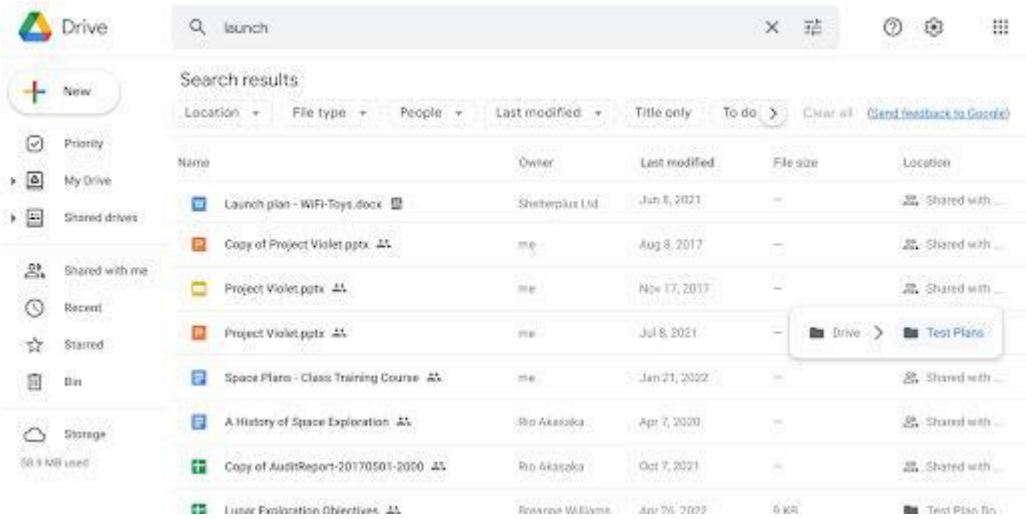


Figure 2.2 Google Drive

Google Drive (Figure 2.2) is a free cloud-based storage service offered by Google. It allows users to store files like documents, PDFs, images, and spreadsheets online (Google, 2022). Accessible from any device with an internet connection, Google Drive makes it easy to store, access, and share your files. It also integrates seamlessly with other Google Workspace applications like Docs, Sheets, and Slides, enabling real-time collaboration on documents. With a free plan offering limited storage and paid plans for additional space, Google Drive is a popular choice for individuals and businesses alike looking for a secure and accessible file management solution.

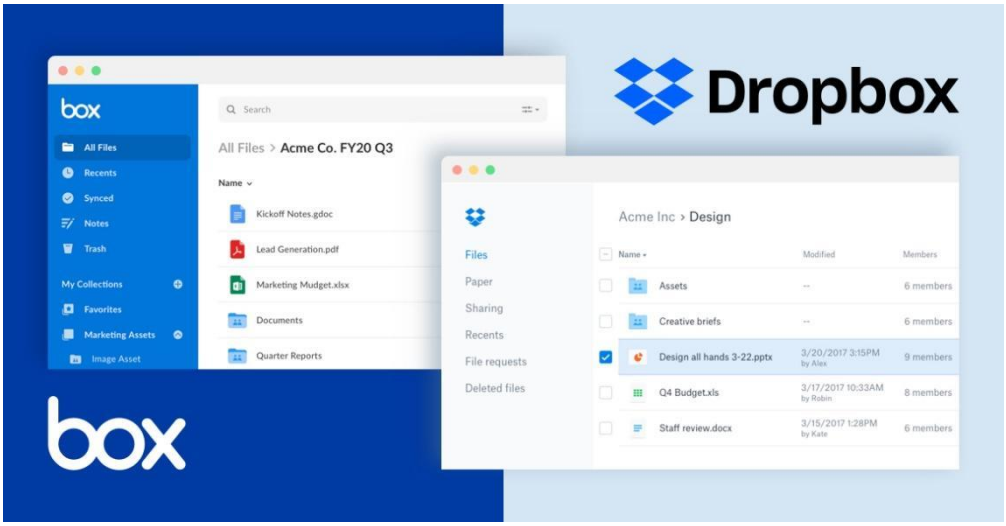


Figure 2.3 Dropbox

Dropbox (Figure 2.3) is a widely recognized cloud storage service that excels in user-friendliness and ease of access (Lessard. 2020). It allows you to store and manage various files, including documents, PDFs, images, and videos, all online. Accessible from any device with an internet connection, Dropbox lets you keep your files handy and share them effortlessly with others. It prioritizes offline functionality, allowing you to selectively sync files for access even without an internet connection. With a free plan offering limited storage and paid plans for expanded space and features, Dropbox caters to both individuals and businesses seeking a simple and reliable solution for storing, sharing, and accessing their important files on the go.

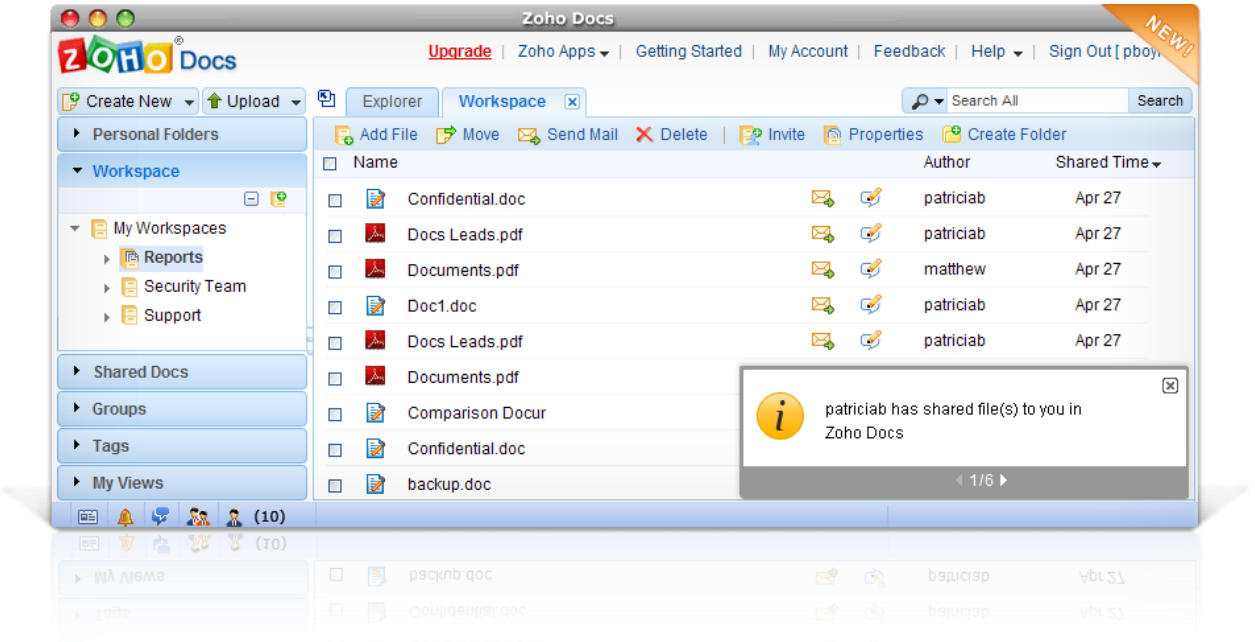


Figure 2.4 Zoho Docs

Zoho Docs (Figure 2.4) is a cloud-based document management system which is a part of the broader Zoho suite of business applications (Sathish. 2011). It allows you to create, store, and collaborate on various documents, including text documents, spreadsheets, and presentations. Similar to Google Drive, Zoho Docs offers real-time collaboration features, making it easy for teams to work together on documents simultaneously. However, where Zoho Docs shines is its integration with other Zoho applications, enabling a more streamlined workflow within the Zoho ecosystem. Zoho Docs offers both a free plan with limited storage and paid plans with increased storage and additional features, making it a compelling option for businesses seeking a comprehensive document management solution that integrates seamlessly with their existing Zoho tools.

2.4 Comparison Between Known Document Management Systems (StackShare Inc, 2024)

Table 2.1 Comparison Between Known Document Management Systems

	Dropbox	**Google Drive**	**Zoho Docs**	**Proposed System**
Storage	Cloud-based	Cloud-based	Cloud-based	On-Premise
Document Types	Docs, PDFs, Images, Videos	Docs, PDFs, Images, Spreadsheets, Presentations	Docs, PDFs, Images, Spreadsheets, Presentations	Docs, PDFs, Images
Version Control	Yes	Yes	Yes	Yes
Access rights and level management	Role-based access control	Role-based access control	Role-based access control	Role-based access control with different permission levels
Offline Access	Yes (with selective sync)	Yes (with selective sync)	Limited offline functionality (may require additional apps)	Consider full offline functionality for critical documents within the university network
Classifying Documents	No	No	No	Yes

The system hopes to use descriptions and comments attached to each document in the system to make sure to gather information in the keyword searching process. The existing systems (Table 2.1) may have a lot of features, but most are not necessary for the expected system for the CODL. Instead, they have different requirements which are not available within these systems or the features are not included in free plans.

2.5 Functional Requirements

The system will contain the following functional activities.
Users have ability to manage minutes document (create, comment, link, verify, approve)
Different User levels with abilities

Director

- Assign roles, view, comment, control access to documents, create users
- View the progress of the new degree application process.
- View the status of addressing comments and feedback
- View the status of the courses and programmes - whether the course coordinators have shared the documents related to the courses (student pass lists, course details, external resource personals' CVs, course home page screen images, syllabi, lecturers' details...)
- Track the records of changes made to any document
- Provide approval for editing and commenting
- Confirm changes made

Deputy Director (Examinations)

- View the exam related documents (pass lists, sample certificates, assignment marks, convocation arrangement related documents, ...)
- Track the updates made to the exam related documents.
- Send reminders to the course coordinators for sharing the required documents.
- Provide approval for making changes to exam related documents
- Comment content in the documents

Deputy Director (Learning Resources)

- View the course and programme related documents
- View programme-wise course home pages (images or pdfs) and number of documents shared.
- Images or pdfs on course resources (evidence of practicing interactive activities and assessments)
- View the number of Syllabi shared.
- Comment of shared documents
- Track the updates made to the course resource related documents

Deputy Director (Training)

- View the requests related to student training
- View the CVs of the resource persons and approval for lecturer assignments
- Track changes made to the lecturer assignments

Administrator

- Not allowed to edit any documents
- can view any document
- can see the number of available documents under each category
- manage user accounts
- generate status reports

Course Coordinators

- Upload course related documents
- Edit documents uploaded by them
- Comment on documents
- View the comments and feedback

Programme coordinators

- Upload programme related documents (approved application, curriculum, lecturer assignments, external resource persons' CVs and other related documents)
- Edit documents uploaded by them
- Comment on documents
- View the comments and feedback
- Track changes made by the course coordinators in the programme

2.6 Non- Functional Requirements

Functionality

Suitability - Employees at different levels has different computers/laptops
System will be designed to accommodate different screens

Accuracy - Accuracy of software is important to manage documents correctly

Validations will be used when entering data to system

Interoperability - The software will interact with existing other infrastructure
Common language and database will be used for new system

Security - Document must be secured from unauthorized access
Create different user levels to access documents

Reliability

Fault Tolerance - Software's resistance for failure and ability to recover
Suitable methods will be implemented

Usability

Understandability - System's functions can be easily comprehended
Use simple languages, clear typography and icons

Learnability - Easy to learn for different groups such as novice, expert

3 DESIGN

This chapter includes the details related to designing of the project such as software development method, system architecture and UML diagrams explaining the system.

3.1 System Process Model

The proposed system users must be able to access, share, and view the relevant documents needed for their work from where they are using the devices they have. A web-based system allows users with an internet connection to perform these activities.

The processes expected from the system are well defined and certain features and objectives are crucial for the success of the project. After essential functions are established, more refined features may need to be developed. There is a learning curve involved when utilizing new technology for the development of a system.

Therefore, for the development of this system Iterative Waterfall model (Figure 3.1) (Pal, 2024)

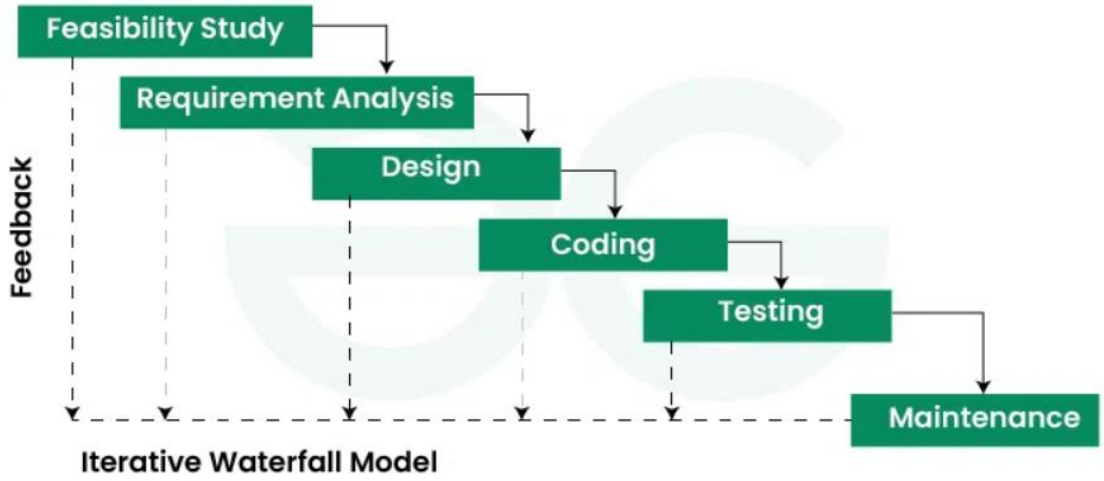


Figure 3.1 Iterative Waterfall Model

3.2 System Architecture

MVC system architecture (Figure 3.2) will be used for proposed system. (Model, View, Controller)

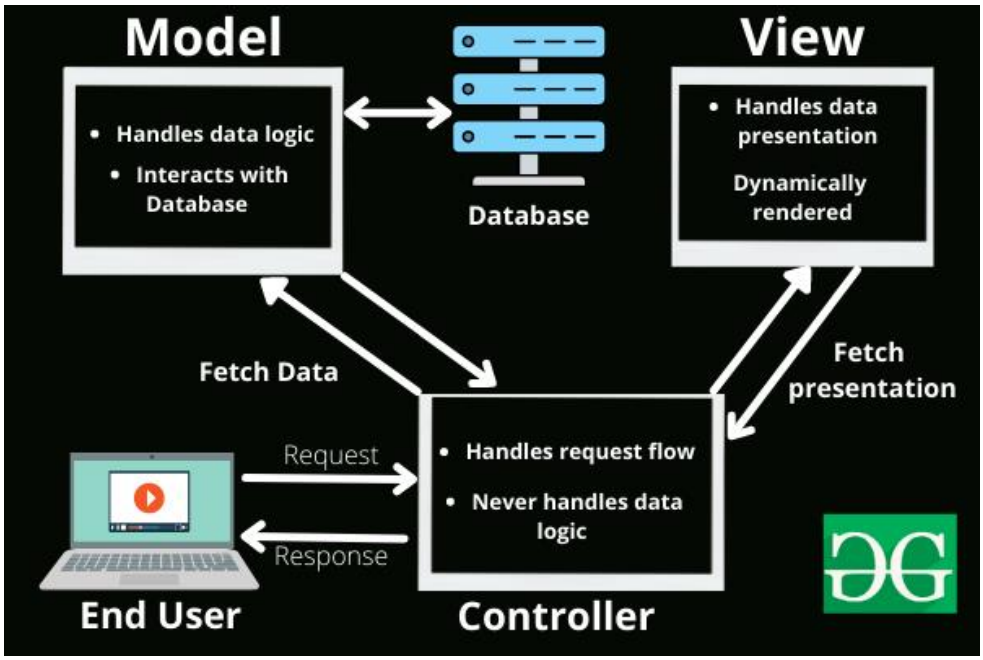


Figure 3.2 MVC Architecture

This architecture allows to write cleaner code, better maintainability and easier testing. The separation will minimize impact of change when modifying the application overtime. The different view implementations will enable developer to swap views while keeping the same model and controller logics.

Model	-	Manage CRUD operations Notify view and controller of state changes
View	-	Display UI elements Update display when model changes
Controller	-	Receive user input and interpret it Select and display appropriate view

3.3 System Users (Actors)

In design phase identifying the Users of the system is a crucial activity.

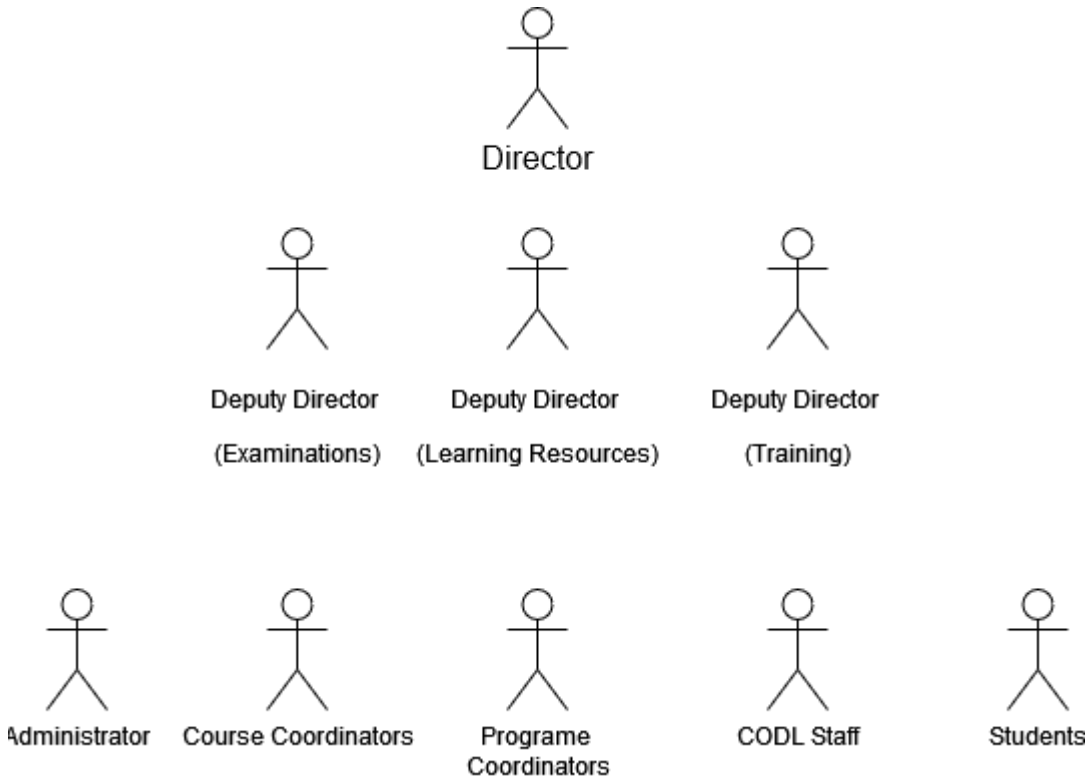


Figure 3.3 System Users

Different Users (Figure 3.3) are capable of doing specific functions and identifying them and the functionalities needed to perform from each help to design the system.

Use cases of each user type will be identified before creating the overall use case diagram.

3.4 Case Diagrams

3.4.1 Use case diagram of Director

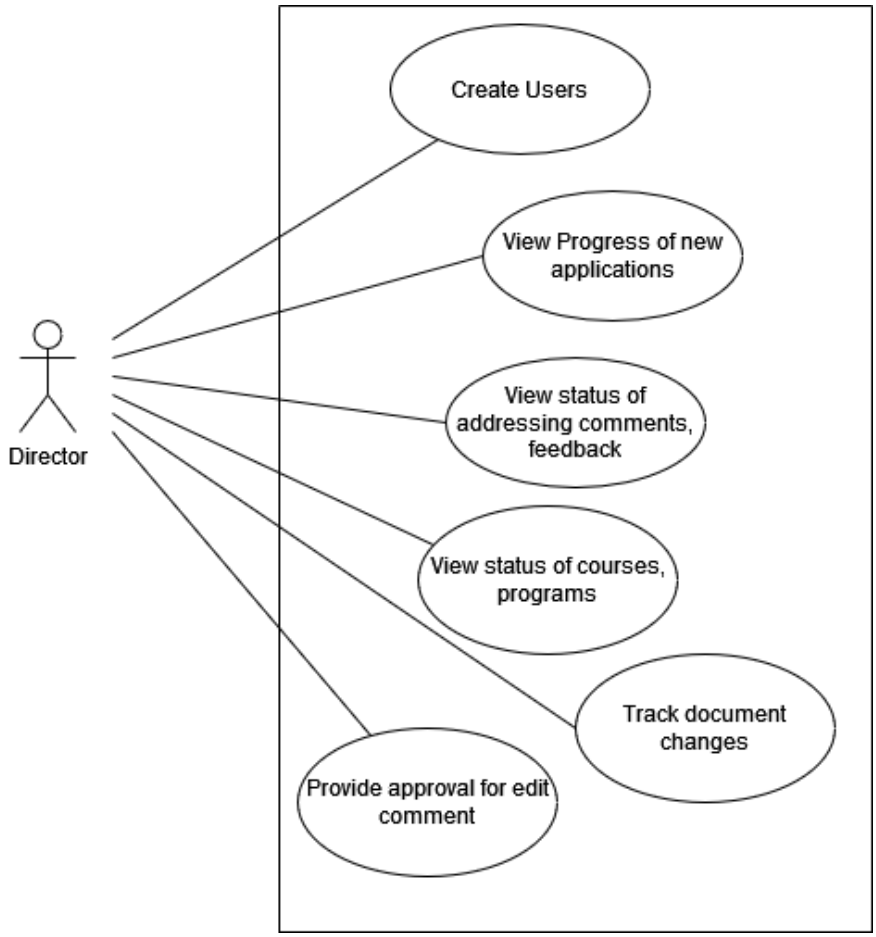


Figure 3.4 Director Use Case Diagram

Table 3.1 Director Use Case 1

Use Case Name	Create Users
Main Flow	Create a new user with privileges
Actor	Director
Pre-condition	• Director is logged in to the system • Director has the necessary permissions to create new users • Ready new user information
Post-condition	• A new user account is created in the system. • A verification email is sent to the new user's email address.

Director logs into the system since he has necessary permissions to create new users, he creates new user by providing the information. A new use account will be created and a notification will be sent to new user. (Table 3.1) (Figure 3.4)

Table 3.2 Director Use Case 2

Use Case Name	View comments, feedback
Main Flow	View comments feedback done on documents
Actor	Director
Pre-condition	• Director is logged into the system. • A document has been selected
Post-condition	• Director views comments and feedback on the selected document.

Director selects a document from document list and system retrieves comments and feedback associated with document and displays them. (Table 3.2) (Figure 3.4)

Table 3.3 Director Use Case 3

Use Case Name	Provide approval for comment/feedback
Main Flow	Provide access to users to edit
Actor	Director
Pre-condition	• Director is logged into the system. • Director has the authority to grant edit permissions. • The user to be granted permission is identified.
Post-condition	• The specified user is granted edit permission. • The system records the permission grant action.

Director identifies user who needs to edit permissions for and grant user the permissions and confirm the permission grant from director. (Table 3.3) (Figure 3.4)

3.4.2 Use case diagram of Deputy Director (Examinations)

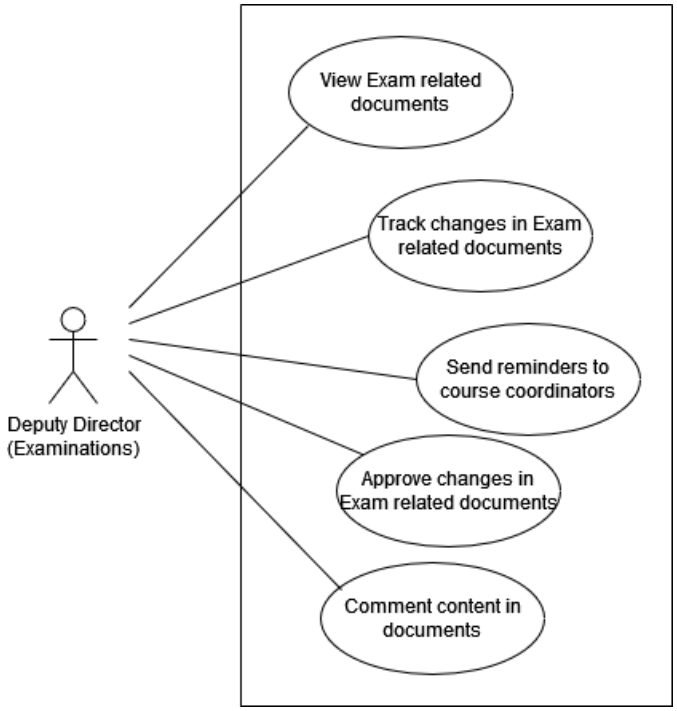


Figure 3.5 Deputy Director Use Case Diagram

Table 3.4 Deputy Director Use case 1

Use Case Name	View Exam related documents
Main Flow	View related documents
Actor	Deputy Director
Pre-condition	• Director logged onto system • Course or lesson is selected
Post-condition	• Successfully viewed documents

Deputy director logs onto system select the needed course or program and view the documents. (Table 3.4) (Figure 3.5)

Table 3.5 Deputy Director Use case 2

Use Case Name	Comment/feedback on documents
Main Flow	Commenting and saving on document
Actor	Deputy Director
Pre-condition	• Deputy Director is logged to system. • A document is selected.
Post-condition	• Comments are saved on document

Deputy Director logs onto system, select the needed document and comment on it. (Table 3.5) (Figure 3.5)

3.4.3 Use case diagram of Administrator

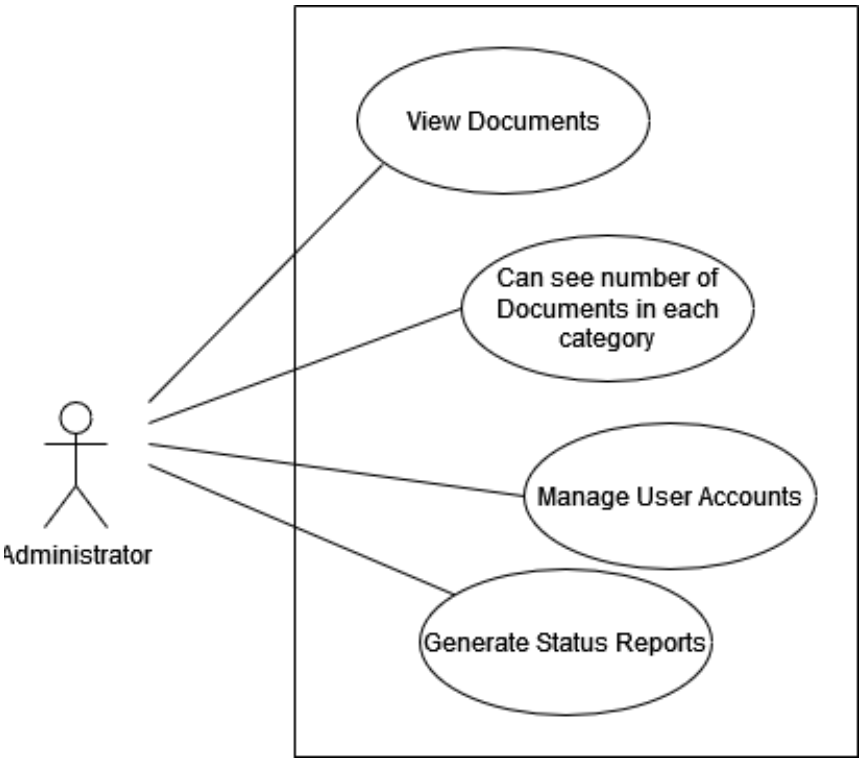


Figure 3.6 Administrator Use Case Diagram

Table 3.6 Administrator Use case 1

Use Case Name	Manage User accounts
Main Flow	Manage issues with user accounts
Actor	Administrator
Pre-condition	• Administrator is logged into system • A user account issue is identified
Post-condition	• User account issue is resolved

Administrator will log into system and the issues regarding a specific user account will be resolved (Table 3.6) (Figure 3.6)

Table 3.7 Administrator Use case 2

Use Case Name	Generate Status reports
Main Flow	Get reports to observe system functionality
Actor	Administrator
Pre-condition	• Administrator is logged into system
Post-condition	• Needed reports are generated

Administrator will log into system and the needed report will be generated and shown (Table 3.7) (Figure 3.6)

3.4.4 Use case diagram of Course Coordinators

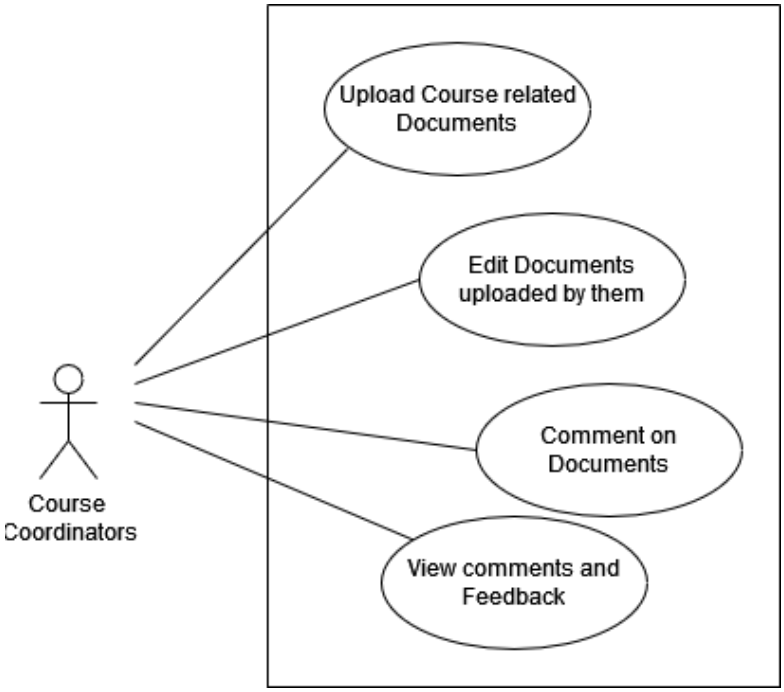


Figure 3.7 Course Coordinators Use Case Diagram

Table 3.8 Course Coordinator Use case 1

Use Case Name	Upload Course related Documents
Main Flow	Uploading course related document
Actor	Course Coordinator
Pre-condition	• Course coordinator logged into system • A specific course is selected
Post-condition	• Uploaded document saved under relevant course

Course Coordinator log into system and select the necessary information and upload document (Table 3.8) (Figure 3.7)

Table 3.9 Course Coordinator Use case 2

Use Case Name	Comment documents
Main Flow	Comment on documents
Actor	Course Coordinator
Pre-condition	• Course coordinator id logged into system • A document is selected
Post-condition	• Comments are saved in document

Course coordinator logs into system select a document and add necessary comments (Table 3.9) (Figure 3.7)

3.5 Class Diagram

The class diagram (Figure 3.8) Class Diagram for the project was created based on information gathered in requirement gathering phase. This diagram may subject to changes when developing the system. Following assumptions were made when creating the diagram.

- User "has many" Document
- Document "belongs to" Category
- Document "has many" Version
- User "has many" Permission
- Permission "grants access to" Document

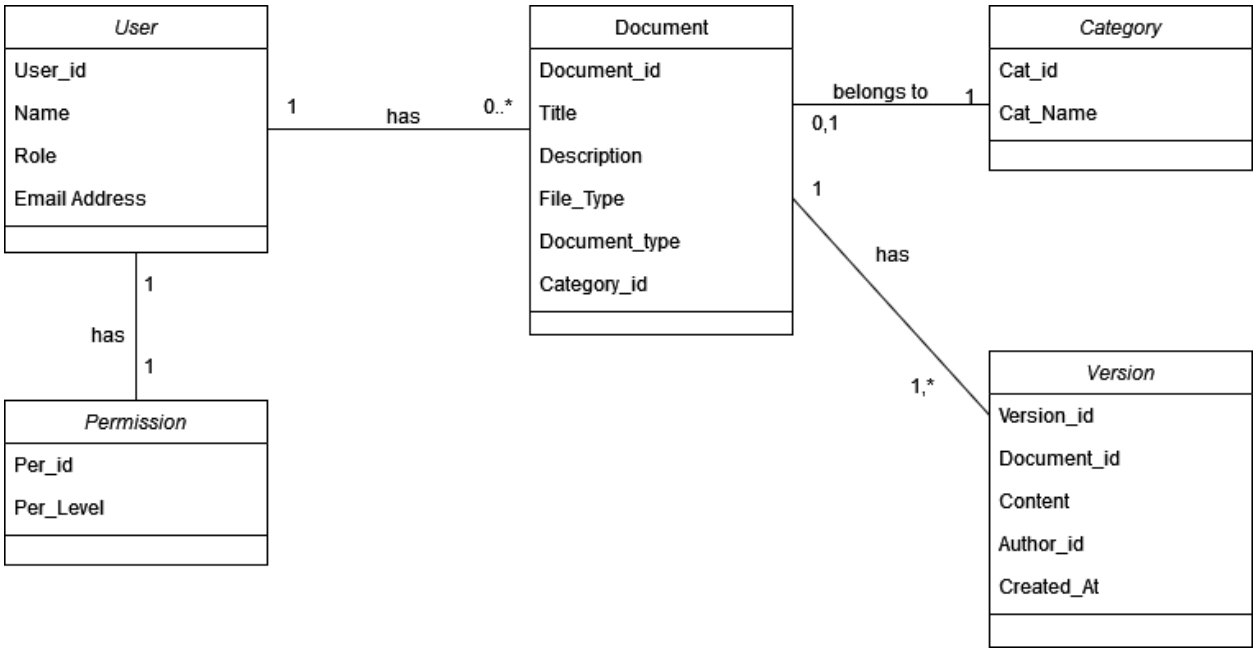


Figure 3.8 Class Diagram

3.6 Entity Relationship Diagram

The entity relationship diagram (Figure 3.9) for the project was created based on information gathered in requirement gathering phase. This diagram may subject to changes when developing the system.

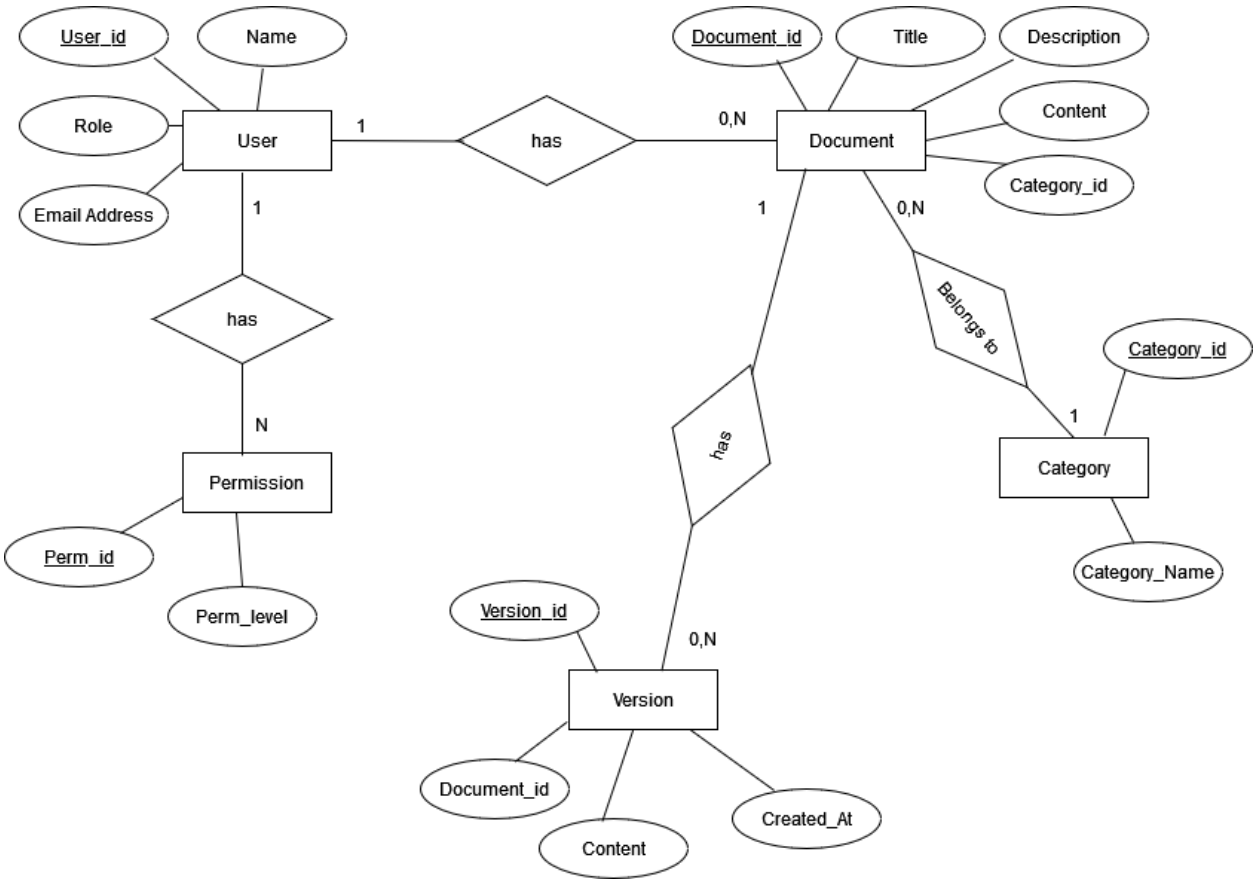


Figure 3.9 ER Diagram

3.7 Activity Diagram

Following activity diagram (Figure 3.10) shows the flow of various documents will be in the system.

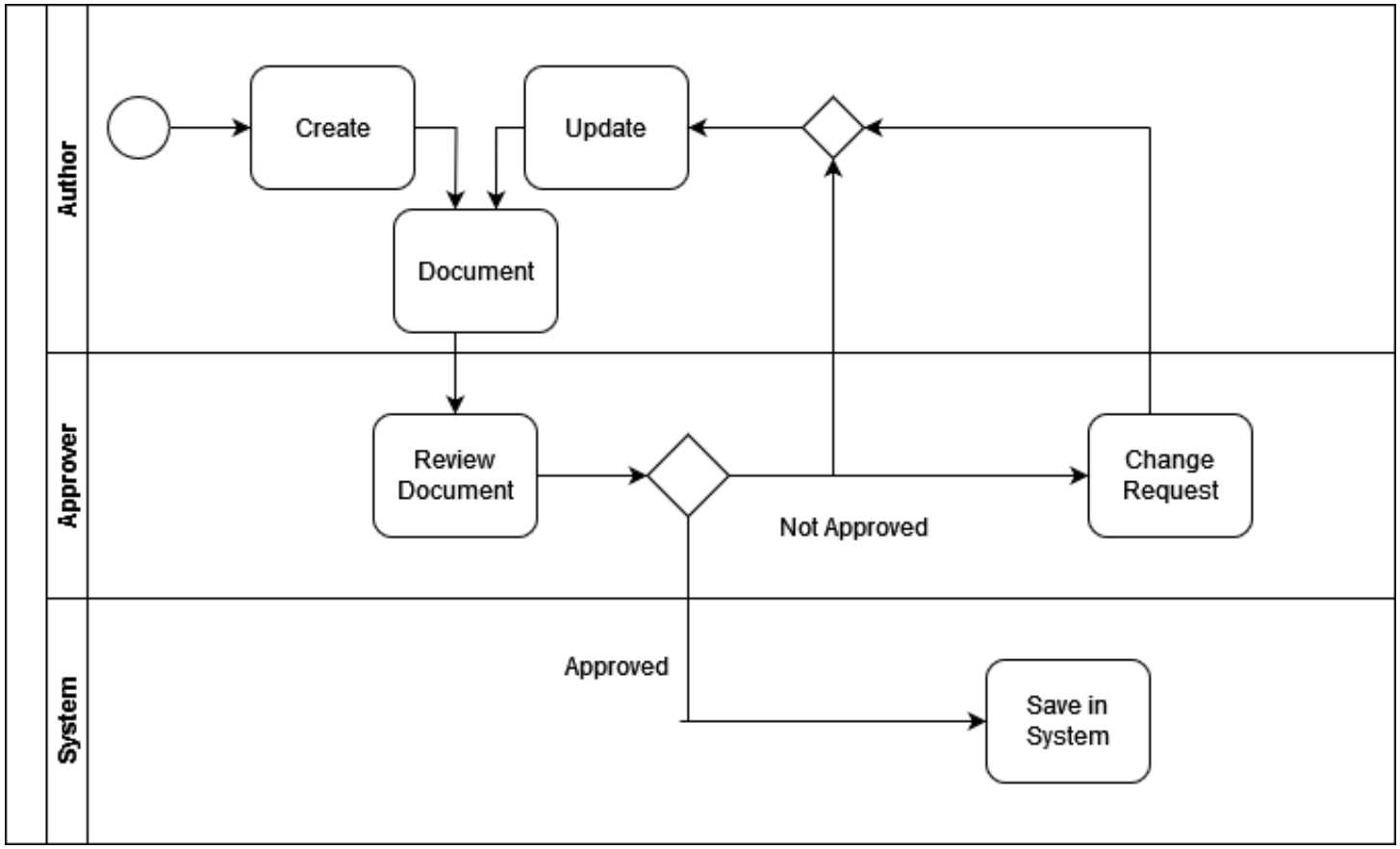


Figure 3.10 Activity Diagram

3.8 Sequence Diagram

Following sequence diagram (Figure 3.11) shows the document uploading process of various documents by different users.

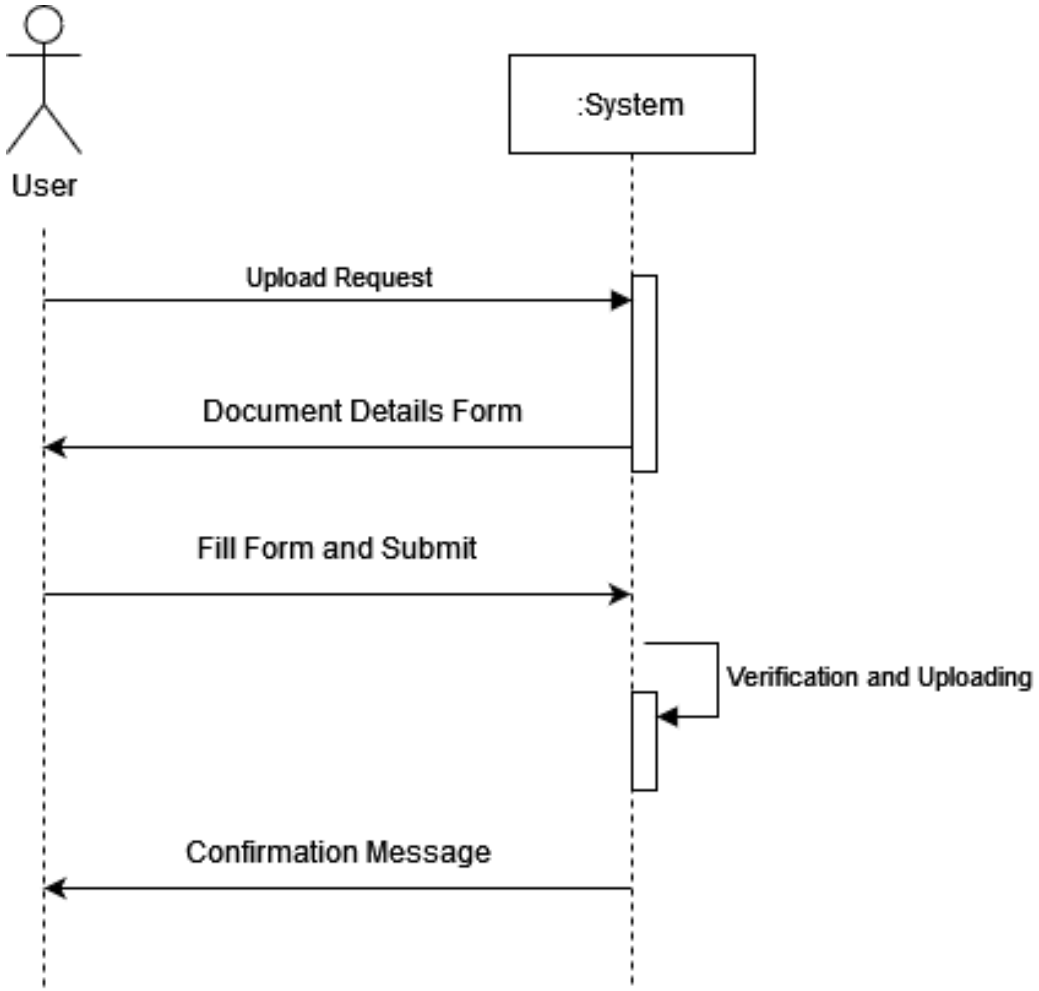


Figure 3.11 Sequence Diagram

3.9 UI Design

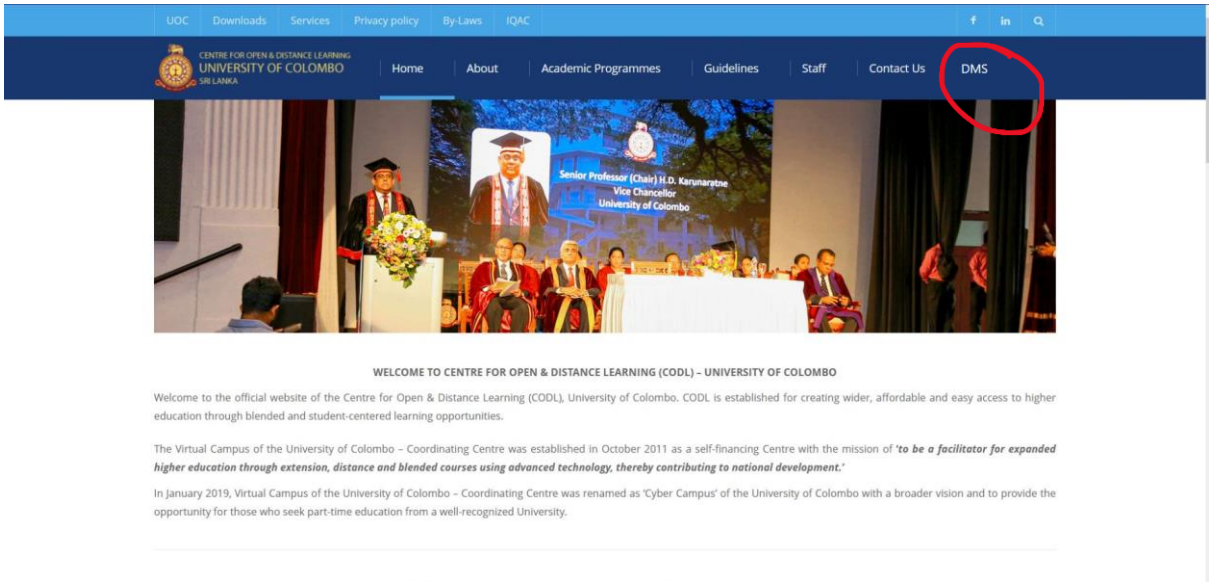


Figure 3.12 Linking Login Page to Existing Web Page

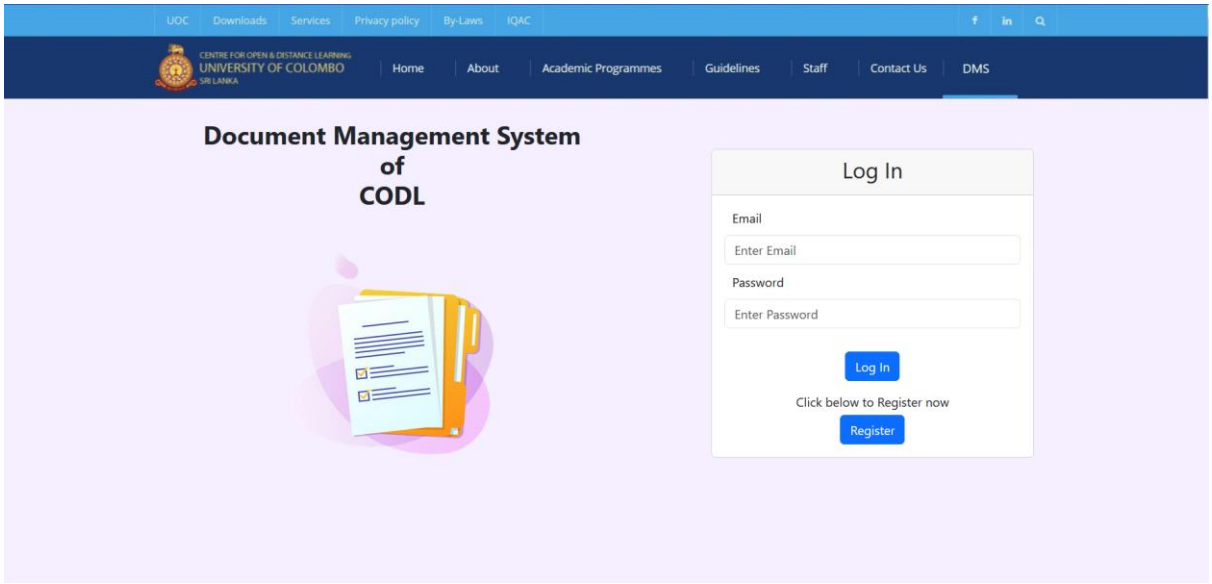


Figure 3.13 Login Page

The system will have a login page for users to login and new users to register (Figure 3.13)

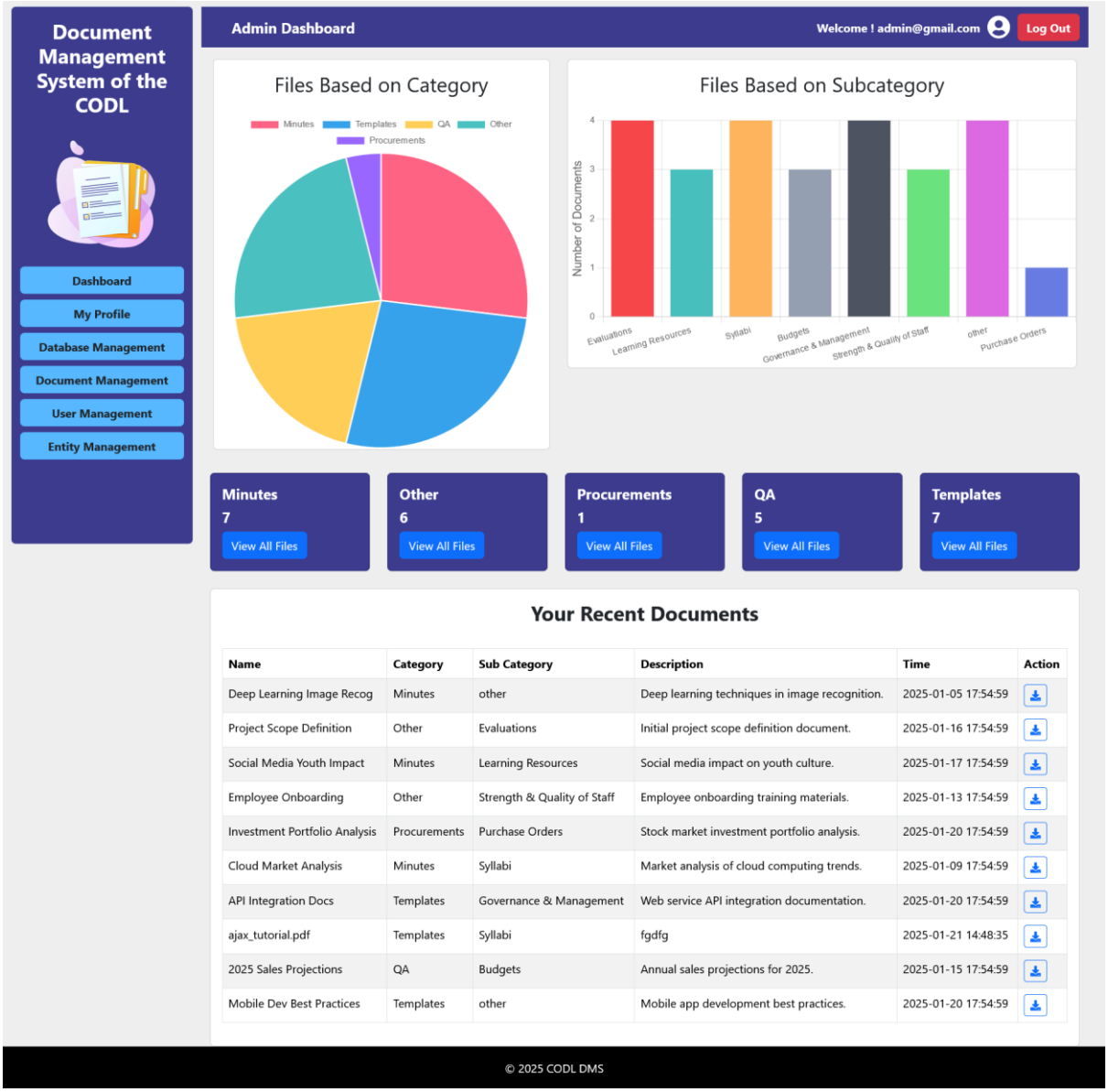


Figure 3.14 Dashboard

After logging in the user will have a dashboard similar to above layout. (Figure 3.14) The details and options will be available as per the privileges given to each user. The dashboard above is for an admin user with privileges.

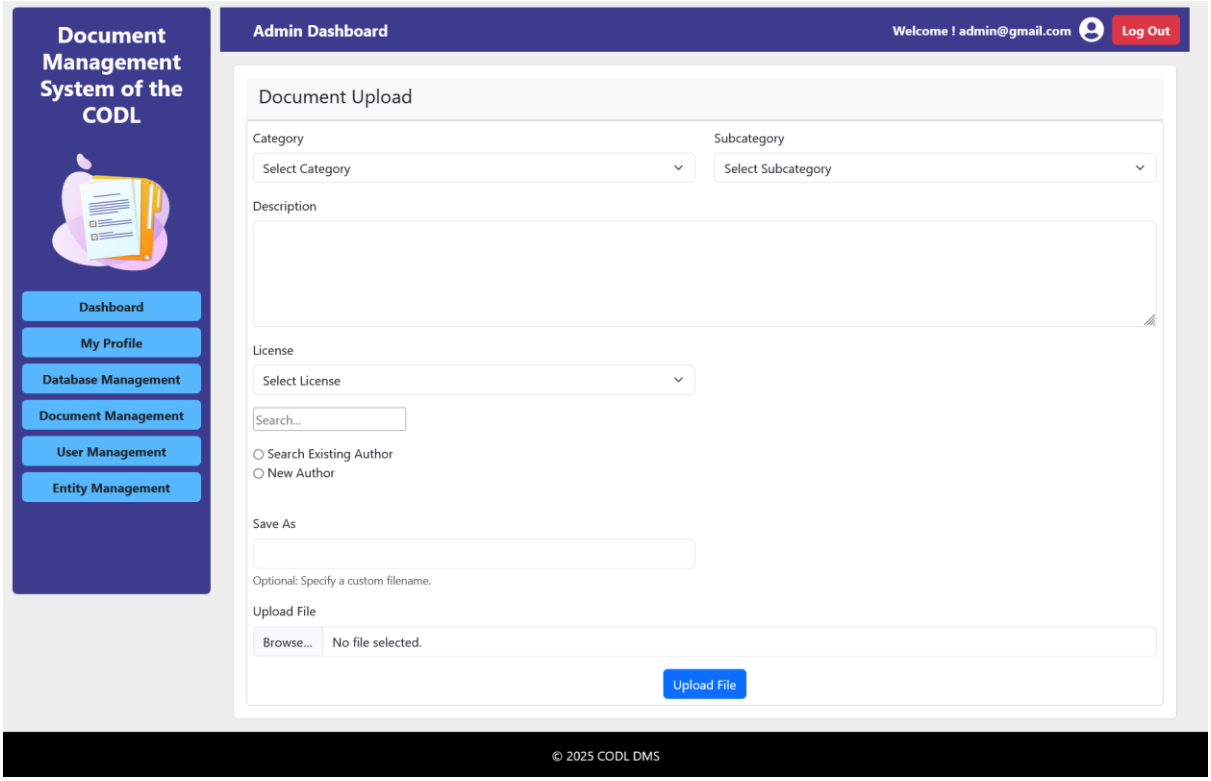


Figure 3.15 Document Upload Form

The user interface of document uploading form is shown above. (Figure 3.15)

4 IMPLEMENTATION

This chapter details the implementation of the proposed document management system described in the previous chapter. It describes the specific technologies, tools and techniques used in the development process including php, xampp, javascript libraries and bootstrap framework. The chapter describes the implementation decisions and their justifications.

4.1 Implementation Process

When planning the implementation process it was clear that several modules were needed to be integrated for the document management system.

- **Document Managing Module**
- **User Managing Module**
- **Database Managing Module**
- **Entity Managing Module**

4.1.1 Programming

PHP is the main programming language used in developing the software. It is widely used and recognized to be sensitive and fast language for web-based software development and a large community support is available.

Initially the Laravel framework was used in development but for more control and to design more specific functionalities including some libraries that were unable to use with Laravel framework, project was designed bearing the MVC architecture.

For the frontend development Bootstrap framework was used because of its popularity and suitability with other aspects.

Xampp which contains Apache server, MariaDB and PHP was installed which provided platform for development. (Figure 4.1)

https://www.apachefriends.org/

Figure 4.1 Xampp

For the code editor Visual Studio Code was used. It provides extensions that can be integrated with code editor which helps development with suggestions and debugging. (Figure 4.2)

https://code.visualstudio.com/

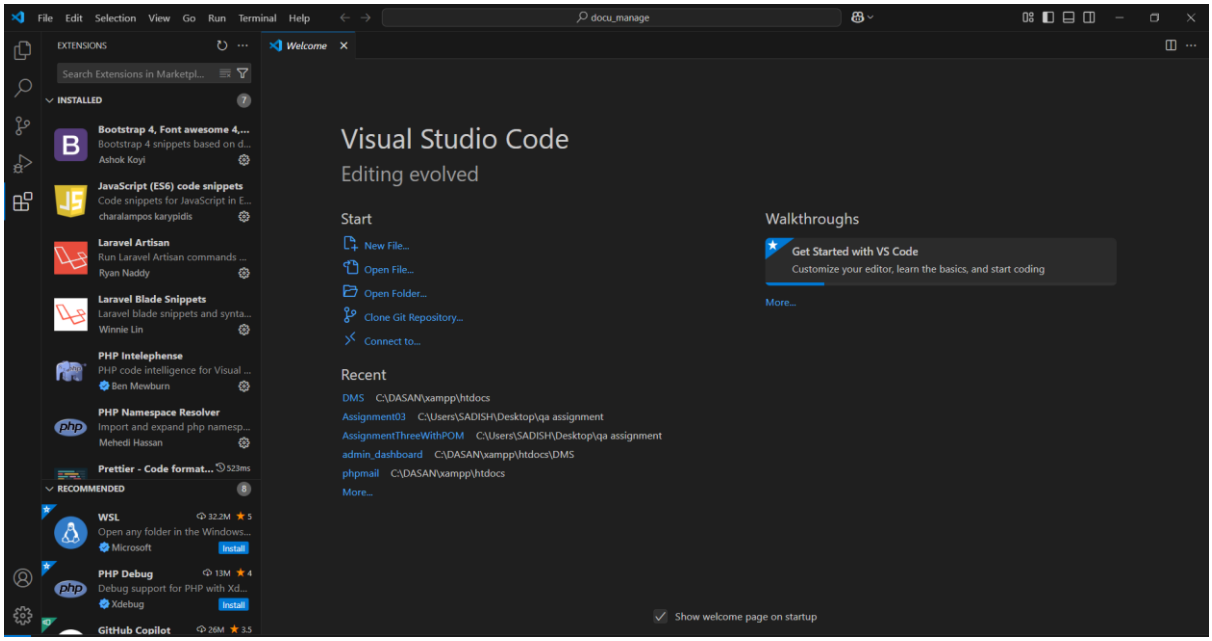


Figure 4.2 Visual Studio Code

4.1.2 Database Management

For database and MySql database offered with Xampp was used in development. Database creation, data and table manipulation was done using it. (Figure 4.3) (Figure 4.4) (Figure 4.5)

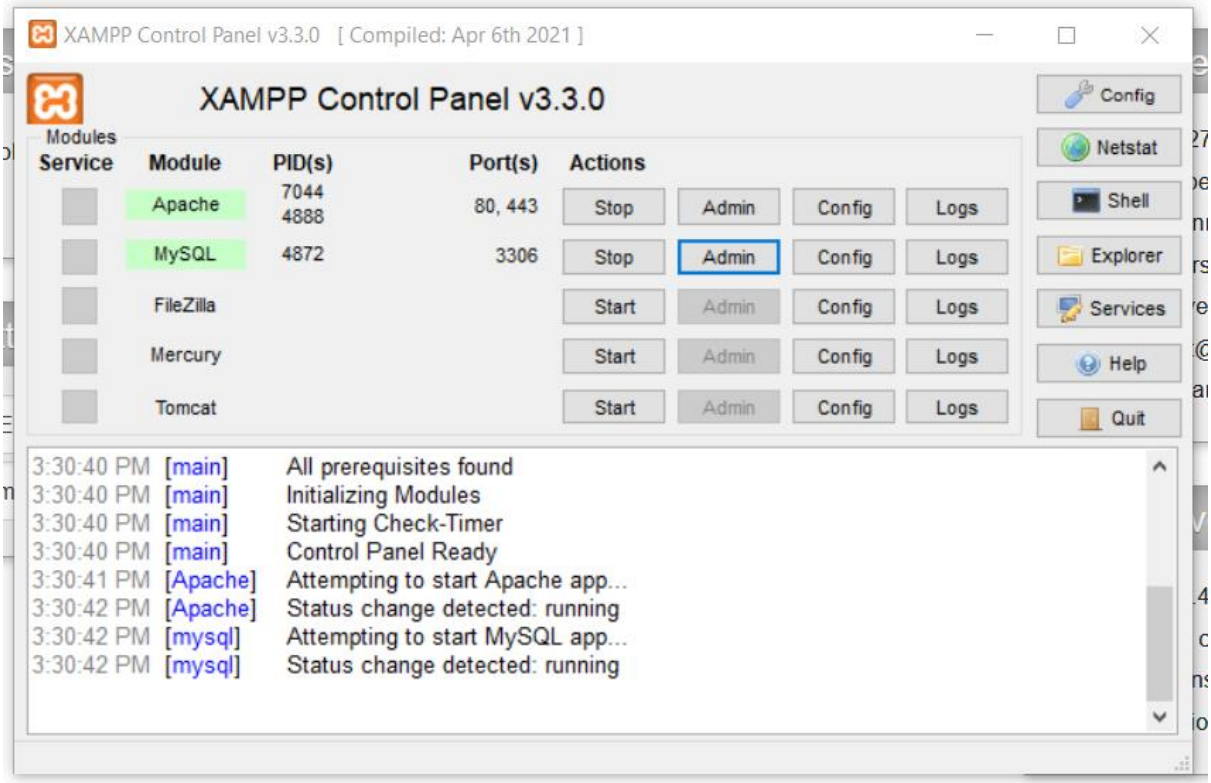


Figure 4.3 Xampp Control Panel

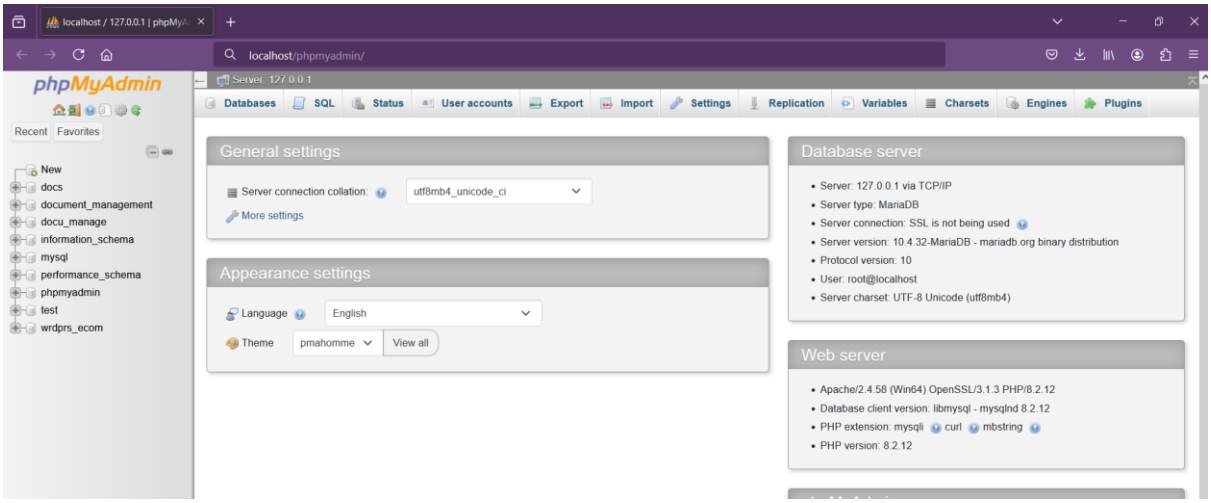


Figure 4.4 phpMyAdmin

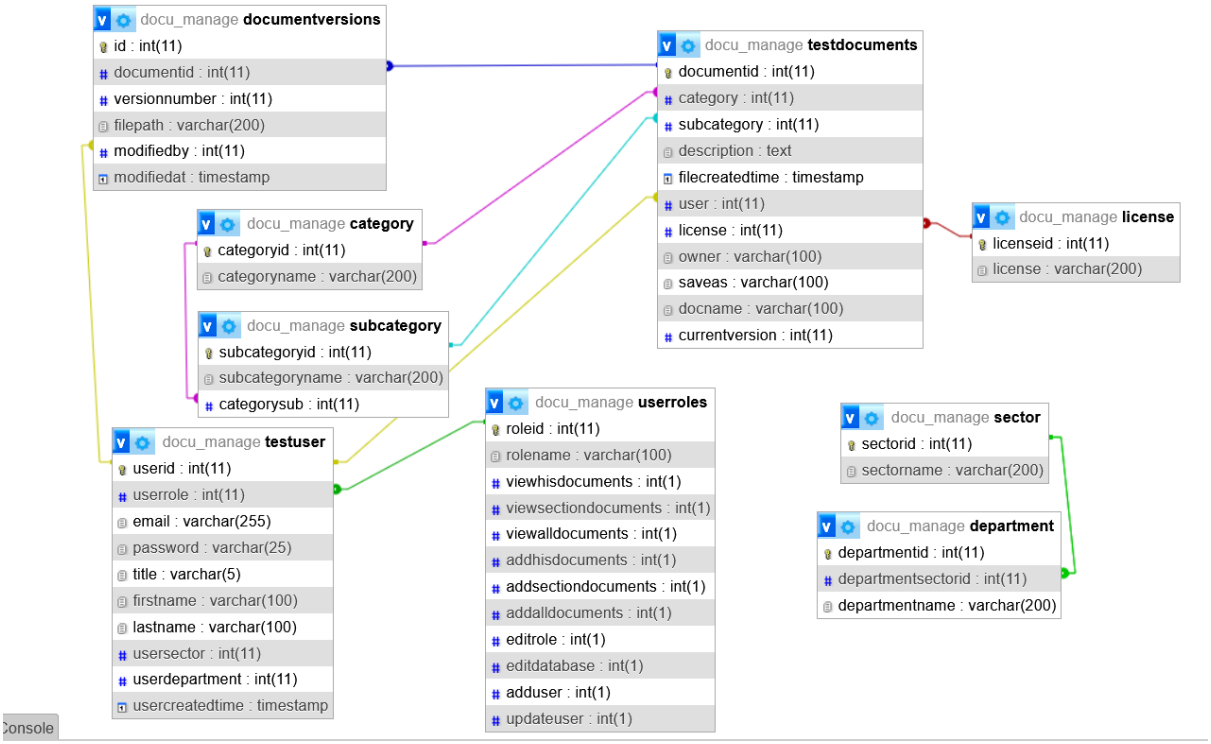


Figure 4.5 Database in Designer View

5 TESTING AND EVALUATION

Testing is a crucial phase in software development which ensures the qualities such as functionality, usability and performance ensuring that it meets the requirements and user needs. Testing reveals problems that can lead to errors in future that could affect the software hindering software operation. This chapter explains the testing methods and results obtained from those testing procedures.

5.1 Testing Methodology

The software will be tested under two categories.

Functional Testing

Functional testing verifies if each function of the software operates accordingly to requirements and ensure software does what it supposed to do. This focusses on testing outputs for given inputs without considering inner workings of code.

Non-Functional Testing

Non-functional testing checks aspects of software that are not related to specific functions or actions of user. Instead, how well the system performs, usability and other qualities will be checked.

5.2 Functional Testing

Functional activities of the system were identified and a test plan was created to conduct the functional testing process. Some of the test cases are as described below.

5.2.1 Test Plan

Test Name	Test Process
Submit Blank Form	Try to login with empty fields
Incorrect Email	Type text which is not an email address
Incorrect Password	Enter Incorrect Password
Enter Correct Details	Enter correct credentials

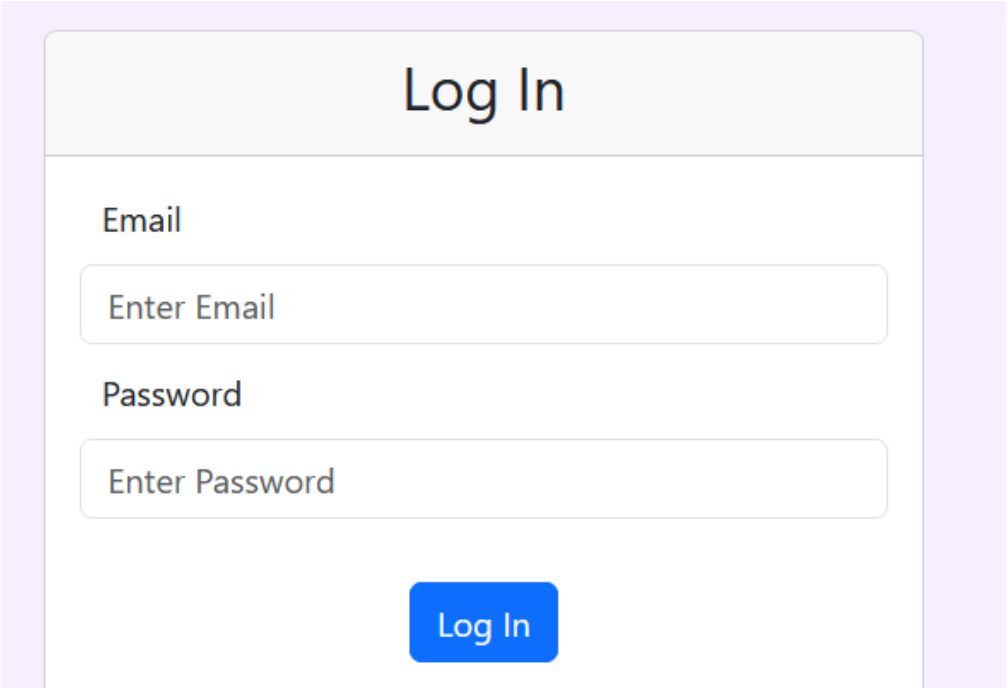


Figure 5.1 Log in

Table 5.1 Test Case T001

Test Case ID	T001
Function	Submit Blank Form
Testing Process	Try to login with empty fields
Expected Output	Pop up Error Message and redirect to login
Output	

Table 5.2 Test Case T002

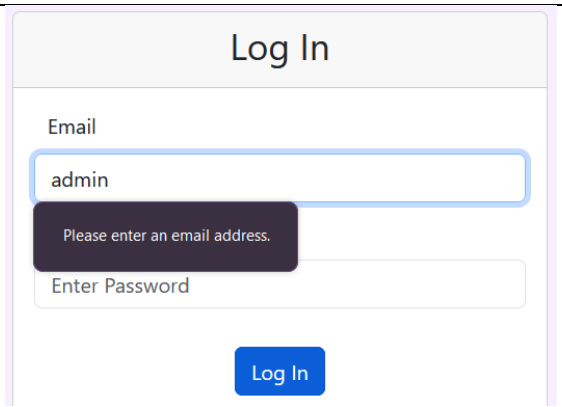
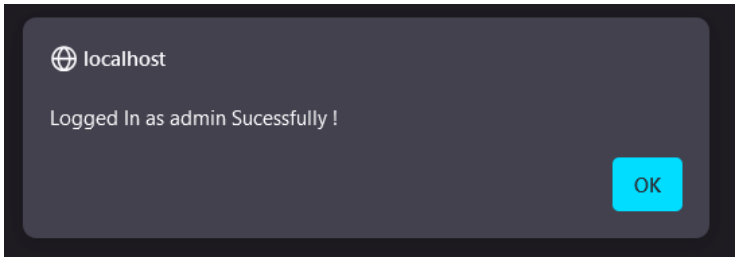
Test Case ID	T002
Function	Incorrect Email
Testing Process	Type text which is not an email address
Expected Output	No action and stays on the form and indicate not an email
Output	

Table 5.3 Test Case T003

Test Case ID	T003
Function	Incorrect Password
Testing Process	Enter Incorrect Password
Expected Output	Pop up error and redirect to login
Output	

Table 5.4 Test Case T004

Test Case ID	T004
Function	Enter Correct Details
Testing Process	Enter correct credentials
Expected Output	Successfully login and directed to dashboard
Output	

5.2.2 MIS Reports

Report generation is a key module in this system. Therefore, testing functionality of these report generation is very important. Same functionalities were tested on all reports.

Table 5.5 Test Case TR001

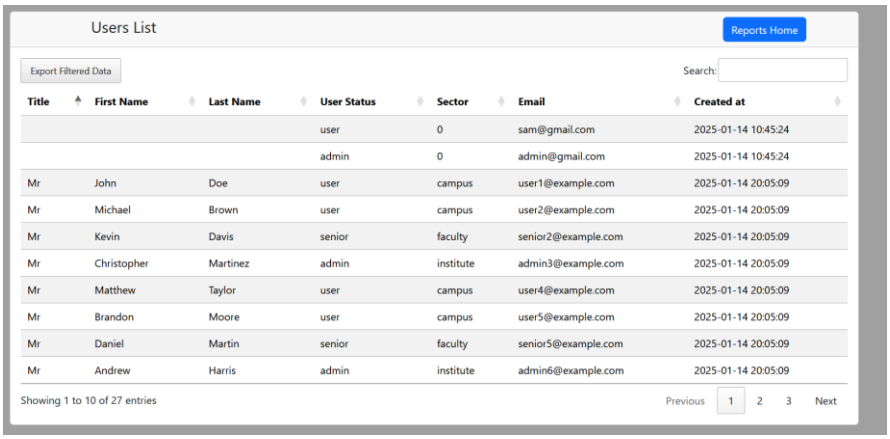
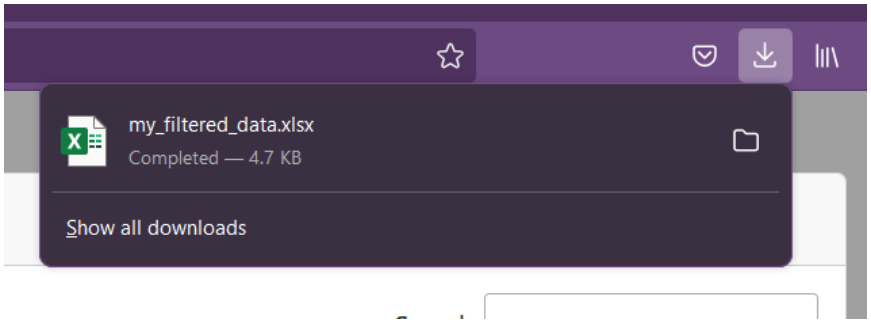
Test Case ID	TR001
Function	Show Registered Users List
Testing Process	Check Report Output
Expected Output	Successfully Load Registered Users List
Output	

Table 5.6 Test Case TR002

Test Case ID	TR002
Function	Export Registered Users List to a excel
Testing Process	Use export filtered data button and check downloaded file
Expected Output	Successfully download exported excel file
Output	

5.3 Non-Functional Testing

5.3.1 Load Testing

Load testing evaluates system behavior under different load conditions to identify system's capacity, and ensure it can handle user traffic without issue when at operation state. JMeter, an open-source load testing tool was used to simulate users and put the system under load testing. Under different concurrent users such as 100, 500, 1000 the system was tested and the results shows the ability of system to endure such conditions. (Figure 5.2) (Figure 5.3) (Figure 5.4) (Figure 5.5)

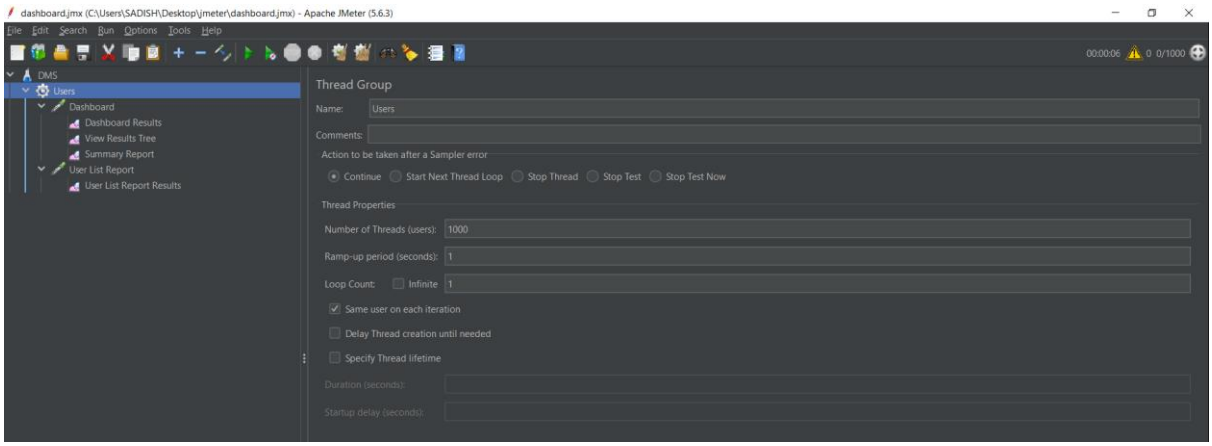


Figure 5.2 JMeter User Thread Setup

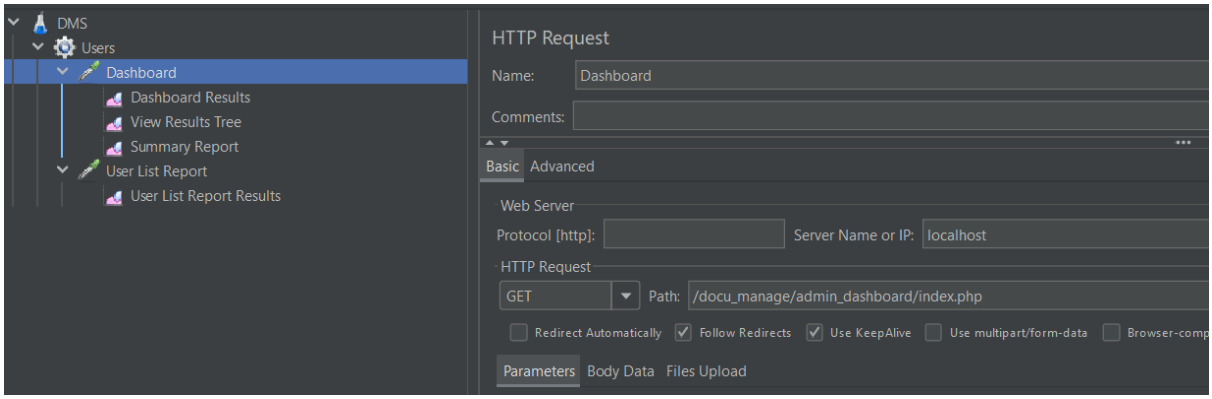


Figure 5.3 HTTP Request

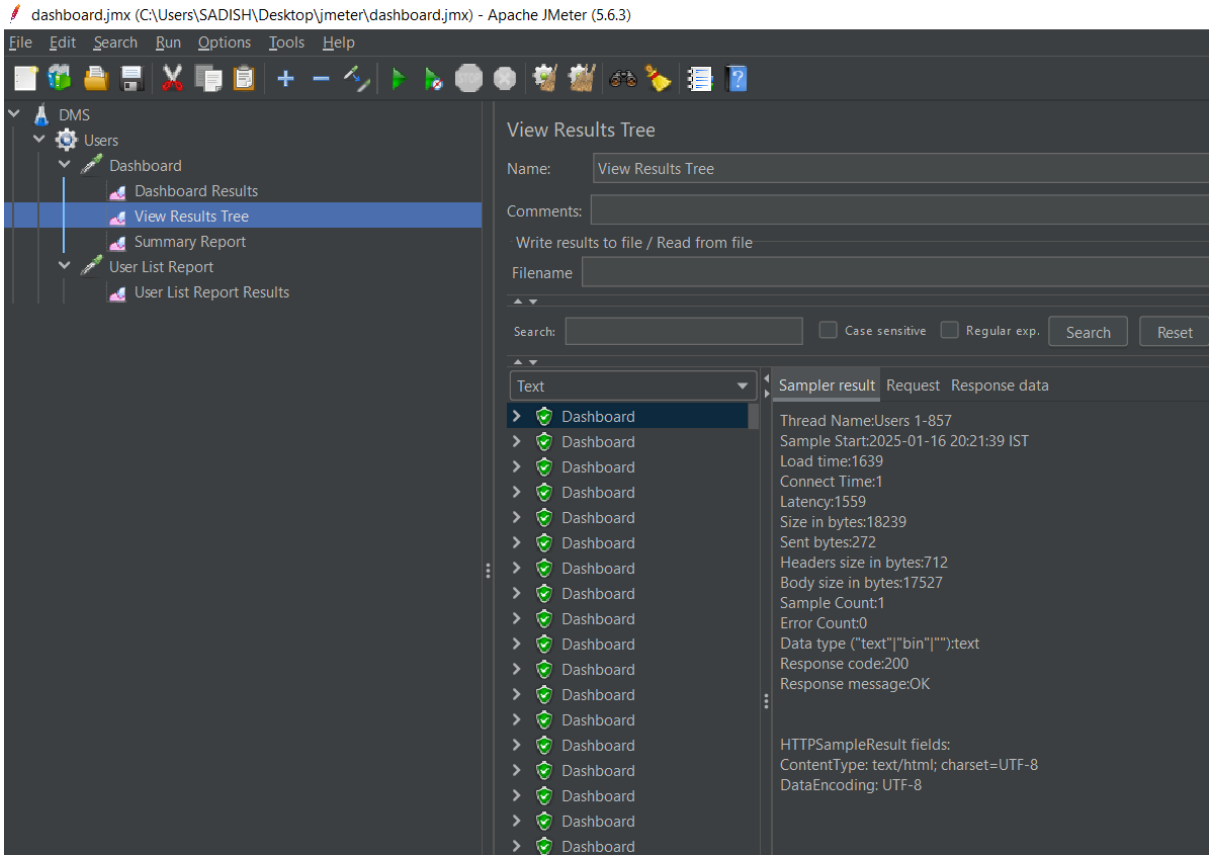


Figure 5.4 Result Tree

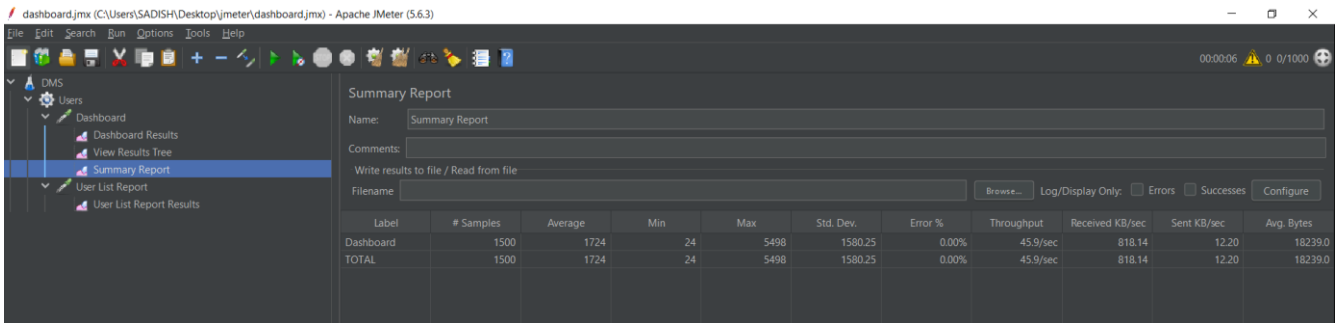


Figure 5.5 Summary Report

5.3.2 Usability Testing

Usability testing, also known as user experience (UX) testing, puts software applications in the hands of real users to assess their ease of use and effectiveness. By observing a small group of target users performing typical tasks, usability testing aims to identify practical problems related to navigation, control, and the ability to achieve desired outcomes.

Developed iteration of the system was given to interact with and measures were taken from small questionnaire. Below is the summary of responses given by the users. (Figure 5.6)

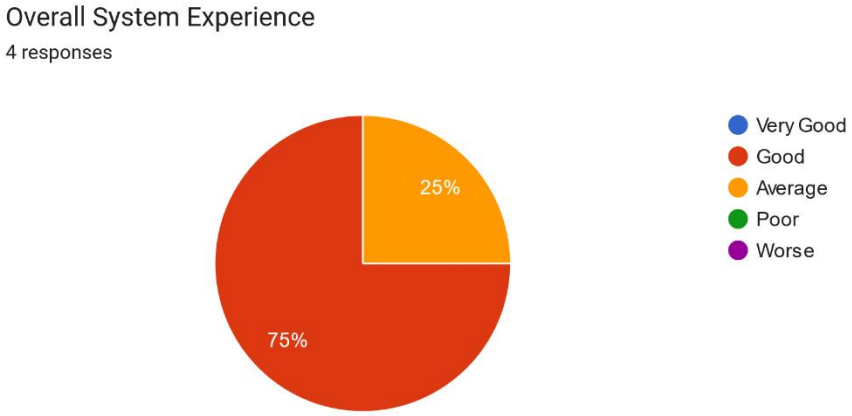


Figure 5.6 Usability Testing Results

6 CONCLUSION

This concluding chapter summarizes the project's outcomes, reflecting on the development of a document management system designed to address the challenges explained in chapters at the beginning.

6.1 Critical Analysis of Project's Success

The objective of improving managing documents in CODL was accomplished by using the developed system. The system stores and manages electronic versions of documents reducing paper-based documentation and saves cost on resources significantly. Version control feature improves document tracking and searching while document retrieving is greatly improved enabling better access to documentation for efficient decision making. While conducting review meeting and user evaluations it was clear that the system improved satisfaction of the stakeholders involving document management activities. User access controlling in the system enables to control access status to respective users very easily.

6.2 Lessons Learnt

The initial problem, managing documents efficiently based on rules applied in physically stored environment, presented unforeseen complexities as requirements evolved during development of the digital system. Traditional frameworks proved unsuitable for the specified needs of this specific context, which caused the need of creating a custom structure and techniques based in the Model-View-Controller (MVC) architectural pattern. Following a SDLC approach the system were created with core functionalities including document storage, search, version control and user access management.

Important challenge came across in implementing user permissions. The need of privileges required for different user roles demanded careful design and implementation. However, iterative interactions with prototype versions of the system provided a clearer understanding of their needs, generating valuable feedback and new ideas that were added into the final product. The project achieved a significant amount of its initial objectives. The system effectively addresses requirements of document storage and retrieval. Document searching capability was praised by users as seen from the feedback from user acceptance testing. In summary the project successfully delivered a functional DMS that met main needs of users identified in requirements analysis.

6.3 Future Work

Finally, considering potential avenues for future work. These include integration with other systems, advanced search capabilities, improved reporting features, mobile accessibility, OCR capabilities for documents. These suggestions are based on the insights gained during the project and aim to further enhance the system's effectiveness and usability. The system can be enhanced by adding collaborative editing features by integrating real-time co-authoring capabilities and improved change tracking.

REFERENCES

Google (2022) *Google Workspace Updates. Easily see file locations in Google Drive*. Available at: https://workspaceupdates.googleblog.com/2022/05/easily-see-file-locations-in-google-drive_0338034513.html (Accessed 18 April 2024).

GeeksforGeeks. (n.d.) *MVC Framework Introduction*. Available at: https://www.geeksforgeeks.org/mvc-framework-introduction/ (Accessed 1 November 2024).

Lessard, K. (2020) 'Box vs Dropbox: A Comparison of File Sharing Apps', *Shift*, 26 May. Available at: https://tryshift.com/blog/working-from-home/box-vs-dropbox/ (Accessed 18 April 2024).

Pal, S.K. (2024) *Software Engineering | Iterative Waterfall Model – Software Engineering*. Available at: https://www.geeksforgeeks.org/software-engineering-iterative-waterfall-model/ (Accessed 18 April 2024).

Sathish, H. (2011) 'Zoho Docs Gets A Fresh New Look And Feel', *Zoho Blog*, 11 May. Available at: https://www.zoho.com/blog/general/zoho-docs-gets-a-fresh-new-look-and-feel.html (Accessed 18 April 2024).

StackShare, Inc (2024) *Google Drive vs Zoho Docs | What are the differences?* Available at: https://stackshare.io/stackups/google-drive-vs-zoho-docs (Accessed 18 April 2024).

University of Colombo (2020) *Centre for Open & Distance Learning | University of Colombo*. Available at: https://vcuc.cmb.ac.lk/ (Accessed 22 June 2025).

APPENDICES

Appendix A – Requirements Gathering Interview

Questions to guide interview on requirements gathering

1. Do you think introducing a new DMS will be valuable?
2. What are the current processes happening when managing documents?
3. What are the types of documents that are currently being used?
4. How do you currently find and locate documents?
5. How do you currently keep track of document status? (version control)
6. Are there any repetitive tasks you follow in current process?
7. What are current methods being used when sharing collaborating creating documents?
8. What are the most exhausting processes in current situation?
9. What are the functions you would like to have in your new system?
10. What kind of security levels user levels are needed for documents?
11. How many users might be using this system?
12. Do you expect to increase number of users in the future?
13. How comfortable are you with technology?
14. What level of training do you think you will need?
15. What can be considered to encourage the users to use the system?

Appendix B – User Evaluation

The Following charts shows the results of User Evaluation. (Figure B.1) (Figure B.2) (Figure B.3) (Figure B.4)

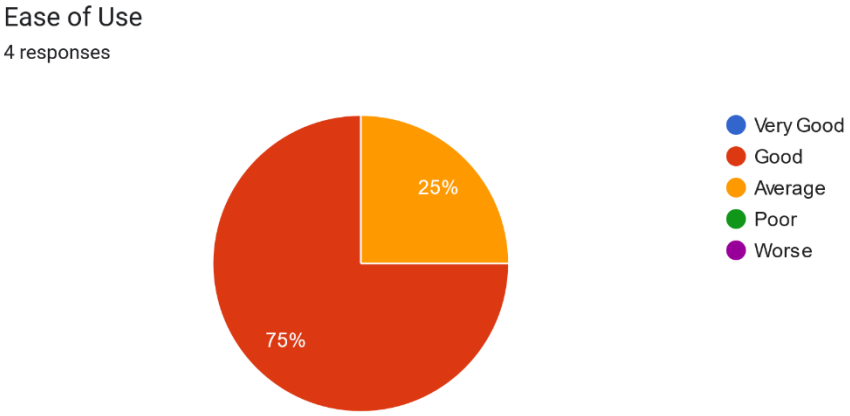


Figure B.1 User Evaluation (Ease of Use)

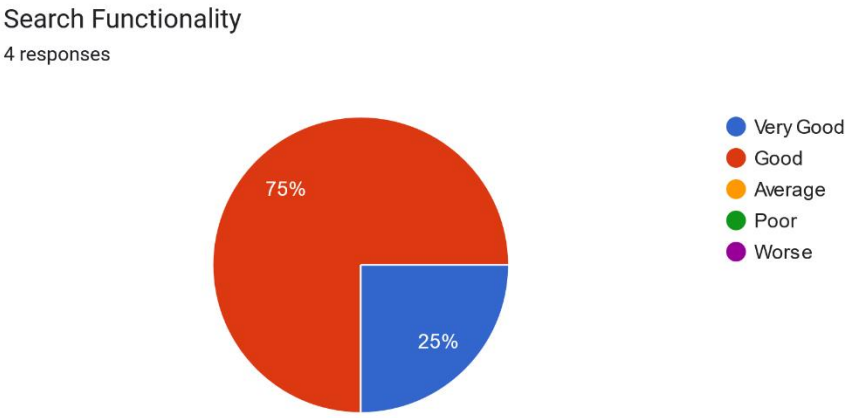


Figure B.2 User Evaluation (Search Functionality)

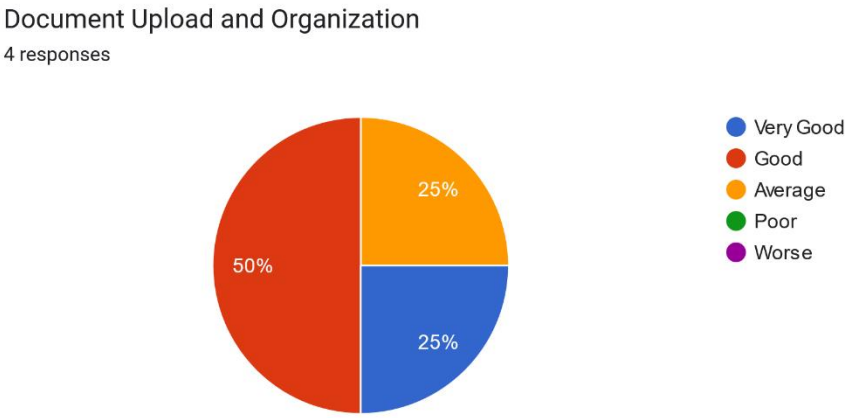


Figure B.3 User Evaluation (Document Download and Organization)

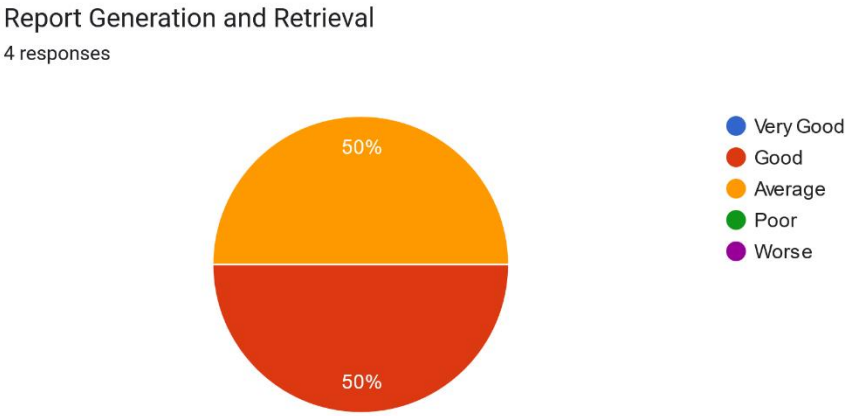


Figure B.4 User Evaluation (Report Generation and Retrieval)

Appendix C – User Manual

Document Management System of CODL

➢ Accessing the system

- Direct to the official website of the CODL (Figure C.1)
- https://vcuc.cmb.ac.lk/

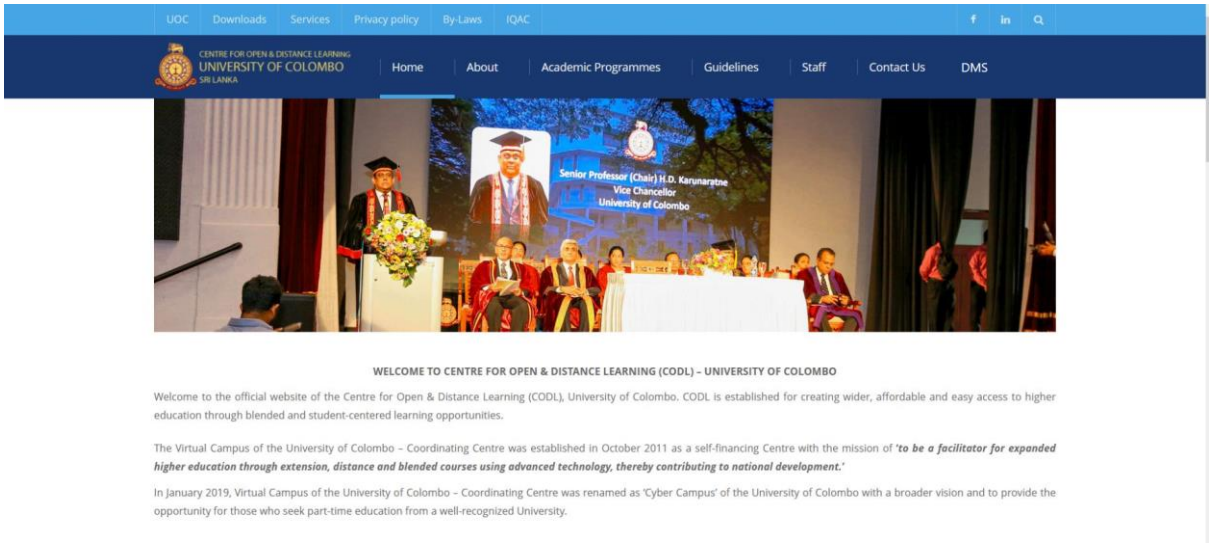


Figure C.1 - CODL Website

- Click on the DMS on navbar (Figure C.2).

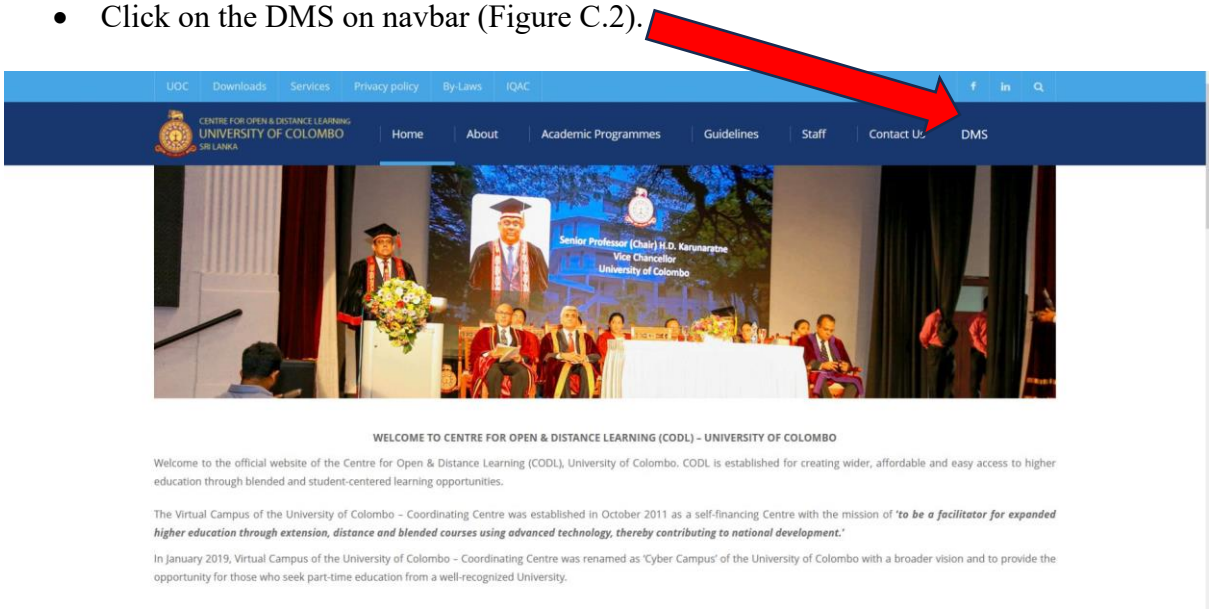


Figure C.2 - CODL Website Navbar DMS

- You will be directed to the Login Page (Figure C.3).

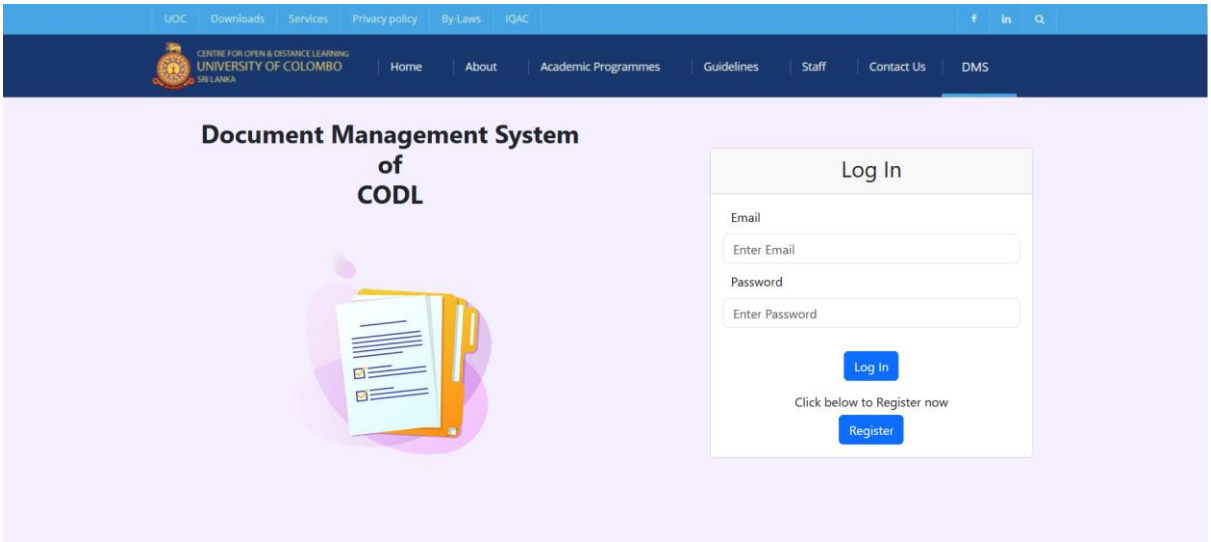


Figure C.3 CODL DMS Login Page

➢ Registering for the system

- If you are a new user you need to **Click on the Register button** in the Login Page.

- You will be directed to following Registering page (Figure C.4).

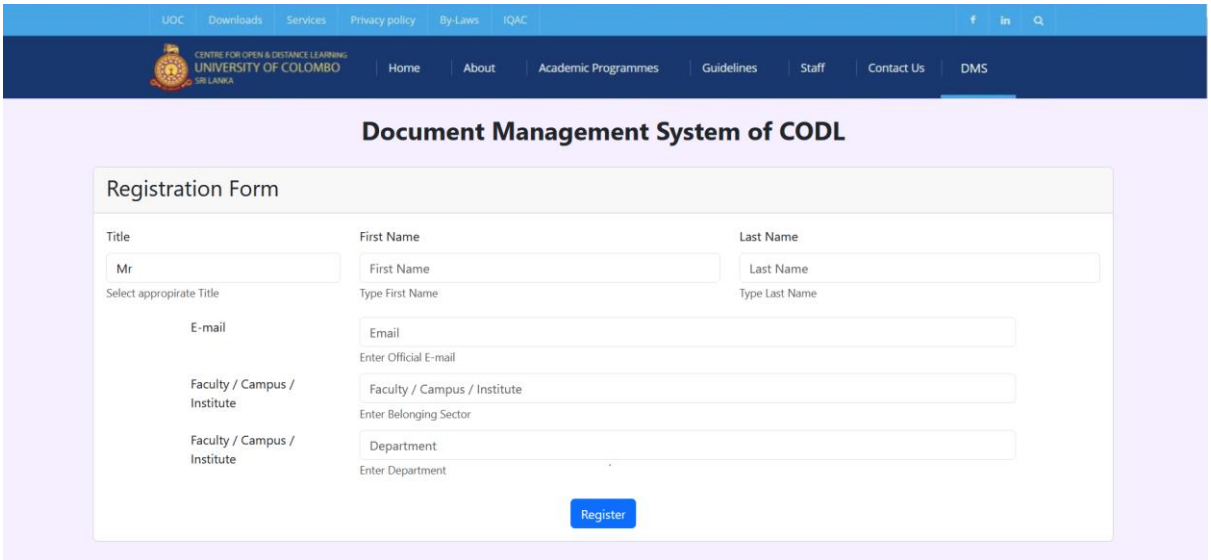


Figure C.4 DMS Registration Page

- We recommend you to gather this information first before registering. Use your official E-mail when entering the details.
- Registration process will be done by CODL staff. The details you enter will be send to CODL staff and after registration confirmation will be sent to your official email you entered.

- **Logging In the system**

- If you are a registered user you need to enter your official Email and Password, **Click on the Log In button** in the Login Page (Figure C.5).

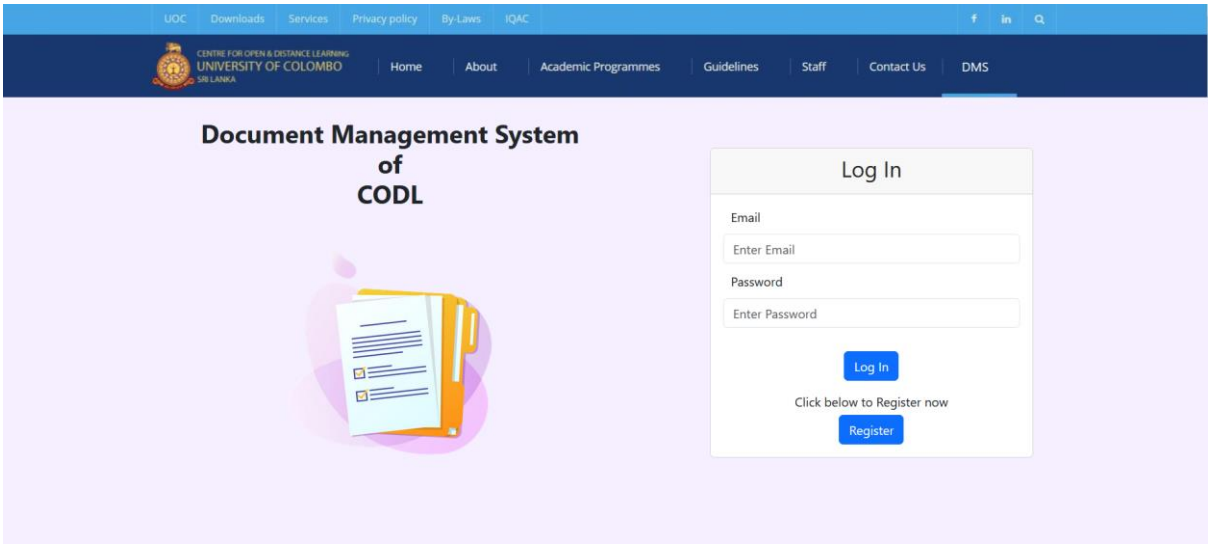
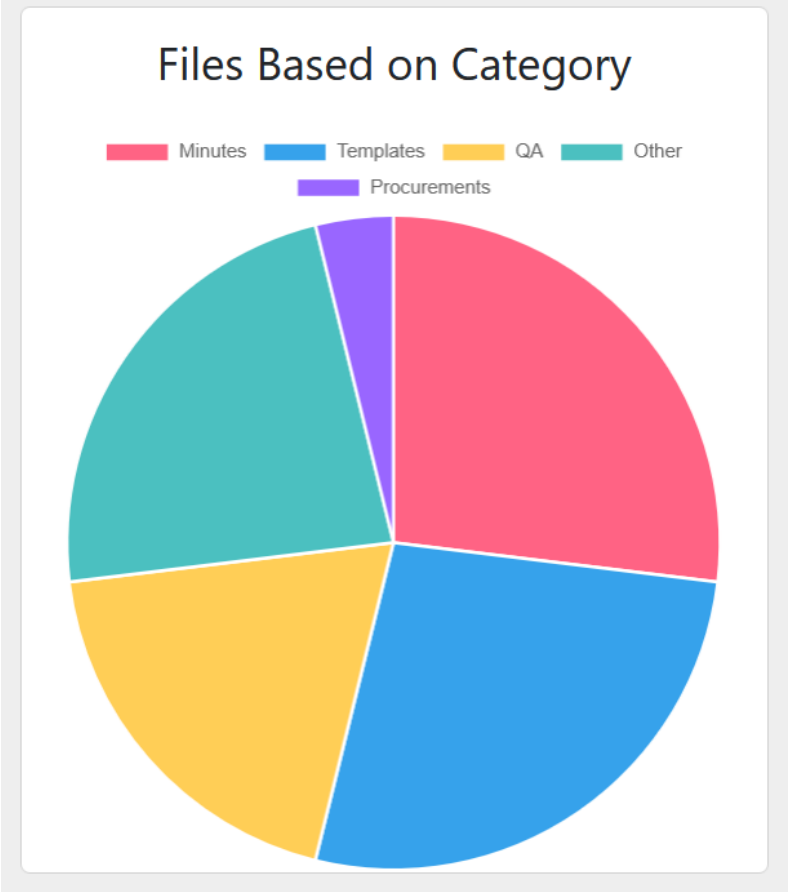


Figure C.5 DMS Login

- Based on your user level and privileges allowed you will be directed to dashboard.

Appendix D – Management Reports



The following Figures (Figure D.1) (Figure D.2) are management reports used to show the types of documents in the document management system.

Figure D.1 - Category based Files Chart

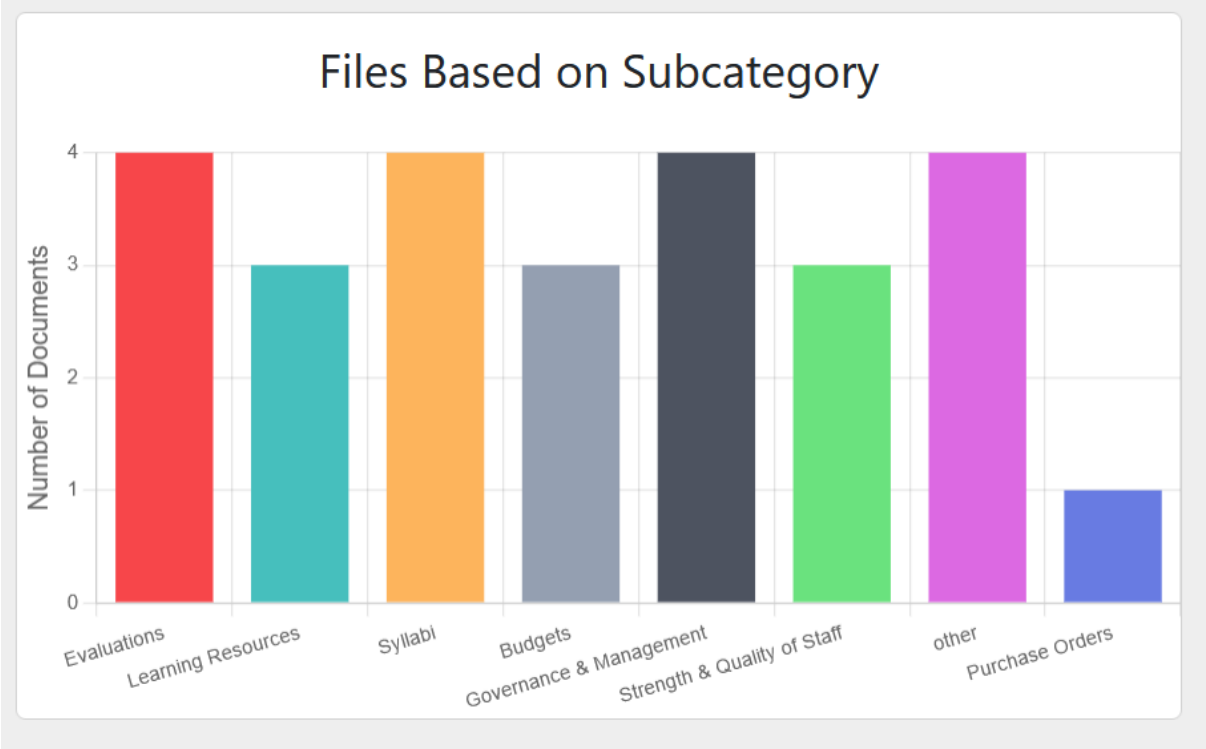
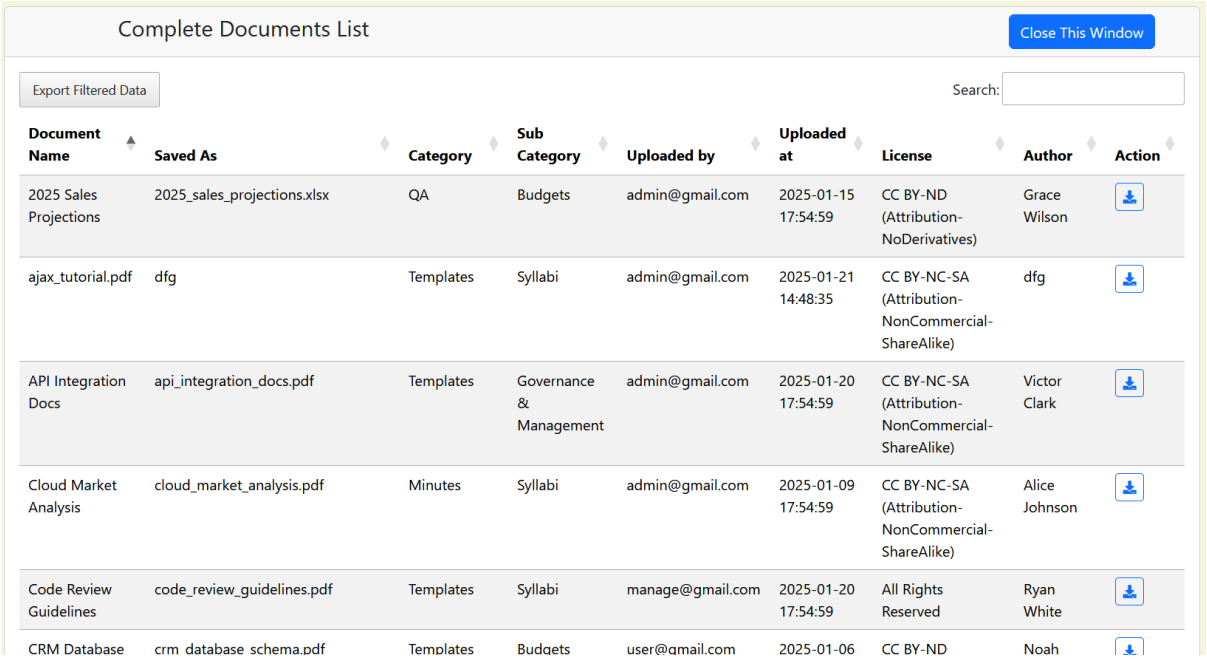


Figure D.2 - Files Count based on file subcategories

The following figures show the reports that can be generated from the system and using Export Filtered Data button the reports can be downloaded as an excel file. (Figure D.3) (Figure D.4) (Figure D.5) (Figure D.6)



Complete Documents List

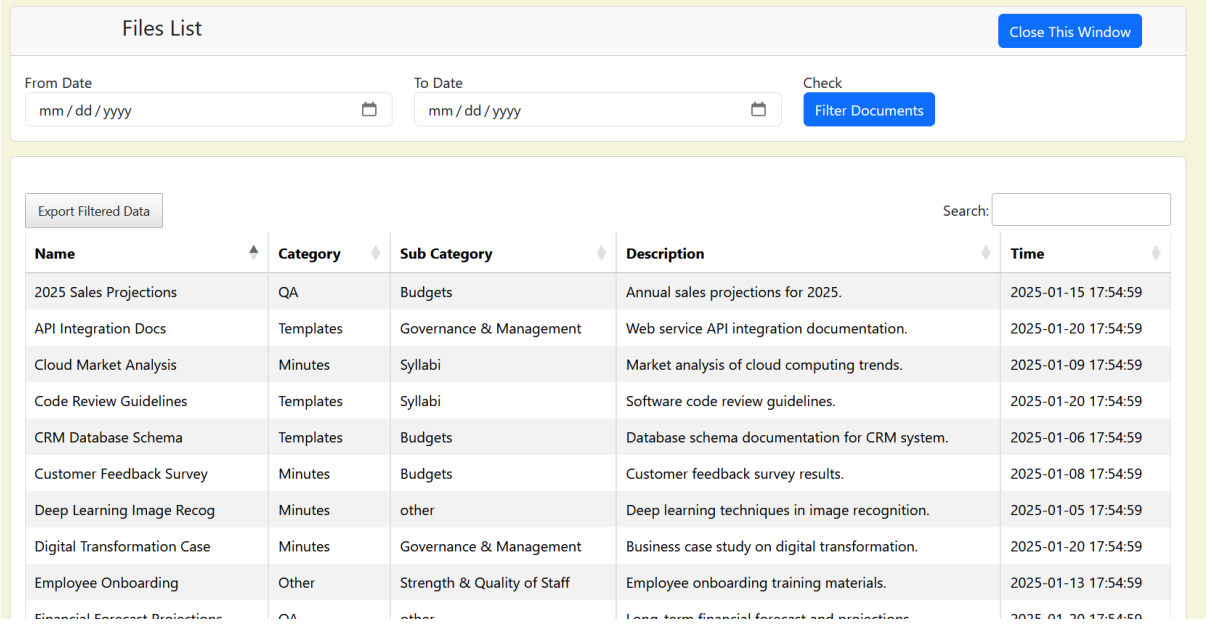
Close This Window

Export Filtered Data

Search:

Document Name	Saved As	Category	Sub Category	Uploaded by	Uploaded at	License	Author	Action
2025 Sales Projections	2025_sales_projections.xlsx	QA	Budgets	admin@gmail.com	2025-01-15 17:54:59	CC BY-ND (Attribution-NoDerivatives)	Grace Wilson	
ajax_tutorial.pdf	dfg	Templates	Syllabi	admin@gmail.com	2025-01-21 14:48:35	CC BY-NC-SA (Attribution-NonCommercial-ShareAlike)	dfg	
API Integration Docs	api_integration_docs.pdf	Templates	Governance & Management	admin@gmail.com	2025-01-20 17:54:59	CC BY-NC-SA (Attribution-NonCommercial-ShareAlike)	Victor Clark	
Cloud Market Analysis	cloud_market_analysis.pdf	Minutes	Syllabi	admin@gmail.com	2025-01-09 17:54:59	CC BY-NC-SA (Attribution-NonCommercial-ShareAlike)	Alice Johnson	
Code Review Guidelines	code_review_guidelines.pdf	Templates	Syllabi	manage@gmail.com	2025-01-20 17:54:59	All Rights Reserved	Ryan White	
CRM Database	crm_database_schema.pdf	Templates	Budgets	user@gmail.com	2025-01-06	CC BY-ND	Noah	

Figure D.3 - Reports Sample 1



Files List

Close This Window

From Date

mm / dd / yyyy

To Date

mm / dd / yyyy

Check

Filter Documents

Export Filtered Data

Search:

Name	Category	Sub Category	Description	Time
2025 Sales Projections	QA	Budgets	Annual sales projections for 2025.	2025-01-15 17:54:59
API Integration Docs	Templates	Governance & Management	Web service API integration documentation.	2025-01-20 17:54:59
Cloud Market Analysis	Minutes	Syllabi	Market analysis of cloud computing trends.	2025-01-09 17:54:59
Code Review Guidelines	Templates	Syllabi	Software code review guidelines.	2025-01-20 17:54:59
CRM Database Schema	Templates	Budgets	Database schema documentation for CRM system.	2025-01-06 17:54:59
Customer Feedback Survey	Minutes	Budgets	Customer feedback survey results.	2025-01-08 17:54:59
Deep Learning Image Recog	Minutes	other	Deep learning techniques in image recognition.	2025-01-05 17:54:59
Digital Transformation Case	Minutes	Governance & Management	Business case study on digital transformation.	2025-01-20 17:54:59
Employee Onboarding	Other	Strength & Quality of Staff	Employee onboarding training materials.	2025-01-13 17:54:59

Figure D.4 - Reports Sample 2

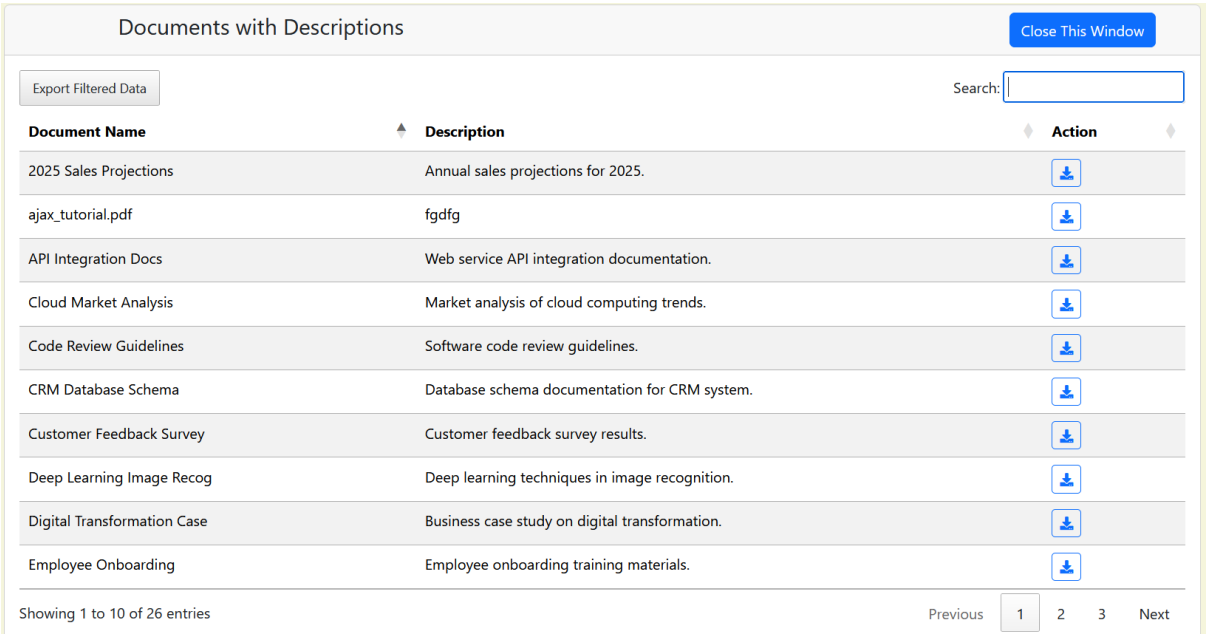


Figure D.5 - Reports Sample 3

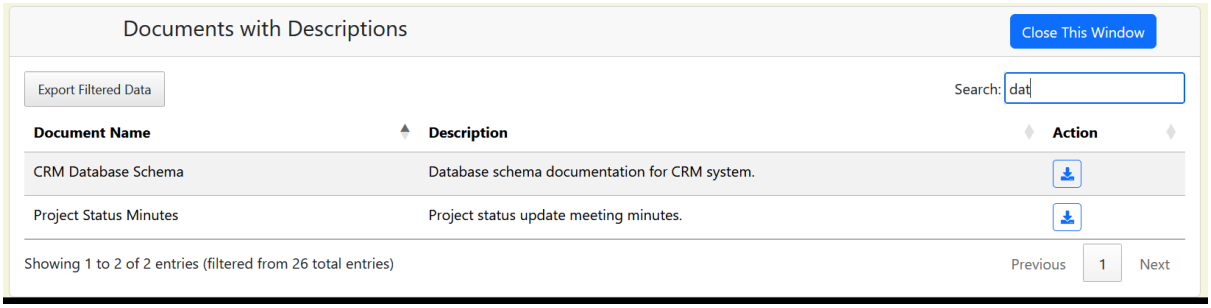


Figure D.6 - Reports Sample 4