



**COMSATS University Islamabad,
Abbottabad Campus**

**SOFTWARE DESIGN
DESCRIPTION
(SDD DOCUMENT)**

for

**Paperless Graduate Research
Management System**

By

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Revision History

Name	Date	Reason for changes	Version

Application Evaluation History

Comments (by committee) *include the ones given at scope time both in doc and presentation	Action Taken
Comments for 10% Add tracking, auto updating on relevant dashboard after comments. define roles clearly. Task for 30% Complete student, supervisor, coordinate module.	complete

Supervised by
<Zia Ur Rehman>

Signature_____

Introduction

Purpose of Document

This document intends to show the details of the “paperless Graduate Research Management System” Web application. The objective of this document is to give its readers a better understanding of the application design and architecture. It will also tell the reader about the tools and technologies.

Motivation

Graduate research is a complex and time-consuming process, and effective management is essential for success. The current paper-based system for managing research proposals and theses at COMSATS University is inefficient and error-prone. Students must submit their proposals and theses in hard copy, which can lead to delays, lost or damaged documents, and difficulty tracking the progress of research projects.

The proposed system will address these challenges by providing a digital solution for managing the entire research approval process. The system will allow students to submit their proposals and theses online, track the status of their approvals, and collaborate with their supervisors and committee members. Our system will also provide several features that are not currently available in the paper-based system, such as a searchable digital repository for theses and synopses, and support for online thesis review by external examiners and many more.

Scope of the Project:

The Paperless Graduate Management System (PGMS) is a web-based application with a primary goal to modernize the research approval process for graduate students. It replaces traditional paper-based workflows with a digital platform, aiming to enhance efficiency, transparency, and collaboration among students, supervisors, committee members, and external examiners.

Key Features Overview

1. Digital Submission of Research Proposals and Theses:

- Streamlining the submission process for research proposals and theses.
- Facilitating feedback from supervisors, committee members, and DAC (Doctoral Advisory Committee) through online collaboration.

2. Online Scheduling of Research Presentations:

- Allowing scheduling of research presentations online.
- Providing a platform for feedback on presentations by supervisors, committee members, and DAC.

3. Approval Workflow Management:

- Automation of approval processes for synopsis, progress reports, leave of absence, and study duration extension.
- Submission of online requests by students with digital approval using confirmation codes via email/SMS.

4. Online Thesis Review by External Examiners:

- Enabling online thesis review by external examiners, supervisors, committee members, and DAC.
- Collecting feedback in the form of comments, annotations, and suggestions.

5. Digital Repository:

- Establishing a secure and searchable digital repository for the storage of theses and synopses.
- Enabling users to search, browse, and download theses and synopses in various formats.

6. Related Reporting:

- Generating reports on the number of students supervised by each faculty member.
- Offering insights into the status of all approval workflows, including completed, in-progress, and pending workflows.
- Providing reports on feedback from supervisors, committee members, and DAC

Design methodology and software process model

The Agile incremental model is an ideal fit for developing our Research Proposal and Thesis Management System for several key reasons. This methodology places a strong emphasis on continuous customer involvement, ensuring stakeholders such as students, supervisors, committee members, and DAC members are actively engaged throughout the development process. The adaptability to changes inherent in Agile is crucial for accommodating the evolving nature of academic processes and requirements.

Breaking the project into manageable increments aligns well with Agile's incremental development approach. Each increment focuses on specific modules, allowing for faster delivery of functional components and providing stakeholders with tangible progress at every stage. This incremental approach not only accelerates the delivery of core functionalities, such as digital submission of proposals and theses but also allows for the early identification and mitigation of risks.

Agile's commitment to frequent testing and quality assurance ensures that individual components are rigorously examined as they are completed, contributing to a higher overall level of system reliability. The collaborative and communicative nature of Agile is especially beneficial in a project involving multiple user roles, fostering effective communication, and understanding of diverse perspectives and requirements.

System overview

The Digital Research Proposal and Paperless Management System aims to replace the paper-based processes for graduate students' research approval workflows in universities. It offers an online and efficient approach by providing digital research proposal and thesis submission, online presentation scheduling, approval workflow management, online thesis review, a digital repository, reporting, The system will provide several advantages over the current paper-based system, including reduced paperwork, faster approvals, improved communication, and enhanced transparency. The system will also allow students to track the progress of their research, and to collaborate with their supervisors and committee members.

Architectural design

Below is the generalized structure of different major components of the “Paper Less Graduate Research Management System”. Stacked is used to build Web App. This architecture was initially a version of MVVM.

These pieces are:

View: Shows the UI to the user. Single widgets also qualify as views (for consistency in terminology) a view, in this case, is not a "Page" it's just a UI representation.

View Model: Manages the state of the View, business logic, and any other logic as required from user interaction. It does this by making use of the services

Model: It help to map data of different entities using database

Services: A wrapper of a single functionality/feature set. This is commonly used to wrap things like showing a dialog, wrapping database functionality, integrating an API, etc.

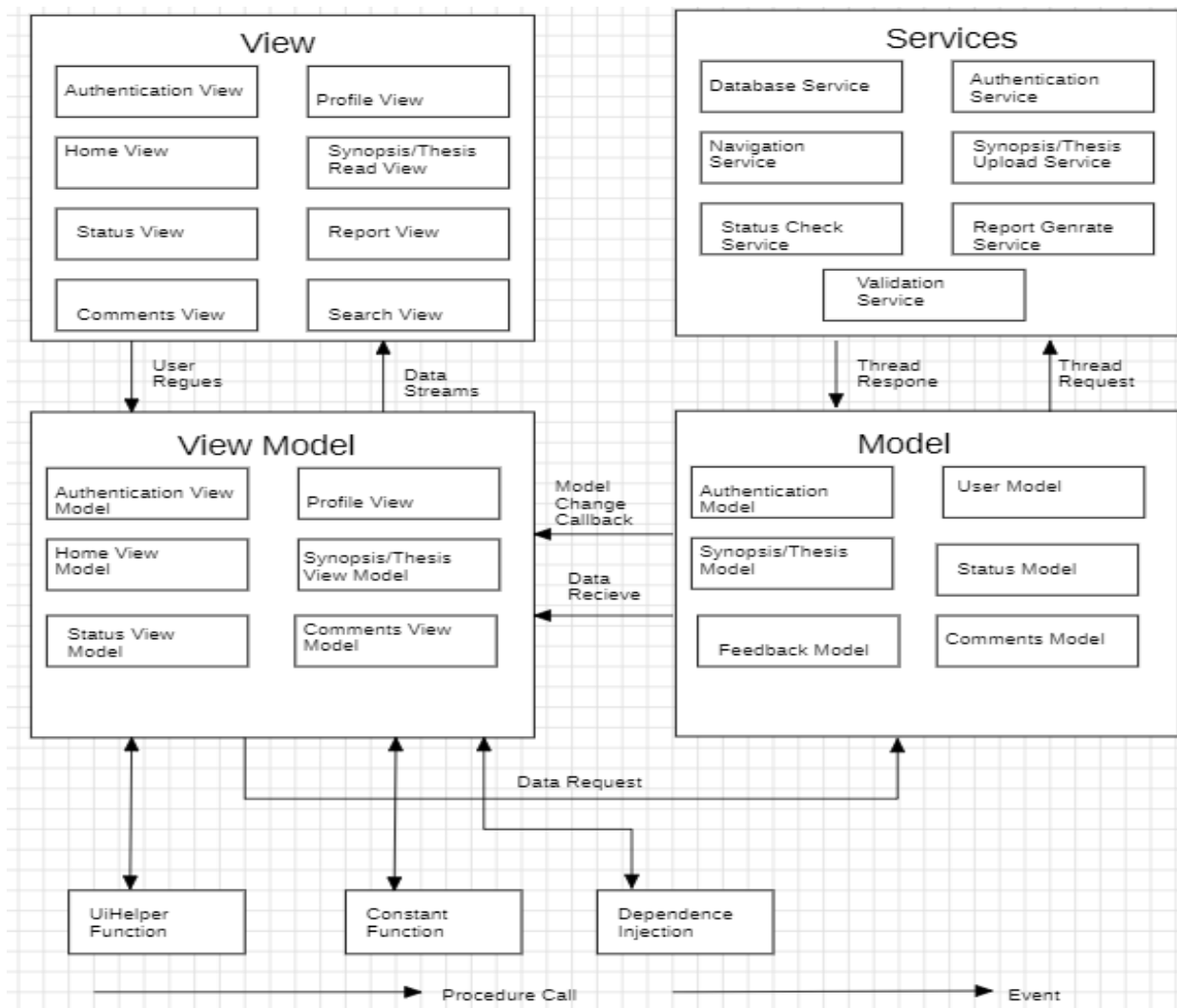


Figure 1.1

Process flow/Representation

PaperLess Graduate Research Management System

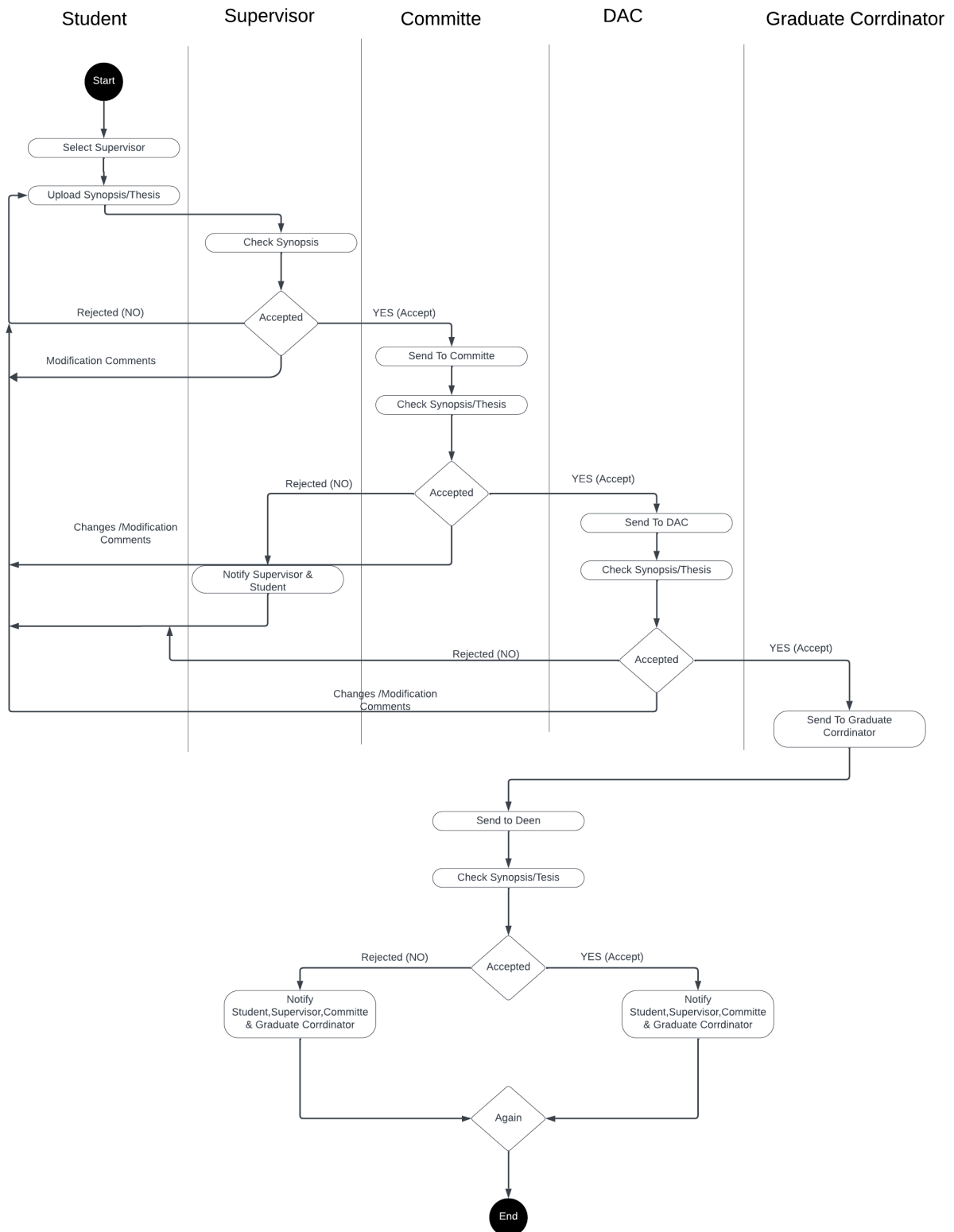


Figure 2.1

Design models

Sequence Diagram

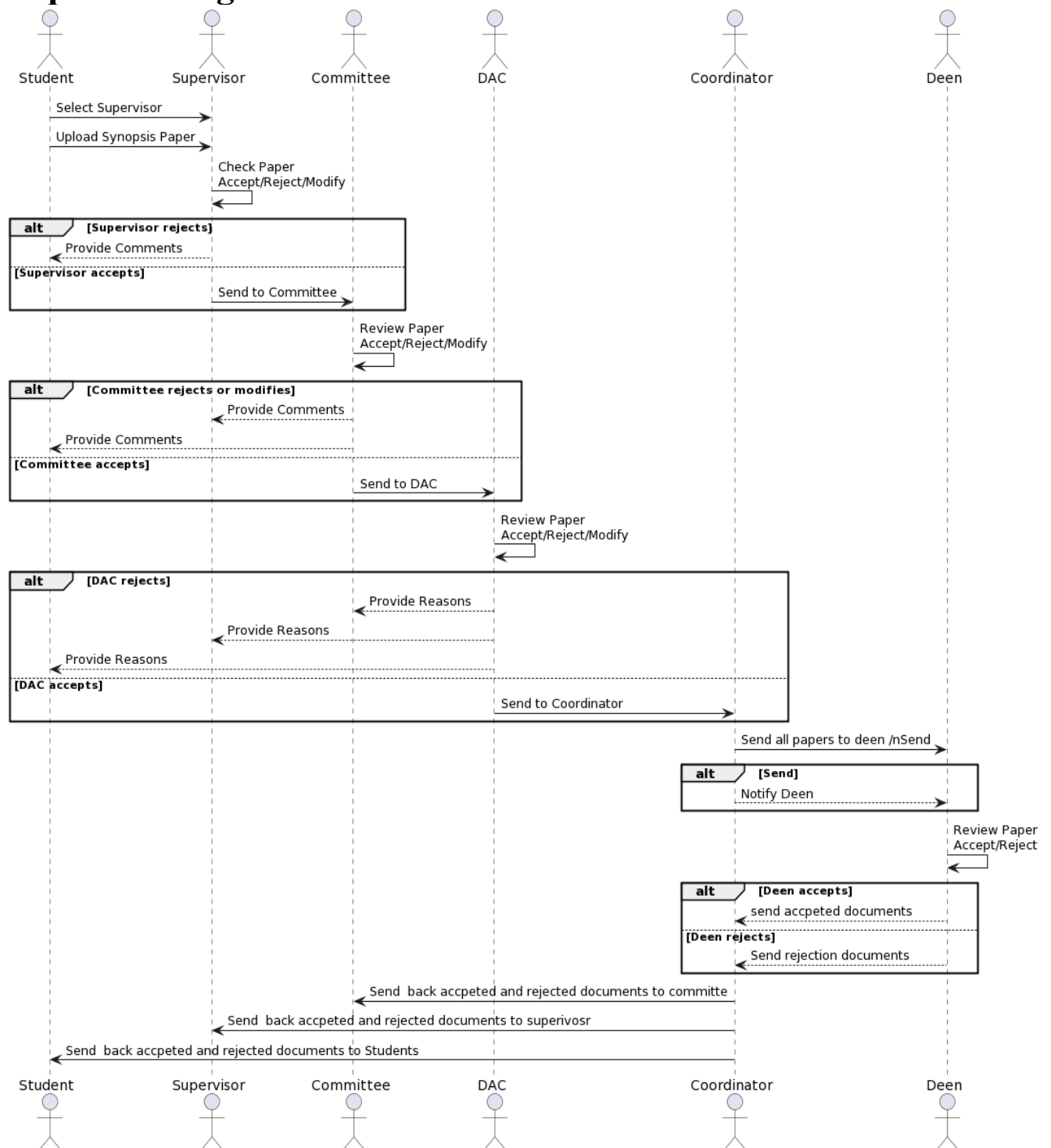


Figure 3.1

Sequence Diagram Digital Repository

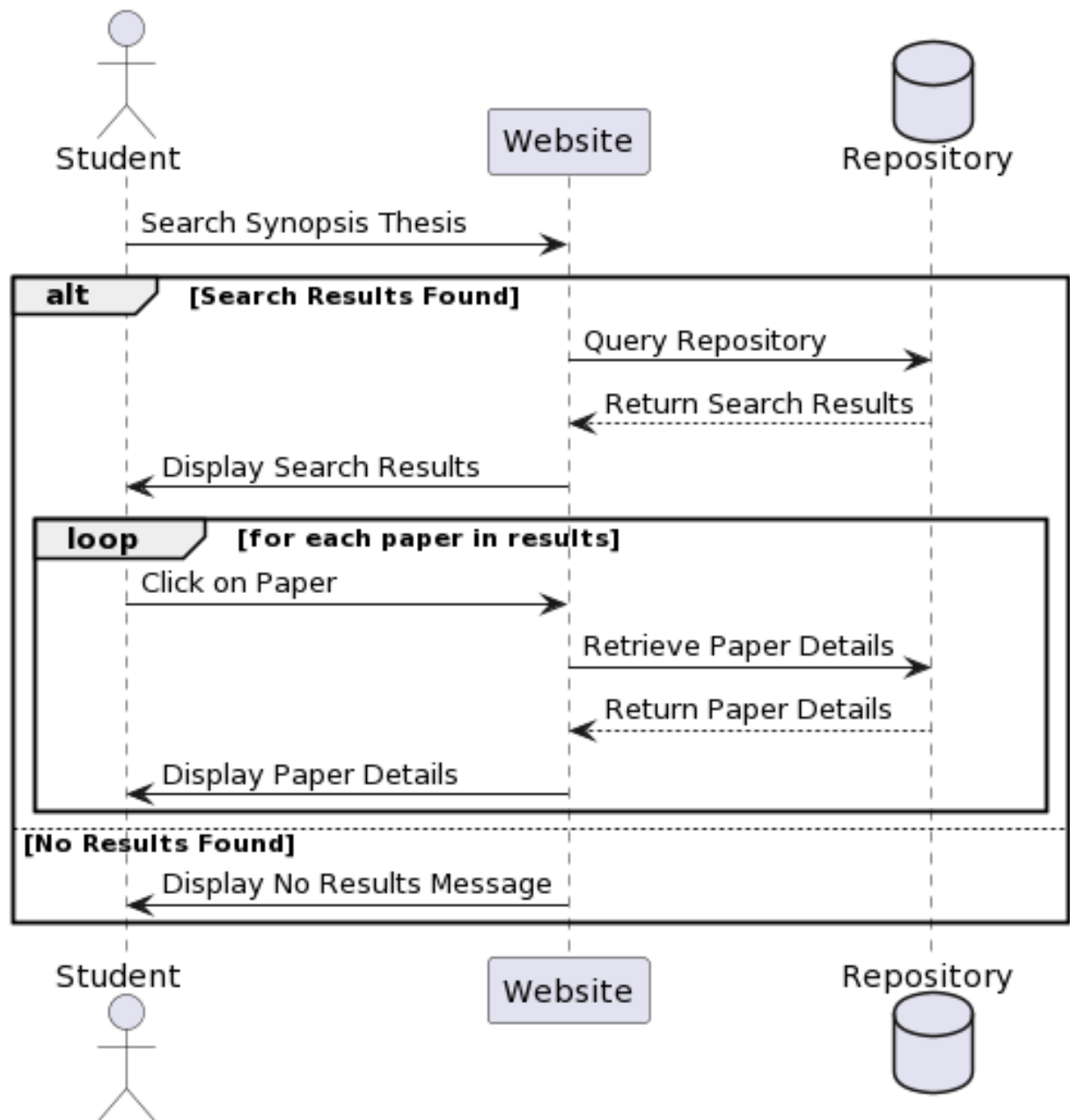


Figure 3.2

Sequence Diagram Schedule Presentation

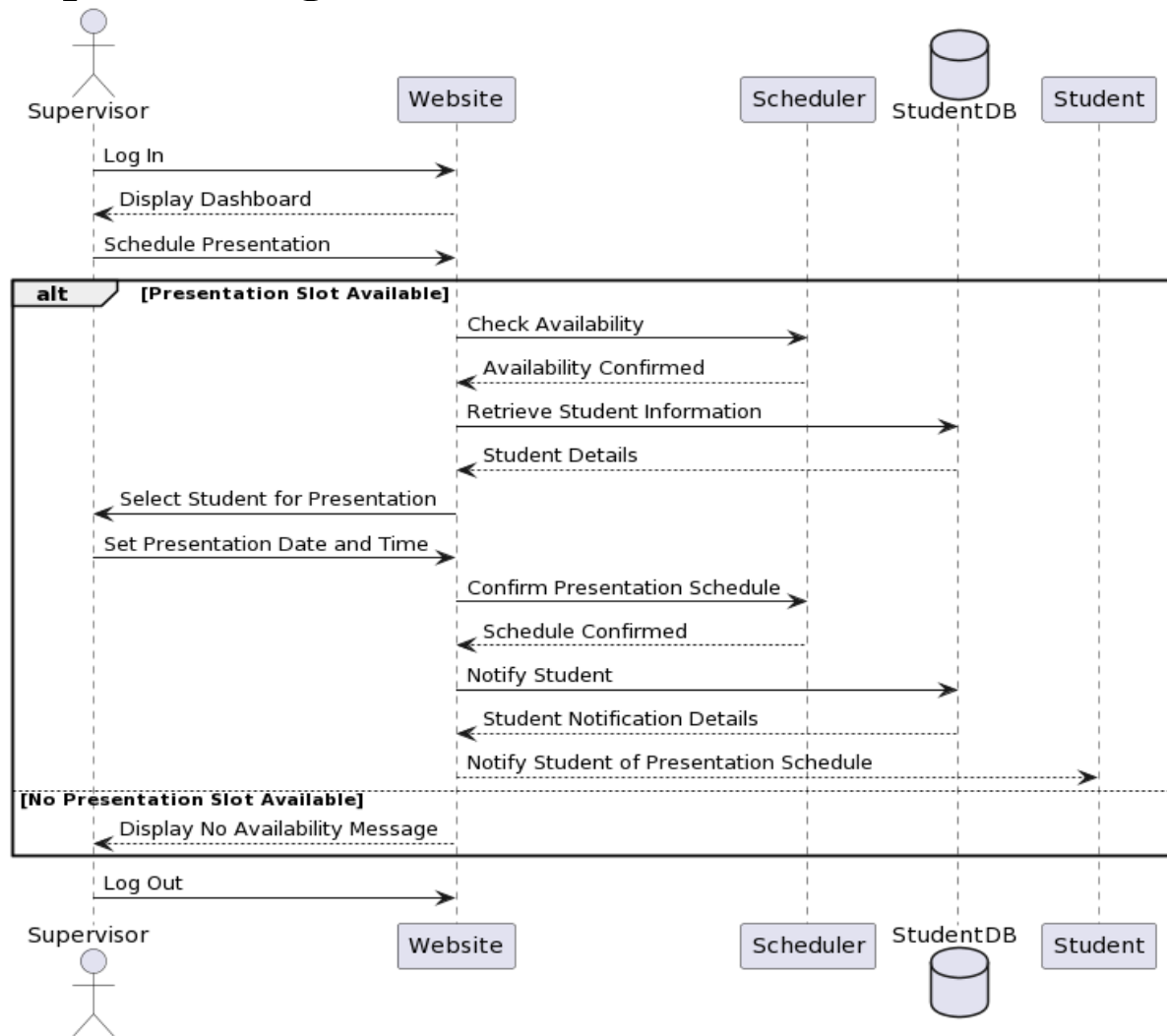


Figure 3.3

Data Flow Diagram

PaperLess Graduate Research Managment System

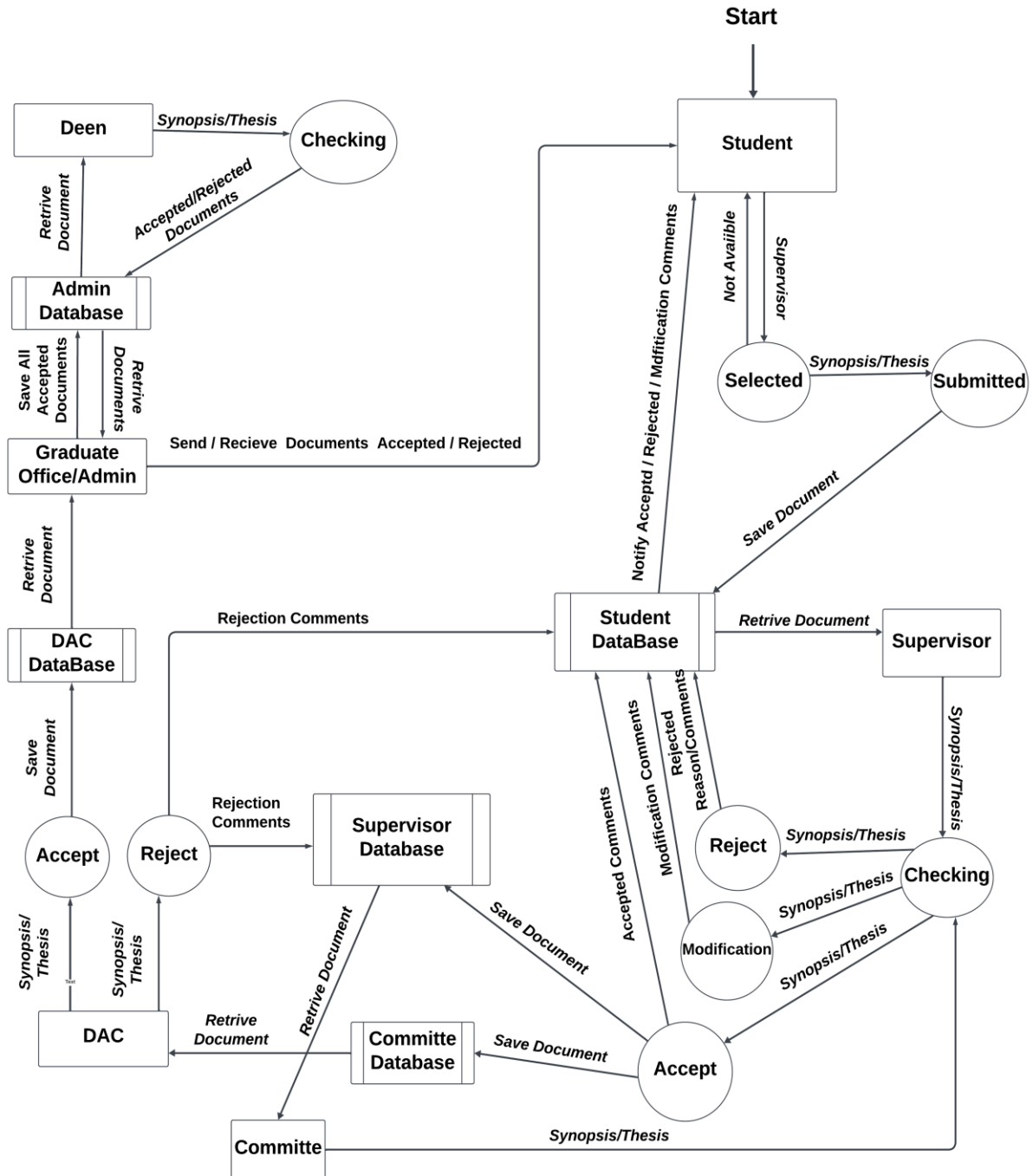


Figure 4.1

JSON TREE

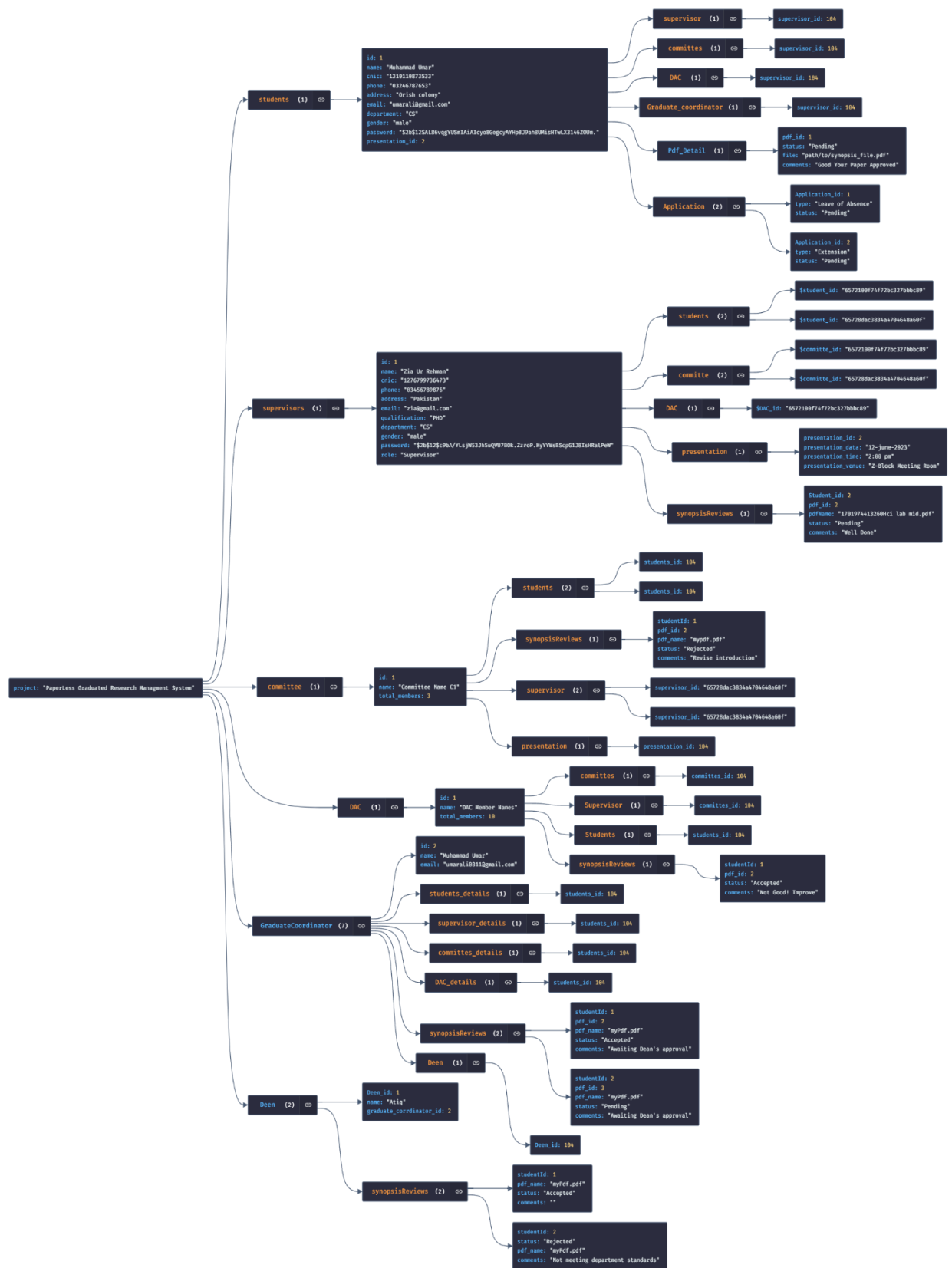


Figure 4.1

State Transition Diagram

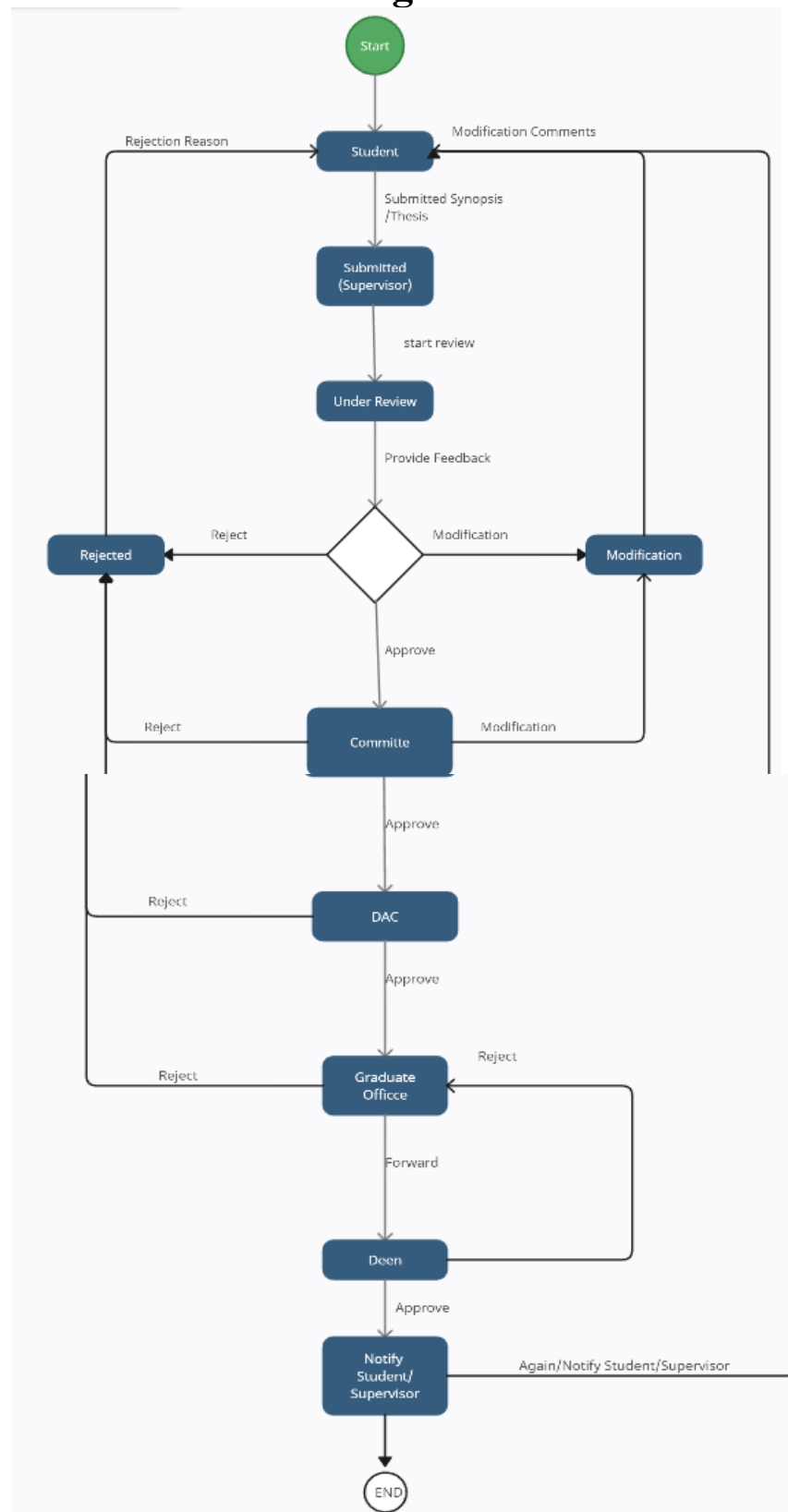


Figure 5.1

Data design

The "Paperless Graduate Research Management System" utilizes MongoDB, a NoSQL database, for storing and managing its data. MongoDB's flexible document-oriented model suits the dynamic nature of the system's information domain.

Database Structure

MongoDB organizes data into collections, each containing documents in BSON (Binary JSON) format. Here's an overview of the major entities and their representation in MongoDB:

1. User Collection:

- Fields: `_id` (Primary Key), `username`, `role`, `email`, `phone No`, `CnicNo`.

2. Student Collection:

- Fields: `_id` (Primary Key), `enrolled Courses`, `userId` (Foreign Key).

3. Supervisor Collection:

- Fields: `_id` (Primary Key), `supervised Students`, `userId` (Foreign Key).

4. Committee Collection:

- Fields: `_id` (Primary Key), `committee Memberships`, `userId` (Foreign Key).

5. DAC Collection:

- Fields: `_id` (Primary Key), `dacMemberships`, `userId` (Foreign Key).

6. External Examiner Collection:

- Fields: `_id` (Primary Key), `userId` (Foreign Key).

7. Document Collection:

- Fields: `_id` (Primary Key), `author` (Foreign Key), `title`, `upload Date`, `content`, `format`.

8. Thesis Collection:

- Fields: `_id` (Primary Key), `author` (Foreign Key), `title`, `submission Date`, `status`, `feedback`.

9. Presentation Collection:

- Fields: `_id` (Primary Key), `scheduled Date`, `schedule Time`, `location`, `feedback`.

10. Approval Request Collection:

- Fields: `_id` (Primary Key), `request Type`, `requester` (Foreign Key), `submission Date`, `status`, `feedback`.

11. Feedback Collection:

- Fields: `_id` (Primary Key), `author` (Foreign Key), `feedback Date`, `comments`, `annotations`, `suggestions`.

12. Digital Repository Collection:

- Fields: `_id` (Primary Key), `documents`.

Databases/Data Storage Items:

MongoDB stores data in collections, and the relationships between entities are maintained using references. The flexibility of MongoDB accommodates the evolving nature of the "Paperless Graduate Research Management System," providing scalability and adaptability as the system expands.

This MongoDB-based data design ensures efficient storage, retrieval, and manipulation of data, contributing to the system's goal of streamlined and effective management of graduate research workflows.

Relationships:

1. Users and Research Documents:

- Each student has a profile and can submit multiple research documents.

2. Approval Workflows:

- Supervisors, committee members, DAC members, and the Dean are associated with specific approval workflows.
- Research documents are associated with approval workflows.

3. Research Documents and Presentation Schedules:

- Presentation schedules are linked to specific research documents.

4. Feedback Comments:

- Feedback comments are associated with presentations and research documents.

Data dictionary

Object	Attributes	Methods
User	userId: string username: string role: UserRole email: string phoneNo:string CnicNo:String	login(username: string, password: string): boolean logout(): void changePassword(newPassword: string): void viewProfile(): UserProfile
Student	studentId: string enrolledCourses: Course[]	submitResearchProposal(proposal: ResearchProposal): void submitThesis(thesis: Thesis): void submitRequest(request: ApprovalRequest): void viewOwnDocuments(): Document[] viewSupervisor(): Supervisor
Supervisor	supervisorId: string supervisedStudents: Student[]	reviewThesis(thesis: Thesis, feedback: Feedback): void schedulePresentation(presentation: Presentation): void approveRequest(request: ApprovalRequest): void rejectRequest(request: ApprovalRequest): void viewSupervisedStudents(): Student[]

Committee	committeeMemberId: string committeeMemberships: CommitteeRole[]	reviewResearchProposal(proposal: ResearchProposal, feedback: Feedback): void reviewThesis(thesis: Thesis, feedback: Feedback): void
DAC	dacMemberId: string dacMemberships: CommitteeRole[]	approveRequest(request: ApprovalRequest): void rejectRequest(request: ApprovalRequest): void
External Examiner	examinerId: string	reviewThesis(thesis: Thesis, feedback: Feedback): void
Document	documentId: string author: User title: string uploadDate: Date content: string format: DocumentFormat	download(): void
Synopsis/Thesis	proposalId: string author: Student title: string submissionDate: Date status: ProposalStatus feedback: Feedback[]	addFeedback(feedback: Feedback): void
Presentation	presentationId: string scheduledDate: Date scheduledTime: Time location: string feedback: Feedback[]	addFeedback(feedback: Feedback): void
Approval Request	requestId: string requestType: RequestType requester: Student submissionDate: Date status: RequestStatus	approve(): void reject(): void
feedback	feedbackId: string author: User feedbackDate: Date comments: string annotations: string suggestions: string	addComment(comment: string): void addAnnotation(annotation: string): void addSuggestion(suggestion: string): void
Digital Repository	documents: Document[]	uploadDocument(document: Document): void searchDocuments(query: string): Document[]

Software requirements traceability matrix

Table 1 Requirements Traceability Matrix

Req. Number	Ref. Item	Design Component	Component Items
R1-Register Account	Class Diagram	Students	AddStudent()
R2- Login	Class Diagram	Authentication	signinWithEmail() signinWithPassword()
R3- SelectSupervisor	Class Diagram	Supervisor Selection	SelectSupervisor()
R4- Upload Synopsis /Thesis	Class Diagram	Synopsis/Thesis	UploadSynopsis
R5-Check Synopsis/Thesis	Class Diagram	Synopsis/Thesis Checking	CheckPaper()
R6- Feedback/Comment	Class Diagram	Feedback or Comments	Feedback() Accept() Reject() Modification
R7- Seclude Presentation	Class Diagram	Seclude Presentation	SecdulePresentation()
R8-Presentation Feedback	Class Diagram	Presentation Feedback	presentationFeedback()
R9- Approval Request	Class Diagram	Approvel Request	ApprovalReq() AcceptRequest() RejectRequest()
R10-Check Workflow Status	Class Diagram	Workflow Status	Status()
R11- Report Genrate	Class Diagram	Report Genrate	Report()

Human interface design

Graduate Coordinators(ADMIN)

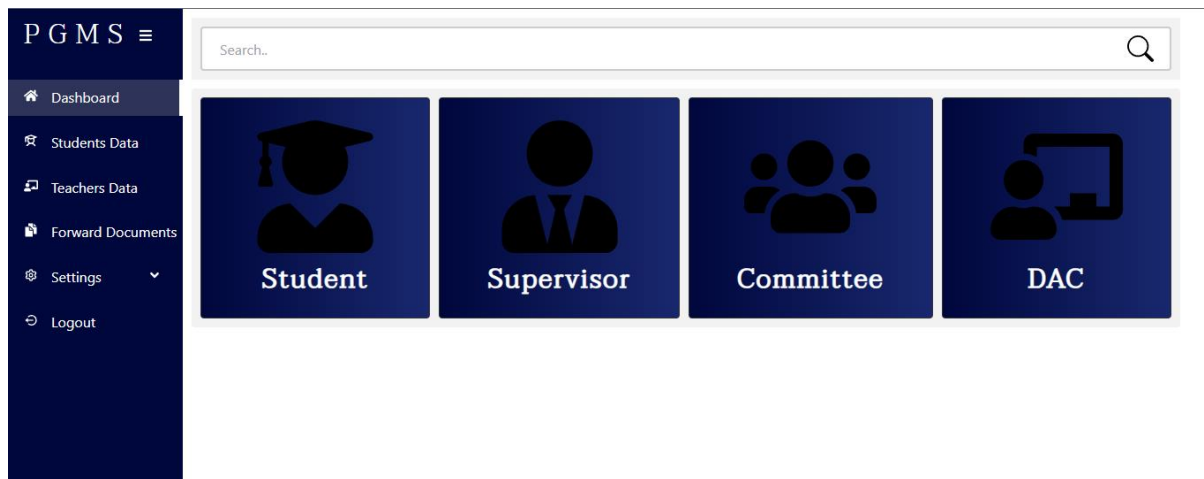


Figure 6.1

PGMS ≡	Students Data								
	Name	Department	Email	Gender	Phone No	Cnic No	Send Password	Update	Delete
Dashboard	Muhammad Umar Abbasi	CS	umarali@gmail.com	male	03246787653	1312456789673			
Students Data	Raja Sheraz	CS	raja@gmail.com	male	03276897672	1328789878928			
Teachers Data	Atiq Ur Rehman	PHM	atiq@gmail.com	male	03567898765	1324567898765			
Forward Documents	Fida Hussain	CVE	fida@gmail.com	male	03245678767	1345678987645			
Settings	Muhammad Umar	SE	umar@gmail.com	male	03232323232	1313131313132			
Logout									
	<div>Prev 1 Next</div>								

Figure 6.2

Student Dashboard

PGMS

Welcome Atiq Ur Rehman

Dashboard

Profile

Proposal Submission

Comments

Application Form

Templates

Setting

Search...

User Information

Name	Atiq Ur Rehman	CNIC	1324567898765
Phone	03567898765	Email	atliq@gmail.com
Department	PHM	Address	Tank, Pakistan

Proposal Status

Submitted

Supervisor Selected

YES

Supervisor Name

Sunda Shujah

Submission Feedback

your project reject

Supervisor committee Acceptance

Accepted

DAC Members Acceptance

Pending

Dean Acceptance

Pending

Figure 7.1

PGMS

Welcome Atiq Ur Rehman

Dashboard

Profile

Proposal Submission

Comments

Application Form

Templates

Setting

Search...

Comments

Comment Date

Comment

View All Comments

Update File

2023-12-10	Hello This Is My First Comments. This Is My Second...	Select	Select
2023-12-12	hello i am muhammad iua r	Select	Select

Figure 7.2

Supervisor Dashboard

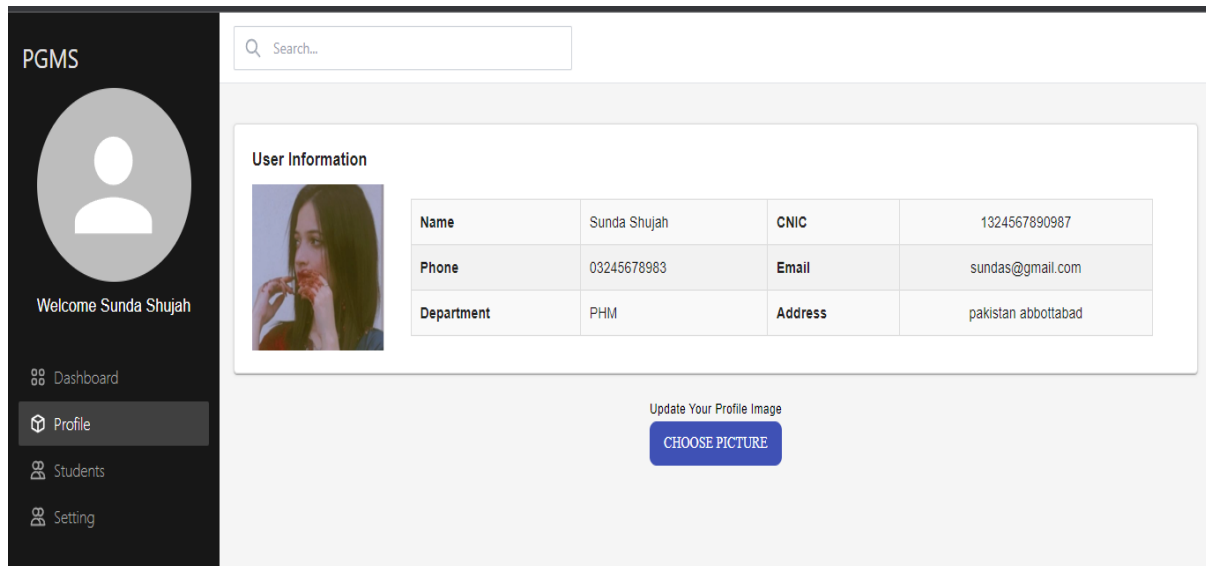


Figure 8.1

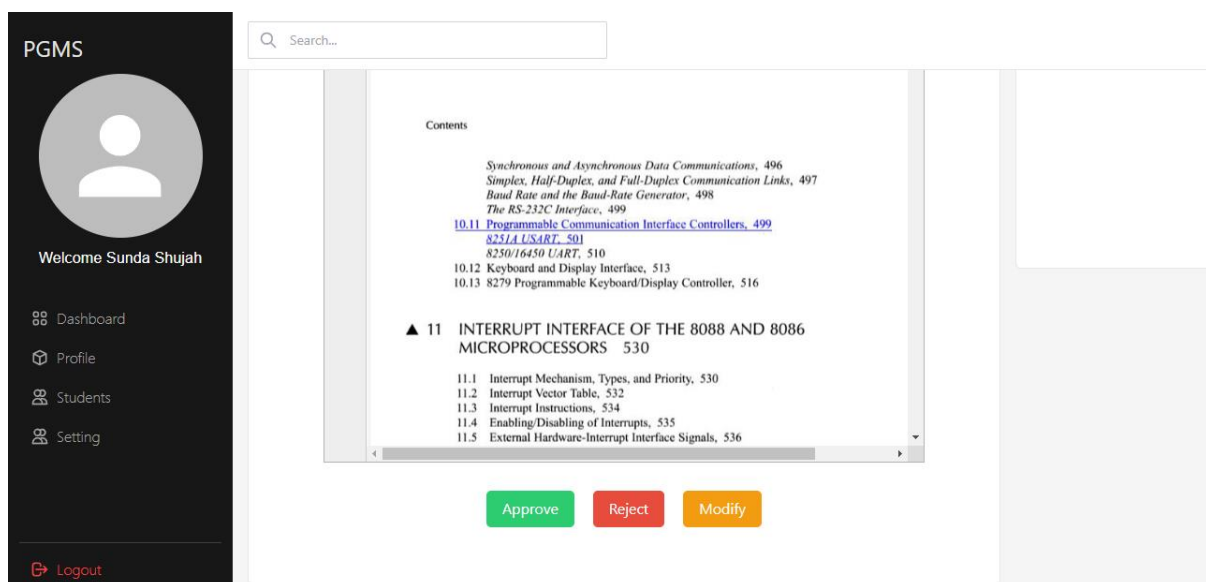


Figure 8.2