BRAUDE
College of Engineering, Karmiel

Capstone Project Phase A
Project Hub
Project code 24-2-D-10

Final Projects Portal: Topics, Partners, Supervisors and more

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Git Repository

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Abstract

In academic settings, final projects are crucial for demonstrating students' skills and knowledge gained during the degree. However, students and lecturers often face challenges accessing and organizing relevant project information. Students struggle to find available topics, identify potential partners, and choose suitable supervisors, while lecturers have difficulties presenting their project topics, managing student inquiries, and overseeing collaborations. Without a centralized and efficient system, these tasks become disorganized, resulting in delays, lower project quality, and frustration for both students and faculty.

To address these issues, we will develop a centralized website specifically for managing final projects. The platform will offer a user-friendly interface that allows students to easily browse available topics, find partners, and select supervisors. It will also provide lecturers with tools to present their projects, manage inquiries, and coordinate with students more efficiently.

The project involves designing and building the website, incorporating advanced search functionality to enhance the user experience, and integrating features that support the needs of students and lecturers. This platform will offer significant benefits to the academic community by improving the organization of final project processes, increasing efficiency, and enhancing the quality of projects. Given the scope of the project and time limitations, we will focus on developing the core features first to ensure a high-quality product.

Keywords:
Task management, Project management, User-Centered Design, Knowledge management, and Web application development.

1. Introduction

The final project is a critical component of the undergraduate curriculum, enabling students to apply theoretical knowledge to practical challenges. However, currently, there is no centralized system for managing these projects, leading to inefficiency and significant challenges that harm the process's efficiency.

To gain a deeper understanding of the existing system and its shortcomings, we conducted interviews with students, faculty supervisors, and administrative staff involved in the final project process. These discussions provided valuable insights that guided our approach to designing a more efficient and centralized management system.

The absence of a centralized platform has led to a reliance on manual processes, such as email communication and information management through Excel spreadsheets and digital forms, resulting in a fragmented and cumbersome workflow. This fragmentation creates numerous challenges for all parties involved: students struggle to access project information, find suitable partners, and navigate the registration process; faculty members face difficulties managing student inquiries, coordinating project schedules, and providing timely feedback, which hampers their ability to support students effectively; and administrative staff is burdened with manual data entry, error-prone processes, and time-consuming tasks, diverting resources away from other essential duties.

Moreover, the current system lacks effective communication, collaboration, and tracking tools, increasing students' stress, adding to the workload for faculty, and imposing a greater administrative burden. These inefficiencies negatively impact the overall quality of the final project experience.

Various institutions have attempted to address these challenges with different approaches. Many rely on email to submit final projects, which leads to disorganization and inefficiency. Some use Learning Management Systems (LMS) like Moodle, which offer basic project management features but often lack the specific functionalities needed for comprehensive final project management. This results in uncoordinated processes that are difficult to track and manage effectively.

We are developing a centralized website dedicated to final projects to address these issues. Our platform aims to differentiate itself from existing solutions by offering a unique combination of features that cater to the specific needs of students, faculty, and administrative staff. The user-friendly interface will allow students to easily access information about available project topics and potential partners, as well as learn about facilitators and their research interests.

Additionally, the platform will provide lecturers with tools to present their topics, manage student inquiries, organize information, and foster collaboration effectively.

As noted in [1], effective web applications should be user-friendly and capable of integrating advanced management and automation features to enhance functionality and reduce manual intervention [1]. Therefore, we propose a solution involving designing and developing a web platform built with modern technologies like React for the front-end and Node.js for the back end, supported by a secure database such as MySQL or MongoDB. The platform will include advanced search algorithms to enhance user experience and integrated collaboration tools like forums to support interaction between students and lecturers. Furthermore, administrative tools will streamline tasks, reduce manual data entry, and ensure user information consistency.

Our project aims to achieve several key goals focused on streamlining the final project management process and improving the accessibility and organization of information. We aim to establish a user-friendly interface that integrates tools for information management, task management, scheduling, and feedback. This will not only make the platform intuitive to use but also ensure that all necessary functionalities are easily accessible.

By enhancing communication among students, supervisors, and administrative staff, the platform will simplify and centralize data management, significantly reducing the administrative workload. It will also facilitate collaboration between students and the management team, enable accurate monitoring of project progress, and ensure prompt responses to inquiries and updates. Achieving these goals will provide a comprehensive solution that improves the overall quality of the final project experience, benefiting all stakeholders in the academic community.

2. Background and Related Work

2.1 Capstone Project Process

Our college's capstone project is divided into 2 phases: Phase A and Phase B, both essential for successful project completion.

Phase A begins with students selecting a project supervisor. Students may either propose their project idea or choose from a list of topics provided by the supervisor. Once a topic is selected, the students submit a formal application to the supervisor for review. This application typically outlines the project's goals, methodologies, and expected outcomes. The supervisor can either approve the project or request revisions based on the application. Upon approval, the project officially commences.

During this phase, students engage in activities such as conducting research, interviews, and data collection. These efforts are documented in a comprehensive project book, which serves as the foundation for a formal presentation. This book is submitted to the supervisor, and students are required to present their findings to a panel, which includes their supervisor and other faculty members. The evaluation process for Phase A consists of two parts: assessment of the project book and the quality of the presentation. Students receive constructive feedback, and any necessary revisions must be addressed before proceeding to Phase B.

After completing Phase A, students move on to Phase B, which focuses on the development and testing of the system or solution that was conceptualized and designed in Phase A. Students refine their work by implementing the system, testing its functionality, and addressing any issues that arise. Upon completion, the final system is submitted alongside a formal presentation. This presentation is again evaluated by the supervisor and lecturers. Grading in Phase B is based on the overall quality of the final system, the project book, and the presentation, with further feedback provided to help students polish their work.

Phase A serves as the foundation for Phase B, ensuring that students enter the development and testing phase with a solid understanding of their project's requirements and goals.

Given the complexity of the capstone project process, it is essential to understand the roles and responsibilities of the various stakeholders involved. Each group plays a vital role in ensuring the project's smooth progression and successful completion. Below is a list of the key stakeholders and their respective roles, which will help clarify their contributions to the overall process and make it easier to understand concepts discussed later in the document.

2.2 Key Stakeholders

Stakeholder	Role
Students	Students are responsible for selecting a research or project topic, conducting research, and developing a solution. They use the system to manage various aspects of their projects, ensuring successful completion of their academic requirements.
Supervisors	Faculty members who mentor, review proposals and assess project books and presentations of students.
Final Project Coordinators and Administrative Staff	Primary users that oversee the entire project process, manage registration, approve proposals, coordinate scheduling, and handle administrative tasks.
Panel Members	Faculty members who evaluate student presentations and provide feedback during the final assessment.

3. Materials and Methods

3.1 Current Project Management System

The final project process is structured into three main parts, each serving a distinct function to ensure the successful completion of the project. These components are illustrated in the Work Breakdown Structure (WBS) chart below, which organizes the project stages (see Figure 1). As outlined in the *Research Project Management Guide*, the WBS allows us to break down large project scopes into manageable tasks, making tracking progress and ensuring timely completion easier [ref]. This organizational tool helps supervisors and students manage their workloads effectively, ensuring each step of the final project process is completed within the set timelines. By structuring the project in this way, the platform addresses the specific needs of users and enhances the overall project management process.

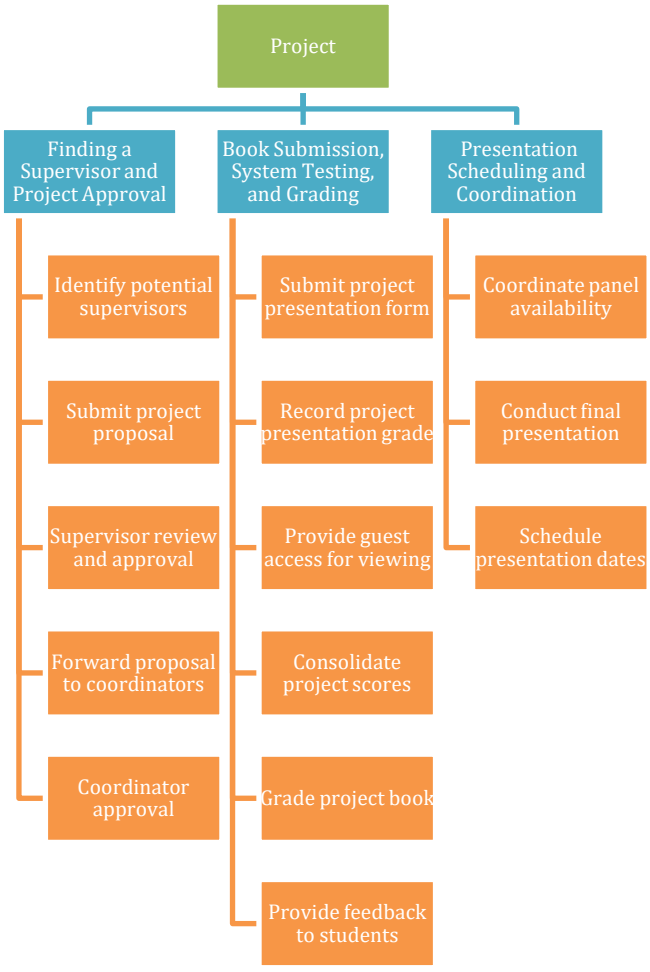

Figure 1: Work Breakdown Structure (WBS) of the Project

Therefore, the three main processes of the capstone project are:

1. **Finding a supervisor and getting approval for the project topic** – In this initial phase, students search for a project supervisor by contacting potential faculty members. Once a supervisor is selected and the project topic is agreed upon, the students submit a project proposal through a Google Form. This form includes the project partners, supervisor details, and project objectives. Upon supervisor approval, the proposal is sent to the project coordinators for final review and approval, which marks the project's official start.

   At this stage, Ora, the department secretary, plays a key role in ensuring that supervisor assignments are correctly recorded and tracked. After students fill out the Google Form, Ora confirms with supervisors whether they are supervising a pair or a single student and updates the supervision information in an Excel sheet. This process is essential for tracking project assignments and reporting supervision hours for salary purposes. Ora also cross-checks this data with Naomi, the project coordinator, to ensure accuracy and consistency between records.

   Additionally, Ora frequently must remind students that registering on the Google sheet does not automatically enroll them in the final project course. Students must still complete registration through the college's official system. A potential improvement would be to integrate an automatic reminder system that prompts students to register for the course once their supervision assignment is confirmed.

   The following activity diagram illustrates the step-by-step process of how students, supervisors, and administrative staff interact during this phase.

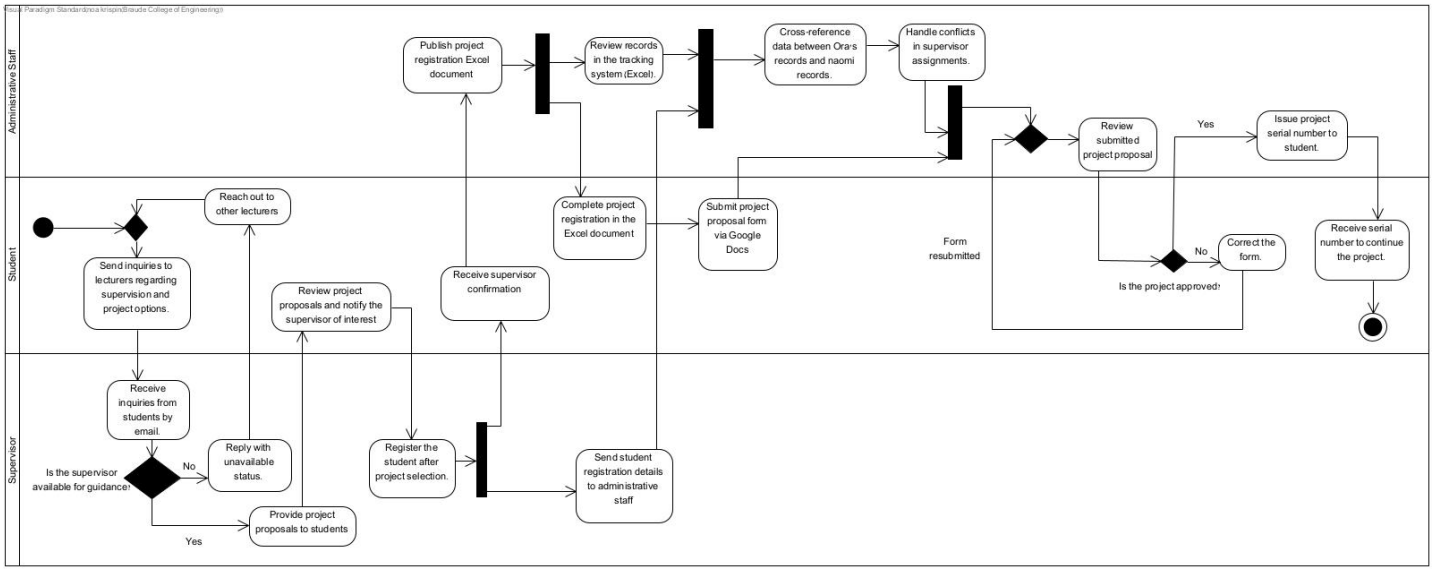

Figure 2: Activity Diagram for the "Finding a Supervisor and Getting Approval" Process. To view an enlarged diagram, click here.

2. **Book submission, system testing, and grading** – At this stage, students conduct research and collect data. After that, they write their project book and, in addition, write an abstract to provide the panel members with background before their presentations. Once everything is ready, the book is submitted for review, and the students present their work to a panel.

   The final grade is composed of three key components:

   1) **Presentation grade:** Evaluated by the panel members based on the quality of the student's presentation.

   2) **Supervisor grade:** Assigned by the supervisor, reflecting the student's overall performance, including their work throughout the project.

   3) **Reviewer grade (Book grade):** Panel members assess the project book and assign a grade based on its quality and completeness.

   Once these individual grades are received from the panel members and the supervisor, the project coordinators combine the scores to calculate the final grade. However, this method can sometimes create delays. For instance, if grades are missing from supervisors or panel members, the project coordinators often only discover the issue when they begin calculating the final grades using the Excel file that tracks each student's scores. In such cases, coordinators must send reminders to ensure that all required grades are submitted, which can lead to delays in delivering the final grades.

   Once all the grades are received, the coordinators calculate the final score and notify the students. If a student wishes to receive feedback on their work, which can be very helpful for Phase B of the project, they need to contact the project coordinators via email. However, due to the large number of projects, manually providing feedback is time-consuming.

The following activity diagram shows how students, supervisors, and administrative staff work together during this phase.

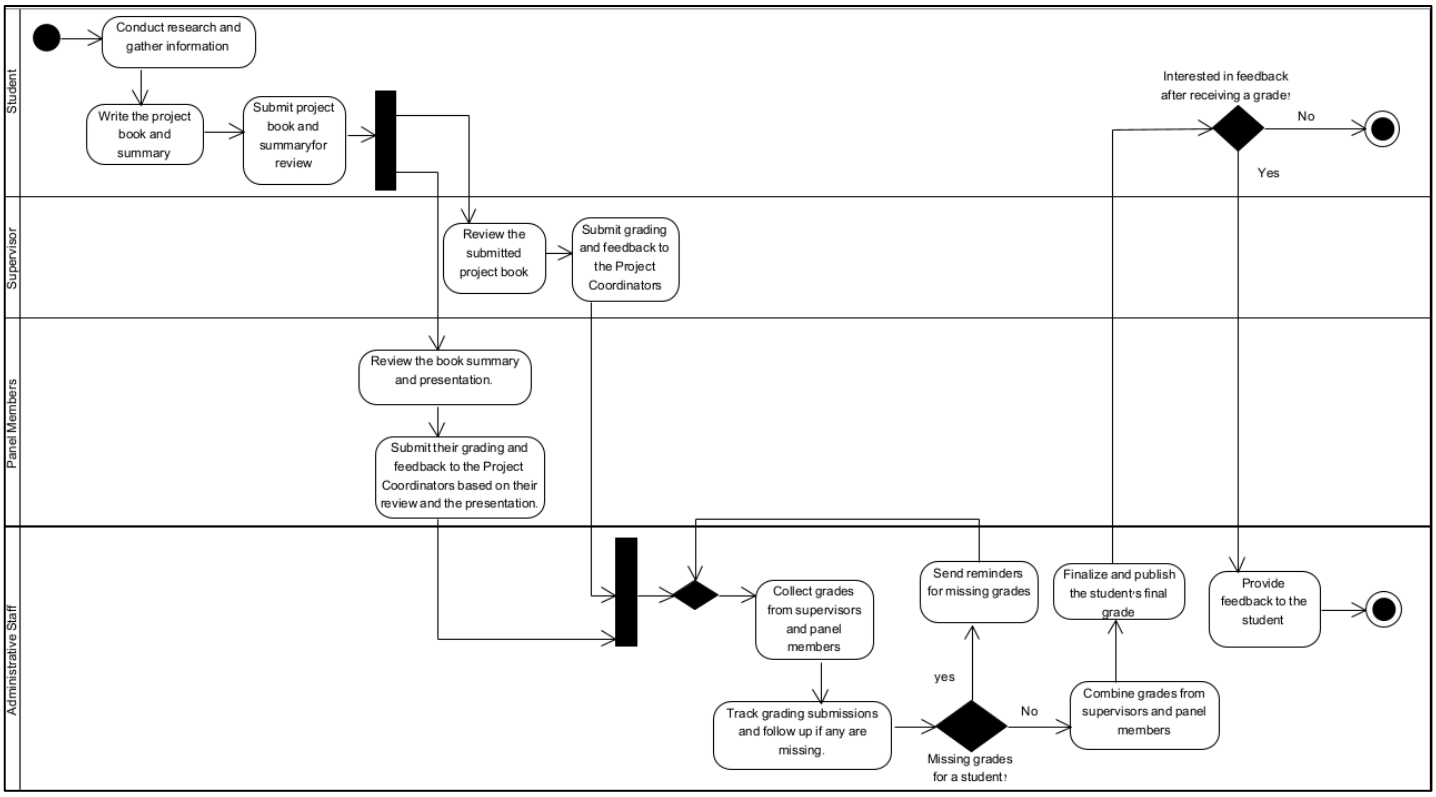

Figure 3: Activity Diagram for the "Book submission, system testing, and grading" Process. To view an enlarged diagram, click here.

3. **Placement for presentations** – This phase involves scheduling the final project presentations with the panel and project coordinators. Students submit abstracts via Google Forms, which the panel reviews to prepare for the presentations. The scheduling considers the availability of both supervisors and lecturers who may not directly supervise students.
   The coordinators handle the placement of panel members manually. First, the coordinators send an email to the supervisors and other lecturers asking for their availability on specific days. Once they gather this information, the coordinators manually match students and panel members for the presentations based on the constraints they received.
   This process can be time-consuming, with the added risk that some constraints might not be submitted. In such cases, coordinators must send multiple reminders to gather the necessary information before finalizing the schedule.

The following activity diagram shows how students, supervisors, and administrative staff work together during this phase.

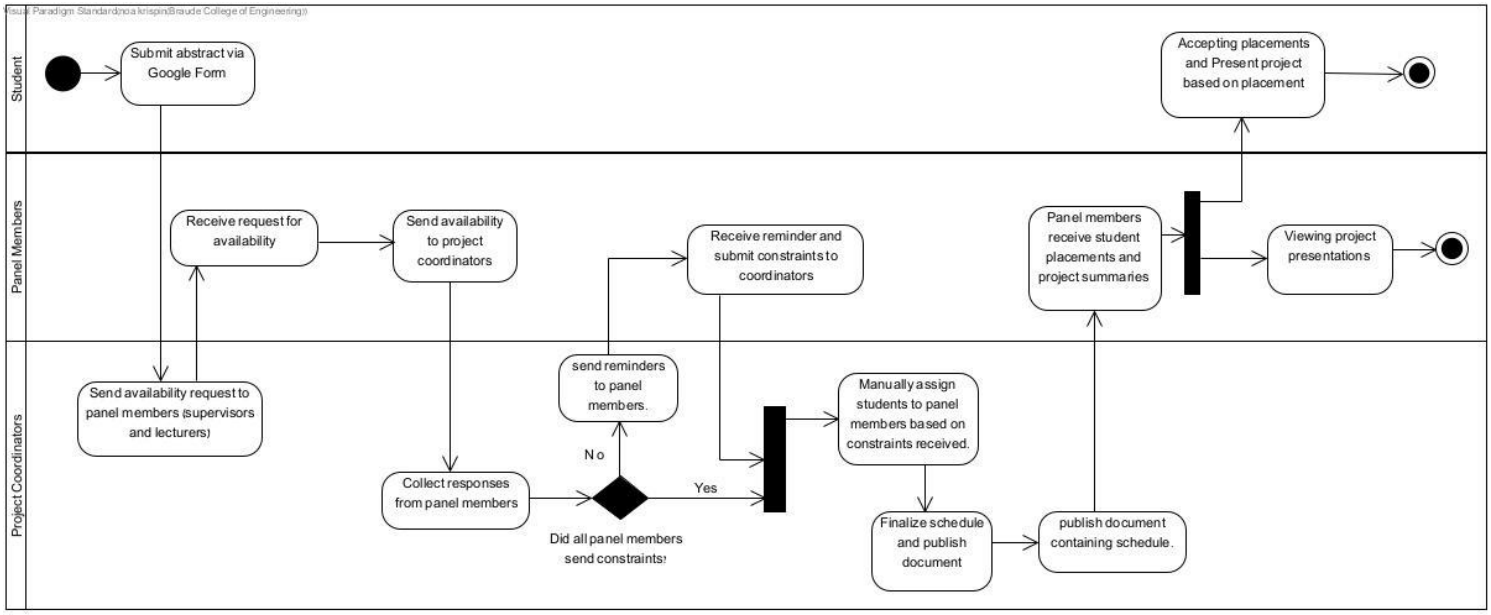

Figure 4: Activity Diagram for the "Placement for presentations" Process. To view an enlarged diagram, click here.

While each part plays an important role in the overall project process and will be characterized in detail, the focus of our development will be on part 2: book submission, system testing, and grading. This stage is where most of the coordination challenges arise, and automating and improving this process can have the greatest impact on the system's overall efficiency.

3.1.1. Personal Experience and Initial Findings

As fourth-year students, we started looking for a final project supervisor toward the end of our third year. Since there wasn't a published list of available supervisors, we had to reach out to multiple lecturers to ask about potential projects. This uncertainty heightened our concern about securing a supervisor on time. After getting in touch with Julia, who became our supervisor, she provided us with a list of possible project ideas.

Recognizing inefficiencies in the current capstone project management system, we decided to develop a centralized website to simplify the management of graduation projects. To better understand the issues faced by everyone involved—students, faculty, and administrative staff—we conducted interviews with key people. We spoke with Naomi, the final project coordinator, and Ora, the administrative manager. Naomi, along with Julia, oversees the project details and student coordination, while Ora handles the administrative

side of things. The feedback from these interviews helped us identify inefficiencies in the system and shaped how we designed our solution.

3.2. Development Process

3.2.1. Interview Process and Key Insights

We began the development process by conducting interviews with key individuals involved in managing the capstone project: Julia, the project coordinator; Naomi, the final project coordinator; and Ora, the administrative manager. These interviews were crucial for identifying weaknesses in the current process and potential areas for improvement.

The interviews followed a semi-structured format, allowing for a natural conversation flow based on the interviewees' responses. This flexibility helped us uncover deeper insights into the challenges and inefficiencies of the capstone project process, including perspectives we hadn't initially considered.

Questions for Administrative Staff (e.g., Ora):

1. "Could you describe the current administrative process for managing information and final project communication?"
2. "What are the main challenges you face in coordinating students, lecturers, and external partners (if any)?"
3. "What improvements would you like to see? Are there any technological solutions that could help?"

Questions for Project Coordinators (e.g., Naomi):

1. "Could you describe your current process for managing final projects and supervising students? How do students currently register and approach facilitators?"
2. "What are the main challenges you face in managing project information and communicating with students?"
3. "How do you currently track and submit grades for final projects? What difficulties have you encountered in this process?"

A. Understanding the Need for Interviews

Our initial conversations highlighted the need for a deeper understanding of the project process. To gather more diverse feedback, we conducted interviews that provided important insights into the weaknesses of the current process, which helped shape the development of our solution.

The open-ended nature of these interviews allowed us to explore issues that were not immediately apparent and provided a comprehensive view of the shortcomings in the existing

process. Reviewing the various forms used in the final project process further highlighted these inefficiencies. Together, the interviews and form reviews gave us a clearer understanding of the current system's inefficiencies, leading to several key insights:

1. **Finding a Supervisor and Getting Project Approval**

- **Lack of centralized communication**: Students and supervisors often rely on different communication channels (email, WhatsApp, Zoom), making it difficult to track interactions effectively. Both coordinators and administrative staff highlighted this as a major inefficiency.
    - **Insight**: A centralized platform for coordinators and administrative staff to manage and track student-supervisor communication would streamline the approval process, reduce the need for multiple communication tools, and provide a clear record for administrative oversight, while allowing supervisors to communicate using their preferred methods.

- **Manual tracking of student-supervisor pairings**: Administrative staff manually track student-supervisor pairings, which can lead to errors and inefficiencies.
    - **Insight**: Automating the pairing process and providing a dashboard for monitoring would significantly reduce manual work and improve accuracy.

2. **Book Submission, System Testing, and Grading**

- **Difficulty in tracking progress**: There is no streamlined way to monitor student progress. Coordinators and administrative staff must manually check in with students, which is time-consuming and inefficient.
    - **Insight**: A system that allows coordinators and administrative staff to track student progress and receive automated reminders would streamline project management, without requiring supervisors to continuously monitor the system.

- **Manual data entry for grades**: Project coordinators and administrative staff manually enter grades from supervisors and panel members, often leading to delays when not all grades are submitted on time.
    - **Insight**: Integrating a grading module that allows supervisors and panel members to submit grades directly through the system would reduce delays, improve accuracy, and eliminate manual data entry.

3. Scheduling Presentations

- **Scheduling challenges**: Coordinating the availability of supervisors, panel members, and students for final presentations is logistically difficult, often resulting in back-and-forth communication and delays.
    - **Insight**: Implementing a scheduling feature that synchronizes the calendars of all parties involved would streamline the process and reduce delays.

- **Submitting abstracts and preparing for presentations**: Students submit project abstracts via Google Forms, which panel members review before the presentations. This process is time-consuming and lacks integration with the main system.
    - **Insight**: A fully integrated abstract submission process that connects directly to scheduling and presentation preparation would improve efficiency and reduce administrative workload.

These insights offered a detailed view of the system's shortcomings and reinforced the need for a centralized platform to streamline communication, reduce manual data entry, and improve tracking capabilities for students, supervisors, and administrative staff.

B. Understanding the context of use (domain and definition stakeholders)

By implementing the Work Breakdown Structure (WBS) early in the process, we were able to break the project's large scope into manageable tasks. This structured approach provided a clear overview of each phase and helped align the tasks with the needs of students, lecturers, and administrative staff. Each group has unique requirements that must be addressed for the system to function effectively:

1. **Students** need an intuitive platform to find project topics, connect with supervisors, and track their progress throughout the project lifecycle.
2. **Lecturers** require tools to efficiently manage project topics, respond to student inquiries, monitor project development, and handle submissions.
3. **Administrative staff** need a system that simplifies data management, reduces errors, and improves process efficiency.

Using WBS ensured that each part of the process was manageable and trackable, allowing supervisors and students to stay on top of deadlines. The result is a system that enhances workload management and ensures that every step of the final project process is completed on time.

By analyzing these specific needs, we aimed to design a system that integrates smoothly into existing workflows, addressing the distinct challenges of each stakeholder group while significantly enhancing overall process efficiency.

C. Problem Analysis

1. Finding a Supervisor and Getting Project Approval

- Registration and Matching Process: The current registration process is fragmented and often confusing for students. They must contact potential supervisors via email and separately register for the course at an information station. This can lead to students mistakenly believing that email confirmation from a supervisor is equivalent to course registration, which is not the case. Misunderstandings also arise from the assumption that registration for Phase A automatically enrolls them for Phase B, causing students to miss important registration steps for the next phase.

- Information Management and Accessibility: There's a lack of a centralized information hub, making it difficult for students to access comprehensive information about project options and supervisor availability. Currently, students view available projects and supervisors via a shared Google sheet (see Figure 5), and then details are entered manually into a shared Google Docs form by students, which is then managed through separate Excel sheets by administrator (see Figure 6).

name	surname	email	Key interests	פים
רנטה	אברוס	ravros@ .ac.il	text classification, generated adversarial networks (GAN), natural language processing (NLP)	0
נעמי	אונקלוס-שפיגל	naomius@braude.ac.il	requirements engineering, augmented reality,internet of things - IoT, gamification, motivation,engagement	0
סמאח	אידריס	Samahl@braude.ac.il	search engine,data classification	0
סטפני	גליק	stephanieg@braude.ac.il	Learning analytics Business Information	1
ענת	דהן	anatdhn@braude.ac.il	Brain recordings, human movement, rehabilitaion, machine learning	0
אלעד	דננברג	eladd@braude.ac.il	Space situational awareness, Evolutionary Algorithms, Industry 4.0	1
(ולדימיר (זאב	וולקוביץ	vlvolkov@braude.ac.il	deep learning, text classification, image restoration, convolutional neural networks (CNN)	0
מירי	וייס-כהן	miri@braude.ac.il	Deep Learning, image processing, genetic algorithms	0
רונן	זילבר	RonenZ@braude.ac.il	image recognition, deep learning	0
איליה	זלדנר	ilyaz@braude.ac.il	AI, deep learning, image feature extraction	0
שמואל	זקס	shmuel.zaks@braude.ac.il	algorithms in distributed computing, self stabilization and networking , combinatorics and graph theory algorithms and generation,	0
דבורה	טולדנו-קטעי	dvora@braude.ac.il	text classification, graph neural networks	0

Figure 5: Overview of the Facilitator List form and the associated projects in Google Docs.

L	M	N	O
רישום לפרויקטים			נא להרשם רק לאחר קבלת מייל מהמנחה כי אכן ההנחיה מאושרת!
נא לא לרשום תז!			
שם סטודנט 1	שם סטודנט 2	מנחה 1	מנחה 2 (אופציונלי)

Figure 6: Student registration form for an instructor in Google Docs.

- Facilitator Registration (Parallel to Student Registration): As students register in Naomi's Google form, facilitators are simultaneously sent a registration form by the secretariat. This form is used to confirm the supervisor's details and the project information. The facilitator's form is crucial for ensuring accurate records and maintaining consistency across registrations, though the process of manually cross-checking both student and facilitator entries can lead to delays (see Figure 7).

המחלקה להנדסת תוכנה ומערכות מידע

טופס דיווח מנחים לצורכי שכר - סמסטר א'

יש למלא את הטבלה המצ"ב ולשלוח במייל ל orad@braude.ac.il

פרויקט מסכם שלב א' סימול קורס 61998

עמודה	סטודנט 1	ת.ז	סטודנט 2	ת.ז	מנחה 1	מנחה 2	סה"כ ש"ש (ימולא ע"י המשרד)
1							
2							

Figure 7: Registration form sent by the secretariat to the facilitator for project confirmation and additional information.

2. Book Submission, System Testing, and Grading

- Administrative Inefficiencies: The manual tracking of project submissions and the grading process involve multiple systems, leading to potential delays and inaccuracies. Administrative staff must navigate between Google Docs, Excel spreadsheets, and direct email communications to manage submissions and grade entries effectively.

- Grading and Feedback Issues: The process of collecting and processing grades is hindered by the lack of timely submissions by supervisors, which are often only discovered during the final grade compilation. The absence of an integrated system for feedback dissemination forces students to seek comments directly from coordinators, further complicating communication.

3. Scheduling Presentations

- Scheduling Challenges: Coordinating the availability of supervisors, panel members, and students for final presentations is cumbersome due to the reliance on emails and manual scheduling. This often results in delays and the need for multiple follow-ups to confirm availability and resolve scheduling conflicts.

- Communication and Collaboration Challenges: Without an effective centralized communication platform, there is increased email traffic, which can lead to delayed responses and miscommunication. Implementing a unified system with real-time messaging and notifications would streamline interactions and ensure that all stakeholders are kept informed of schedule changes and other important updates.

D. Proposed Solutions for Each Phase

1. Finding a Supervisor and Getting Project Approval

- Centralized Platform for Registration: Implement a unified platform where students can view project topics posted by facilitators in one central location. Each project idea will have additional details, allowing students to gain more information about the topic before selecting a supervisor. This will streamline the process and provide students with clarity regarding available projects.

- Automated Supervisor Matching: Implement an automated system to handle supervisor approvals and student registration. This system will track supervisor availability in real-time and send notifications for approval, streamlining the matching process and reducing reliance on manual communication.

- Integration of Facilitator and Student Registrations: Ensure both student and facilitator registration forms are linked within the same system. This integration allows real-time cross-checking and automatic updates when a supervisor approves a project, reducing delays caused by manual cross-referencing.

- Facilitator Reminders: Implement reminders for facilitators regarding student registrations or project approvals to ensure timely responses and reduce administrative delays in moving forward with project approvals.

2. Book Submission, System Testing, and Grading

- Centralized Grading and Feedback Module: This system will allow panel members and supervisors to submit grades and feedback directly through the platform, eliminating the need for manual data entry and reducing delays. The module will automatically track submissions and remind any panel members or supervisors who haven't submitted their grades. This centralized platform will not only calculate grades efficiently but will also provide students with quick access to their final grades and feedback.

- Progress Tracking for Students: Introduce a progress tracking feature, where coordinators and supervisors can monitor student's work. The system would send automated reminders to supervisors if any important milestones, such as progress reviews or updates, are missed.

- Feedback Request Automation: Allow students to request feedback from supervisors or panel members through the platform after receiving their grades. This feature will enable project coordinators to handle feedback more efficiently, as they will no longer need to manage individual email requests.

3. Scheduling Presentations

- Automated Scheduling Tool: Implement an automated scheduling feature that collects availability from facilitators, panel members, and students and automatically generates presentation schedules based on constraints. This will reduce manual scheduling tasks for project coordinators and decrease the risk of scheduling conflicts.

- Real-Time Notifications: Provide real-time notifications to students, supervisors, and panel members about their scheduled presentation times. Instead of sending individual emails, a centralized embedded document can be continuously updated and viewed by all parties involved.

- Project Summary for Panel Members: Once students are assigned to panel members for their presentations, the platform will automatically send the project summaries to the panel members in advance. This will ensure that panel members are fully prepared for the presentations, allowing them to review the student's work beforehand and provide more informed evaluations during the session.

By introducing a centralized platform and automating key processes such as registration, grading, and scheduling, the proposed solutions will enhance efficiency, reduce errors, and improve the overall experience for students, supervisors, and coordinators. These changes address the main challenges identified in each phase of the final project process.

E. Specify User Requirements

To ensure that the system meets the specific needs of its users, we divided the requirements according to the three parts of the system. This focused approach allows us to address the unique challenges faced by administrative staff and project supervisors, streamlining workflows and increasing efficiency throughout the process.
Administrative staff play a central role in coordinating the entire project process, and their requirements focus on efficient management and reducing manual workloads. Supervisors are responsible for managing project topics, reviewing student progress, and providing timely feedback.

The user requirements for each part are:

1. Finding a Supervisor and Getting Project Approval

Administrative Staff Requirements

- Registration and Tracking Tools: The ability to monitor student registrations, supervisor assignments, and project proposals in real-time, including features for tracking approvals and updates.

- Task Automation: Automation of routine administrative tasks, such as sending reminders to students and supervisors for project approvals and registrations.

- Reports and Analytics: The ability to generate reports on registration statuses, supervisor workloads, and overall project assignments to monitor the system's health and detect potential issues early "*Web Application Development: Process, Tools, & Examples*" highlights how automation and analytics features in web platforms provide key insights for optimizing workflows (BrowserStack, 2024).[1]

Project Supervisors Requirements

- Project Management Tools: Options to post, update, and manage project topics, allowing students to browse and select from an up-to-date list of projects.

- Proposal Review and Approval: Simple tools to review, approve, or request revisions for student proposals, with options to track approvals.

2. Book Submission, System Testing, and Grading

Administrative Staff Requirements

- Grading Automation: Automatic calculation and weighting of grades, optimizing the grading process for project coordinators, reducing delays, and minimizing manual input.

- Progress Tracking: Features for tracking project submission status and sending automated notifications to ensure that all required documents (e.g., project books) are submitted on time. *Nwanakezie & Ogona* (2021) emphasize that performance tracking is critical in educational task management, as it allows supervisors to provide timely interventions and guide students toward project completion.[3]

- Feedback Management: A streamlined feedback-handling system where students can request feedback through the platform, making the process more efficient for coordinators to manage and deliver feedback. According to *Nwanakezie & Ogona* (2021), structured feedback mechanisms and clear monitoring of task progress are essential for ensuring that educational projects are completed efficiently and successfully.[3]

Project Supervisors Requirements

- Submission Review: Easy access to student submissions and the ability to provide grades and feedback through the platform.

- Grade Submission Tools: Direct access to submit grades for each phase, reducing the need for emails and manual grade entry.

3. Scheduling Presentations

Administrative Staff Requirements

- Automated Scheduling Tools: A scheduling module that collects availability from panel members, supervisors, and students and automatically generates the final presentation schedule.

- Real-Time Notifications: Notifications to update panel members, supervisors, and students about the presentation schedule, ensuring that all parties are informed of updates.

Project Supervisors Requirements

- Availability Management: Tools to input their availability for presentations, ensuring that schedules are seamlessly coordinated with project coordinators.

By tailoring the user requirements to the specific phases of the project management system, we have ensured that the system will effectively meet the needs of both administrative staff and supervisors. This focused division enables efficient task management, reduces manual effort, and streamlines the coordination of activities throughout the project lifecycle.

The following flowchart **(Figure 8)** illustrates how the requirements for **Part 2: Book Submission, System Testing, and Grading** will be addressed within the system.

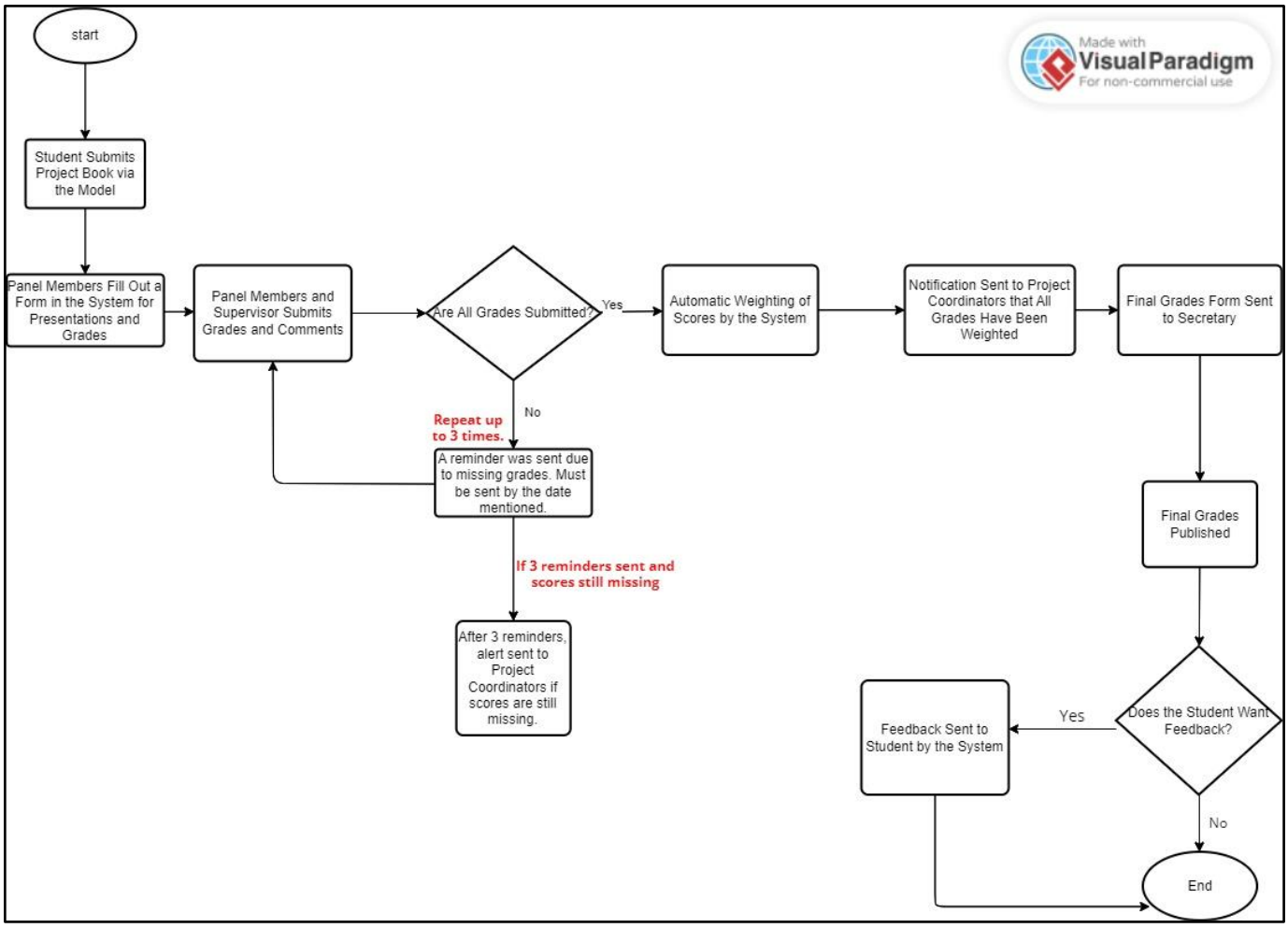

Figure 8: illustrates the process of submitting project books, checking them, and assigning grades through the system.

3.3 Design Solution - the product (architecture, UC, etc.)

3.3.1 Overall Architecture

The platform is designed using a three-tier architecture that separates the front end, back end, and database layers. This approach enhances modularity, scalability, and maintainability.

1. **Front end (Client-Side):** Developed using React, the front end delivers a dynamic and responsive user interface. React's component-based structure allows for reusable UI components such as forms, dashboards, and search interfaces. This modular design ensures consistent user experience and smoother data flow between the interface and back end.

2. **Back end (Server-Side):** The back end, built with Node.js, manages server-side logic and data processing. It handles tasks such as user authentication, project data handling, and communication between the front end and the database. Node.js enables efficient handling of concurrent requests, ensuring the platform's scalability and reliability as user demand grows.

3. **Database**: The choice of database—either MySQL or MongoDB—depends on the specific requirements of the data model:
    i. **MySQL**: A relational database ideal for structured data, complex queries, and transactional operations. It excels in scenarios where data relationships are predefined and require robust transactional support.
    ii. **MongoDB**: A NoSQL, document-based database that offers flexibility for handling unstructured or semi-structured data. It is suitable for systems that need to adapt rapidly to changing requirements.

Both database options provide secure, reliable data storage and retrieval, ensuring the platform operates smoothly regardless of scale.

The following diagram (**Figure 9**) visually represents the three-tier architecture discussed above, showing how each component interacts across the client-side, server-side, and database layers.

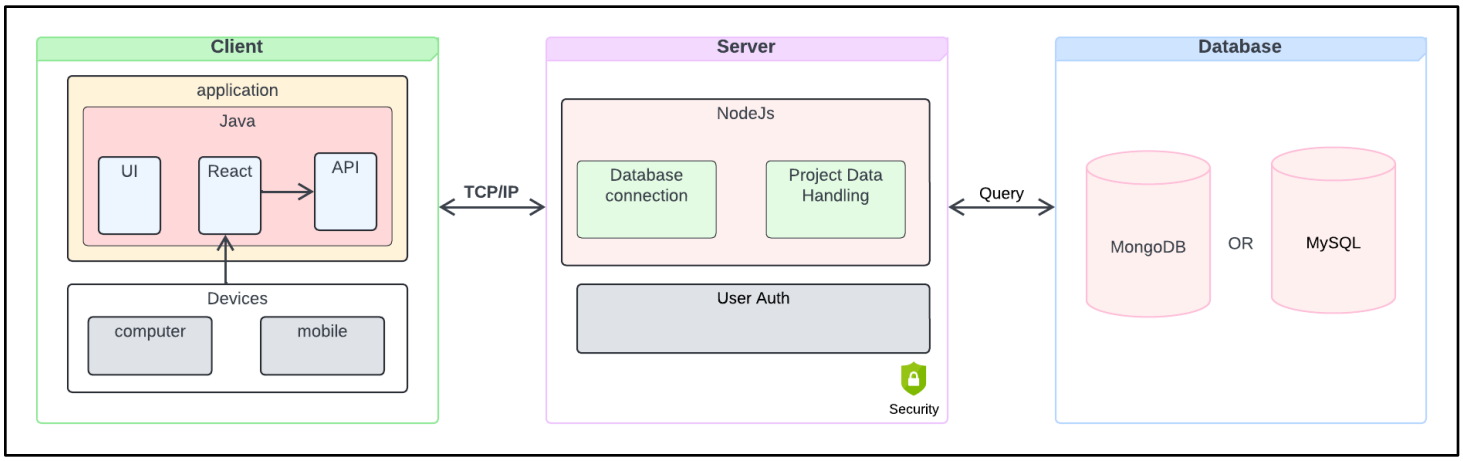

Figure 9: Three-Tier Architecture Diagram Showing Client-Side, Server-Side, and Database Interactions.

A. User Interfaces by System Part

This section presents the user interfaces relevant to part 1 and part 2 of the system, focusing on how students, lecturers, and administrative staff interact with the project management platform during these phases.

Part 1: Finding a Supervisor and Getting Project Approval

Student Interface

- Project Discovery: Students can browse available project topics by category, research area, or supervisor, streamlining the process of finding suitable projects.
- Application Management: A feature where students can apply for a project, track their application status, and receive supervisor feedback.

Supervisor Interface

- Project Management: Supervisors can post and update available project topics, making them visible to students.
- Application Review: Supervisors have tools to review student applications, approve or reject them, and provide feedback or revisions.

Administrative Staff Interface

- Registration and Tracking shows the main project management interface for administrative staff (project coordinators). The coordinators can view a list of all ongoing projects, including the project title, students involved, assigned supervisors, and the status of the project (e.g., "Approved," "Unassigned," or "Not Approved"). This interface allows staff to keep track of which students and supervisors are engaged in each project, ensuring smooth coordination across all stages of the project**. (see Figure 11)**

- Search and Filter Options: At the top of the interface, project coordinators can filter and search projects by title, student name, or supervisor using the search bar, making it easier to locate specific projects or review the status of certain students. The tabs at the top ("All," "Unassigned," "Approved," "Not Approved") allow for quick filtering based on the project's approval status, further streamlining the workflow.

- Reports and Analytics: Real-time data on student registrations, project approvals, and supervisor assignments to ensure the smooth functioning of the system.

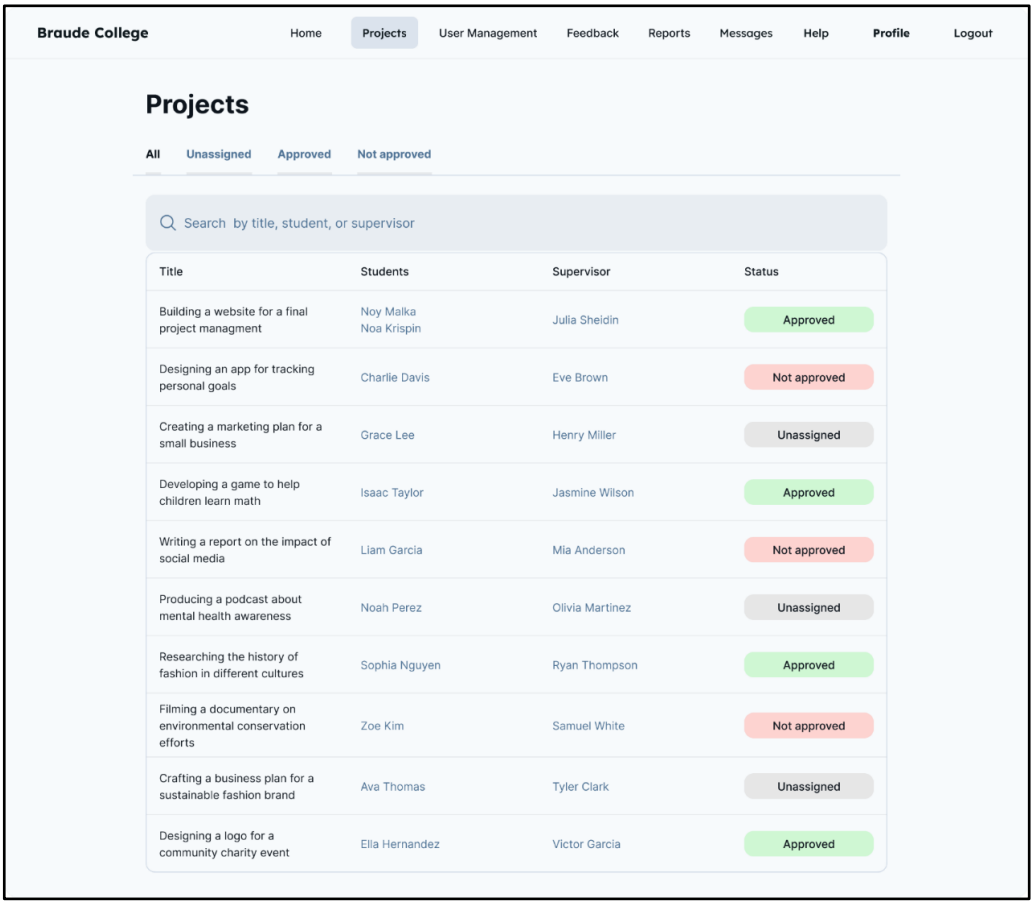

Figure 11: Project Tracking page for administrative staff.

Part 2: Book Submission, System Testing, and Grading

Student Interface

- Document Submission: A system for students to submit project abstracts and final project books. Students can upload required documents efficiently within a clear deadline.
- Notifications: Students receive automated notifications and reminders about submission deadlines and other important updates related to the grading process.

Supervisor Interface

- Submission Review: Supervisors can review student submissions, such as project books or abstracts, and submit grades and feedback directly through the platform.
- Grading Tools: Tools to help supervisors input and calculate grades efficiently for each stage of the project.
- Panel Members Interface
- Evaluation and Feedback: Panel members can review student project submissions and presentations, provide feedback, and submit grades. This streamlines the evaluation process and ensures all data is centralized.

Administrative Staff Interface

- Grading and Feedback Management: The interface allows project coordinators to efficiently track the grading progress of each project, ensuring that all required grades are submitted on time. The system provides a clear overview of the grading status for each project, displaying key metrics such as presentation grades, book grades, and supervisor grades, along with the overall status (e.g., "Fully Graded," "Partially Graded," or "Haven't Graded"). This offers a comprehensive summary of final grades for all projects, including the submission status and feedback options **(Figure 12)**. Furthermore, this enables coordinators to monitor the completion of grading tasks, ensuring that no project is left ungraded, and that feedback is provided where necessary. When all the final grades are weighted, the project coordinator will be able to submit them to the secretary.

- Reports and Notifications: The system generates automated reports on the submission statuses of grades, final grades, and feedback, allowing project coordinators to track the progress of each project's grading process. Coordinators can view which projects are fully, partially, or not yet graded and send reminders to supervisors who have not completed their grading tasks. The interface also allows the scheduling of reminders and tracks the history of previously sent notifications, ensuring no delays in grade submissions **(Figure 13)**. This system helps ensure that grading is completed efficiently and in a timely manner.

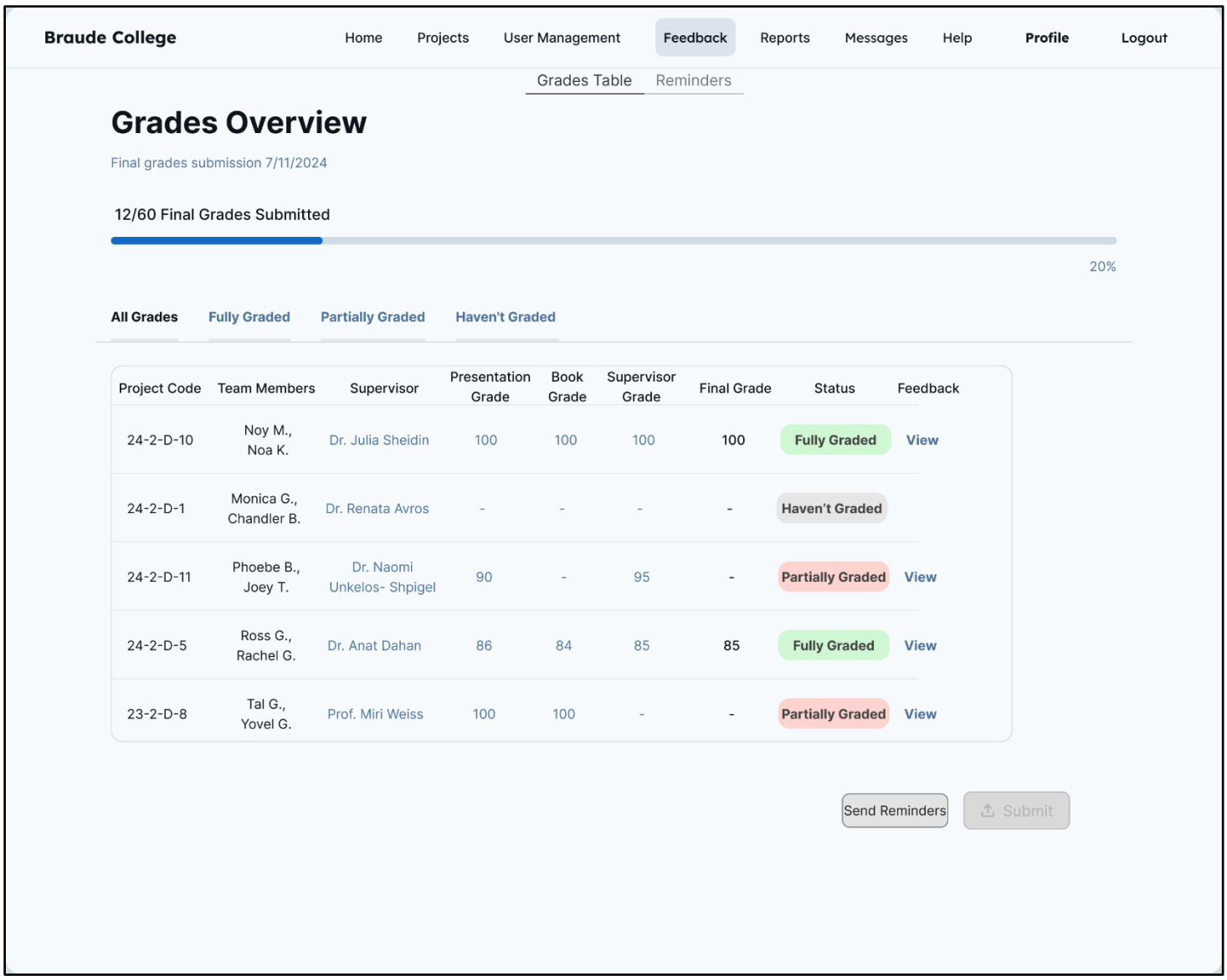

Figure 12: Reports and Notifications for project coordinators

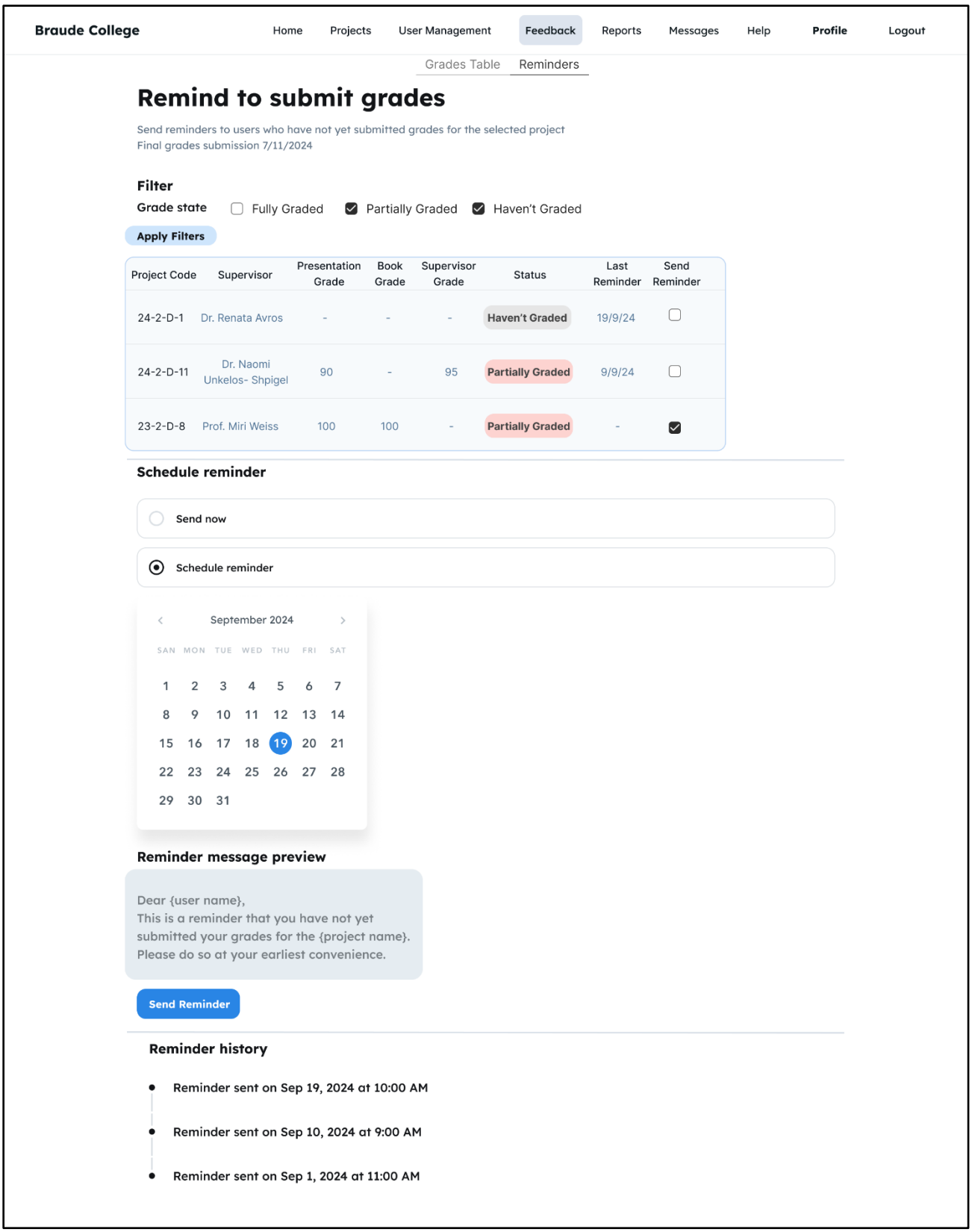

Figure 13: Grading and Feedback Management for project coordinators.

B. Use case

The use case highlights how students, supervisors, and administrative staff interact with the platform to manage tasks throughout the final project lifecycle. Below are the key processes divided according to the three parts of the system for clarity:

1. **Finding a Supervisor and Getting Project Approval**
   - Student-Supervisor Interaction: Students browse through available project topics and submit applications to supervisors. To prevent overlapping applications, the system limits students to one application at a time. Supervisors review the applications, approve or reject them, and update the system accordingly. Notifications are sent to students about their application status via their dashboard, keeping them informed of their progress.
   - Administrative Role: Administrative staff oversee the registration process, monitor project approvals, and ensure that supervisors and students are assigned correctly. Reports and real-time data tracking tools enable administrators to monitor registration statuses and resolve any issues as they arise.

2. **Book Submission, System Testing, and Grading**
   - Feedback and Grading: Supervisors and panel members review submitted project documents, such as abstracts and project books, and provide feedback through the platform. The grading process is streamlined, with grades entered directly into the system by the appropriate lecturers and panel members. The system tracks grading progress and sends reminders to supervisors and panel members if any grades are missing. Once all grades are submitted, the system calculates the final score, notifying both students and administrative staff about the result.
   - Administrative Role: Administrative staff track submission statuses, ensure all required documents are submitted, and verify that grading is completed in a timely manner. They generate reports on submission progress and track any delays in the grading process to intervene when necessary.

3. **Scheduling Presentations and Communication**
   - Communication and Scheduling: The platform facilitates smooth communication and scheduling between students and their supervisors, reducing reliance on external tools like email. Notifications and reminders are automatically sent out for key milestones such as submission deadlines and scheduled meetings. Real-time messaging allows for direct interaction between students and supervisors, with all communications stored within the system for future reference.

- Administrative Role: Administrative staff manage the scheduling process, ensuring that supervisors, panel members, and students are informed of presentation dates and times. They also handle any changes or updates and track the communication history to ensure the process runs smoothly.

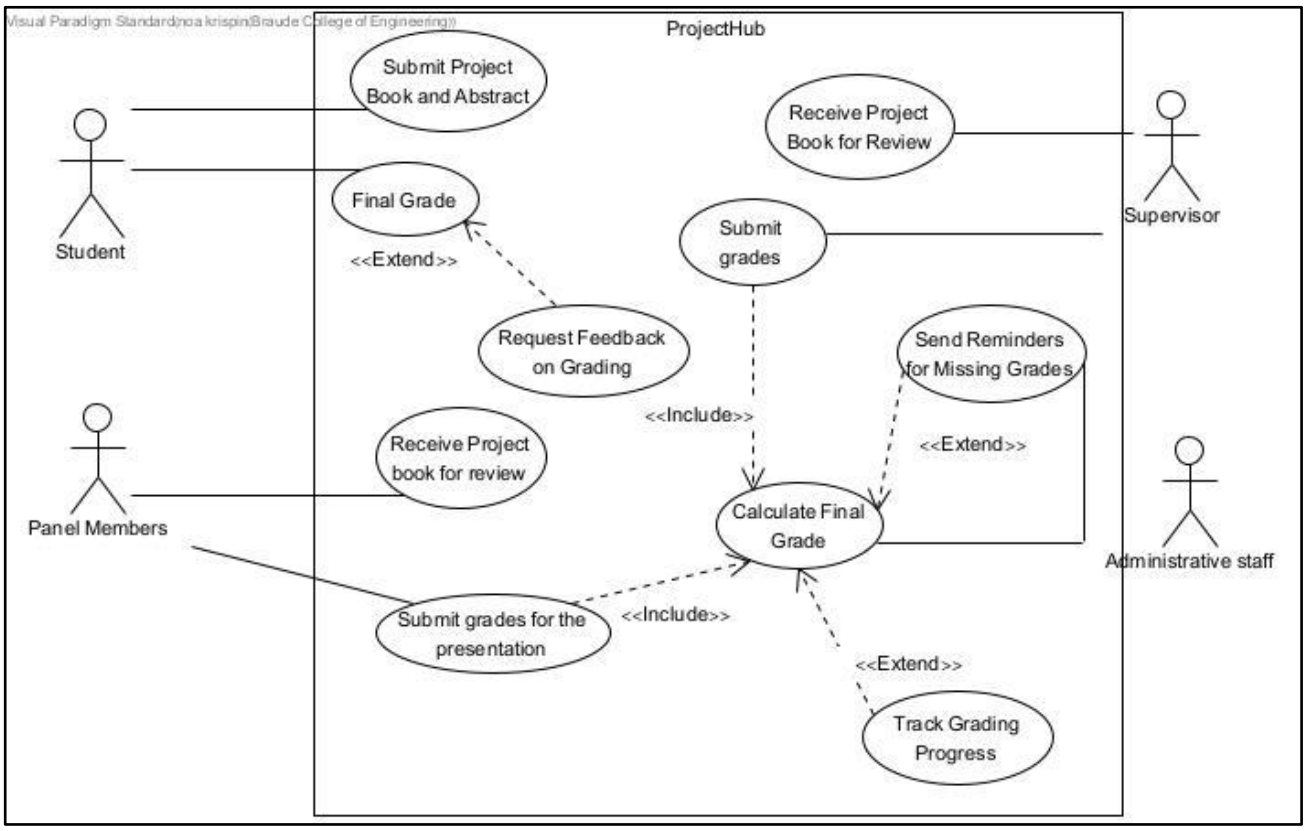

Figure 14: Use Case Diagram for Book Submission, System Testing, and Grading

3.4 Expected Achievements

To evaluate the success of the project, several key criteria will be considered. These criteria will ensure the platform meets both the functional requirements and the overall goals of improving the final project management process. The criteria are divided according to the three main parts of the system: Finding a Supervisor and Getting Project Approval, Book Submission, System Testing, and Grading, and Scheduling Presentations and Communication.

1. **Finding a Supervisor and Getting Project Approval**

Core Functionality

Measurable Criteria:
The platform must include essential features such as project browsing, student-supervisor matching, and administrative tracking of approvals.

Success Measurement:

- 95% of students and supervisors should successfully match within the first two weeks of the project registration period.
- Reports generated by the system must show complete and accurate records for each student within the registration period.
- User logs must show no significant delays or failed submissions during the registration process.

Usability

Measurable Criteria:
The registration and matching interface must be intuitive and user-friendly for both students and supervisors.

Success Measurement:

- Conduct usability testing, with at least 90% of users completing the registration and matching process without assistance.
- Gather survey responses from users, aiming for a satisfaction rate of over 80% in terms of ease of use.
- Measure the average time spent on key tasks (e.g., project registration), targeting a completion time of under 5 minutes for each task.

2. Book Submission, System Testing, and Grading

Grading and Feedback Automation

Measurable Criteria:
Grades and feedback must be submitted and processed efficiently with minimal manual intervention.

Success Measurement:

- 80% of grade submissions must be processed and recorded within a week of panel member input.
- Automated reminders should reduce the rate of missing grades by at least 80% compared to the previous process.
- Surveys should show that 90% of users are satisfied with the feedback submission process, enjoying the ease of submitting, receiving, and managing feedback directly through the system.

Error Reduction and Efficiency

Measurable Criteria:
The platform should reduce the time spent on manual processes and the occurrence of errors during submission and grading.

Success Measurement:

- A 50% reduction in errors previously caused by manual processes, which will now be automated in the new system.
- Administrative staff should report a 50% or more reduction in time spent managing project submissions and grade entries.

3. Scheduling Presentations and Communication

Automated Scheduling Efficiency

Measurable Criteria:
The scheduling of presentations must be automated and conflict-free.

Success Measurement:

- 100% of panel member availability should be collected and scheduled within 48 hours.
- At least 80% of scheduling should be completed without manual intervention by administrative staff.

User Interaction Flow

Measurable Criteria:
Interaction between students, supervisors, and administrative staff must be seamless and efficient, ensuring that all participants are informed of key deadlines and schedules.

Success Measurement:

- Notifications must be successfully delivered to 100% of users for all scheduled presentations and important deadlines.
- Response rates for notifications (such as meeting schedules and feedback requests) should be above 90% within 48 hours.

4. General Success Criteria

User Adoption and Satisfaction

Measurable Criteria:
High adoption rates and satisfaction from all user groups—students, supervisors, and administrative staff—will be key indicators of success.

Success Measurement:

- Target a 90% adoption rate for students and staff within the first month of launch.
- Post-launch user surveys should indicate an overall satisfaction rating of 85% or higher across all user groups.

Impact on Project Quality

Measurable Criteria:
The system should facilitate high-quality project outcomes by enabling better communication, faster feedback, and smoother processes.

Success Measurement:

- 80% of students should report improvements in project management compared to previous processes.
- Supervisors should observe a 50% increase in the timeliness and quality of project submissions.

Scalability

Measurable Criteria:
The platform must be scalable to accommodate increasing numbers of users without performance degradation.

Success Measurement:

- The system must be able to scale to handle up to 500 projects concurrently without impacting user experience.
- Testing should demonstrate smooth performance even with 100% increases in user load during peak times.

User Training and Support

Measurable Criteria:
Effective user training and support resources should be provided to ensure smooth adoption.

Success Measurement:

- At least 90% of users should report that training materials (user guides, help sections) are helpful and comprehensive.
- Helpdesk response time should average less than 24 hours for user issues.

4. Evaluation plans

The evaluation of our project will focus primarily on assessing the core functionality, system performance, user satisfaction, and the overall impact of the features developed in **Part 2** (*Book Submission, System Testing, and Grading*). **Part 1** (*Finding a Supervisor and Getting Project Approval*) and **Part 3** (*Scheduling Presentations and Communication*) are considered for future development and evaluation. Below is the structured evaluation plan for **Part 2**.

4.1 Testing Plan (Part 2)

Test Number	Test Subject	Test Headline	Expected Result
1	Provide Feedback	Supervisors and panel members provide feedback on a project.	Feedback is saved in the system and accessible for administrative staff to share with students upon request.
2	Grade Submission by Panel Members	Panel members submit grades for a student project.	Grades are recorded and tracked in the system.
3	Grade Submission by Supervisors	Supervisors submit their grades for student projects.	Supervisor's grades are recorded in the system and used for the final grade weighting along with the panel member's grades.
4	Final Grade Weighting	The system calculates final grades based on input from panel members and supervisors.	Final grades are automatically weighted by the system, and administrative staff are notified when all grades are received and calculated.
5	Automated Reminder for Missing Grades	The system sends reminders to panel members or supervisors who have not submitted grades.	Missing grades are flagged, and reminders are automatically sent to ensure timely submissions.

These tests validate the core functionality of **Part 2**, ensuring that key processes like submission, feedback, and grading work seamlessly.

4.2 Evaluation by User Groups (Part 2)

We will collaborate with students, lecturers (supervisors and panel members), and administrative staff to evaluate Part 2 of the platform, focusing on grading, feedback, and process automation.

Students

- Usability testing will be conducted to assess student's experience with receiving and requesting feedback via the platform.
- Students will provide insights into how the platform supports feedback requests after receiving grades.

Lecturers (Supervisors and Panel Members)

- Lecturers will evaluate the grading and feedback submission tools. Feedback will focus on the platform's ability to streamline the grading process and automate reminders for missing grades, ensuring timely completion of grading.

Administrative Staff (Project Coordinators)

- Administrative staff will assess the platform's effectiveness in tracking grade submissions, processing grades, and generating reports.
- The assessment will focus on how well the platform reduces manual effort in grade tracking and feedback management, and how accurately it generates reports and notifies them when tasks are pending or completed.

Surveys: Surveys and response forms will be distributed to gather insights from each user group on the platform's performance, ease of use, and overall efficiency in managing grading and feedback.

4.3 Key Metrics for Evaluation (Part 2)

Metric	Evaluation Method	Success Criteria
Grading Efficiency	User testing, feature checklists	All core grading and feedback submission features for Part 2 operate as expected, with grades processed within one week.
System Performance & Reliability	Load testing, security audits	The platform performs efficiently under concurrent users load during grading periods, and system security is verified.
User Satisfaction	Surveys, feedback forms	Positive user feedback from supervisors, panel members, and administrative staff, with satisfaction ratings of 85% or higher.
Process Automation Efficiency	Task analysis, automated reminders	Automated reminders reduce delays in grade submissions by 80%, and administrative staff report a 50% reduction in manual work.
Error Reduction	Error tracking, incident reports	A 50% reduction in errors related to grade entry, submission tracking, and feedback compared to the previous manual process.
Impact on Feedback Process	Feedback requests and student surveys	80% of students report satisfaction with the feedback process, and supervisors report a 50% increase in timely feedback submissions.

4.4 Future Evaluation for Parts 1 and 3

Part 1 (*Finding a Supervisor and Getting Project Approval*) and **Part 3** (*Scheduling Presentations and Communication*) will undergo similar evaluation processes if developed further. These evaluations will assess their unique functionalities, focusing on student-supervisor matching in Part 1 and automated scheduling and communication tools in Part 3.

Part 1 Evaluation:

Metric	Evaluation Method	Success Criteria
Core Functionality	User testing, feature checklists	Efficient matching between students and supervisors.
Usability	Surveys, forms	90% of students can complete the process without assistance.

Part 3 Evaluation:

Metric	Evaluation Method	Success Criteria
Automated Scheduling Efficiency	Test automated scheduling features	Scheduling must be conflict-free and automated.
User Interaction Flow	User testing, feedback	Notifications and messaging must support seamless interaction.

This plan focuses on ensuring that Part 2 is the immediate priority, with the potential for expanding to Parts 1 and 3 in future development.

5. References

1. BrowserStack (2024). *Web Application Development: Process, Tools, & Examples*. BrowserStack.
2. *Memorial University of Newfoundland. Research Project Management Guide for Researchers. Section 7.1.3*. Research-Project-Management-Guide-January-2018.pdf
3. *Nwanakezie, H., & Ogona, I. (2021). Task Development Procedures for Effective Educational Management*. Based_learning_environment.pdf

6. Appendices

Appendix A: Interview Transcripts

Interview with Julia (Project Coordinator and Facilitator) and Naomi (Final Project Coordinator and Facilitator)
Date: 7.7.2024
Participants: Dr. Julia Sheidin and Dr. Naomi Unkelos Shpigel , Noy Malka and Noa Krispin.

Transcript:

Julia and Naomi's need for a 3-part system:

Julia and Naomi explained the current process where students contact lecturers via email to inquire about available projects and supervisors. They highlighted the need for a centralized system where all information about supervisors and projects is accessible, including project availability and status updates. Julia pointed out that students often contact multiple supervisors, leading to confusion about who is supervising which project. They suggested that the new system will allow students to register for one project and require them to cancel other registrations before finalizing their choice. Additionally, proposals for projects often require approval or corrections, which should be tracked in the new system. There is also a need for handling changes in supervisors when students switch to another supervisor.

They emphasized the need for the system to assign a project code that combines the year, the semester and other variables, and contain a field to add a Git Repository to centralize and organize the project work.

Presentations and Submissions (Julia and Naomi)

About a month before the project presentations, the students submit summaries of their work and then the coordinators schedule the project presentations according to lecturers' constraints. Julia and Naomi suggested the system should send reminders to lecturers to provide scheduling constraints for performances. While external systems like Moodle or Git can be used for final submissions, they emphasized the need for reminders and coordination to ensure smooth presentation scheduling. Naomi mentioned that sometimes placements for presentations change due to various reasons, and the system should allow adjustments for that.

We also discussed the possibility of providing a **guest login** feature for people to view presentation schedules, like Google Sheets but with better integration and export options.

Grades on Submissions (Julia and Naomi):

During the interview, Julia and Naomi mentioned that students currently contact lecturers by email to request comments, which results in an overwhelming and busy process for them. They raised concerns about missing grades and lecturer feedback, proposing that the system should send automatic reminders to lecturers to submit grades and make it easier for lecturers by providing an integrated form. This form would allow lecturers to give comments on the presentation or the book and submit grades all in one place. Additionally, they suggested that students should have direct access to these comments and feedback through the system.

Naomi further explained that the grading system consists of:

- **Supervisor Grade (50%)** – The supervisor's evaluation of the project book and presentation, reflecting the student's overall performance, including their work throughout the project.
- **Presentation Grade (25%)** – Evaluated by the panel members based on the quality of the student's presentation.
- **Book Grade (25%)** – One of the panel members assesses the project book and assigns a grade based on its quality and completeness.

Naomi suggested that the system should automatically send all grades to students, including the supervisor, presentation and book grades. It should also be possible for students to receive feedback from the examining staff at the end of phase A and at the end of phase B.

Key Insights from the Interview:

1. Centralized registration system to handle project sign-ups and supervisor assignments.
2. Automatic status updates for project registration and tracking.
3. Reminders for presentations, scheduling, and grade submissions.
4. Easy access for students to review their grades and receive feedback on their project.
5. Guest login feature for viewing presentation schedules.

Appendix B: Interview Transcripts

Interview with Ora, Department Secretary.
Date: 23.07.2024
Participants: Noy Malka, Noa Krispin and Ora Dahan.

Transcript:

- **Supervision Process:** Ora explained that once students have selected a supervisor and partner for the final project, she sends the facilitators an email with a form **(Figure 7)** that they need to fill out to confirm whom they are mentoring. Supervisors send the information back to Ora. In addition, Ora has built and maintains an Excel sheet, which she updates based on the information received from the facilitators. This sheet is also used to track supervision hours for salary purposes.

- **Issues with Supervisor Assignments:** Ora mentioned a recurring problem where multiple supervisors might mistakenly think they are supervising the same student. Students often contact several supervisors at once without finalizing their choice, leading to confusion.

- **Double registration of students with different supervisors:** A recurring problem is that students may register with one supervisor and then change their registration to another supervisor without notifying the first. This results in two supervisors believing they are supervising the same student, which creates complications for Ora when registering supervision hours for payroll purposes.

- **The Role of the Gilboa System:** Ora is responsible for entering supervision hours and salary details into the Gilboa system, which handles the college's reporting and payroll for lecturers. Cross-referencing supervision assignments is crucial for accurate data entry.

- **Cross-Checking with Naomi:** Ora cross-checks her supervision data with Naomi to ensure accuracy. They exchange forms and verify that the information matches their records.

- **Registration Confusion and Potential Solution:** Many students believe they are automatically registered for Phase A or B once they've connected with a supervisor or completed Phase A, which is not the case. Ora often needs to manually reach out to remind students to properly register in the college's information system. To streamline this process and reduce confusion, Ora suggested adding a reminder feature to the system. This feature would automatically notify students who register with a supervisor to also register for the course at the information station.