Capstone Project Phase A

MentorMatch: Final Projects Portal: Topics, Partners, Supervisors and more

Project code 25-2-D-7

Supervisor:

Dr. Julia Sheidin

Students:

Eldar Gafarov- Eldar.Gafarov@e.braude.ac.il

Roee Bar- Roee.Bar@e.braude.ac.il

https://github.com/MentorMatch

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Abstract

In academic institutions, final projects are crucial for demonstrating students' accumulated knowledge and skills. However, the initial phase of matching students with appropriate supervisors represents a significant challenge that impacts the entire project lifecycle. At Braude College, students currently face substantial obstacles in identifying available supervisors, understanding their research interests, and determining their capacity to take on new projects. This process relies heavily on fragmented communication channels, including emails, static spreadsheets, and word-of-mouth information, creating inefficiencies and missed opportunities for optimal matching. Simultaneously, supervisors struggle to manage multiple inquiries, communicate their availability, and identify students whose interests align with their expertise. The MentorMatch system, extending the existing ProjectHub platform developed by Noy Malka and Noa Krispin, addresses these challenges by implementing a comprehensive solution for the project selection and initiation phase. Our system features intuitive supervisor profiles showcasing research interests and project suggestions, a structured student application portal with advanced filtering capabilities. This integrated communication system documents all interactions and provides robust administrative oversight tools for project coordinators. Through this user-centered design approach, MentorMatch transforms a previously disorganized process into a streamlined, transparent system that enhances visibility, standardizes applications, reduces administrative burden, and facilitates better alignment between student interests and supervisor expertise. The platform aims to significantly improve task management efficiency, reduce search time, achieve user satisfaction, and decrease unmatched students by registration deadlines, ultimately enhancing all stakeholders' entire project management experience.

Keywords:

Academic workflow optimization, Student-supervisor matching, Final project coordination, Project initiation platform, Academic mentorship, Project management, Web application development,

1. Introduction

Final-year projects are a crucial component of engineering education, allowing students to apply theoretical knowledge to real-world challenges. A critical phase in this process is the initial connection between students and supervisors, establishing the foundation for successful project implementation. At Braude College, as in many academic institutions, this matching process has historically relied on fragmented manual systems that create inefficiencies for all stakeholders.

1.1. Problem Statement

The current process of connecting students with project supervisors is characterized by disorganized communication, limited information visibility, and inefficient workflows. Students struggle to identify available supervisors, understand their research interests, and determine their capacity to take on new projects. Simultaneously, supervisors face challenges in managing student inquiries, communicating their availability, and finding students whose interests align with their expertise. This fragmented approach, which primarily relies on email exchanges and static Excel spreadsheets, creates several critical problems:

- **Limited Visibility**: Students lack clear information about which supervisors are available and their areas of expertise, forcing them to contact multiple lecturers through trial and error. This creates a significant information gap where students have no centralized way to discover which faculty members are accepting new projects, what their research interests are, or how many students they can currently supervise. This opacity leads to wasted time and missed opportunities for optimal matching.
- **Communication Inefficiency**: Both students and supervisors spend excessive time on email exchanges, often repeating the same information to multiple recipients. Supervisors become overwhelmed with inquiries, many of which may not align with their expertise or availability. Students must craft individual emails to each potential supervisor, resulting in inconsistent communication and information overload for faculty members who must sort through numerous unstructured requests.
- **Administrative Burden**: Project coordinators must manually track and update supervisor capacities and student assignments, leading to potential errors and outdated information. Research on educational management procedures has shown that these manual administrative tasks significantly reduce efficiency and increase error rates in academic workflows [3]. Administrative staff spend countless hours cross-checking information between different systems, sending reminders about registration deadlines,

and reconciling conflicting records when students change supervisors without proper notification.

- **Missed Opportunities**: Optimal matches between student interests and supervisor expertise may be overlooked without visibility into the complete landscape of available projects and interested students. Students may settle for projects that don't fully align with their interests or capabilities simply because they were unaware of better matching opportunities, while supervisors miss chances to work with students whose interests perfectly complement their research areas.

1.2. Current Solutions

The existing approach to student-supervisor matching relies on several manual and disconnected methods:

- **Email Communication**: Students send individual emails to potential supervisors, inquiring about availability and research interests. This creates inbox congestion and often results in delayed or missed responses. Supervisors must manually track these inquiries, with no systematic way to manage their capacity or prioritize student requests based on alignment with their expertise.
- **Static Excel Spreadsheets**: Project coordinators maintain spreadsheets listing supervisors, their project topics, and capacity. These become outdated quickly and lack real-time updates. When supervisors take on new students or when project topics change, these updates often don't propagate to all versions of the spreadsheets, leading to inconsistent information and confusion.
- **Departmental Announcements**: Occasional emails or notices about supervisor availability are distributed, but these provide only snapshots of information at specific points in time, failing to reflect the dynamic nature of supervisor availability and project opportunities.
- **Word-of-Mouth**: Students often rely on information from peers about supervisor preferences and availability, leading to inconsistent and potentially inaccurate information. This informal channel creates inequity in access to information, with some students having better insights than others based solely on their social connections.

While the grading and evaluation phase of the project lifecycle has been addressed by the previous ProjectHub implementation by Noa Krispin & Noy Malka [1], the critical first phase of supervisor-student matching remains unsupported by a centralized, efficient system. Their platform successfully handles grading process, but the initial matching process continues to rely on fragmented, manual approaches that create bottlenecks at the very beginning of the project experience.

1.3. Proposed Solution

Building upon the existing ProjectHub platform developed by Noa Krispin & Noy Malka [1] we propose to expand the system to address the critical first phase: "Project Selection and Initiation." Our extension will create a centralized, transparent, and efficient platform for connecting students with supervisors. The key features of our solution include:

- **Supervisor Profiles**: A dedicated interface displaying each supervisor's research interests, available capacity, and project topic suggestions. This will provide students with comprehensive information about potential supervisors, eliminating the current information gap and reducing the need for exploratory emails.
- **Student Application Portal**: A structured system for students to express interest in specific supervisors or project topics, providing relevant information about their skills and interests. This standardizes the application process, ensuring supervisors receive consistent, complete information from all applicants.
- **Matching Dashboard**: Real-time tracking of supervisor capacity, student applications, and match status. This dynamic system will prevent double-bookings and provide accurate, up-to-date information on supervisor availability.
- **Automated Application Notifications:** The system automatically sends email notifications to supervisors when students submit applications through the platform. This email contains all relevant application details including the student's profile information, proposed project topic, and relevant skills, eliminating the need for supervisors to constantly check the platform for new applications. Supervisors can customize their notification preferences (immediate, daily digest, or at a specific hour of their choosing) through their dashboard settings, as specified in Requirement 3.1.2: This streamlined approach ensures supervisors never miss potential student applications while preventing email overload, addressing a key pain point identified in stakeholder interviews where supervisors struggled to manage numerous unstructured inquiry emails efficiently
- **Administrative Oversight**: Tools for project coordinators to monitor the matching process, adjust supervisor capacities, and facilitate connections when needed. This significantly reduces the manual administrative burden of cross-checking information and sending reminders.

Implementing these features will transform a fragmented, manual process into a streamlined, transparent system that benefits all stakeholders. By integrating seamlessly with the existing ProjectHub platform, MentorMatch will create a comprehensive solution that supports students and faculty throughout the entire project lifecycle, from initial matching through final evaluation.

2. Background and Related Work

The process of matching students with appropriate supervisors for capstone projects represents a significant challenge in academic institutions. This review examines key research and existing solutions addressing this challenge, focusing specifically on systems designed to facilitate the student-supervisor matching process.

2.1. Current Capstone Project Process

Capstone project is divided into two phases: Phase A and Phase B, both essential for successful project completion. The process begins with students selecting a project supervisor, either by proposing their own project idea or choosing from topics provided by supervisors. This structured approach aligns with recommended project management practices for academic research [2]. This initial connection phase is critical yet currently lacks systematic support.

Currently, students must email potential supervisors or rely on word-of-mouth to discover available supervisors and their interests. After a supervisor is selected, students submit a formal application for review. Once approved, students proceed with research, interviews, and data collection (if needed), culminating in a comprehensive project book and presentation to a panel including their supervisor and other faculty members.

Upon completing Phase A, students move to Phase B, focusing on implementing and testing the solution designed in Phase A. The final system is submitted alongside a formal presentation, evaluated by the supervisor and panel members.

Our project focuses specifically on enhancing the pre-Phase A of this process, finding a supervisor, and obtaining project approval. This phase lays the foundation for the entire project experience, but currently relies on fragmented, manual systems that create inefficiencies and challenges for all stakeholders. Building a comprehensive system that supports all stages of the capstone project workflow would be extremely complex. Therefore, we're addressing this challenge through a modular approach, with each module focusing on a specific phase of the project lifecycle.

The existing ProjectHub platform, developed by Noy Malka and Noa Krispin [1], already addresses the later phases of the project process, specifically focusing on grading. Our MentorMatch system will complement ProjectHub by focusing exclusively on the initial matching between mentors and students, creating a seamless transition between the different stages of the project lifecycle.

2.2. Current Project Matching System

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 supervise a pair or a single student, if they supervise alone or with a co-supervisor, 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 and Julia, the project coordinators, 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 integrating an automatic reminder system that prompts students to register for the course once their supervision assignment is confirmed.

The following activity diagram (Figure 1) illustrates the step-by-step process of how students, supervisors, and administrative staff interact during this phase.
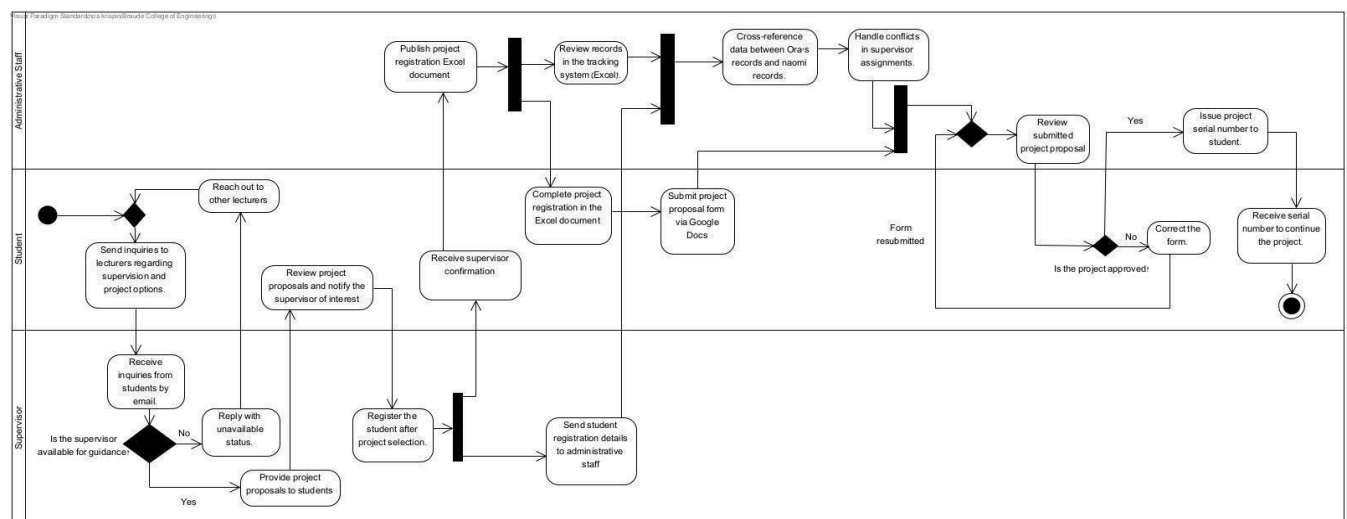

Figure 1: Activity Diagram for the "Finding a Supervisor and Getting Approval" Process.

2.3. Personal Experience and Initial Findings

As proactive fourth-year students, we averted the common supervision challenges by securing our project supervisors well in advance. However, many of our peers weren't as fortunate. We witnessed firsthand their struggles in the absence of a centralized supervision system, watching as they sent countless emails to potential supervisors, faced prolonged uncertainty, and wrestled with looming deadlines. Their experiences illuminated several critical issues in the current process. A particularly illustrative case highlighting the current system's inefficiencies involves two fourth-year students. While searching for a project supervisor, they simultaneously contacted three different lecturers expressing interest in potential projects. Each lecturer responded positively, invested time discussing project ideas, and began preliminary planning, assuming they would supervise the students. However, after the students ultimately decided to work with one of the project supervisors, they failed to notify the other lecturers of their decision. As a result, both supervisors who weren't notified continued to hold capacity for these students, declining other interested students, believing their supervision slots were filled. This miscommunication created unnecessary administrative confusion, wasted valuable preparation time for the lecturers, and potentially prevented other students from securing their preferred supervisors. When administrative staff attempted to reconcile supervision assignments, she discovered the conflicting records, requiring additional time to contact all parties and resolve the discrepancy. This example perfectly illustrates how the lack of a centralized, transparent system creates ripple effects throughout the department, affecting not only the students and supervisors directly involved but also the broader project assignment ecosystem: These observations from our peers' experiences directly informed our understanding of the key challenges outlined in section 1.1.

2.4. Key Stakeholders

The following stakeholders are essential to the capstone process, each with distinct needs and challenges related to the student-supervisor matching process:

Stakeholder	Role
Students	Responsible for selecting a research or project topic, conducting research, and developing a solution. They struggle to identify available supervisors, understand research interests, and navigate the application process efficiently.
Supervisors	Faculty members who mentor, review proposals, and assess project work. They face challenges managing student inquiries, communicating their availability and interests, and identifying students whose interests align with their expertise.
Administrative Staff	Responsible for managing registration and handling administrative tasks. They currently manage these tasks through manual processes including email confirmations and Excel spreadsheets, which are time-consuming and prone to errors
Final Project Coordinators	Oversee the entire project process, approve proposals, finding supervisors for students that don't have one. They currently manage this process through manual tracking in Excel spreadsheets, facing difficulties in keeping information current and ensuring all students find appropriate supervision.

Our solution will address the specific needs of these stakeholders by providing a centralized platform that enhances transparency, streamlines communication, and optimizes the process.

3. Development Process

Our approach to developing the MentorMatch system follows the User-Centered Design (UCD) methodology, a design philosophy that places users at the core of the design and development process. In our work, we followed all four phases of the approach: understanding the context, specifying user requirements, designing solutions, and evaluating against requirements [4].

3.1. The Process

3.1.1. Understanding the Context

To foster empathy and deepen our understanding of the development field, we began by thoroughly analyzing the problem domain. This aligns with research project management principles outlined in the Research Project Management Guide, which emphasizes that "understanding all relevant project stakeholders and their relationship to the project is established and project expectations can be agreed upon with the stakeholder in advance" [2]. We approached this phase through several complementary methods:

We performed an in-depth analysis of the current capstone project process, particularly focusing on the initial phase of supervisor-student matching. This analysis revealed significant inefficiencies in the current process, including limited visibility of supervisor information, communication challenges, and administrative burden, as detailed in Section 1.1.

Additionally, we conducted semi-structured interviews with key stakeholders, including project coordinators, students, and supervisors (Interview with Administrative staff was conducted by Noa & Noy). The semi-structured format allowed for natural conversation flow while ensuring coverage of key topics. This approach aligns with Sanders & Stappers' research on co-creation, which emphasizes the importance of understanding user experiences as a foundation for design [4].
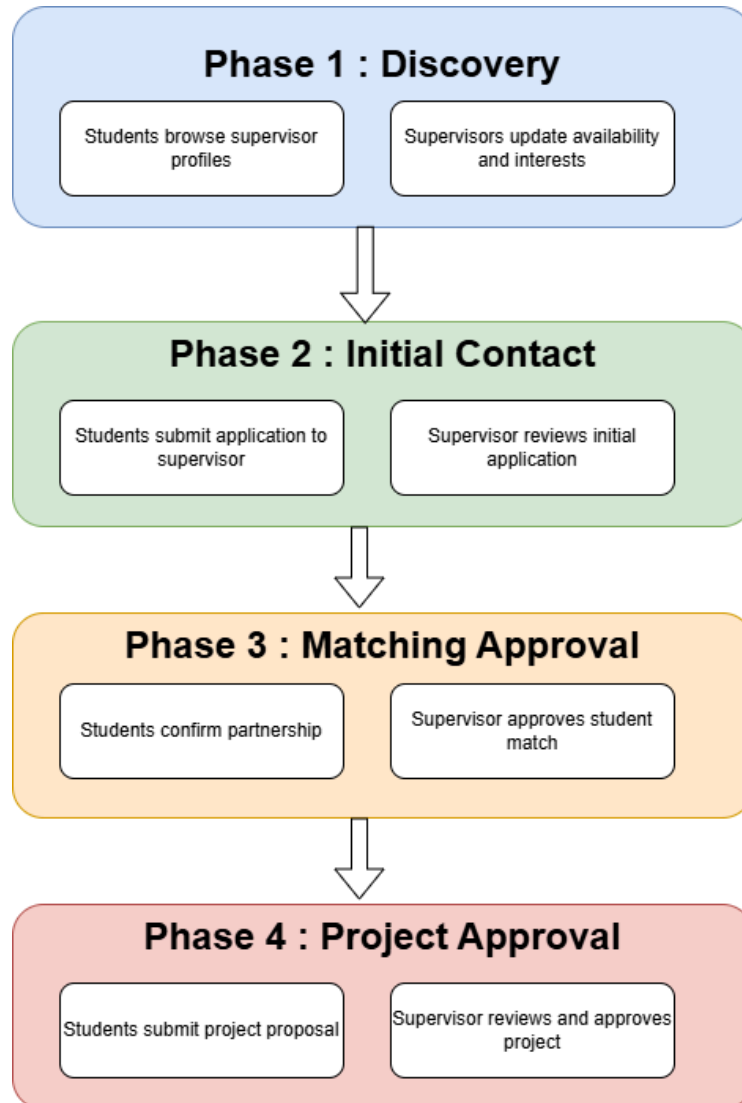
Figure 2 Process Workflow

This diagram (Figure 2) illustrates the core workflow of the MentorMatch system, focusing on the critical stages of connecting students with project supervisors for capstone projects. The process is divided into four main phases: (1) Discovery Phase, where students browse supervisor profiles and supervisors update their availability and research interests; (2) Initial Contact Phase, which describes the submission of applications by students and their review by supervisors; (3) Matching Approval Phase, where the supervisor approves the student match and students confirm their partnership; and (4) Project Approval Phase, in which the formal project proposal is submitted and approved by the supervisor. Efficient flow between these phases addresses the key problems in the current process, creating a transparent, efficient, and structured workflow for all stakeholders in the system.

3.1.1.1.   Interview Process and Key Insights

To gain a comprehensive understanding of the current challenges and user needs, we interviewed key stakeholders involved in the project process: the final project coordinator, a student, and a supervisor.

These interviews followed a semi-structured format, allowing for natural conversation flow while ensuring coverage of key topics. Questions focused on current processes, pain points, and potential improvements.

Key Insights from the Interview with the Supervisor:

1. Supervisors receive student inquiries through multiple uncoordinated channels, creating inefficient workflows.
2. Supervisor availability fluctuates based on teaching loads and existing commitments, making a static representation of capacity problematic.
3. A flexible space for sharing project concepts and resources would help students make informed decisions before applying.
4. Uncertain teaching schedules prevent supervisors from making definitive long-term commitments, requiring accommodation for provisional matching.

Key Insights from the Interview with Project Coordinator:

1. Need for stronger commitment mechanisms in the student-supervisor matching process
2. Importance of reputation management for both students and supervisors
3. Value of integrating course syllabus information into the system
4. Potential for a social network-type approach to improve visibility and matching
5. Need for self-management of user information for accuracy
6. Addressing the gap in familiarity between students and potential supervisors

Key Insights from the Interview with Student:

1. Students struggle with the lack of visibility into supervisor availability and research interests
2. The current email-based communication system leads to miscommunications and inefficiencies
3. There's a need for a formal commitment mechanism to prevent double-bookings
4. Students need more guidance on appropriate project topics and examples
5. A centralized platform would significantly reduce stress and uncertainty for students seeking supervisors

Transcripts of the interviews are included in section 4 of this document, Appendixes.

3.1.2. Specifying User Requirements

Based on our interviews with stakeholders and analysis of the current processes, we have identified the following functional requirements for the MentorMatch system. These requirements are organized by user role to ensure that the specific needs of each stakeholder group are addressed.

3.1.2.1. Student Requirements

Feature	Functional Requirement
Registration and Profile Management	o The system shall provide a registration form for students to create accounts in the MentorMatch system o The system shall require students to provide essential information, including name, Braude email, department, and current academic year o The system shall allow students to create and maintain a profile showcasing their skills, interests, academic background, and relevant experience o The system shall enable students to upload a profile picture to o The system shall require email verification to complete the registration process o The system shall allow students to edit and update their profile information at any time.
Supervisor Discovery	o The system shall allow students to browse available supervisors filtered by department and research interests o The system shall enable students to search for supervisors by name, research area, or keywords through a search bar o The system shall display supervisor availability status and current capacity
Project Topic Exploration	o The system shall allow students to view project topic suggestions from different supervisors
Application Submission	o The system shall allow scheduling the first appointment with the supervisor o The system shall provide a standardized application form for students to express interest in specific projects o The system shall allow students to include information about their skills, interests, and project ideas in their applications

	o The system shall enable students to select project partners when submitting the application o The system shall allow students to choose between proposing their own project or selecting from a supervisor's suggested topics
Application Tracking and Management	o The system shall enable students to track the status of their applications in real-time o The system shall notify students when their application status changes o The system shall prevent students from submitting new applications after accepting a supervisor offer. The software shall block the student from applying after accepting a supervisor (After approving no change back) o The system shall allow students to withdraw applications before they are approved the student should be allowed to cancel their application before it is approved or rejected.

3.1.2.2.   Supervisor's Requirements

Feature	Functional Requirement
Registration and Profile Management	o The system shall provide a registration form for supervisors to create accounts in the MentorMatch system o The system shall require supervisors to provide essential information including name, email, department, and research areas o The system shall allow supervisors to set their maximum supervision capacity (number of projects/students they can supervise) o The system shall enable supervisors to upload a profile picture o The system shall require email verification to complete the registration process o The system shall allow supervisors to edit and update their profile information at any time
Application Management	o The system shall provide a dashboard for supervisors to view and manage incoming student applications o The system shall display all relevant student information in applications

Feature	Functional Requirement
	o The system shall allow supervisors to approve, request revisions, or decline student applications o The system shall enable supervisors to provide feedback to students on their applications including a text area for providing feedback to students
Notification Preferences	o The system shall allow supervisors to customize notification preferences for new applications allowing the user to decide on what hour they should get the email notification o The system shall automatically send email notifications to supervisors when students submit applications

3.1.2.3.   Administrative Requirements

Feature	Functional Requirement
Registration and System Access	o The system shall require administrative users to provide essential information, including name, email, department, and administrative role o The system shall require approval from an administrator for new administrative user registrations o The system shall allow administrative users to manage their account settings and notification preferences of all accounts o The system shall provide administrative users with the ability to reset passwords and manage access for other users
User Registration Management	o The system shall allow administrators to approve or reject supervisor registration requests o The system shall enable administrators to create user accounts manually for both students and supervisors o The system shall provide tools for administrators to verify user information against institutional records o The system shall allow administrators to disable or deactivate user accounts when necessary
Project Coordination	o The system shall provide a dashboard for project coordinators to monitor the matching process, providing a tracking interface showing all ongoing projects, including project title, students involved, assigned supervisors, and project status o The system shall enable project coordinators to view lists of all ongoing projects, including project title, students involved, assigned supervisors, and project status

	o The system shall generate real-time data and reports on student registrations, project approvals, and supervisor assignments
Manual Intervention	o The system shall allow administrative staff to manually assign supervisors to students when necessary o The system shall support uploading student and supervisor data from external systems, allowing users to upload an Excel file from the Gilboa system containing ID, Name, Email, and other information
System Management	o The system shall generate project codes automatically, showing project codes made automatically by the system o The system shall support the export of matching data in Excel format for reporting purposes

The use case (Figure 3) highlights how students, supervisors, Project Coordinators, and administrative staff interact with the platform.

Figure 3: MentorMatch Use case

3.1.3. Designing Solutions - Prototype

Following the User-Centered Design (UCD) methodology, we've created an interactive prototype as a tangible representation of our solution. This prototype visualizes the user interface and core functionality of the MentorMatch system, allowing stakeholders to interact with it and provide valuable feedback before full-scale development begins.

Prototyping is crucial for a project like MentorMatch for several key reasons. First, it enables stakeholders to experience the proposed solution before significant development resources are invested, reducing the risk of building features that don't address actual user needs. This is particularly important for our system, which must serve multiple user types (Students, Supervisors, and Project Coordinators) with distinct requirements and workflows.

Our prototype was developed using HTML, CSS, and JavaScript to simulate the key functions of the MentorMatch platform. It features three distinct but interconnected interfaces (Student View, Supervisor View, Administrative View). The prototype incorporates intuitive navigation, responsive layouts, and clear visual indicators such as capacity meters and status badges to communicate system state. Modal dialogs provide focused interaction points for key activities like application submission and review. By demonstrating the intended functionality through the interface, we've generated enthusiasm among stakeholders who might otherwise resist adopting a new system.

3.1.3.1. Students' Interface

The Student View (Figure 4) in our prototype provides a user-friendly interface designed specifically to address the challenges students face when seeking project supervisors. The interface features a clean, modern design with an intuitive navigation bar at the top that allows students to easily access different sections of the platform.

The main dashboard prominently displays comprehensive search functionality, enabling students to find supervisors by name, research area, or keywords. This directly addresses the "Limited Visibility" issue identified in our problem statement, where students previously lacked centralized information about available supervisors and their expertise areas.

Below the search bar, students can view available supervisors presented in a card format.

When students click "View Details," a modal appears with comprehensive information about the supervisor.

The application process is streamlined through a structured application form that opens when students click "Apply for Supervision."
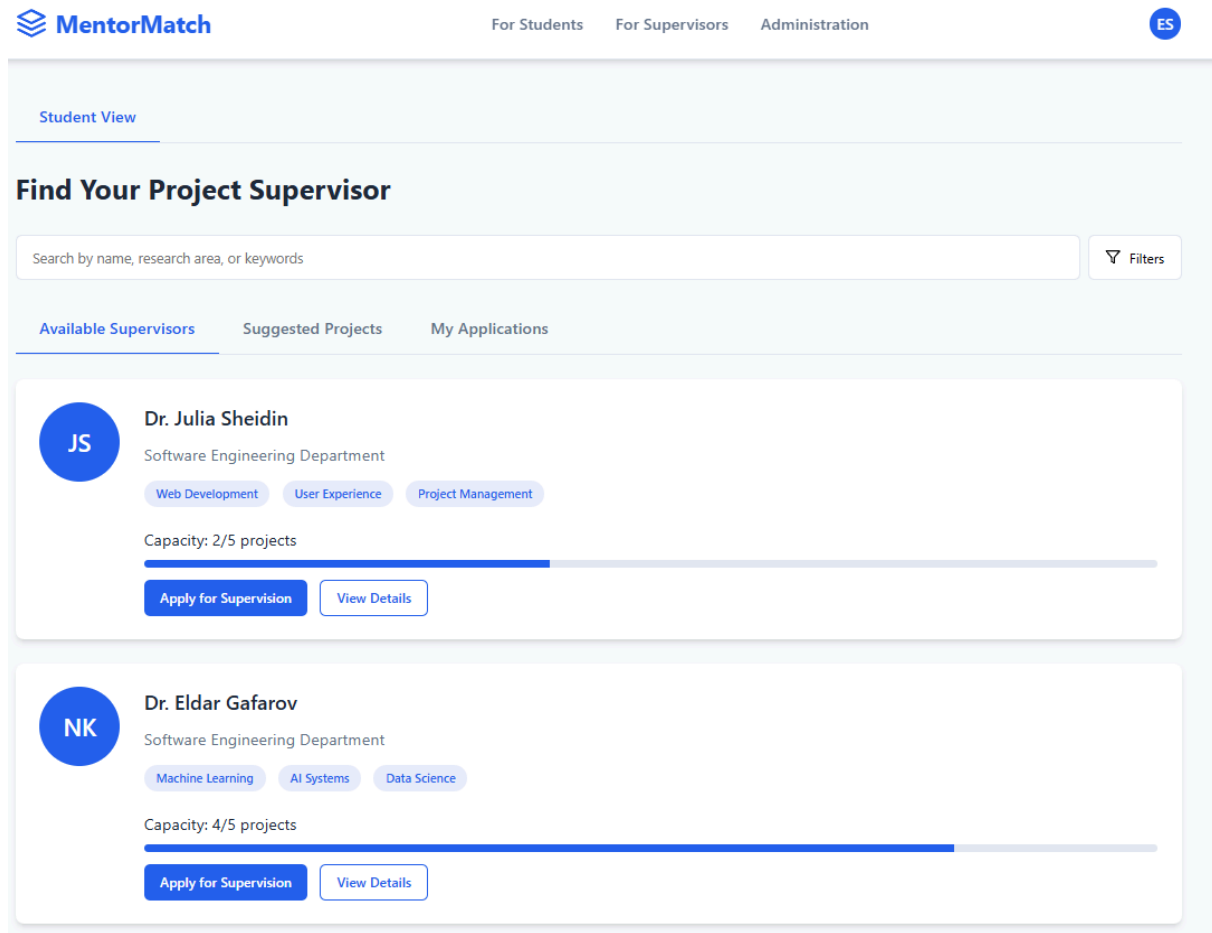

Figure 4 Student interface Demo

This structured approach standardizes the application process, ensuring supervisors receive consistent, complete information from all applicants.

3.1.3.2.   Supervisor's Interface

The Supervisor View (Figure 5) in our prototype presents a streamlined dashboard designed to efficiently manage student applications and supervision workload. This interface directly addresses the communication inefficiencies and administrative burden identified in our problem analysis.

At the top of the supervisor dashboard, a statistical overview provides immediate visibility into key metrics:

- Current Projects (displayed as a fraction of maximum capacity, e.g., "3/5")
- Pending Applications (showing the number of student applications awaiting review)
- Available Slots (indicating remaining supervision capacity)

This at-a-glance information helps supervisors quickly assess their workload and availability without manual tracking, addressing the challenge of capacity management identified in our research.

The main workspace is organized into a tabbed interface with sections for:

- Pending Applications (showing students who have applied for supervision)
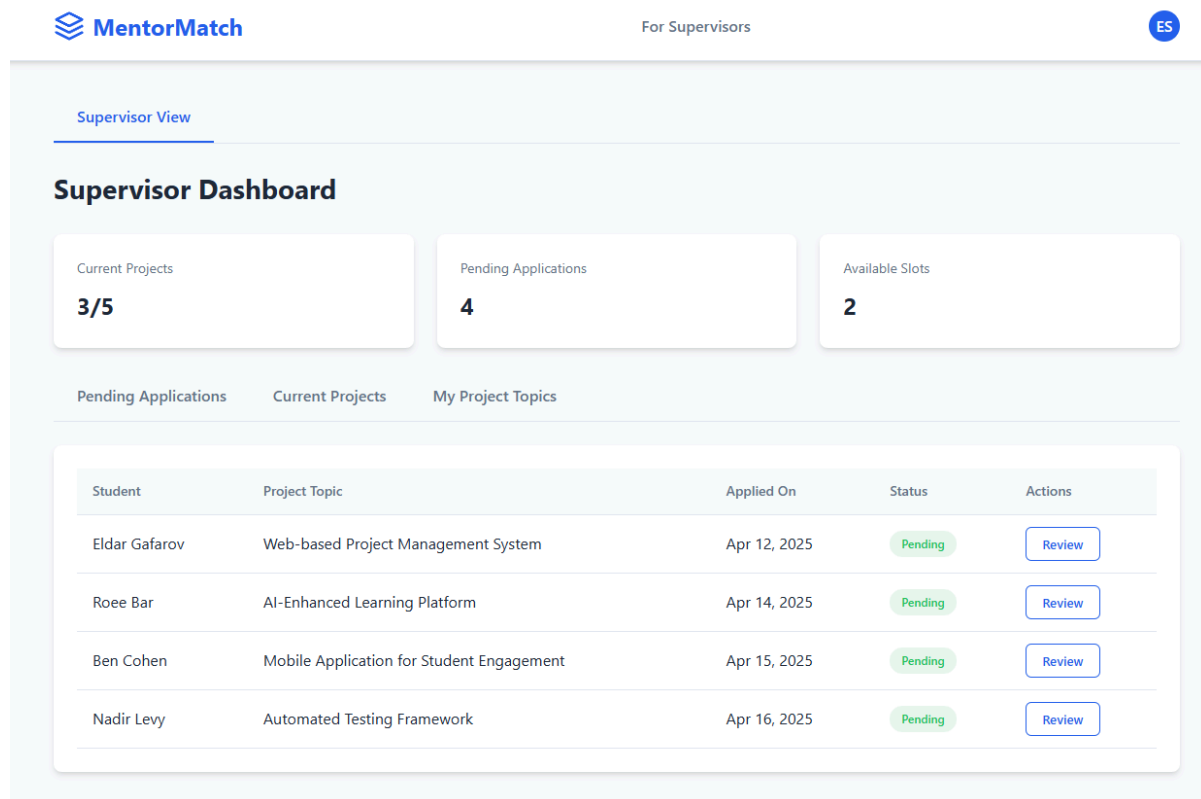- Current Projects (tracking ongoing supervised projects)

Figure 5 Supervisor Interface Demo

The Pending Applications section displays a comprehensive table with:

- Student names for quick identification
- Proposed project topics to assess alignment with research interests
- Application dates to track recency
- Status indicators showing the current stage in the review process

- Action buttons for reviewing applications

When supervisors click the "Review" button, a detailed application review modal appears showing:

- Student information in a clearly organized format
- Project title and complete description
- Student skills relevant to the project
- A decision dropdown menu with options to Approve, Request Revision, or Decline
- A feedback text area for providing constructive comments to students
- Action buttons to submit the decision or cancel the review

3.1.3.3.   Project Coordinators / Admin Interface

The Administrative View in our prototype provides project coordinators and administrative staff with a comprehensive oversight platform designed to streamline the management of the entire matching process. This interface addresses the administrative burden identified in our problem analysis by centralizing information and automating manual processes.

The dashboard prominently displays key performance metrics at the top of the screen:

- Total Students (showing the overall number of students in the system)
- Matched Students (indicating how many students have secured supervisors)
- Pending Matches (highlighting the number of students still seeking supervision)
- Active Supervisors (showing the total number of participating faculty members)

These statistics provide administrators with immediate visibility into the matching process status, enabling them to identify potential issues before registration deadlines approach.

The main interface is organized into a tabbed structure with sections for:

- All Projects (displaying comprehensive project information)
- Unassigned Students (highlighting students who still need supervisors)
- Supervisor Management (tools for adjusting supervisor capacity and availability)

A powerful search and filter system allows administrators to quickly locate specific projects, students, or supervisors, addressing the challenge of managing large volumes of information across multiple stakeholders.

When administrators need to view comprehensive project information, they can click the "Details" button to access a modal showing:

- Complete project information, including code, title, and participants
- Project description and timeline
- Status history and any administrative notes
- Options to edit details if necessary

For unassigned students, the system provides a dedicated assignment interface where administrators can:

- Select from available supervisors with capacity information
- Document the reasoning for specific assignments
- Compose notification messages to both students and supervisors
- Formalize the assignment with clear tracking

The Administrative View (Figure 6) also supports data import/export functionality, allowing administrative staff to upload student and supervisor information from external systems (specifically the Gilboa system as specified in requirement 4.2) and export matching data in Excel format for reporting purposes.

Figure 6 Administrator interface Demo

This comprehensive administrative interface transforms what was previously a fragmented, manual process into a streamlined, transparent system that significantly reduces administrative workload while improving visibility into the matching process.

3.2. The Product

3.2.1.   Architecture

Our platform will extend the existing ProjectHub architecture, using the same three-tier structure that separates frontend, backend, and database layers to ensure compatibility and maintainability.(See Figure 7). This architectural approach is consistent with established project management frameworks that emphasize clear component separation for better maintenance and scalability [2].

Figure 7: Three-Tier Architecture Diagram Showing Client-Side, Server-Side, and Database Interactions.

3.2.1.1.   Frontend (Client-Side):

The frontend will be developed using React, a JavaScript library for building user interfaces. We chose React for several compelling reasons:

Reason	Explanation
Component-Based Architecture	React's component-based structure enables the creation of reusable UI components such as supervisor cards, application forms, and dashboard widgets. This modular approach will enhance maintainability and consistency across the application.

Virtual DOM Performance	React's virtual DOM implementation optimizes rendering performance, particularly important when displaying dynamic content such as real-time capacity updates and application status changes.
Ecosystem and Community Support	The extensive React ecosystem provides numerous libraries for UI components, form validation, and state management, accelerating development without sacrificing quality.
Consistency with Existing System	Using React aligns with the existing ProjectHub implementation, ensuring visual and functional coherence between the two systems while facilitating knowledge transfer among developers.

We'll create new components for supervisor profiles, student applications, and matching dashboards while maintaining consistency with the existing system's design language.

3.2.1.2.   Backend (Server-Side)

The backend will be built with Node.js and Express.js, creating a robust foundation for our system's business logic and data processing capabilities:

Reason	Explanation
JavaScript Throughout the Stack	Using Node.js allows for JavaScript across the entire application stack, streamlining development by eliminating the need to switch between programming languages for frontend and backend development.
Asynchronous Processing	Node.js's non-blocking I/O model is particularly well-suited for handling multiple concurrent user requests during peak registration periods, such as when many students are simultaneously searching for supervisors.
RESTful API Design	We'll implement a RESTful API structure for clear separation of concerns and standardized communication between client and server. This approach will facilitate future enhancements and integrations.
Middleware Support	Express.js provides robust middleware support for handling authentication, request validation, and error handling in a modular and maintainable way.

New API endpoints will be created to manage supervisor profiles, student applications, and matching functionalities, with careful attention to security and data validation.

3.2.1.3. Database

Following the existing implementation, we'll use Firebase Firestore as our database solution. This choice offers several significant advantages for our specific use case:

Reason	Explanation
Document-Based NoSQL Structure	Firestore's flexible document-based structure is ideal for handling the complex relationships between students, supervisors, and projects. Unlike rigid relational databases, this approach allows for easier evolution of data models as requirements change.
Real-Time Updates	Firestore's real-time capabilities enable instant updates to user interfaces when data changes, such as when a supervisor accepts an application or updates their availability. This feature is crucial for maintaining transparency and keeping all stakeholders informed.
Scalability	Firestore automatically scales with application needs, handling peak loads during registration periods without manual intervention.
Security Rules	Firestore's declarative security rules allow for fine-grained access control, ensuring students can only view their own applications and supervisors can only access relevant student information.
Offline Support	Firestore provides offline data persistence, enabling users to continue working with the application even when temporarily disconnected from the internet.

While Firestore offers these advantages, we acknowledge potential limitations:

- Query Complexity: Complex queries may require additional client-side processing compared to SQL databases.
- Cost Considerations: Firestore's pricing model based on reads/writes requires careful optimization to manage costs as the system scales.
- Learning Curve: Team members who are more familiar with relational databases may need additional training to effectively work with Firestore's document-based approach.

Despite these considerations, we believe Firestore's benefits for our specific use case—particularly its real-time capabilities and seamless integration with our chosen technology stack—outweigh these limitations.

3.3. Expected Challenges

The implementation of the MentorMatch system presents several noteworthy challenges that must be addressed to ensure successful development and adoption. Based on our stakeholder interviews and analysis of the current processes, we have identified key obstacles that could impact on our development timeline and adoption strategy. These challenges span technical, organizational, and user experience domains, each requiring specific mitigation strategies. The following table outlines the primary challenges we anticipate encountering during the development and implementation of our solution:

Challenge	Explanation
User Adoption	- Resistance to new system from supervisors accustomed to email-based processes - Learning curve for lecturers and administrative staff
Data Management	- Ensuring accurate supervisor capacity tracking - Maintaining consistent communication history - Having enough space at Free DB - Updating of supervisor availability
Integration	- Compatibility with existing ProjectHub platform - Integration with Google Forms currently used for registration
Communication	- Managing structured communication between students and supervisors - Ensuring students properly notify supervisors of decisions

3.4. Evaluation plans

To ensure the effective functioning of the supervisor-student matching system, we will implement a comprehensive testing plan focused on the following key areas. As outlined in research project management guidelines [2], systematic testing is essential for validating functionality and ensuring system reliability.

3.4.1. Testing Plan

Test Number	Test Subject	Test Headline	Expected Result
1	Supervisor Profile Creation	Supervisors create and update their profiles with research interests and capacity	Profiles are successfully created and visible to students
2	Student Application Submission	Students browse for supervisors and submit applications	Applications are recorded and notifications are sent to supervisors
3	Application Review Process	Supervisors review and respond to student applications	Responses are recorded, and students are notified of status changes
4	Matching Filter	The system suggests potential matches based on interests	Appropriate supervisor suggestions are provided to students
5	Project coordinators Oversight	Project coordinators monitor the matching process and the application status.	The dashboard accurately reflects the current matching and application statuses.
6	Administrative Oversight	Administrative staff monitor the matching process.	The dashboard accurately reflects the current matching status.

These tests will validate the core functionality of our extension, ensuring that all key processes from profile creation to successful matching work seamlessly.

3.4.2. Evaluation by User Groups

We will evaluate the system's effectiveness through structured feedback from each stakeholder group:

User Group	Evaluation
Students	- Usability testing will assess the ease of finding supervisors, submitting applications, and tracking status. - Focus groups will gather qualitative feedback on the matching experience. - Surveys will measure satisfaction with the process compared to previous methods.
Supervisors	- Evaluations will focus on profile management, application review, and communication tools. - Time tracking will measure efficiency gains compared to email-based processes. - Interviews will assess improvements perceived in matching quality.
Project Coordinators	- Evaluations will determine dashboard effectiveness and reporting capabilities. - Time tracking will measure reductions in manual data entry and cross-checking. - Feedback sessions will identify any remaining process gaps.

3.4.3. Key Metrics for Evaluation

Metric	Evaluation Method	Success Criteria
Core Functionality	User testing, feature checklists	All matching and communication features operate as expected
System Performance	Load testing, response time measurement	System handles peak registration periods with <2 second response time
User Satisfaction	Surveys, feedback forms	>80% satisfaction rating from all user groups
Process Efficiency	Time tracking, comparative analysis	30% reduction in time spent on the matching process

| Match Quality | Follow-up surveys, project outcomes | Improved alignment between student interests and supervisor expertise |
| Matching Efficiency | Comparative analysis | 90% of the matching will be done before the beginning of the semester |

References

1. *Krispin N & Malka N. (2025). Capstone Project Phase A: Project Hub (Project code 24-2-D-10). ORT Braude College of Engineering.* [Github](#)
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4. Appendixes

Appendix A: Interview Transcripts

Interview with Naomi (Project Coordinator and Lecturer)
Date: 25.04.2025
Participants: Dr. Naomi Unkelos Shpigel, Roee Bar, and Eldar Gafarov

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

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?"

Transcript:

Student Commitment Issues: Students frequently "shop around" by talking with multiple lecturers but then disappear without proper notification. Ora has to send reminders to these students.

Student Commitment Importance: Naomi emphasized the need for a stronger commitment mechanism from students to supervisors. This directly impacts students' reputation and their final grades, as supervisors account for 50% of the project grade.

System Integration with Syllabus: The course syllabus should be reflected in our system for a better understanding of requirements and expectations.

User Information Management: Information about users (students/supervisors) should be entered by the users themselves to ensure accuracy.

Social Network Approach: Naomi suggested developing the project in the direction of a social network to better showcase students to supervisors and vice versa.

User Experience: It's important to create an enjoyable experience between students and supervisors through the system.

Reputation Management: The system should help students understand the importance of maintaining their reputation with lecturers.

Lecturer Familiarity Gap: There's a lack of familiarity between students and lecturers they haven't had classes with, especially external lecturers who only work in supervising final projects.

Salary Delays Issue: Naomi explained that there may be salary delays to the following semester due to the late completion of registration files. Supervisors often need to file tax returns to receive their compensation.

Appendix B: Interview Transcripts

Interview with Student
Date: 26.04.2025
Participants: Eldar Gafarov, Roee Bar, and Student

Questions for Students

1. "Please describe the process you went through finding the project mentor and subject for Phase A"
2. "What were the main challenges? "
3. "How would you improve the process in your perspective?"

Transcript:

Finding a Supervisor Experience: Ben described his challenging experience trying to secure a project supervisor. "I started looking for a supervisor toward the end of my third year. Without any centralized list of available supervisors, I had to email multiple lecturers individually to inquire about potential projects. This was very stressful as I wasn't sure if I would find someone on time."

Communication Challenges: "I contacted three different lecturers who seemed to have interesting research areas. All three initially responded positively, and we had preliminary discussions about potential projects. Each lecturer invested time discussing ideas with me, which made the decision difficult."

Decision-Making Process: "After meeting with all three, I decided to work with Dr. Dvora Toledano because her research interests aligned best with my career goals. The problem was, I didn't immediately notify the other lecturers about my decision."

Consequences of Poor Communication: "I later learned that the other two lecturers had reserved capacity for me and even declined other interested students, assuming I would be working with them. This created unnecessary confusion and potentially prevented other students from working with their preferred supervisors."

Project Topic Selection: "Another challenge was finding a suitable project topic. I had some ideas, but wasn't sure if they were appropriate for a final project. It would be helpful to see examples of previous projects or have supervisors list potential topics they're interested in supervising."

Appendix C: Interview Transcripts

*This interview transcript was taken from [1]

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.

Appendix D: Interview Transcripts

Interview with Supervisor
Date: 09.05.2025
Participants: Roee Bar, Eldar Gafarov and Supervisor.

Questions for Supervisors():

1. "Please describe the process you went through finding a pair of students to supervise a final project."
2. "What were the main challenges? "
3. "How would you improve the process in your perspective?

Transcript:

Current Student Connection Process: "Even when students know me personally, they don't always understand my research interests. Students typically approach me in different ways. Some send emails, and from my experience, I receive a surge of emails in the last three weeks before the deadline. Other students who know me from courses might approach me in hallway conversations. I also have connections with students from my roles as both a lecturer and department head, so there's sometimes a pipeline of students I've worked with before. And quite often, it happens through a 'friend brings friend' approach."

Capacity Management Challenges: "There's a technical limitation set by the department regarding how many projects I can supervise. I actually supervise far fewer projects than what the college would allow me to take on. This is because I have regular weekly meetings with my students. The process takes significant time, so I don't feel I can do an optimal job if I take on too many projects. I often have to decline many requests."

Scheduling and Planning Difficulties: "A secondary problem is that if there's a heavy teaching load in a particular semester, I prefer to supervise fewer projects during that time. Even this semester, I agreed to supervise more than I had initially planned. Our teaching schedules are only finalized in July or August, which makes advance planning difficult."

Commitment Management: "When I commit to supervising a project, I take it very seriously. I also teach in the graduate program and am committed to supervising graduate projects, which take priority. Currently, I'm supervising two graduate projects. I personally do risk management—if I say yes, it's for projects I'm certain I can handle. For uncertain situations, I leave myself flexibility."