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**SCUOLA DI INGEGNERIA INDUSTRIALE
E DELL'INFORMAZIONE**

Requirement Analysis and Specification Document (RASD)

Students & Companies Problem

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Academic Year: 2024-25

Deliverable:	RASD
Title:	Requirement Analysis and Verification Document
Authors:	Acquadro Patrizio, Colosio Giacomo, Drugman Tito Nicola
Version:	1.0
Date:	November 23, 2024
Download page:	GitHub Repository
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1 | Introduction

For university students finding the right internship that match their interest and their skills can sometimes be hard. At the same time companies sometimes suffers to clearly defines their projects and what they are looking for from the students. For almost 60% of United States students, not knowing how to find an internship was the main reason for not taking one [1].

The number of internships available for students has plunged by 30%, with only 3,817 opportunities in October 2024 being advertised compared to almost 5,500 a year ago [2]. Also the estimated number of American college students take up formal work experience is 21.5% while only 8.7% of UK students take this path. Even among students studying at the top ten universities, the rate is only 19% [2].

While platforms like LinkedIn offer a broad range of job opportunities, they are not tailored specifically to internships, thus make it difficult for students to find internships that align with their skills and interests. Furthermore, companies may struggle to clearly define their projects and requirements, leading to mismatches and inefficiencies in the recruitment process.

Before COVID-19 in the United States, internship rates were between 50% and 60%. However, recent research indicates a much lower number of 21.5% [1].

Even if in the United States, students on average reported being very satisfied with their internship experiences, there are still many students (1 in 4 reported) that had less than satisfactory experiences showing the needs of both students and companies to clearly define what they are looking for from the internships experience. [1].

1.1. Purpose

"Students&Companies" is imagined to be a platform dedicated solely to internships that can implement sophisticated matching algorithms to facilitate the interaction of students with the companies offering an internship and leading to more successful internship experiences.

The scope of the platform is to facilitate the matching between students and companies by assessing the student experiences, skills and attitudes (available in his/her CVs) and the projects and terms offered by the companies.

S&C can be used by the companies, who want to attract students with internships, and by the students who are looking to work for a company by actively searching for an internship

or which receives a recommendation from a system implemented in the platform.

If both the student and the company have a mutual interest in each other then a contact is established, followed by a selection process during which the student is interviewed, S&C also support the selection process by helping managing the interview and finalize the selections.

If the student and the company agree, the platform can collect various kind of informations (such as feedback and suggestions), additionally S&C provides suggestions both to companies and to students on how to improve the company and student appearance on the platform (in terms of project descriptions for companies and CVs for students).

Lastly, S&C monitors the internship and the outcomes of the matchmaking process by allowing students and company to complain, communicate problems and more. Universities can also use the platform to monitor the situation of internships and handle complains.

The main goals of the platform "Student&Companies" are reported in subsection 1.1.1.

1.1.1. Goals

- [G1] Match students with internships that align with their experiences, skills and attitudes written on their CVs.
- [G2] Match companies with students that might be interested to an internship in that company.
- [G3] Let companies advertise the internships that they offer.
- [G4] Allow students to search for internships proactively and apply for opportunities that match their interests and skills.
- [G5] Offer personalized internship recommendations to students using matching algorithms based on their CVs and profiles.
- [G6] Facilitate interaction and communication between students, companies, and universities to ensure a collaborative environment.
- [G7] Support companies in managing the selection process and tracking the status of applications and selections.
- [G8] Enable universities to monitor their students' internships and handle complaints effectively.
- [G9] Collect feedback from students and companies and gather statistical data to improve recommendations and platform features.
- [G10] Ensure data security and privacy for all users on the platform.

1.2. Scope

The scope defines the broader context in which the system operates, clarifying its boundaries and interactions with external factors such as users, hardware, and other software

systems. This document adopts the "World-Machine Approach," identifying phenomena controlled by the external world, by and those shared by machine and the world.

As said before and as exploited during the whole document the **Students & Companies (S&C)** platform is designed to facilitate meaningful connections between university students and companies while supporting universities in their role of oversight and guidance. The platform comprehensively manages the internship lifecycle, from posting offers to evaluating completed experiences, while ensuring alignment with the goals of its primary users: students, companies, and universities. Students use the platform to explore and apply for internship opportunities that match their interests and profiles. They can receive personalized notifications about relevant offers and access tools that help them improve their resumes, making their profiles more attractive to companies. The platform also allows students to track their applications, engage in meaningful communication with stakeholders, and receive updates on their internship progress. For students, the system provides a streamlined process that simplifies their search and application journey while enhancing their prospects for success. Companies leverage the platform to create and manage internship postings, review applications, and oversee the selection process. They can access detailed student profiles, invite suitable candidates for interviews, and evaluate students' performance at the end of the internship. To attract the best talent, companies receive feedback from the system on how to refine their job descriptions and improve their outreach. By streamlining recruitment and enhancing the visibility of their postings, the platform helps companies identify candidates who align with their organizational needs. Universities, as key stakeholders, use the platform to monitor internships and support students throughout their professional development. They ensure that internships meet academic and institutional standards, intervene when issues arise, and provide additional guidance to students if needed. For example, if a student struggles with assigned tasks, the university can coordinate with the company to adapt the workload or provide additional support. This oversight ensures that internships are meaningful, beneficial, and aligned with students' educational goals.

By clearly defining the roles and responsibilities of students, companies, and universities, the Scope section establishes the boundaries between the world and the system through the analysis of world and machine phenomena presented in the following subsections.

1.2.1. World Phenomena

World phenomena are events that occur in the real, external context, outside the platform, and thus are not observed or controlled by the machine. These phenomena influence the operations of the system. They include:

- [WP1] Students create their resumes with information about experiences, skills, and attitudes.
- [WP2] Companies define internship offers with details about tasks, technologies used, and required qualifications.
- [WP3] Companies set the terms for internship offers, including salary details, working hours, work type (full-remote, smart-working, office-only), and schedule.

- [WP4] Universities provide guidelines for internships, such as minimum required hours, student placement areas, and the requirement for at least one company mentor.
- [WP5] Companies and universities collaborate through the platform to establish internship requirements and objectives.
- [WP6] Universities weekly contact students via messages to monitor internship progress.
- [WP7] Universities manage student complaints by taking concrete actions against companies (reminders via messages/calls, legal actions, etc.).
- [WP8] Students search and identify relevant internship offers through external resources (e.g., job boards, company websites, or social media platforms).
- [WP9] Students communicate with their academic tutors outside the platform for advice on internship selection or preparation.

1.2.2. Shared Phenomena

Shared phenomena involve both the external world and the machine, requiring direct interactions between the system and users. These phenomena are crucial for the correct execution of system functionalities and represent the point of contact between the machine and the world. Shared phenomena are usually classified in 2 subcategories: World controlled and Machine controlled.

World controlled

- [SP-1]: The student creates a profile.
- [SP-2]: The company tutor creates a profile.
- [SP-3]: The university tutor creates a profile.
- [SP-4]: The student uploads their resume.
- [SP-5]: The company tutor uploads a profile document.
- [SP-6]: The university tutor uploads academic documents.
- [SP-7]: The student logs into the platform.
- [SP-8]: The company tutor logs into the platform.
- [SP-9]: The university tutor logs into the platform.
- [SP-10]: The student changes the platform language.
- [SP-11]: The company tutor changes the platform language.
- [SP-12]: The university tutor changes the platform language.
- [SP-13]: The student recovers their password.
- [SP-14]: The company tutor recovers their password.

- [SP-15]: The university tutor recovers their password.
- [SP-16]: The student interacts with the chat bot.
- [SP-17]: The company tutor interacts with the chat bot.
- [SP-18]: The university tutor interacts with the chat bot.
- [SP-19]: The student searches for internships using filters.
- [SP-20]: The student browses internship offers without filters.
- [SP-21]: The student uses recommendations for internship search.
- [SP-22]: The student views and selects internship offers.
- [SP-23]: The student submits an internship application, demonstrating interest in an internship.
- [SP-24]: The student accepts an invitation from a company.
- [SP-25]: The student rejects an invitation from a company.
- [SP-26]: The student schedules an interview with the company.
- [SP-27]: The student accepts an internship offer.
- [SP-28]: The student rejects an internship offer.
- [SP-29]: The student views active internships.
- [SP-30]: The student tracks internship progress.
- [SP-31]: The student completes the final internship evaluation.
- [SP-32]: The student views upcoming events in the calendar.
- [SP-33]: The student sets reminders for important events.
- [SP-34]: The company tutor creates a company profile for their university.
- [SP-35]: The company tutor searches for students using filters (field, skills, location).
- [SP-36]: The company tutor searches for students based on recommendations.
- [SP-37]: The company tutor searches for students by browsing public profiles.
- [SP-38]: The company tutor invites students to apply for an internship.
- [SP-39]: The company tutor accepts a student's application.
- [SP-40]: The company tutor rejects a student's application.
- [SP-41]: The company tutor moves students to the next phase of selection.
- [SP-42]: The company tutor finalizes the selection and offers an internship.
- [SP-43]: The company tutor creates a new internship position on the platform.

- [SP-44]: The company tutor manages internship drafts (edits, publishes, deletes).
- [SP-45]: The company tutor completes questionnaires for internship feedback.
- [SP-46]: The company tutor manages events through the calendar (creates, edits, deletes events).
- [SP-47]: The company tutor schedules meetings using the calendar.
- [SP-48]: The company tutor views and tracks internship-related deadlines on the calendar.
- [SP-49]: The company tutor uses the messaging system to communicate with students.
- [SP-50]: The company tutor uses the messaging system to communicate with academic tutors.
- [SP-51]: The company tutor sends messages to students regarding selection progress.
- [SP-52]: The university tutor creates a university profile on the platform.
- [SP-53]: The university tutor monitors internship progress for assigned students.
- [SP-54]: The university tutor reviews applications submitted by students.
- [SP-55]: The university tutor communicates with students about internship progress.
- [SP-56]: The university tutor communicates with company tutors regarding issues or progress.
- [SP-57]: The university tutor provides feedback on internship quality.
- [SP-58]: The university tutor resolves issues reported by students or company tutors.
- [SP-59]: The university tutor completes a questionnaire about internship academic alignment.
- [SP-60]: The university tutor schedules monitoring meetings through the calendar.
- [SP-61]: The university tutor tracks deadlines and reports using the calendar.
- [SP-62]: The university tutor reviews student feedback submitted via questionnaires.
- [SP-63]: The university tutor reviews company feedback submitted via questionnaires.
- [SP-64]: The university tutor communicates with students and companies through messaging.
- [SP-65]: The university tutor uses the platform to approve or deny internship opportunities.
- [SP-66]: The university tutor requests modifications to internship offers based on academic standards.

- [SP-67]: The university tutor reviews and updates student records after an internship.
- [SP-68]: The university tutor uses the platform to monitor and report compliance with institutional policies.

Machine controlled

- [SP-69]: The system sends notifications to students about new internship offers matching their profiles.
- [SP-70]: The system sends notifications to company tutors about new student candidates matching their criteria.
- [SP-71]: The system delivers student applications to company tutors for review.
- [SP-72]: The system matches students with internships based on skills, experience, and preferences.
- [SP-73]: The system matches company tutors with students based on internship requirements and student profiles.
- [SP-74]: The system recommends internships to students using machine learning algorithms.
- [SP-75]: The system recommends students to companies using machine learning algorithms.
- [SP-76]: The system extracts key information from student resumes to improve matching accuracy.
- [SP-77]: The system extracts key information from internship descriptions uploaded by company tutors.
- [SP-78]: The system provides students with feedback on their resumes to improve alignment with internship offers.
- [SP-79]: The system provides company tutors with feedback on their internship postings to attract better candidates.
- [SP-80]: The system generates reminders for students about application deadlines.
- [SP-81]: The system generates reminders for company tutors about pending student applications.
- [SP-82]: The system facilitates scheduling of interviews between students and company tutors using the calendar.
- [SP-83]: The system generates video call links for interviews scheduled on the platform.
- [SP-84]: The system collects feedback from students, company tutors, and university tutors through questionnaires.

- [SP-85]: The system analyzes feedback from questionnaires to improve internship recommendations.
- [SP-86]: The system tracks the progress of active internships and generates status updates for students and tutors.
- [SP-87]: The system automatically flags overdue tasks or issues in internships for review by university tutors.
- [SP-88]: The system syncs calendar events with external platforms (e.g., Google Calendar, Outlook).
- [SP-89]: The system displays a consolidated view of calendar events for students, company tutors, and university tutors.
- [SP-90]: The system enables automated messaging to notify users about changes in internship statuses.
- [SP-91]: The system allows users to filter and search messages by keywords, sender, or date.
- [SP-92]: The system generates and updates dashboards for students, company tutors, and university tutors to reflect real-time data.
- [SP-93]: The system calculates statistics on platform usage for reporting and analysis.
- [SP-94]: The system encrypts and secures user data to maintain privacy and comply with data protection regulations.
- [SP-95]: The system verifies uploaded documents (e.g., resumes, contracts) for format and validity and size.
- [SP-96]: The system provides automated suggestions for meeting times based on calendar availability.
- [SP-97]: The system detects potential conflicts in schedules and suggests resolutions.
- [SP-98]: The system provides chatbot assistance for answering frequently asked questions and guiding users through processes.
- [SP-99]: The system escalates unresolved issues reported in messaging to relevant university or company stakeholders.
- [SP-100]: The system monitors and logs all interactions for accountability and auditing purposes.

1.3. Definitions, Acronyms, Abbreviations

1.3.1. Definitions

- **User:** a generic person who use the platform. Can be either a student, company tutor or a professor.

1.3.2. Acronyms

1.3.3. Abbreviations

- **RASD:** Requirements Analysis & Specification Document
- **S&C:** Students & Companies
- **WP:** World Phenomena
- **SP:** Shared Phenomena
- **LLM:** Large Language Model
- **RAG:** Retrieval Augmented Generation
- **UI:** User Interface
- **API:** Application Programming Interface
- **AI:** Artificial Intelligence
- **NLP:** Natural Language Processing
- **HTTPS:** Hypertext Transfer Protocol Secure

1.4. Revision History

[QUI METTERE DOCUMENTO CHE HO JACK HA FATTO SU GITHUB] **Version 1.0** Since we worked with Overleaf we continuously updated the same document, as such there is only one single version. Some backup are uploaded on Github.

1.5. Reference Documents

The document is based on the following materials:

- The specification of the RASD and DD assignment of the Software Engineering II course a.a. 2024/2025
- Slides of the course on WeBeep

1.6. Document Structure

- **Introduction:**
- **Overall Description:**

- Specific Requirements:
- Formal Analysis Using Alloy:
- Effort Spent:

2 | Overall Description

This section provides a general overview of the Students & Companies (S&C) system, describing its operational context and interaction with users and the external environment. This part of the document is essential to understand the system's structure, its main actors, and how it fulfills user requirements. Specifically, it covers:

- The product perspective, offering a detailed analysis of usage scenarios.
- Conceptual diagrams representing the main domain entities and their interactions.
- The lifecycle of states for key system functionalities.

2.1. Product Perspective

The Students & Companies (S&C) system is a platform designed to facilitate interactions among students, companies, and universities in the context of internships. This subsection provides an overview of the system's scope and purpose, highlighting how it addresses key challenges in managing internships effectively.

The Product Perspective section is structured into the following subsections:

- **Scenarios:** Describes typical use cases for the system, illustrating how students, companies, and universities interact with its functionalities.
- **Domain Class Diagram:** Provides a conceptual representation of the main entities within the system and their relationships.
- **State Diagram:** Outlines the lifecycle of the system's core processes, detailing the transitions between different states.

These subsections collectively define the operational context of the system, offering insights into how its components work together to meet user requirements.

2.1.1. Scenarios

The purpose of this section is to illustrate the operational contexts in which the Students & Companies (S&C) system will function. It explains how the system's functionalities are designed to meet user requirements by presenting a detailed exploration of the entire operational cycle of the software from the perspective of all user types. The description begins with the creation of a user profile and concludes with the completion of the

internship.

To ensure clarity and transparency, a narrative style is used to describe these scenarios. This approach not only enhances readability but also introduces the key stakeholders, settings, and motivations driving their actions. Each scenario tells a story that depicts a possible real-life situations within the S&C software. This aims to provide transparency from both theoretical and practical viewpoints, ensuring clarity not only about what happens but also about how users interact with the system to make it happen.

The protagonists of the following scenarios are:

- **Lorenzo:** Lorenzo is a university student who pursues a Bachelor's degree in Artificial Intelligence at the University of Pavia. As part of his academic program, he is required to complete an internship which he also intends to use as the basis for his thesis. After not receiving positive responses to his CV submissions through various company websites, Lorenzo decides to explore the S&C platform.
- **David:** David works at AISent, a small and medium-sized company (PMI). He is looking for a student to collaborate on a Computer Vision project, making him an ideal example of a company recruiter who benefits from the S&C platform.
- **Claudio:** Claudio is a professor at the University of Pavia. Lorenzo contacts him to request that he serve as his academic tutor. In this capacity, Claudio will act as a liaison between the company and the intern, oversee the internship's progress.

The interaction lifecycle between these three stakeholders and the S&C platform will be analyzed in detail through the following stages:

1. Student's (Lorenzo) scenarios.
2. Company Recruiter (David) scenarios.
3. University tutor (Claudio) scenarios.

Although there are common user scenarios, it was decided to present everything separately in order to make the process clear from start to finish for each type of user.

Stage A: Student's Scenarios

Scenario [A-1]: *The Student Opens the S&C Application*

The first interaction between the student **Lorenzo** and the S&C application focuses on accessing the platform. Upon entering, Lorenzo is presented with the following options on the access page which features the system's logo:

- **Login:** If Lorenzo already has an account, he can log in to access his profile and continue using the platform.
- **Registration:** If Lorenzo is a new user, he may choose to create an account, allowing him to explore the platform and assess how his profile aligns with available internships.

- **Language Change:** Lorenzo can switch the system language via a dropdown menu to suit his preference.
- **Assistant:** If Lorenzo encounters issues or has questions, he can open a chat to receive support from the platform's LLM with RAG.

This scenario focuses solely on the student's access. The subsequent four points will now be analyzed in detail as individual scenarios. They are presented here to provide context for the genesis of this scenario. The analysis will proceed with scenarios spanning from the student's initial application access to the internship's conclusion.

Scenario [A-2]: *Student Registration*

Upon choosing to register on the Students & Companies (S&C) platform, Lorenzo is presented with a registration form that requires filling out various fields. He has the option to upload his CV, which the system can use to auto-fill these fields. If he does not upload a CV, he must enter his information manually:

- *Profile Photo*
- *Personal Data:* Name and Surname.
- *Contacts:* Phone Number, LinkedIn profile.
- *Institutional Email*
- *Password*
- *Department and Role*
- *Professional Biography*
- *Certifications, Awards, Recognitions*
- *Languages Spoken*
- *Security Question*

The institutional email plays a crucial role on the platform, as it is used to verify a user's status as a student along with their university affiliation. This verification is possible through a list of email domains provided by university staff such as secretaries or professors during the university profile setup process. As detailed in section C-3, "University Profile Generation" these administrators must include all relevant institutional email domains. This inclusion enables the system to accurately categorize each user's type and university affiliation. A feature at the bottom of the registration form, "Information Improvement," uses an LLM to analyze and suggest improvements for the clarity and quality of the entered information. Upon revising the details with the LLM's suggestions, Lorenzo can proceed to confirm the creation of his profile. Potential outcomes post-registration include the following 4 subscenario:

Subscenario [A2-1] Mandatory fields incomplete:

Lorenzo will be prompted to complete any missing fields.

Subscenario [A2-2] All fields completed, domain registered:

If the email domain matches one registered by his university, Lorenzo is directed to his new homepage to start using the application.

Subscenario [A2-3] Fields complete, domain not registered:

If Lorenzo's email domain is not recognized, he is put in contact with a support operator. Together, they discover that although he is part of a registered university, his specific email domain has not yet been added to the system. The university's profile creator, typically an administrative staff member like Claudio, is then requested to add Lorenzo's specific email domain to the list of recognized domains. Once this addition is made, Lorenzo will receive an email confirmation allowing him to proceed with his registration.

Subscenario [A2-4] Domain and university not registered:

If Lorenzo's email domain is not recognized, he is put in contact with a support operator. They determine that his university does not have an institutional profile on the platform. Consequently, registration cannot proceed until an administrative member or academic tutor from the university registers the institution and includes all potential institutional email domains. Lorenzo can opt to be notified via email once his university is registered, allowing him to complete his registration afterward.

Scenario [A-3]: *The Student Login in the S&C Application*

Lorenzo (or any other student) proceeds to log in using the credentials obtained during the registration process. From the initial page, the student navigates to the dedicated login page with the intent of accessing the functionalities of the **S&C** platform. To complete the login process, Lorenzo must enter his username and password into the designated fields for student credentials. Once authenticated, he gains access to the platform.

Scenario [A-4]: *The Student Credential Recovery*

Despite having created a profile, Lorenzo (or any other student) has forgotten both his email and password. Using the credential recovery feature, Lorenzo provides the answers to the security questions he selected during registration. The **S&C** system validates his responses, retrieves the email associated with his profile, and sends a temporary password to that email. Lorenzo can then use the provided credentials to regain access to his account and reset his password if needed.

Scenario [A-5]: *The Student and the Chatbot Interaction*

Lorenzo is uncertain about the detailed functionalities of the **S&C** application and wants to understand how his data will be used before providing his information. To address this and other doubts, Lorenzo interacts with the platform's chatbot. The chatbot offers clear explanations, providing information about data usage and the platform's features. If Lorenzo requires further clarification, the chatbot sends his query to a human representative for additional support.

Scenario [A-6]: *Student Language Change* .

Whenever Lorenzo wishes to change the platform's language, he can easily do so without navigating away from his current activity. A flag icon representing the current language is visible on every page of the S&C platform. By clicking on this icon, Lorenzo is presented with a dropdown menu featuring other available languages, each represented by its respective flag. He selects his preferred language, such as Italian, English, French, Spanish, or German. The platform instantly updates to his chosen language.

Scenario [A-7]: *The Student Enters the S&C Homepage* .

After successfully logging into the Students & Companies (S&C) platform, Lorenzo is immediately presented with a homepage tailored to support his needs as a student navigating internship opportunities. The platform welcomes him with a personalized interface designed to streamline his academic and professional journey.

Lorenzo's profile is prominently displayed on the left side of the screen. Here, he can see his profile picture, his full name, and his role at the university, reaffirming his presence on the platform. A settings option allows him to adjust his account details and preferences, ensuring the platform aligns with his personal requirements. At any moment, Lorenzo can switch the platform's language to suit his preference, and he has access to an intelligent assistant powered by an LLM with RAG, which provides guidance whenever he encounters doubts or difficulties.

In the main section of the homepage, Lorenzo can quickly orient himself using two essential tools: the *Calendar Widget* and the *Notifications Widget*. The calendar helps him stay organized, showing upcoming dates and allowing easy access to a more detailed planning view. Notifications ensure Lorenzo stays informed, highlighting key updates about internships or administrative matters. These updates are color-coded, so he can immediately distinguish between calendar events, internship updates, and urgent issues.

Lorenzo's navigation experience is further simplified by a bar at the bottom of the page, which provides direct links to vital sections of the platform. He can explore internship opportunities through the *Matchmaking* section, track his progress in the *Monitoring* area, manage his schedule in the *Calendar*, and communicate with companies or administrators in the *Messages* section. These tools are strategically designed to empower Lorenzo, giving him control and clarity over his internship journey.

The homepage reflects Lorenzo's personalized experience, making it easier for him to focus on his goals. By organizing the information and functionalities around his needs, the platform ensures that Lorenzo's time is spent effectively, allowing him to seamlessly move from planning to action in pursuit of his academic and career aspirations.

Scenario [A-8]: *The Student Searches for an Internship* .

After successfully logging into the S&C platform and viewing his homepage, Lorenzo is ready to embark on his search for internships. This search process includes all preliminary actions before establishing contact between Lorenzo and potential employers. Contact occurs when there is mutual interest from both the company and the student concerning a position.

The contact can be classified into two main categories: The first is related to Lorenzo's applications (i.e., the search part that starts from the student via the matchmaking page). From here, two sub-scenarios derive: A8.1 and A8.2.

The second category of internship search focuses on the possibility that contact occurs not because of initial interest from the student followed by the company's response, but the opposite—where the company sends a request for participation in the selection process. This category of contact will be explored in Scenario 11.

In this scenario, we analyze the initial part of potential contacts from CATEGORY 1, namely those that begin with Lorenzo's applications, which can occur in the two following ways:

Subscenario [A8-1]: *Recommendation List in Matchmaking*

In the Recommendation List section of the matchmaking interface, Lorenzo is presented with internship opportunities that are closely aligned with the qualifications and career aspirations detailed in his CV during registration. This recommender system is designed to provide him with curated opportunities directly at his fingertips, offering personalized suggestions that match his preferences and requirements. The Recommendation List, centrally positioned on the matchmaking page, includes:

- **Title and Details:** Clicking on an internship title, Lorenzo accesses a detailed description of the role, outlining the expectations, responsibilities, and required qualifications.
- **Engagement Options:** Each listing provides Lorenzo with options to apply directly, save for later review, or decline. This adaptability helps him tailor the recommendations over time according to his changing preferences. Being a recommendation-based scenario, what Lorenzo selects in the engagement options can influence the system's future suggestions, enhancing the relevancy of future presented opportunities.

If Lorenzo decides to refine the list further, he can use tags recommended by the system to filter positions by job type or category.

If Lorenzo applies for a job, the application moves from the matchmaking page to the Monitoring page, where he can monitor the progress of his application as described in detail in Scenario 9.

Subscenario [A8-2]: *Custom Search in Matchmaking*

If the recommendation system fails to meet Lorenzo's preferences, he has the option to perform a custom search. By utilizing the Search Bar, located at the top right of the matchmaking interface, Lorenzo can input specific keywords related to his desired internships. This search functionality significantly enhances his ability to uncover roles that might not be immediately visible through default filters. Utilizing the platform's comprehensive search engine, Lorenzo explores all available positions listed on the platform. This approach grants him the ultimate flexibility in finding opportunities that perfectly align with his specific interests and career goals, ensuring he does not miss out on potential matches that could be hidden beyond the immediate recommendations.

Scenario [A-9]: *The Student Navigates the Monitoring Page*

After navigating the matchmaking page, Lorenzo moves on to the subsequent Monitoring Page. This section allows him to manage various aspects of his internship process, organized into three distinct tabs, each with its unique purpose.

The first tab, *Selection Process*, is dedicated to managing all activities from the initial matchmaking phase to the start of an internship. It enables Lorenzo to track applications, respond to company invitations, and take necessary actions before an internship begins. The second tab, *Active Stage*, focuses on internships that are currently ongoing, allowing him to monitor progress and address issues during this phase. The third tab, *Questionnaire*, provides access to feedback forms completed during two critical phases of the internship: after the first meeting and at its conclusion. Navigation within this tab is organized into sub-sections, one for each questionnaire.

The *Selection Process* tab contains a detailed table listing all internships Lorenzo is currently managing. Each row in the table represents a specific internship and includes several fields. The *Company* field displays the company name, which Lorenzo can click to view additional details. Similarly, the *Company Tutor* field shows the tutor's first and last name, with clickable access to their profile. A *Tag* indicates the origin of the application, using color codes to differentiate between internships applied for by Lorenzo (green) and those sent to him by companies (blue).

The *Academic Tutor* field reflects the current status of tutor assignment. If no tutor has been selected, the field shows "Not Defined," prompting Lorenzo to make a choice. Once a professor agrees to take on the role, their name appears in the field and is clickable for further information. The *Associated Internship* field lists the title of the internship, also clickable, allowing Lorenzo to quickly review its details.

A particularly useful column, *Process Status*, summarizes the current state of each internship application, such as "Not Yet Seen" or "Accepted". This status guides Lorenzo's actions for each application. For instance, if edits are needed, the *Modify Internship* option allows him to open a pre-filled form to make changes. If he decides to withdraw from an application, the *Remove* button enables him to terminate the process, automatically notifying the company of the rejection.

Through this organized interface, Lorenzo can efficiently manage his applications and monitor the progress of each internship. The Monitoring Page serves as a central hub, providing him with the tools and insights needed to navigate the different stages of his academic and professional development with confidence and ease.

Scenario [A-10]: *The Student Monitors the Progress of his Applications*

As mentioned in Scenario A-8, the applications sent by the student are tracked in the Monitoring Page, specifically within the first tab named "Selection Process" described in detail in the A-9 Scenario. These kind of application applications can be recognized as they are the ones marked with the "Sent" tag in the Tag column of the table.

Within this tag, the status of these internships can be specifically identified as follows:

- **Not yet seen:** The company has not yet responded to the sent application.

- **Seen but no response:** The company has viewed the application but has not responded.
- **Rejected2:** The company has rejected the sent application; this terminates the selection process.
- **Accepted2:** The company has accepted the sent application.

This setup allows Lorenzo to efficiently track the status of each application and respond accordingly.

Scenario [A-11]: *The Student Monitors the Status of Requests Sent to Him*
As mentioned in Scenario A-8, contact occurs when there is mutual interest. In the previous scenario, we have seen scenarios related to Category 1, where Lorenzo initiates contact by demonstrating interest. This scenario explores Category 2, which occurs when companies express interest in Lorenzo.

To view the companies that have invited him to participate in their selection process for specific positions, Lorenzo navigates within the "Monitoring Page" tab and looks at entries where the tag column is marked "Received". Specifically, the student can accept or reject these positions, changing the status to:

- **Rejected1:** The student has rejected the received offer; this terminates the selection process.
- **Accepted1:** The student has accepted the received offer.

This mechanism allows Lorenzo to effectively manage the incoming requests from companies. He can swiftly navigate through his options, making decisions that best align with his career goals.

Scenario [A-12]: *A Contact is Established* .

A contact is established between Lorenzo and a company when mutual interest has been expressed, regardless of the order in which the interest was shown. To summarize the processes described in Scenarios A-8, A-10 and A-11 , a contact can occur in the following ways:

- **Through Recommendation Lists:** If Lorenzo shows interest in an internship by liking or applying directly from the Recommendation List, and the company reciprocates this interest by accepting his application. Lorenzo will receive a notification or he can view this acceptance through the Monitoring Page. Once accepted, an icon appears indicating that the company's tutor is scheduling the meeting.
- **Through Custom Searches:** Lorenzo may initiate contact by applying to a position found via a custom search. If his application aligns with the company's requirements and the company reciprocates interest, thus establishing contact, Lorenzo will receive a notification or he can view this acceptance through the Monitoring Page. Upon acceptance, an icon indicates that the meeting is being scheduled by the company's tutor.

- **Through Company Initiatives:** Companies can initiate contact by sending invitations to Lorenzo to participate in their selection processes, especially when they find his profile suitable from their end. Lorenzo can view these invitations in the "Monitoring Page" under the tab marked "Received" and can either accept or reject these offers. Accepting an invitation directly influences his status and moves the process forward. Once accepted, an icon appears indicating that the company's tutor is scheduling the meeting.

Once this connection is made, the system sends a notification to inform Lorenzo of the successful match. The notification includes key details, such as the name of the company and the position for which the contact was made. This notification is stored in the message section of the application, allowing Lorenzo to review it at any time. This ensures that Lorenzo remains informed about new opportunities and can easily keep track of his connections as they arise, supporting effective engagement with companies.

Scenario [A-12]: Selection Process (Student Overview)

Once a contact is established between Lorenzo and a company, the selection process unfolds in a structured and interactive manner. The process is designed to guide Lorenzo through each step, ensuring he has all the tools and information necessary to make informed decisions.

After a meeting has been scheduled, an icon appears on the platform that allows Lorenzo to access a dedicated chat. This feature facilitates direct communication between him and the company tutor, enabling immediate discussion about the internship. Following the meeting, the company tutor is required to complete a questionnaire evaluating Lorenzo. They have three days to submit this evaluation, during which Lorenzo receives a notification on his homepage reminding him of the deadline. Once completed, the questionnaire is stored in a specific section for later reference.

After reviewing the questionnaire, Lorenzo has one week to make a decision regarding the internship. He can use a dedicated icon to confirm his decision, and the system provides a notification to remind him of the deadline. At this stage, Lorenzo communicates his final decision, which could take one of several paths. If he chooses to reject the internship, the selection process is terminated. Alternatively, if he requires additional information or discussion, Lorenzo can request another meeting with the company. The company selects a new date, and a pop-up notification is generated in the existing chat. Lorenzo has three days to respond to this meeting without the possibility of scheduling another. A reminder notification ensures he is kept informed of the deadline.

If Lorenzo decides to accept the internship, the process advances to the next stage. This transition does not require a specific icon but is automatically reflected in the system, moving to stage 6, which involves assigning an academic tutor. Lorenzo then selects a professor to act as his tutor by entering their email address. A notification is sent to the professor, who has three days to accept or decline the role. If the professor rejects the role, the system updates the status with an icon change, allowing Lorenzo to select a new tutor. This process repeats until a tutor is successfully assigned, activating the selection process.

The final step in the selection process involves the company making its decision. The company has three days to finalize their decision, during which they can either reject the internship, terminating the process, or accept it, activating the internship. Upon acceptance, the internship is moved to the next screen, and all other selection processes associated with Lorenzo are automatically rejected. The system also creates a history of states for the newly activated internship, starting with the status "Internship Started".

Throughout the process, Lorenzo receives timely notifications on his homepage, keeping him informed of deadlines and key updates. This structured approach ensures that Lorenzo can efficiently navigate and manage each step of the selection process, making it clear and straightforward for him to progress toward securing an internship.

Scenario [A-13]: *Lorenzo Monitors Active Stages*

After accessing the monitoring section, Lorenzo navigates to the **Active Stages** tab, where he can track his ongoing internships and manage any issues reported by his academic or company tutors. Upon entering the tab, Lorenzo is presented with a list of his active internships. Each entry in the list prominently displays the name of the assigned company tutor, the academic tutor, and the current status of the internship, which might be labeled as "*In Progress*", "*Suspended*", or "*Completed*". These statuses are accompanied by color-coded icons, allowing Lorenzo to quickly identify the state of each internship. As Lorenzo reviews the list, he notices that any reported issues are clearly highlighted in red. Clicking on an issue opens a dedicated chat window where Lorenzo can discuss the matter directly with the relevant tutor, ensuring immediate communication to resolve the problem. The platform also provides useful tools to help Lorenzo stay on top of his internship activities. He can initiate direct chats with his tutors via quick-access buttons, enabling him to ask questions or provide updates about his progress. Real-time updates ensure that Lorenzo is always aware of any changes in the internship's status, such as schedule adjustments or new deadlines communicated by his tutors. This section of the platform empowers Lorenzo to stay informed and proactively manage his internship experience. The clarity of the displayed information and the ability to engage directly with tutors make monitoring an efficient and straightforward process.

Scenario [A-14]: *The Student Completes the Final Evaluation Form*

At the conclusion of his internship, Lorenzo reflects on his experience by completing the Final Evaluation form. He accesses this form through Questionnaire Tab of the monitoring page, where it is prominently available as part of the closing phase of the internship. The form allows him to share his perspective on various aspects of the internship, providing valuable input for future improvements.

Lorenzo begins by rating the support he received from his company tutor, assessing how well the objectives and responsibilities were communicated, and evaluating whether the internship contributed to his professional growth. Beyond these quantitative ratings, Lorenzo takes time to provide qualitative feedback by describing what he enjoyed most about the experience and offering suggestions for improvement.

Once he has answered all the questions, Lorenzo submits the form, ensuring his feedback is included in the overall evaluation of the internship. His responses, along with those of the

company and academic tutors, contribute to a comprehensive assessment that helps refine future internship opportunities. This step marks the final action in Lorenzo's internship process, allowing him to conclude the experience with meaningful input that supports both his personal growth and the system's continual improvement.

Scenario [A-15]: *The Student Navigates the Calendar Page*

To stay organized and manage his internship commitments effectively, Lorenzo accesses the Calendar page. This tool helps him keep track of all scheduled activities, ensuring he is prepared for upcoming events and deadlines.

Lorenzo uses the calendar to view his schedule in various timeframes, such as daily, weekly, or monthly formats, depending on his needs. Key events related to his internship, including feedback meetings, monitoring sessions, and deadlines, are clearly displayed. The calendar's structure makes it easy for Lorenzo to understand the nature of each event at a glance, thanks to its intuitive layout.

Although Lorenzo cannot create new events, he can modify certain details where allowed, such as adding personal notes or setting reminders for meetings with tutors or company representatives. Additionally, the platform provides notifications to help him stay informed, ensuring he does not miss important deadlines or appointments.

To further simplify his planning, Lorenzo integrates the internship calendar with his personal tools, such as *Google Calendar* or *Outlook*. This synchronization allows him to have all his commitments in one place, making it easier to manage both academic and personal tasks. When needed, Lorenzo can also search for specific events, quickly finding relevant details without manually scrolling through the calendar.

By relying on the Calendar page, Lorenzo ensures that he remains organized and proactive, effectively balancing the demands of his internship with other responsibilities.

Scenario [A-16]: *The Student Interacts with the Messaging System*

To manage communication during his internship, Lorenzo uses the platform's messaging system. This tool provides him with a convenient way to stay connected with company tutors, academic tutors, and other stakeholders. Whether he needs to coordinate meetings, seek clarifications, or report issues, Lorenzo can rely on this system for efficient and organized communication.

The messaging system notifies Lorenzo of new messages and organizes conversations by context, allowing him to quickly find relevant discussions. Through this feature, Lorenzo maintains effective communication with everyone involved in his internship, ensuring he can address concerns and stay aligned with expectations.

Subscenario [A16-1]: *The Student Files a Complaint via Messaging*

During his internship, Lorenzo encounters a situation that requires formal intervention. Using the messaging system's dedicated complaint feature, Lorenzo submits a detailed message explaining the issue he is facing. The platform ensures that his complaint reaches the appropriate parties, such as his academic tutor or the university administration, depending on the nature of the issue.

Once the complaint is submitted, Lorenzo receives confirmation, and the system allows him to monitor the status of the complaint as it progresses. Through follow-up messages, the responsible parties communicate with Lorenzo to provide updates and solutions. This process ensures that Lorenzo's concerns are addressed in a structured and timely manner, helping him feel supported throughout his internship.

Stage B: Company Recruiter's Scenarios

Scenario [B-1]: *The Recruiter Opens the S&C Application*

When David, a recruiter from AISent, accesses the S&C application, his first interaction is with the access page. He is faced with several options:

- **Login:** David can log in using his existing credentials to manage internship postings and review applications.
- **Registration:** new recruiters can register their account to start using the platform.
- **Language Change:** David can modify the system's language through a drop-down menu, facilitating communication in his preferred language.
- **Assistant:** for any assistance or queries, David can access immediate support through the chat feature powered by the platform's LLM with RAG.

This scenario outlines the initial access steps for the company recruiters. Further scenarios will detail each action individually as they relate to the recruiter's interaction with the S&C platform.

Scenario [B-2]: *Company Recruiter Registration*

David, a recruiter from AISent, decides to register on the Students & Companies (S&C) platform and is directed to complete a registration form specifically designed for company recruiters. The information required includes:

- *Profile Photo*
- *Personal Data:* Name and Surname.
- *Contacts:* Phone Number, LinkedIn profile.
- *Institutional Email*
- *Password*
- *Department and Role*
- *Professional Biography*
- *Certifications, Awards, Recognitions*
- *Languages Spoken*
- *Security Question*

At the bottom of the registration form, David can use the "Information Improvement" button, which employs an LLM to analyze and suggest improvements to the clarity and quality of the information provided.

Once the form is completed and refined, David can proceed to confirm the creation of his company recruiter profile. Depending on the information provided, the following subscenarios may occur:

Subscenario [B2-1]: Mandatory fields incomplete.

David will be prompted to complete them if any required fields are left unfilled.

Subscenario [B2-2]: All fields completed, domain registered.

If the email domain matches one already registered with the platform and associated with his company, David is directed to his new homepage to start managing internship postings and reviewing applications.

Subscenario [B2-3]: Domain not registered.

If David's email domain is not recognized, he is put in contact with a support operator. Together, they discover that while his company is registered with the platform, his specific email domain has not yet been added to the system. David is then instructed to contact a company administrator to add his specific email domain to the list of recognized domains. Once this addition is made, David will receive an email confirmation allowing him to proceed with his registration.

Subscenario [B2-4]: Domain and company not registered.

If David's email domain is not recognized, he is put in contact with a support operator. Together, they determine that his company does not have a profile on the platform. Consequently, registration cannot proceed until a company administrator registers the institution and includes all potential company email domains. David will be prompted to initiate the company profile setup as described in scenario [B-3]. He can also opt to be notified via email once his company is registered if he does not want to create the company profile.

Scenario [B-3]: *Company Profile Creation*

As said in Scenario B2-4, If a company recruiter like David finds that his company's domain is not registered on the S&C platform, he is put in contact with a support operator. Together, they verify that the company does not have a profile on the platform. Following this verification, David is sent a link via email to a profile creation page. This page allows him to establish a complete profile for his company with the following required fields:

- *Logo*
- *Name*
- *Contacts*

- *Office Address*
- *Operational Sector*
- *Size*
- *Description*
- *Certifications, Awards, Recognitions*
- *Tutor Domain(s)*
- *Information Improvement*
- *Language Change*
- *Assistant*
- *Continue*

Once the profile is submitted, it undergoes a verification process. If it meets the platform's standards, it is activated, and David receives an email with a link to his company's homepage. If the profile is not approved, he will receive detailed feedback with a link to revise and resubmit the profile.

Scenario [B-4]: *Recruiter Login*

David (or any other recruiter) proceeds to log in using the credentials obtained during the registration process. From the homepage, David navigates to the login page, intending to access the **S&C** platform to manage internship opportunities and applications. To log in, David must enter his username and password into the fields designated for recruiter credentials. Upon successful authentication, he gains access to the platform.

Scenario [B-5]: *The recruiter Credential Recovery*

David (or any other recruiter) encounters a situation where he has forgotten both his email and password. Using the credential recovery feature, David answers the security questions he set up during registration. Upon verifying his responses, the **S&C** system provides him with the email linked to his account and sends a temporary password to that email address. With these credentials, David can log in and reset his password for continued access.

Scenario [B-6]: *The recruiter and the Chatbot Interaction*

David has questions about how to use specific features of the **S&C** application, such as creating an internship posting or reviewing student profiles. To resolve his doubts, David interacts with the platform's chatbot. The chatbot provides step-by-step guidance and answers frequently asked questions. If David's concerns are not fully addressed, the chatbot sends his query to a human representative for further assistance.

Scenario [B-7]: *Company Recruiter Language Change*

David can change the platform's language at any time during his session by interacting with the flag icon displayed on every page. This icon opens a dropdown menu containing

options like *Italian*, *English*, *French*, *Spanish*, and *German*, each accompanied by its national flag. Selecting a new language from this menu immediately updates the interface, allowing David to continue his recruitment activities in the language of his choice.

Scenario [B-8]: *The Company Tutor Enters the S&C Homepage*

When David, acting as a company tutor, logs into the Students & Companies (S&C) platform, he is greeted by a personalized homepage tailored to his responsibilities.

On the left side of the page, David's profile is prominently displayed, including his name, role, and profile picture. This section also provides him with options to adjust account settings, switch the platform's language, or access support through an integrated assistant. These features ensure that the platform is adaptable to David's preferences and needs.

As he scans the central area of the homepage, David notices two key widgets that keep him informed and organized. The calendar widget highlights upcoming events, offering a quick way to view his schedule or jump to the full calendar for detailed planning. The notifications widget provides updates on critical matters, such as internship progress and reported issues. These notifications are color-coded, allowing David to quickly identify and prioritize tasks, from reviewing calendar events to resolving urgent problems flagged in red.

At the bottom of the homepage, David finds a navigation bar that simplifies access to the platform's main sections. This includes a matchmaking area, where he can explore recommended student profiles, and a monitoring section, where he can manage internships. Within the monitoring area, David can track internships he has created, review their selection processes, and oversee active engagements with students. The navigation bar also connects him to tools for managing meetings, events, and communications.

This intuitive setup allows David to efficiently oversee all aspects of his internship-related activities. Whether he needs to plan meetings, track student progress, or address issues, the homepage serves as a hub that empowers him to fulfill his role effectively and stay organized throughout the process.

Scenario [B-9]: *The Company Tutor Searches for Candidates*

After logging into the S&C platform, David navigates to the Matchmaking section to explore potential candidates for his company's internship positions. The platform provides him with a personalized interface, offering recommendations based on a detailed analysis of the skills, experiences, and interests of students compared to the requirements of the internships posted by David's company.

Through this section, David can efficiently search for candidates using tailored recommendations or by conducting a more specific search. The system is designed to assist him in identifying the most suitable students, streamlining the candidate selection process and saving time.

Subscenario [B-9.1]: *Recommendation List in Matchmaking*

David begins by reviewing a curated list of students whose profiles closely match the internships he has posted. Each recommendation is accompanied by key details, including

the student's name, the relevant internship title, and a match percentage that indicates how well the student aligns with the position. If David finds a profile particularly relevant, he can view more details and send a direct offer to the student, initiating the selection process.

To refine the recommendations further, David can apply filters to narrow down the list based on specific criteria, such as required skills or language proficiency. He can also sort the list by relevance, ensuring the most suitable candidates appear at the top. If he feels the recommendations do not fully meet his needs, David has the option to provide feedback on the suggestions, helping improve future results.

Subscenario [B9-2]: Custom Search in Matchmaking .

If the recommended profiles do not fully satisfy his requirements, David switches to a custom search. Using keywords or specific criteria, he can locate students whose profiles might not appear in the default list. This approach provides David with the flexibility to search for highly specific qualifications or specific skills that align with the unique needs of his company.

Once David identifies a suitable candidate, he sends an invitation to initiate the selection process. The system automatically transfers this interaction to the Monitoring section, where David can track the progress of his applications and manage follow-up actions as needed.

Scenario [B-10]: *The Company Tutor Navigates the Monitoring Page* .

After exploring potential candidates in the matchmaking section, David moves on to the Monitoring Page to manage ongoing applications and internships. This page serves as a central hub for overseeing all stages of the internship process, from the initial selection phase to active internships and feedback evaluations.

The Monitoring Page is divided into three main tabs, each addressing a specific aspect of internship management. In the *Selection Process* tab, David tracks applications and interactions with students before an internship officially begins. This includes reviewing candidate details, monitoring application statuses, and making decisions about proceeding to the next steps. The *Active Stages* tab focuses on managing internships that are currently in progress, enabling David to address any issues or updates during this phase. Finally, the *Questionnaires* tab provides access to feedback forms, which are completed at key moments, such as after the first meeting or at the conclusion of the internship.

In the *Selection Process* tab, David sees a table summarizing all the internships he is managing. Each row represents a specific internship, displaying details about the student, including their name and the origin of the application—whether the student applied directly or was invited by the company. David can also review the associated academic tutor for each internship, if one has already been selected, or follow up if this step is still pending.

The table also highlights the title of the internship, providing a quick link to review or modify its details if needed. The current process status is clearly displayed, guiding David on what actions are required next, whether it's scheduling an interview, updating

application details, or removing an application entirely. For any adjustments, David can open the internship creation screen to edit pre-filled fields or terminate the process if necessary, automatically updating the status for the student.

By using the Monitoring Page, David efficiently manages all aspects of the internship workflow. The structured design of this section ensures that he can focus on each phase of the process, from selecting the right candidates to tracking active internships, while maintaining clarity and control over his responsibilities.

Scenario [B-11]: *The Company Tutor Monitors the Progress of Applications Sent to Students*

As mentioned in Scenario B-9, the applications sent by the company to students are tracked in the Monitoring Page, specifically within the first tab named *Selection Process*. These applications can be recognized as they are the tables marked with the "Sent" tag in the Tag column.

Within this tag, the status of these applications can be specifically identified as follows:

- **Not yet seen:** the student has not yet responded to the sent application.
- **Seen but no response:** the student has viewed the application but has not responded.
- **Rejected1:** the student has rejected the sent application; this terminates the selection process.
- **Accepted1:** the student has accepted the sent application.

This setup allows David to efficiently track the status of each application and respond accordingly. The design of the Monitoring Page ensures that David is kept up-to-date with real-time updates regarding the applications he has sent, enabling him to manage the selection process effectively and plan next steps based on the feedback from students.

Scenario [B-12]: *The Company Tutor Monitors the Status of Requests Sent by Students*

As mentioned in Scenario B-9, contact occurs when there is mutual interest. Until now, we have seen scenarios related to Category 1, where the company initiates contact by demonstrating interest. This scenario explores Category 2, which occurs when students express interest in the company's positions.

To view the students who have applied to participate in their selection process for specific positions, David navigates within the *Monitoring Page* tab and looks at entries where the Tag column is marked "Received". Specifically, the tutor can accept or reject these applications, changing the status to:

- **Rejected2:** the company has rejected the received application; this terminates the selection process.
- **Accepted2:** the company has accepted the received application.

This mechanism allows David to effectively manage incoming applications from students. He can swiftly navigate through the options, making decisions that best align with the company's goals. This proactive engagement ensures that David remains in control of the selection process, effectively managing and responding to the opportunities presented by students.

Scenario [B-13]: *Selection Process (Company Tutor Overview)* .

Once David establishes contact with a student, he begins the detailed selection process to finalize the internship. Each step is designed to guide David through his responsibilities and ensure efficient communication and decision-making.

The process starts when the student accepts the initial contact, enabling David to schedule a meeting directly through the calendar. Once the meeting is arranged, David can initiate a dedicated chat with the student, allowing for seamless communication to discuss internship details and address any questions or clarifications.

After the meeting, David completes a questionnaire to evaluate the student's suitability for the role. He has three days to finalize this task, and the platform provides reminders to ensure timely submission. The completed questionnaire is stored for future reference, contributing to the decision-making process.

Following the evaluation, the student reviews the feedback and has one week to decide whether to accept the internship. If further clarification is needed, David can schedule another meeting with the student, ensuring all doubts are resolved. Once the student makes their decision—whether to accept, request modifications, or decline the internship—the process advances accordingly. If the student accepts, they proceed to select an academic tutor, a step that involves notifying the professor and awaiting their confirmation.

At the final stage, David reviews all aspects of the process and has three days to make the company's decision. If the internship is approved, the selection process transitions to the active internship phase, automatically rejecting other pending applications from the student. The platform logs the decision and creates a history of the internship's progress, starting with the status *Internship Started*.

Throughout this process, notifications and interactive tools keep David informed and help him manage each stage efficiently. The structured approach ensures that David can make informed decisions while maintaining clear communication with all parties involved.

Scenario [B-14]: *The Company Tutor Monitors Active Internships* .

After logging into the Monitoring section, David navigates to the Active Stages tab to oversee the internships currently in progress. This section provides him with a clear and organized view of all active internships, enabling him to manage ongoing tasks and address any issues that arise.

David begins by reviewing a table that summarizes key details for each active internship. For every student, he can see their name, which he can click to access their profile for additional information. The table also displays the name of the academic tutor assigned to the internship, providing David with a direct communication link if needed. The status

of each internship is clearly indicated, using icons to show whether it is "In Progress", "Suspended", or "Completed". If any issues have been flagged, they are highlighted in red, allowing David to quickly identify and address them. Clicking on an issue reveals further details and provides access to a dedicated chat feature for resolution.

Beyond monitoring, David has the ability to actively manage the internships. He can update the status of an internship to reflect changes, such as marking it as "Suspended" if a problem arises. If David identifies a new issue, he can report it using the problem reporting field, ensuring that all parties involved are informed. Additionally, he can use the built-in chat system to contact the academic tutor or the student directly, facilitating quick communication and resolution of any concerns.

Through the Active Stages tab, David remains in control of all active internships, ensuring that any challenges are addressed promptly and that the process continues smoothly. This feature supports David in maintaining oversight and fostering collaboration among all participants involved in the internships.

Scenario [B-15]: *The Company Tutor Creates a New Internship*

David, acting as a company tutor, accesses the "Monitoring" section of the platform to create a new internship opportunity. This task allows him to define a position that aligns with his company's needs while attracting suitable candidates from the student community. David navigates to the "New Internship Creation" screen, where he can either start from scratch or simplify the process by using predefined templates.

If David opts for a template, he can quickly populate key fields such as the title, category, and basic requirements for the position, saving time and ensuring consistency with common internship structures. For a more customized approach, David manually fills out mandatory fields, such as the title and description of the internship, specific skills or qualifications required, and the duration of the internship. He also specifies whether the position is remote, in-person, or hybrid, and includes details about compensation, the application deadline, and the operational languages needed for the role.

To ensure clarity and attractiveness, David can use the platform's built-in content optimization feature, which leverages an LLM to refine the internship description. This tool helps him present the opportunity in a professional and engaging manner, increasing the likelihood of attracting well-suited candidates.

Once the details are finalized, David has several options to manage the internship posting. He can save it as a draft to review later, publish it immediately to make it visible to students, or save it as a reusable template for similar positions in the future. If needed, David can also return to the previous screen without saving his changes.

Through this streamlined process, David creates an internship that clearly communicates the company's expectations and provides students with a comprehensive understanding of the opportunity. The platform's tools and intuitive design support David in efficiently completing this task, ensuring that the internship meets both company needs and student expectations.

Scenario [B-16]: *The Company Tutor Manages Internship Drafts* .

David, acting as a company tutor, accesses the "Draft Management" screen to review and manage the internship drafts he previously saved. This section provides him with a clear overview of all draft positions and the tools needed to finalize or remove them based on his current requirements.

On the screen, David sees a list of all saved drafts displayed in a central table. Each draft includes essential details, such as the internship title, the date and time of the last modification, and the status of the draft—indicating whether it is complete and ready for publication or if mandatory fields are still missing. This summary helps David quickly identify which drafts need further attention before they can be published.

To manage a draft, David can choose from several actions. If a draft requires updates, he can open it in the "New Internship Creation" screen, where he can make modifications to fields such as the description or required skills. Once satisfied with the content, David has the option to publish the internship, making it visible to students on the platform. Alternatively, if a draft is no longer needed, he can delete it permanently, with the system prompting him to confirm the action to avoid accidental removal.

To streamline his workflow, David can use filters and sorting tools to organize drafts by their completion status, category, last modification date, or title. This functionality ensures that David can efficiently locate and prioritize drafts, saving time and effort when managing multiple internship positions.

By leveraging the tools in the "Draft Management" screen, David can effectively handle all drafts, ensuring that only well-prepared and relevant internship opportunities are published while maintaining a clear and organized workflow.

Scenario [B-17]: *The Questionnaire Functionality (Company Tutor Perspective)* .

David, a company tutor, uses the "Questionnaires" section within the Monitoring page to provide evaluations at different stages of a student's internship. This section is divided into two tabs, each dedicated to a specific phase: the first meeting and the final evaluation. Each tab guides David in providing structured feedback tailored to the internship's progress.

Subscenario [B17-1]: *First Meeting Questionnaire* .

At the start of the internship, David navigates to the first meeting questionnaire to assess the student's initial performance. This tab prompts David to evaluate key aspects, such as the student's clarity in communication, their understanding of the internship requirements, and their enthusiasm for the role. Using multiple-choice and scale questions, David provides ratings and feedback on the student's suitability for the position.

In addition to structured questions, the tab includes open-ended fields where David can highlight the student's strengths and note areas that may require improvement. At the end of the process, David can save the completed questionnaire, ensuring the feedback is recorded for future reference. This step is essential in shaping the student's development and aligning expectations for the rest of the internship.

Subscenario [B17-2]: *Final Evaluation Questionnaire*

As the internship concludes, David accesses the final evaluation questionnaire to provide a comprehensive review of the student's performance. This tab allows David to assess areas such as the student's ability to meet deadlines, their problem-solving skills, and their overall contribution to the internship objectives. The questionnaire also includes open-ended fields for David to highlight the student's key strengths and suggest areas for growth.

The final evaluation gathers input not only from David but also from the student and the academic tutor, creating a complete overview of the internship. David can view feedback submitted by the other parties, which helps contextualize his own observations. Once completed, the evaluations are saved in the system, contributing to a detailed summary of the internship experience.

Scenario [B-18]: *The Company Tutor Manages Events Through the Calendar*

David, acting as a company tutor, accesses the "Calendar Events" section to navigate, manage, and create events related to internships. This tool provides him with a comprehensive overview of all scheduled activities, ensuring effective organization and coordination with students, academic tutors, and other stakeholders.

Subscenario [B18-1]: *Navigating Events in the Calendar*

David begins by exploring the calendar to review upcoming deadlines and scheduled activities. Switching between daily, weekly, and monthly views, he gets a clear picture of his commitments. Events are visually organized and color-coded based on their category, such as meetings in purple, feedback sessions in green, and project submissions in blue. This layout allows David to quickly identify the type and priority of each event.

When David selects an event, a detailed view opens, showing all relevant information. He can see the event's title, category, date, time, and description, along with the list of participants and their roles. If the event is virtual, David can access the video call link directly from the event details, along with a shortcut to the associated chat for quick communication. David also confirms his attendance using the available options, which automatically updates his status for the event.

Subscenario [B18-2]: *Creating and Managing Events*

When David needs to schedule a new event, he uses the calendar's creation functionality. He specifies key details such as the title, date, and time, and selects participants, including students, academic tutors, or other company representatives. For virtual events, David includes a video call link, which automatically generates an associated chat to facilitate communication before and after the meeting.

David categorizes the event using a dropdown menu, assigning a color-coded category such as "Meeting" or "Feedback." If the event marks the end of an internship, David flags it as the "Final Event," prompting the system to send final evaluation forms to all participants. Once all details are finalized, David saves the event, and notifications are sent to all invited users to ensure they are informed.

For events already scheduled, David can make modifications, such as updating the time or participants, or canceling the event entirely. These changes trigger updated notifications to all involved, keeping everyone aligned.

Scenario [B-19]: *The Company Tutor Manages Communications Through Messaging*

David, acting as a company tutor, accesses the "Messaging" section to manage his communications with students and academic tutors. This centralized platform simplifies the process of tracking and organizing conversations, ensuring effective communication and timely follow-ups.

Upon entering the messaging screen, David begins by selecting the type of user he wants to communicate with using the options at the top left of the interface. For example, he can choose to view conversations exclusively with students, companies, or university representatives. In cases where a conversation overlaps multiple categories, such as group discussions or video calls, the messages appear in each relevant category, ensuring they are easy to locate.

To refine his view further, David uses the filtering tools available at the top right. These tools allow him to search for messages by user name, date, type of message (e.g., text or video call), or specific keywords. If David needs to focus on conversations related to problem resolution, he can activate the “Problematic Messages” filter, which highlights issues flagged in red and places them at the top of his inbox.

In the central area of the screen, all messages are displayed in a unified view, organized based on David’s preferences. Messages related to specific issues are emphasized, helping David quickly identify and address urgent concerns. When a video call is scheduled via the calendar, a dedicated chat is automatically generated for the invited participants, allowing seamless communication before and after the meeting.

The integration of video calls and automatic message summaries further enhances David’s ability to manage discussions. By generating concise overviews of lengthy conversations, the system ensures that David can keep track of key points and follow-up actions without needing to review entire chat histories.

Through the messaging section, David ensures effective communication with all stakeholders involved in the internship process. The intuitive design and robust filtering options enable him to prioritize important conversations and maintain a clear overview of all interactions.

Stage C: University Tutor’s Scenarios

Scenario [C-1]: *The University Tutor Opens the S&C Application*

Claudio, a university professor, upon entering the S&C application, is greeted with the access page that provides:

- **Login:** Claudio can log in to manage his monitoring duties and oversee his students’ internships.

- **Registration:** new university staff can create accounts to connect with their students and manage internship affairs.
- **Language Change:** Claudio has the option to switch the system's language via a dropdown menu to ensure comprehension.
- **Assistant:** for any technical support or questions, Claudio can utilize the chat feature to receive guidance from the LLM with RAG.

This scenario introduces the access options available to university tutors. It sets the stage for further detailed analysis of each option as individual scenarios, covering the full spectrum of the tutor's interactions with the S&C platform.

Scenario [C-2]: *University Tutor Registration*

When Claudio, a professor from the University of Pavia, decides to register on the S&C platform, he follows a registration process tailored for academic staff. The form he fills out includes:

- *Profile Photo*
- *Personal Data:* Name and Surname.
- *Contacts:* Phone Number, LinkedIn profile.
- *Institutional Email*
- *Password*
- *Department and Role*
- *Professional Biography*
- *Certifications, Awards, Recognitions*
- *Languages Spoken*
- *Security Question*

At the bottom of the registration form, Claudio can use the "Information Improvement" button, which employs an LLM to analyze and suggest improvements to the clarity and quality of the information provided.

Once the form is completed and refined, Claudio can proceed to confirm the creation of his university tutor profile. Depending on the information provided, the following subscenarios may occur:

Subscenario [C2-1]: Mandatory fields incomplete.

If any required fields are left unfilled, Claudio will be prompted to complete them.

Subscenario [C2-2]: All fields completed, domain registered.

If the email domain matches one already registered by his university, Claudio is directed to his new homepage to start utilizing the application for his academic and administrative duties.

Subscenario [C2-3]: Domain not registered.

If Claudio's email domain is not recognized, he is put in contact with a support operator. Together, they determine that although his university is registered, his specific email domain has not yet been added to the system. Claudio is then instructed to contact a university administrator to add his specific email domain to the list of recognized domains. Once this addition is made, Claudio will receive an email confirmation allowing him to proceed with his registration.

Subscenario [C2-4]: Domain and university not registered.

If Claudio finds that his email domain is not recognized, he is put in contact with a support operator. They determine that his university does not have a profile on the platform. Consequently, Claudio is prompted to initiate the university profile setup. This process must be completed before he can finalize his registration, as will be detailed in Scenario [C-3].

Scenario [C-3]: *University Profile Creation* .

Similarly, if a university tutor like Claudio discovers that the university's domain is not registered, he receives an email with a link to a profile creation page for educational institutions. Claudio must fill out the following mandatory fields to complete the university profile:

- *Logo*
- *Name*
- *Contacts*
- *Office Address*
- *Operational Sector*
- *Size*
- *Description*
- *Certifications, Awards, Recognitions*
- *Student Domain(s)*
- *Information Improvement*
- *Language Change*
- *Assistant*
- *Continue*

The profile is then reviewed by the platform's team. If it complies with the platform's standards, it is activated, and Claudio is notified with a link to his new homepage. If there are issues, he will receive feedback and a link to adjust and resubmit the profile.

Scenario [C-4]: *The academic tutor Login in the S&C Application* .

Claudio (or any other academic tutor) proceeds to log in using the credentials obtained during the registration process. From the homepage, Claudio navigates to the login page, intending to access the **S&C** platform for overseeing and managing internships. To complete the login process, Claudio enters his username and password into the fields designated for tutor credentials. Once successfully authenticated he gains access to the platform.

Scenario [C-5]: *The academic tutor Credential Recovery* .

Claudio (or any other academic tutor) forgets his login credentials, including both his email and password. To recover them, Claudio uses the credential recovery feature and submits answers to the security questions he chose during registration. After validating his responses, the **S&C** system provides Claudio with the email associated with his profile and sends a temporary password to that email. This enables Claudio to log in and update his password as necessary.

Scenario [C-6]: *The academic tutor and the Chatbot Interaction* .

While navigating the platform, Claudio encounters a situation requiring assistance, such as managing student evaluations or communicating with companies. To resolve his query, Claudio interacts with the platform's chatbot. The chatbot offers automated assistance, providing answers to common questions or guiding Claudio step by step through the issue. If Claudio's problem requires further support, the chatbot sends the query to a human representative who contacts him directly.

Scenario [C-7]: *University Tutor Language Change* .

Claudio has the flexibility to switch the operating language of the platform directly from any page he is working on. The visible flag icon at the top of every page reveals a dropdown menu with various language options, each denoted by a flag. Claudio selects his preferred language from this menu, ensuring that the platform instantly reflects this change. This immediate update allows Claudio to manage his tasks in a language he is most comfortable with, supporting his administrative and academic duties.

Scenario [C-8]: *The University Staff Member Enters the S&C Homepage*

When Claudio, a university staff member, logs into the Students Companies (S&C) platform, he is greeted by a personalized homepage designed to streamline his responsibilities. This dashboard provides Claudio with an overview of critical updates and quick access to tools that support his academic and administrative duties.

On the left side of the homepage, Claudio sees his profile section, which prominently displays his name, role, and profile picture. This area also provides options to adjust account settings, change the platform's language, or access support via an integrated assistant. These features ensure the platform can be tailored to Claudio's preferences and needs.

The central part of the homepage highlights two key widgets that keep Claudio informed and organized. The calendar widget offers a snapshot of upcoming events, such as meet-

ings, deadlines, and evaluations, with shortcuts to the full calendar for detailed planning. The notifications widget organizes important updates into categories. Claudio can easily identify calendar events, internship status updates, or reported issues, which are color-coded to prioritize urgent matters. For example, red-highlighted notifications alert Claudio to problems requiring immediate attention, with direct links to chats for resolving them.

At the bottom of the homepage, Claudio finds a navigation bar that connects him to the platform's core functionalities. He can access the monitoring section to track the progress of internships, review academic evaluations, and manage questionnaires. The calendar section helps him plan events and meetings, while the messaging system ensures effective communication with students, companies, and other staff members.

By leveraging these tools, Claudio efficiently manages his responsibilities, ensuring smooth oversight of academic processes and proactive resolution of issues. The intuitive layout of the homepage helps Claudio stay focused and organized, allowing him to dedicate more time to meaningful academic support.

Scenario [C-9]: *The University Staff Member Navigates the Monitoring Page*
After navigating the homepage, Claudio moves on to the Monitoring Page. To understand the upcoming scenarios, it is essential to comprehend the structure of this page, where Claudio can perform various academic and administrative tasks. Let's explore what Claudio sees upon entering the Monitoring Page.

This page is divided into three different subsections (Tabs), each with unique features that allow the university staff member to perform various actions:

- The first tab, ***Selection Process***, manages the processes where students explicitly request Claudio's supervision as an academic tutor.
- The second tab, ***Active Stages***, focuses on scenarios related to ongoing internships where Claudio is actively involved.
- The third tab, ***Questionnaires***, provides access to evaluation forms completed during key phases of the internship process: the first meeting and the end of the internship.

Since the next scenarios are focused on what Claudio does in the first tab, let's analyze its structure to clarify the actions available in this and the upcoming scenarios. In the case of the university staff member, the tab contains a list of internships through tables (one per internship), with:

- **Student:** name and surname of the student, clickable for detailed profiles.
- **Company Tutor:** name and surname of the company tutor, clickable for details.
- **Associated Internship:** title of the internship the student is involved in, clickable for more information.
- **Process Status:** current state of the process, with associated and clickable icons representing specific stages and actions.

- **Remove:** button to remove the selection process, which automatically updates the company tutor's status to rejected.

The key feature of these tables is the **Process Status**, which represents the situation for each stage and enables specific actions to be taken as described in the upcoming scenario.

Scenario [C-10]: *The University Staff Member Manages the Selection Process*

After navigating the homepage, Claudio proceeds to the Monitoring section to oversee the selection process for internships. This process involves evaluating and responding to student requests for academic supervision and monitoring the overall progress of the selection stages.

Subscenario [C-10.1]: *Tutor Selection*

In this stage, Claudio is notified when a student nominates him as their academic tutor by submitting their email. Claudio can perform the following actions:

- **Accept:** by accepting the request, Claudio confirms his role as the tutor. The system updates the status and displays Claudio's name in the relevant table row for the internship.
- **Reject:** by rejecting the request, the selection process for the specific student and internship is terminated, and the entry is removed from the table.

Claudio has three days to make a decision, during which the process status is displayed with a *Tutor* icon to indicate the pending action.

Subscenario [C-10.2]: *Final Decision by the Company*

Once Claudio has made his decision, the company has three days to finalize the selection process. The company's options are:

- **Accept:** the internship is activated and moved to the *Active Stages* tab. The system creates a history log marking *Stage Started* as the initial state.
- **Reject:** the selection process is terminated, and the entry is removed from the table.

The system notifies Claudio of the company's decision through the homepage, ensuring they are informed of the outcome.

Subscenario [C-10.3]: *Process Status Indicators*

The Monitoring section provides icons to represent the current state of the selection process, helping Claudio track progress and take necessary actions. Key icons include:

- **Tutor:** indicates that the student has nominated Claudio as their tutor and is awaiting a response.
- **Accepted:** confirms that Claudio has accepted the tutor role, and the process is progressing.

- **Rejected:** indicates that Claudio or the company has declined the request, terminating the process.
- **Meeting Scheduled:** appears when the company is organizing a meeting with the student.
- **Active Internship:** displays once the internship is officially started and moved to the *Active Stages* tab.

Subscenario [C-10.4]: Notifications and Deadlines .

The platform ensures that Claudio remains updated by providing:

- **Notifications:** alerts about pending tutor requests and company decisions.
- **Reminders:** automated reminders of deadlines for responding to tutor nominations or tracking company decisions.

The Monitoring section equips Claudio with the tools and information needed to efficiently manage the selection process, ensuring clarity and accountability at every stage.

Scenario [C-11]: *The Academic Tutor Reviews Active Internships* .

When the academic tutor accesses the Monitoring section, they navigate to the Active Stages tab to supervise and manage ongoing internships. This tab provides a structured view of all active internships, helping the tutor stay informed and address any issues efficiently.

At a glance, the academic tutor can see a table summarizing key details for each internship. For every student, their name is displayed and clickable, allowing the tutor to access the student's profile for additional information. The name of the company tutor is also included, with a direct link to initiate communication if needed. Each internship's current status is visually represented with descriptive icons, while any flagged issues are highlighted in red, drawing attention to matters requiring immediate action.

The academic tutor uses this section to take several critical actions. When issues are flagged, the tutor can contact the student or the company tutor to resolve them directly. They can also review feedback provided by the company tutor, ensuring that the internship is progressing as expected. If necessary, the academic tutor can update the internship's status to reflect changes, such as marking it as "Suspended" or "Completed." For unresolved problems, the tutor can escalate them through internal university channels, ensuring appropriate follow-up and resolution.

This system ensures that the academic tutor has full oversight of ongoing internships, fostering clear communication and proactive management. By keeping all stakeholders informed, the platform helps ensure that internships are successfully guided to completion.

Scenario [C-12]: *The Academic Tutor Completes the Final Evaluation Questionnaire* .

At the conclusion of an internship, the academic tutor reflects on the program's effectiveness by completing the Final Evaluation questionnaire. This form is accessed through the

Questionnaire Tab within the Monitoring page, where it is prominently available as part of the closing phase of the internship. The form enables the tutor to provide insights into the internship's academic value and alignment with educational objectives.

The academic tutor begins by assessing whether the internship met its intended learning goals, rating this aspect on a six-point scale. This evaluation reflects how well the internship supported the student's academic development and provided meaningful learning experiences. In addition to this quantitative feedback, the tutor provides a detailed written assessment of the internship, highlighting its strengths, identifying areas for improvement, and offering suggestions to enhance its academic relevance in the future.

Once all questions are completed, the academic tutor submits the form, ensuring their input becomes part of the overall evaluation. These responses, combined with feedback from the student and company tutor, contribute to a comprehensive review of the internship. This process ensures that all perspectives are considered, fostering continuous improvement in the structure and execution of future internships.

By completing the Final Evaluation, the academic tutor plays a vital role in maintaining the quality and academic relevance of the internship program. Their feedback not only supports the student's growth but also helps refine and enhance opportunities for future participants.

Scenario [C-13]: *The Academic Tutor Interacts with the Messaging System* . To manage communication during internships, the academic tutor uses the platform's messaging system. This tool allows the tutor to stay connected with students, company tutors, and university staff, ensuring effective coordination and support throughout the internship process. Whether following up on flagged issues, providing feedback, or addressing administrative queries, the academic tutor relies on the messaging system for efficient and organized communication.

The messaging system notifies the tutor of new messages and organizes conversations based on context, making it easy to locate and respond to relevant discussions. This functionality helps the academic tutor maintain clear and timely communication with all stakeholders, ensuring that any concerns are promptly addressed and that the internships remain on track.

Subscenario [C13-1]: *The Academic Tutor Resolves an Issue via Messaging*.

During an internship, the academic tutor may be contacted by a student or company tutor regarding an issue requiring academic guidance. Using the messaging system, the tutor reviews the detailed message outlining the concern and provides appropriate advice or instructions to address the situation. In cases where additional input is needed, the tutor can coordinate with other parties, such as the university administration or the company tutor, to ensure the issue is resolved effectively.

Once the tutor's response is sent, the platform keeps a record of the conversation for future reference, allowing all parties to track the resolution process. The system's structured approach ensures that the academic tutor can support the stakeholders involved and uphold the quality of the internship experience.

2.1.2. Domain Class Diagram

2.1.3. State Diagram

Here we include scenarios and further details on the shared phenomena and a domain model (class diagrams and state diagrams).

2.2. Product Functions (BOZZA)

This section outlines the primary functionalities of the "Students & Companies (S&C)" platform. It categorizes these functionalities into distinct groups that will be consistently maintained and elaborated upon in the Functional Requirements detailed in the section 3.2. The categorization not only aids in the structured development of the system but also ensures that each functionality is clearly aligned with the overall objectives of the platform.

Sign Up (Upload CV) *Target Users:* All potential users of the platform.

This feature allows new users to register on the "Students & Companies" platform. During the registration process, users can upload their Curriculum Vitae (CV), which the system uses to pre-fill parts of their profile. This accelerates the account creation process and improves the accuracy of profile information.

Log In *Target Users:* All registered users.

This function enables users to enter the system using their established credentials (e.g., email and password). It verifies user identity and ensures that they only access functions they are authorized to see and use.

Edit Profile Information *Target Users:* All registered users.

This functionality allows users to modify their profile information after registration. Users can update details such as address, contact information, work experience, and education to keep their profile current and relevant.

Chatbot Communication *Target Users:* All users.

This feature provides an automated communication system through a chatbot, offering immediate assistance to users for frequently asked questions, guidance in using the system, and real-time support for technical or procedural issues.

Change Language *Target Users:* All users.

This functionality allows users to select their preferred language for the user interface of the system. This ensures that users can use the platform in the most comfortable and effective manner possible, regardless of their native language.

Create Internships *Target Users:* Companies.

This feature allows companies to create new internship listings on the platform. Companies can enter details such as job title, description, required qualifications, duration of

the internship, and compensation, if applicable. This functionality is designed to make it straightforward for companies to outline the roles they are offering, specifying the skills and experiences they are seeking in candidates. The creation process includes options for setting application deadlines and choosing whether the internship will be remote, on-site, or hybrid.

Save Internship Draft *Target Users:* Companies.

This functionality allows companies to save their internship listings as drafts before finalizing and publishing them. This is particularly useful for obtaining additional approvals within the company or making sure that all necessary information has been included before the internship goes live. Drafts can be revisited, edited, and adjusted as needed, providing flexibility in managing internship offers and ensuring that all details are correct prior to publication.

Internship Search *Target Users:* Students.

Students can search for internships using various methods provided by the platform. These include browsing through a list of available internships, using filters such as location, field of interest, and required skills, or utilizing a recommendation system that suggests internships based on the student's profile and past applications. Students can also receive alerts for new postings that match their preferences.

Application for Internship *Target Users:* Students.

This function allows students to apply for internships. Students can submit their applications through the platform, which typically include their CV, a cover letter, and sometimes answers to specific questions posted by the hiring company. This initiates their participation in the selection process.

Search for Students *Target Users:* Companies.

Companies can search for potential candidates among the student users of the platform. They can use filters such as academic performance, skills, previous internship experiences, and geographical preferences. Companies can also view recommendations provided by the system, which are based on the alignment of student profiles with the company's internship requirements.

Accept/Reject Participation in the Selection Process *Target Users:* Companies.

Companies can review applications from students and decide whether to accept or reject their participation in the selection process. This decision can be based on the student's qualifications, the quality of the application, and the fit between the student's profile and the internship role.

Accept or Reject Participation to the Selection Process *Target Users:* Students.

Students can receive requests from companies to participate in the selection process. Students have the option to either accept or reject these requests. Accepting the request moves them further into the selection process, potentially leading to an interview, while rejecting it removes them from consideration for that particular internship.

Communication *Target Users:* All users.

This functionality facilitates direct communication among users within the platform, enabling students, companies, and university tutors to interact with each other. The system supports various forms of communication, including messaging, email notifications, and forum interactions. This feature is designed to ensure seamless exchange of information, clarify the requirements and statuses of internships, and provide a channel for real-time feedback and discussions.

Accept to be a Tutor *Target Users:* University tutors.

University tutors have the option to accept requests to become tutors for specific internships. This feature allows them to review the details of the internship and the responsibilities involved before making a decision. Accepting to be a tutor involves overseeing the academic aspects of the internship, mentoring students, and ensuring that the internship meets educational standards and objectives.

Create and Manage Events *Target Users:* Company tutors and university tutors.

This functionality enables company tutors and university tutors to create and manage events related to internships. Events can include interviews, workshops, seminars, and deadlines for various stages of the internship process. The system provides tools to set up event details, invite participants, manage RSVPs, and integrate with common calendar applications for easy scheduling and reminders.

Compilation of the First Questionnaire *Target Users:* Company tutors.

After an internship application process begins, company tutors are required to compile a first questionnaire to assess the suitability of applicants. This questionnaire typically includes questions regarding the candidate's skills, experiences, and fit with the company culture. The results are used to screen candidates effectively and decide who will proceed to the next stage of the selection process. This initial assessment is crucial in narrowing down the pool of applicants to those who best match the internship's requirements.

Monitor Active Internships *Target Users:* All users.

This feature allows all users—students, company tutors, and university tutors—to monitor ongoing internships. It provides real-time updates on the status of active internships, including progress reports, upcoming deadlines, and any deliverables due. This monitoring tool is essential for keeping all parties informed about the internship's progression and ensuring that milestones are met on schedule.

Report an Issue *Target Users:* Students and university tutors.

Students and university tutors can use this feature to report any issues they encounter during an internship. This could include problems with meeting internship requirements, conflicts within the workplace, or other concerns that may affect the quality or success of the internship. Reporting an issue triggers a review process by the responsible authority (company or university) to address and resolve the matter promptly.

Resolve Issues *Target Users:* University tutors.

University tutors are responsible for resolving issues reported by students during internships. This functionality includes accessing reported issues, investigating the circumstances, and taking appropriate actions to resolve them. Resolutions may involve mediating between the student and the company, providing additional support to the student, or making changes to internship arrangements to better suit the educational goals.

Compilation of the Final Questionnaire *Target Users:* All users.

At the end of an internship, all users are required to complete a final questionnaire. This questionnaire assesses the overall success and effectiveness of the internship experience from multiple perspectives. Students, company tutors, and university tutors provide feedback on various aspects such as the achievement of learning objectives, the adequacy of support provided, and the quality of the professional and academic experience. The information gathered is crucial for evaluating the internship program and implementing improvements for future iterations.

Real-Time Notifications *Target Users:* All users.

This feature provides immediate updates to users through real-time notifications, enhancing the responsiveness and engagement of the platform. Notifications alert users about important events such as new internship postings, changes in application status, upcoming deadlines, interview schedules, and responses to reported issues. This system is designed to ensure that all users stay informed and can react promptly to developments, thereby improving communication efficiency and user satisfaction.

Calendar Integration *Target Users:* All users.

Calendar integration functionality allows users to sync internship-related events with their personal. This feature supports the management of interviews, deadlines, workshops, and other important dates by automating reminders and updates directly in the users' preferred calendar application. It facilitates better time management and scheduling efficiency, ensuring that users can seamlessly integrate their internship activities with other commitments.

2.3. User Characteristics

The **Students & Companies (S&C)** platform is designed to cater to three primary user groups: students, company staff members, and university staff members. Each group has unique characteristics that influence the system's design, functionality, and accessibility requirements.

Student Characteristics

Students represent the core user group of the platform and include individuals pursuing undergraduate or postgraduate degrees. They seek internships or job opportunities in diverse fields of study, requiring the system to address a variety of industry-specific needs. Students typically possess moderate to high levels of digital literacy, particularly in using

online platforms for academic and career purposes. However, the system is designed with an intuitive interface, tooltips, and clear error feedback to accommodate less tech-savvy users, ensuring accessibility for all. Their primary motivation is to secure internships and job opportunities aligned with their academic background and career aspirations. Students interact with the platform intermittently, especially during academic breaks or application deadlines, and benefit from timely notifications and reminders for pending tasks, upcoming deadlines, and relevant opportunities. Due to their academic commitments, students often have limited time to engage with the platform. To address this, the system streamlines its core functionalities, minimizing the steps required to complete essential actions.

Company Staff Member Characteristics

Company staff members, including recruiters and HR professionals, are key users of the platform. They represent diverse industries and are responsible for managing recruitment processes such as posting job opportunities, tracking applications, and conducting interviews. These users typically possess moderate to advanced technical proficiency, particularly in using professional recruitment tools. The system facilitates quick onboarding and task efficiency through intuitive navigation and clear instructions. Their motivation lies in identifying and recruiting top talent for their organizational needs, which the platform supports with advanced filtering, insightful recommendations, and streamlined communication tools. To ensure inclusivity, the platform adheres to WCAG standards, supporting assistive technologies such as screen readers and keyboard navigation. Company staff members primarily use the platform during working hours, focusing on tasks such as posting internships, managing applications, and scheduling interviews. The system accommodates asynchronous workflows with features like draft saving, reminders, and real-time notifications. Given their professional responsibilities, company staff members often face time constraints. To address this, the platform prioritizes time-efficient functionalities, reducing the steps required for key actions such as posting jobs or reviewing candidates.

University Staff Member Characteristics

University staff members include academic tutors, internship coordinators, and administrative staff who oversee student internships and ensure academic alignment. These professionals, associated with academic institutions, play a critical role in supporting students' practical learning experiences. They generally exhibit moderate technical expertise in using academic and administrative platforms, and the system provides a user-friendly interface to ensure seamless interaction. Their primary motivation is to ensure that internships deliver meaningful educational and professional experiences aligned with institutional goals. University staff interact with the platform intermittently, focusing on specific tasks such as reviewing internships, addressing issues, and evaluating reports. The platform supports asynchronous usage, enabling flexibility for users balancing multiple responsibilities. To address their time constraints, the system streamlines critical actions like reviewing applications, resolving flagged issues, and submitting feedback, minimizing effort without compromising effectiveness.

2.4. Assumptions, Dependencies, and Constraints

2.4.1. Regulatory policies

Since the S&C platforms needs to handle sensitive personal data (such as names, academic affiliations and contact information) it must comply with all the relevant legal frameworks and regulations about data protection and data privacy such as General Data Protection Regulation (GDPR) in Europe.

Also the platform might be required to respect some specific guidelines set forth by universities and companies for handling internship details and evaluation. Lastly the platform must also comply to possible institutional and corporate communication standards.

2.4.2. Domain Assumptions

- **D1:** The platform takes whatever you defined as input (if the input is of correct type, format and within the maximum size). If, for example, the name of the student is misspelled, the system is still supposed to work.
- **D2:** The platform relies on the domain assumption that the role a user claims reflect the real-world status. Universities and companies are responsible for ensuring that only authorized individuals use their institutional email domains and are assigned correct roles within their organization.
- **D3:** all the companies and universities are registered in the platform are legitimate entities operating in the bounds of local laws and regulations.
- **D4:** Companies are assumed to provide genuine internship opportunities.
- **D5:** Universities are assumed to offer academic support and oversight.
- **D6:** Assume that there are no massive modifications on internships policies, jobs criteria and academic requirements over time.
- **D7:** An user belongs to one category at a time (a student can not also be a professor or a company tutor).
- **D8:** Every user has its own credentials.
- **D9:** Each user has the legal age to register to the platform.
- **D10:** Each student has the legal age to start an internship.

3 | Specific Requirements

This section delineates the detailed technical aspects and specifications necessary for the "Students & Companies (S&C)" platform. It serves as an essential guide for developers and designers, providing comprehensive information required for the implementation and verification of the system functionalities.

Derived from the overall description contained in the previous chapter, the requirements are now structured to ensure traceability, clarity, and coherence with the system's objectives. This chapter addresses the following key aspects:

- **External Interface Requirements:** These include user interfaces, hardware interfaces, software dependencies, and communication protocols essential for seamless interaction between the system, its users, and external systems.
- **Functional Requirements:** Detailing the core interactions between the system and its environment, these requirements specify the behaviors and functionalities the system must exhibit, such as user authentication, profile management, CV creation, and internship tracking.
- **Performance Requirements:** Focusing on the expected system performance including speed, reliability, and scalability to ensure it meets user demands efficiently.
- **Design Constraints:** Covering any limitations or conditions that must be considered during the system development process, including standards compliance, hardware limitations, and other specific constraints.
- **Software System Attributes:** Essential qualities such as reliability, availability, security, maintainability, and portability that are crucial for the long-term effectiveness and robustness of the system.

The structure and content of this chapter are intended to provide a comprehensive reference for all stakeholders, ensuring the system is built and maintained according to the specified requirements.

3.1. External Interface Requirements

This subsection focuses on the external interfaces with which the S&C platform will interact. These interfaces are essential for ensuring seamless communication and interaction between the system, its users, and external components. The external interfaces are categorized as follows:

- **User Interfaces:** This includes visual representations, such as wireframes or mockups, to clarify how users (students, recruiters, and academic tutors) will interact with the system. While UI design is not the primary focus, these visuals help convey the intended user experience.
- **Hardware Interfaces:** If the system interacts with physical devices, such as computers, smartphones, or external sensors, this section describes the nature of these interactions and any specific requirements.
- **Software Interfaces:** This covers interactions between the **S&C** platform and external software components, such as APIs, third-party applications, or services integrated into the system.
- **Communication Interfaces:** This details the protocols and mechanisms used for data exchange, whether for system-to-system communication or user notifications over networks.

By defining these external interfaces, this subsection ensures clarity and consistency in the system's integration with external components.

3.1.1. User Interfaces

The purpose of this section is to define the user interfaces (UIs) of the **Students & Companies (S&C)** platform. User interfaces serve as the primary interaction points between the system and its users (students, recruiters, and academic tutors). This subsection outlines the structure, elements, and functionalities of these interfaces, ensuring they align with the requirements and workflows described in the overall description. User interfaces in this document are not intended to represent the final design but rather provide a clear understanding of the system's interaction points for implementers. Through wireframes and mockups, the UIs illustrated here establish a foundation for design and development while maintaining consistency with the system's overall goals and requirements. Each interface detailed below corresponds to specific functionalities. This section ensures the interfaces meet the needs of the users and support the operational goals of the platform.

Structure of Interfaces:

- **Authentication Interfaces:** Interfaces for authentication, registration and login. These are common to the three main users of the system (from x to y).
- **Homepage Interface:** Almost equal to the three main users of the system (from x to y).
- **Matchmaking Interface:** Almost the same for both students and company tutors (from x to y).
- **Monitoring Interfaces:** The three tabs for monitoring the selection process, the active stages in which the user is involved and all the questionnaires produced in these 2 processes. These interfaces are almost equal between the three users of the system (from x to y).

- **Calendar Interfaces:** Common to the three users of the system (from x to y).
- **Messaging Interfaces:** Common to the three users of the system (from x to y).
- **Complaints Interfaces:** Both the interface to signal an issue and to handle it (from x to y).
- **General Interfaces:** The common interfaces for settings, the assistant, and language setup (from x to y).

Authentication Interfaces Description

The Authentication Interfaces ensure secure and user-friendly access to the platform, guiding users through various processes necessary for account creation or login. Each screen includes the ability to interact with a chatbot (LLM with RAG) for support, and to change the platform's language. Both these two interfaces are described in the *General Interfaces*.

Authentication Interface The process begins at the Authentication Screen, which provides users with options to either log in or register. This interface serves as the entry point for all authentication-related actions, ensuring accessibility even for new users.

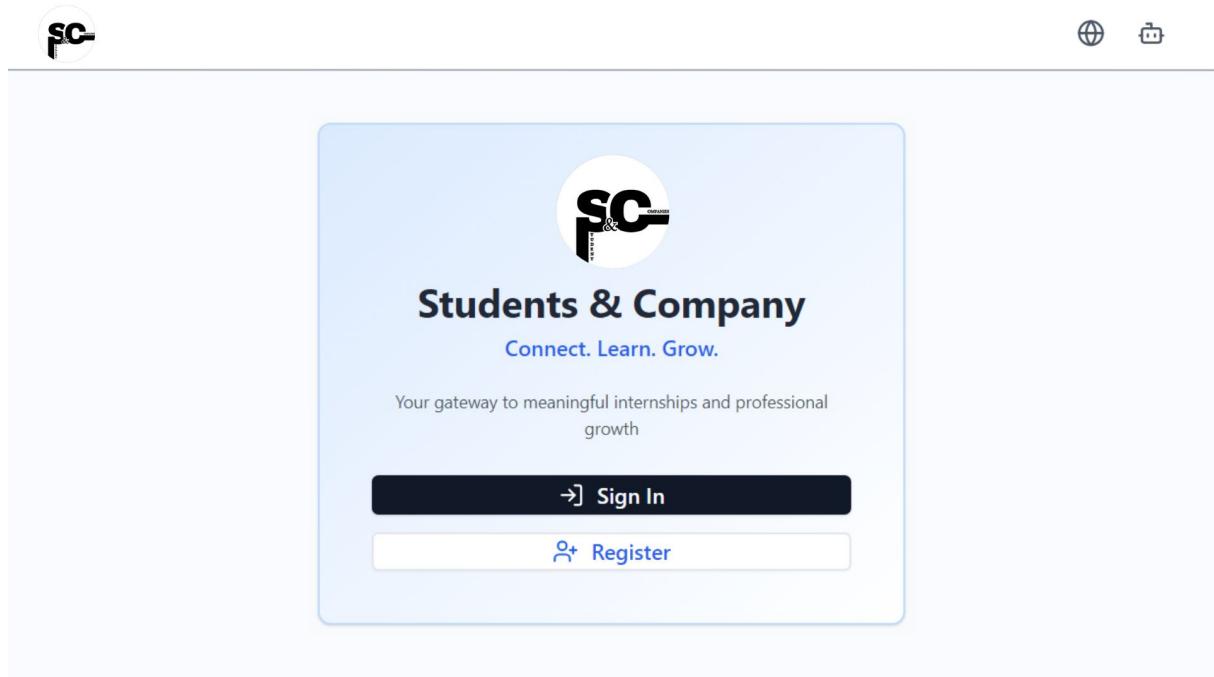


Figure 3.1: Authentication Interface of the Students & Companies platform.

Registration Interfaces The registration process is designed to onboard new users smoothly, ensuring that profiles are properly configured and linked to their respective institutions. This phase is composed of multiple screens that guide users step-by-step:

- **Introduction Screen:** This screen greets users with a welcoming interface that provides an overview of the platform's purpose and main functionalities. It introduces the system's capabilities, highlighting how it facilitates internship management, application tracking, and candidate selection. The screen also explains the types of users the platform accommodates - students, universities, and companies - without going into extensive detail. Users are then encouraged to initiate the registration process, signaling the beginning of a tailored setup experience.
- **CV Upload and Profile Creation:** Users are prompted to upload their CV, which the platform analyzes to pre-fill fields in their personal profile. While the CV facilitates automatic completion of the fields, users can still review, modify, or manually

input text into any of these fields, ensuring both flexibility and accuracy. Among the most critical fields are the security question, essential for password recovery as explained later; the email address, which enables correct user registration by linking the account to an institution; the password, which users must set for secure login; the acceptance of terms and conditions, required to complete registration; and the information improvement tool, which leverages an LLM to suggest enhancements, modifications, or additional details to make the profile more appealing to potential employers. Alternatively, users without a CV can manually fill out all the required fields, ensuring accessibility for all.

- **Institutional Affiliation:** Based on the user's institutional email domain, the system determines affiliation:

- If the domain matches an existing institution, the user's profile is automatically linked to it.
- If the domain is unrecognized, the user is directed to the Verification in Progress screen, where the system communicates that the domain is under review. This screen informs the user that their domain is under review by platform administrators, who will validate the domain and notify the user upon approval.
- If the email domain does not correspond to a registered institution, the system initiates specific workflows depending on the user type:
 - * For students, the system notifies them that their account is pending verification and advises contacting their institution's administrators to register with the platform.
 - * For tutors, being the first affiliated user of a new institution, they are prompted to create the Institution Profile. This involves uploading the institution's logo, providing contact and location details, defining affiliated email domains for students and tutors, and adding a description of the institution's mission and specializations. Once the institution profile is validated and approved, it becomes active, allowing subsequent users with the same domain to be automatically affiliated.

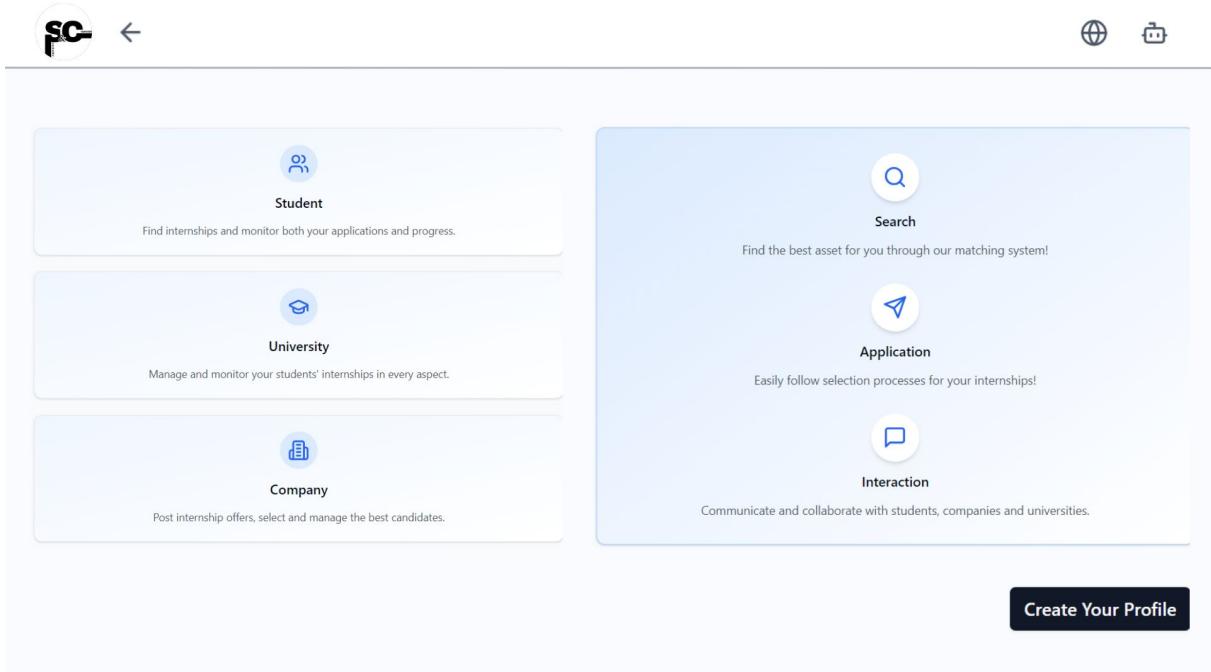


Figure 3.2: Introduction Screen.

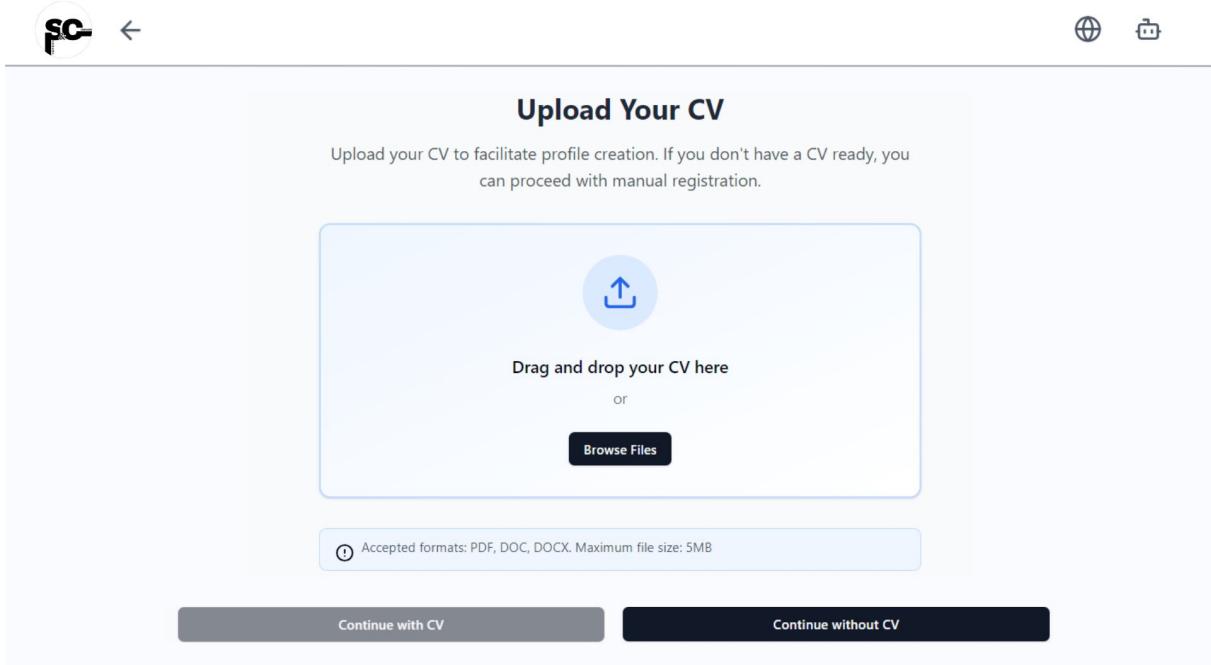


Figure 3.3: Interface to Upload the CV.




Create Your Profile

Fill in your profile details



Personal Information

First Name	Last Name
<input type="text" value="Enter your first name"/>	<input type="text" value="Enter your last name"/>

Contact Information

Phone Number
<input type="text" value="Enter your phone number"/>
LinkedIn Profile
<input type="text" value="Enter your LinkedIn URL"/>
Institutional Email
<input type="text" value="Enter your institutional email"/>

Professional Information

Department	Role
<input type="text" value="Select department"/>	<input type="text" value="Select role"/>
Professional Biography	
<input type="text" value="Describe your professional background and interests"/>	
Certifications & Awards	
<input type="text" value="List your certifications, awards, and recognitions"/>	
Languages	
<input type="text" value="Enter languages (comma separated)"/>	

Security Settings

Security Question	
<input type="text" value="Choose a security question"/>	
Security Answer	
<input type="text" value="Enter your answer"/>	
Password	Confirm Password
<input type="text" value="Enter password"/>	<input type="text" value="Confirm password"/>

I accept the terms and conditions

 Improve Content

Continue

Figure 3.4: Personal Profile Creation Screen.

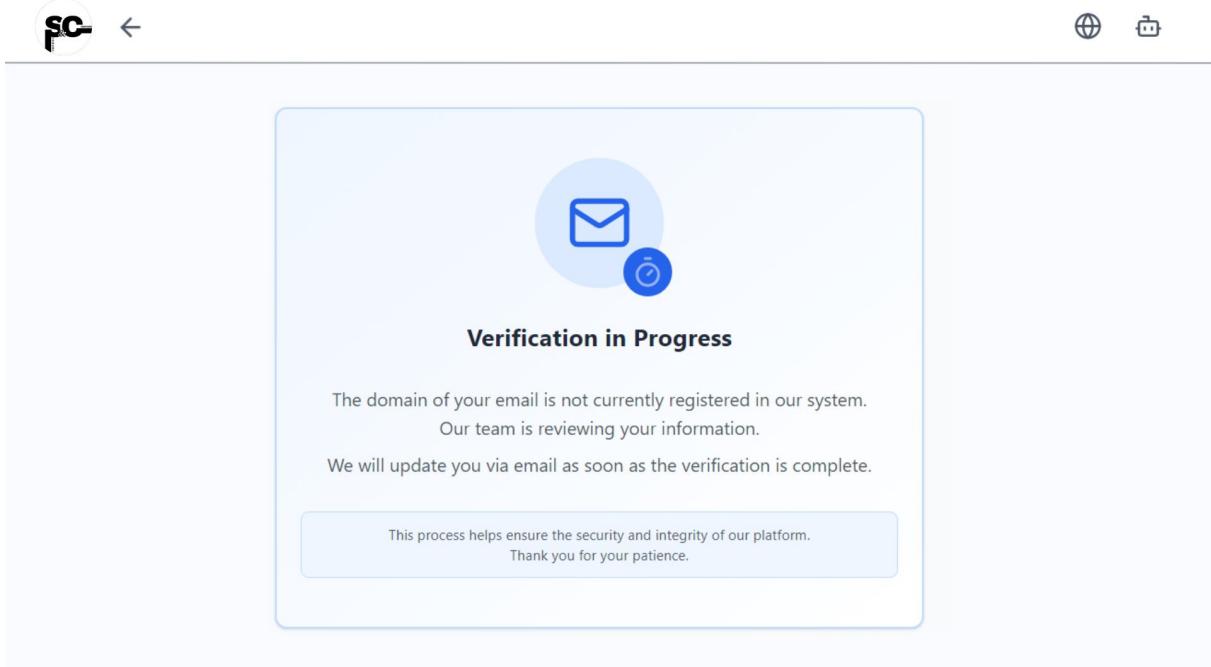


Figure 3.5: Ongoing Verification Notification Screen.

Create Institution Profile

Complete the information below to register your institution

Basic Information

Institution Name

Contact Information

Phone Number	Email
<input type="text" value="Enter phone number"/>	<input type="text" value="Enter administrative email"/>
Website	LinkedIn
<input type="text" value="Enter website URL"/>	<input type="text" value="Enter LinkedIn URL (optional)"/>

Address

Street Address

City

 ZIP Code

Country

Institution Details

Sector	Size
<input type="text" value="Select sector"/>	<input type="text" value="Select size"/>

Description

Certifications & Awards

Domain Management

Tutor Domains

Add Another Tutor Domain

Student Domains

Add Another Student Domain

✖ Improve Content

Continue

Figure 3.6: Institution Profile Creation Screen.

Login and Password Recovery Interfaces: The Login Screen allows users to securely access their accounts following successful registration and verification. This interface also handles situations where users have previously accessed the platform in incognito mode or after a prolonged period of inactivity, ensuring their credentials (email and password) are revalidated for secure access. The process is seamless, offering a straightforward pathway back into the system, ensuring security and session integrity and accommodating all user roles (students, company staff, and university tutors). This interface includes also a convenient link to reset forgotten passwords, maintaining accessibility for all.

The Password Recovery interface ensures that users who have forgotten their credentials can regain access through a secure process. To initiate recovery, users must correctly answer a security question, whose answer was selected during the registration. This step acts as the first layer of verification. Once validated, the system sends a detailed email with step-by-step instructions to reset the password, guaranteeing both security and ease of use.

Together, these interfaces streamline the authentication journey while maintaining high security and user guidance.

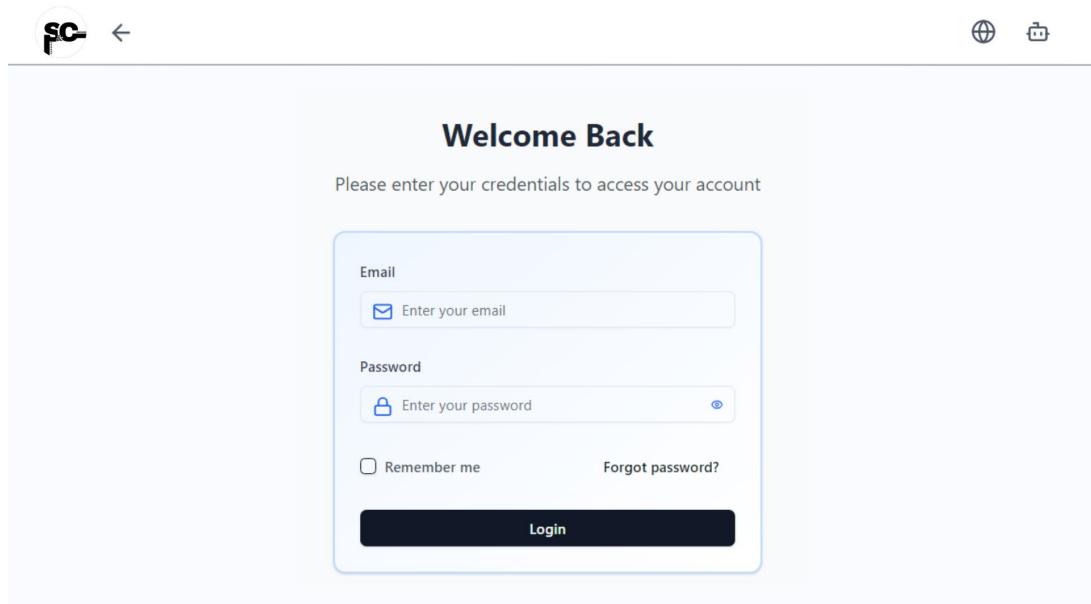


Figure 3.7: Log In Interface of the Students & Companies platform.

Homepage Interfaces

The homepages of the various users (student, company tutor, and academic tutor) share a common structure designed to provide intuitive navigation and quick access to key features. Each homepage is tailored to ensure a personalized experience, with central elements that cater to the specific needs of the user's role.

The left-hand side of the homepage is dedicated to the user profile, which includes the personal image, name, role, and personalization options such as settings, language change, and a chatbot assistant. These buttons, if selected, they bring to the relative interface (defined in the paragraph "General Interfaces"). This section acts as an immediate reference point for the user, facilitating access to essential functions.

In the central and right-hand parts of the homepage are the calendar and notifications. The calendar displays upcoming events, such as meetings, interviews, or workshops, while the notifications keep the user updated on relevant activities or potential issues. The information displayed in these sections is adapted to the specific role of the user: for example, a student will see events related to workshops or interviews, while company and academic tutors will receive updates on the management and supervision of internships.

The bottom navigation bar connects the platform's main features, allowing quick access to sections such as matchmaking (not available for the academic tutor), monitoring, calendar, and messages. This cohesive organization ensures that every user can interact with the platform efficiently and intuitively, maintaining a uniform experience across roles. This navigation bar is accessible from any screen (not just the homepage), enabling users to move quickly between sections and primary functions in a simple and intuitive manner.

Thanks to its flexibility, the homepage not only provides a personalized starting point but also ensures that each user can quickly access the key functionalities to maximize their productivity within the platform.

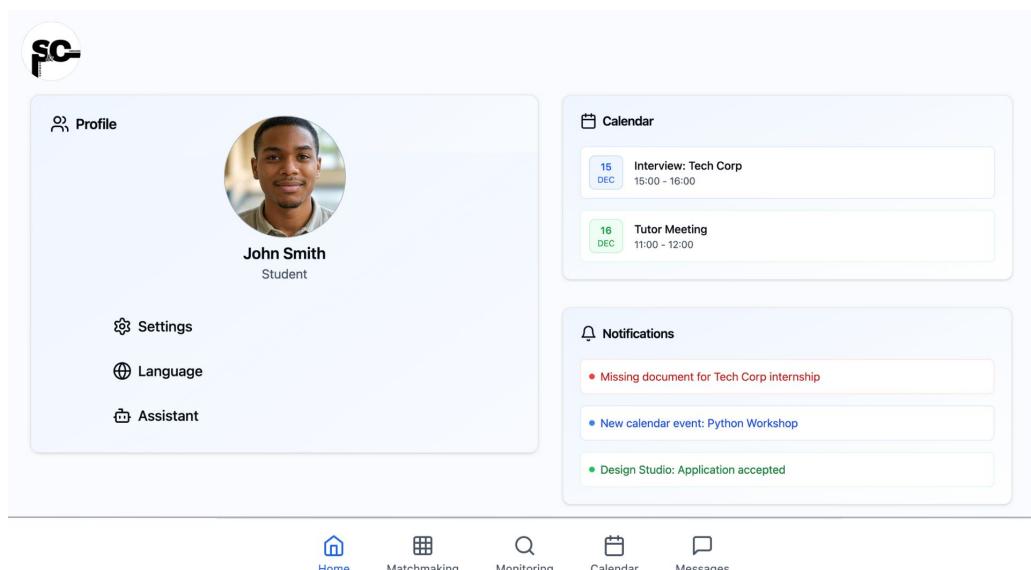


Figure 3.8: Homepage for a Student in S&C platform.

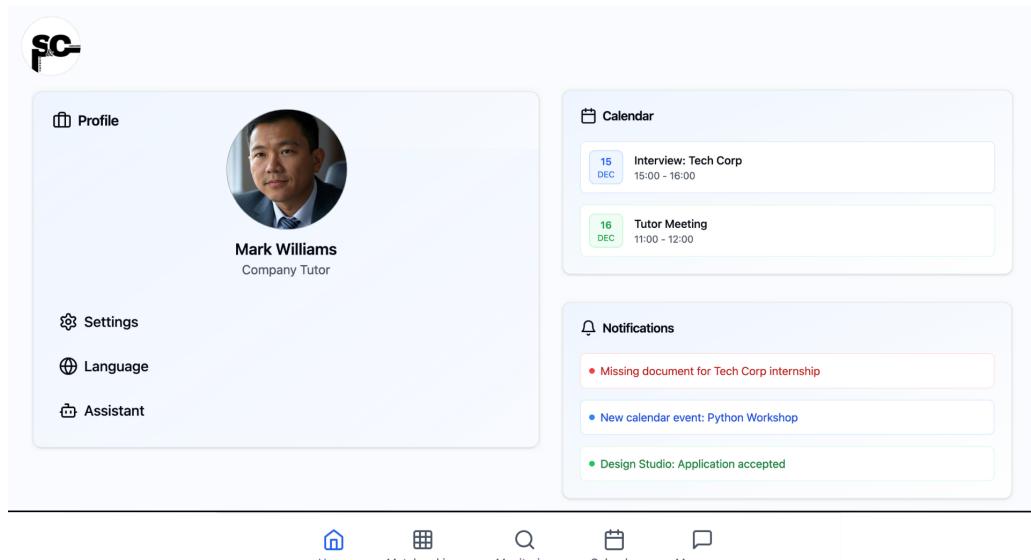


Figure 3.9: Homepage for a Company Tutor in S&C platform.

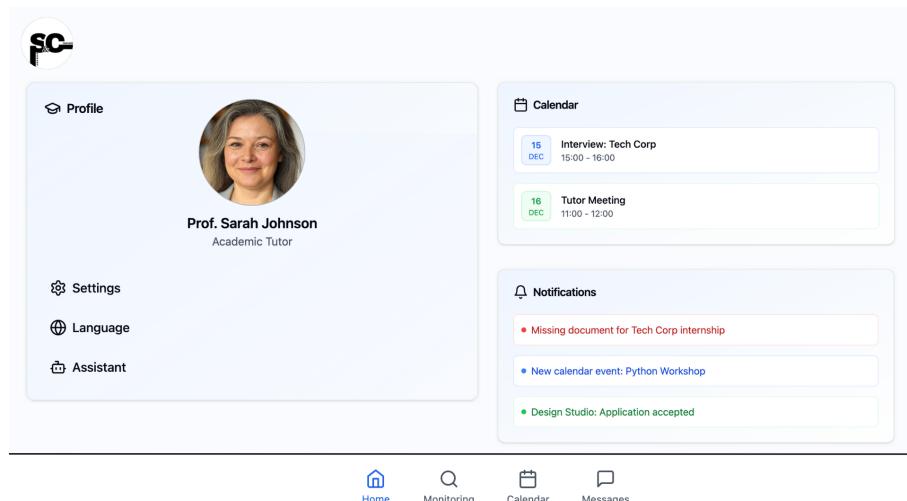


Figure 3.10: Homepage for an Academic Tutor in S&C platform.

Matchmaking Interface

The Matching interface is a vital component of the platform, designed to facilitate the recommendation and exploration of internships for students and the identification of suitable candidates for company tutors. Academic tutors do not have access to this functionality, as their role focuses on overseeing the academic aspects of internships rather than actively searching for positions or candidates. The interface is structured to provide a consistent user experience across roles while adapting its content and functionality to meet the specific needs of each user type.

At the top of the interface, tools for filtering and sorting recommendations are prominently displayed, separate from the advanced search bar positioned below. Alongside these tools, a "Clear All" button allows users to reset any applied filters or search queries, restoring the default view of system-generated recommendations. The central section of the interface displays a list of dynamically generated recommendations tailored by the system based on predefined criteria, specifically the matching between information provided by the student during profile creation and the details of internships entered by companies when posting their opportunities. The bottom navigation bar provides seamless access to core platform functionalities such as the home page, monitoring, calendar, and messaging, ensuring smooth integration with other sections of the platform.

For students, the Matching interface presents internships that align with their profile data, including languages, descriptions, and department. Filters enable students to refine their search using specific criteria such as required skills, languages, or percentage match with their profile. Each internship is displayed with essential details, including the title, company, category, duration, compensation (if applicable), location, and working mode (on-site, online, or hybrid). The internship title is clickable, directing users to a detailed view of the opportunity. Students can also send predefined contact messages to companies to express interest and provide feedback on recommendations using thumbs-up or thumbs-down icons, which help improve the relevance of future suggestions.

For company tutors, the Matching interface highlights students recommended for specific internship postings. Filters and sorting tools allow refinement based on skills, languages, or percentage match to the position requirements. Each recommended student is presented with key details, including their name (clickable to view the full profile), the internship title they are matched for (clickable to modify the offer), their educational background, certifications, and the percentage match. Company tutors can initiate contact with students through predefined messages and provide feedback on recommendations to refine the system's future matches.

While the general layout and functionality of the Matching interface remain consistent across these roles, the displayed content and specific actions available are tailored to the user's role. For students, the focus is on discovering and exploring internships, while for company tutors, it revolves around identifying and connecting with potential candidates. This unified yet adaptable design ensures a personalized and effective experience for both user types. By addressing the unique needs of students and company tutors, the Matching interface plays a crucial role in fostering meaningful connections and optimizing the internship search and candidate recruitment processes within the platform.

The screenshot shows the 'Matching' interface for a student. At the top right are buttons for 'Clear All' and 'Sort'. Below is a search bar with placeholder text 'Search internships...'. Three internship listings are displayed in cards:

- Frontend Developer Intern** at Tech Solutions Inc. Match 95%
 - Software Development
 - 6 months
 - 1000€/month
 - Milan • Hybrid
- UX Design Intern** at Creative Studio Match 88%
 - Design
 - 3 months
 - 800€/month
 - Rome • In-person
- Data Analysis Intern** at Data Insights Corp Match 82%
 - Data Science
 - 4 months
 - No compensation
 - Remote • Online

At the bottom are navigation icons: Home, Matchmaking (highlighted), Monitoring, Calendar, and Message.

Figure 3.11: Matching Interface for a Student in S&C platform.

The screenshot shows the 'Matching' screen for a company tutor. At the top right are buttons for 'Clear All' and 'Sort'. Below is a search bar with placeholder text 'Search internships...'. Three student profiles are listed in cards:

- Marco Rossi** Recommended for: Frontend Developer Intern Match 95%
 - Computer Science and Engineering
 - AWS Certified Cloud Practitioner
 - Politecnico di Milano
 - Italian, English
- Laura Bianchi** Recommended for: UX Design Intern Match 88%
 - Digital Communication
 - Adobe UX Certification
 - Università di Bologna
 - Italian, Spanish
- Giuseppe Verdi** Recommended for: Data Analysis Intern Match 82%
 - Mathematics and Statistics
 - Microsoft Data Analyst
 - Università di Torino
 - Italian, German

At the bottom are navigation icons: Home, Matchmaking (highlighted), Monitoring, Calendar, and Message.

Figure 3.12: Matching Screen for a Company Tutor in S&C platform.

Monitoring Interfaces

Selection Process:

Active Stages:

Questionnaires:

Calendar Interfaces

The Calendar interface is a fundamental feature of the platform, offering all user types a tool for managing and visualizing events. Designed to be consistent across all user types, the interface supports seamless organization of activities while addressing the varied needs of students, company tutors, and academic tutors involved in internships and related processes.

The interface is structured into three primary components: the main calendar view, which provides a comprehensive overview of events across daily, weekly, and monthly timeframes; the event creation functionality, enabling users to schedule and customize activities in detail; and the event visualization feature, which allows detailed exploration of individual events, including those created by other users, with options to confirm attendance and access additional tools. These features collectively enhance the platform's usability and support effective coordination between all stakeholders.

Calendar: The Calendar interface is a vital tool designed to provide users with a clear and comprehensive overview of their scheduled events, ensuring seamless organization and effective management of deadlines, meetings, and related activities. Its intuitive design supports all users, including students, company tutors, and academic tutors, in efficiently coordinating their schedules.

The main calendar screen offers three distinct views—Day, Week, and Month. The Day View presents a detailed breakdown of activities for a single day, ideal for managing immediate tasks and events. The Week View provides a balanced perspective, displaying a week's worth of commitments to assist with medium-term planning. Finally, the Month View delivers a broad overview, allowing users to identify patterns and manage long-term deadlines and goals effectively. These multiple views ensure that users can adapt the calendar to meet their specific planning requirements.

The Calendar interface also supports integration with external calendars, such as Google Calendar and Outlook, enabling users to synchronize their professional and personal commitments in one place. For added convenience, a filtering function allows users to narrow down visible events by applying criteria such as keywords, dates, or event types. This streamlines the navigation process, enabling users to focus on specific activities and enhance their overall experience.

Each event is displayed as a visually distinct entry on the calendar, with color-coded categories that enable users to quickly differentiate between various types of activities. Such events include meetings (such as videoconferences or in-person sessions between students, company tutors, and academic tutors, marked in purple), feedback sessions (dedicated to performance reviews and guidance, marked in green), project submissions or completions (highlighted in blue), and other general activities as needed, categorized accordingly.

Clicking on an event provides two distinct functionalities based on the user role and event context. For users who created the event, clicking opens a dedicated editing screen, allowing them to modify details such as the title, time, participant list, and description, or delete the event if necessary. For invited participants, clicking the event opens a

detailed view that showcases its full information, including the title, time, participants, description, and any associated resources, ensuring a comprehensive understanding of the event. These functionalities are seamlessly integrated to cater to both organizers and attendees.

New events can be created using the "+" button located near the calendar synchronization option. This action opens the event creation interface, where users can define all relevant details, such as date, time, category, and participants. This same interface is utilized for editing events, pre-filled with existing details to ensure consistency and ease of use.

These interfaces, including event creation, editing, and detailed viewing, will be described further in the following section, highlighting their specific functionalities and features. By combining a structured layout, customizable views, and advanced functionality, the Calendar interface serves as an indispensable tool for maintaining organization and ensuring smooth coordination across all user roles.

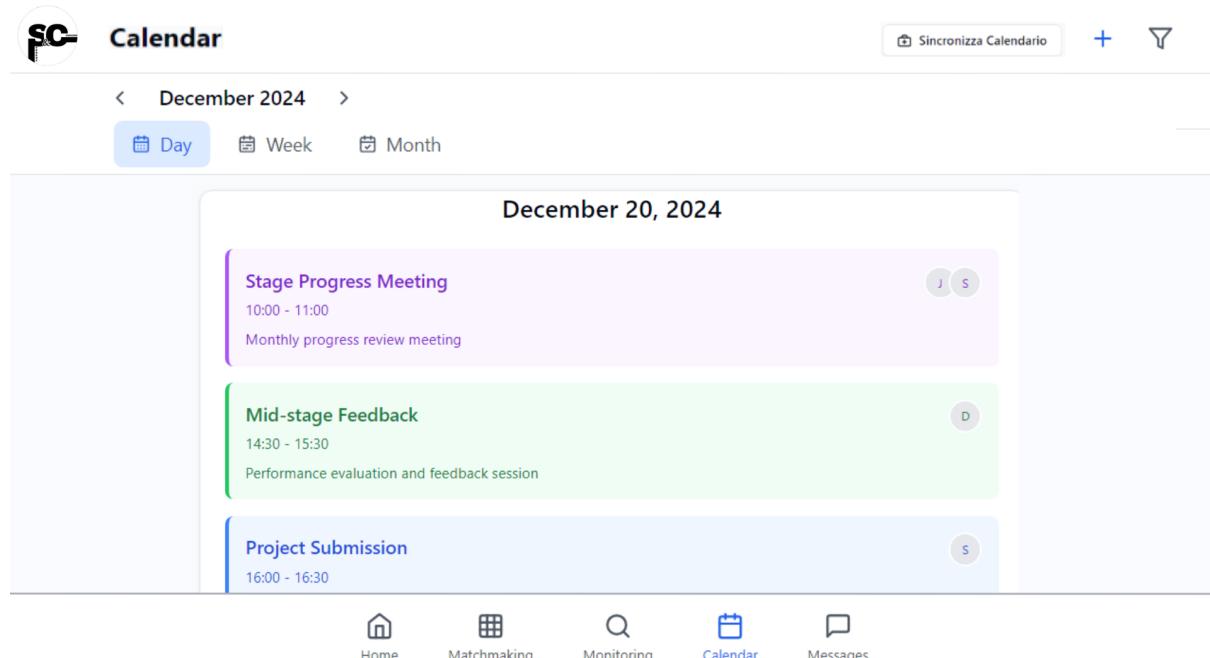


Figure 3.13: Detailed view of events for a single day, for precise scheduling.

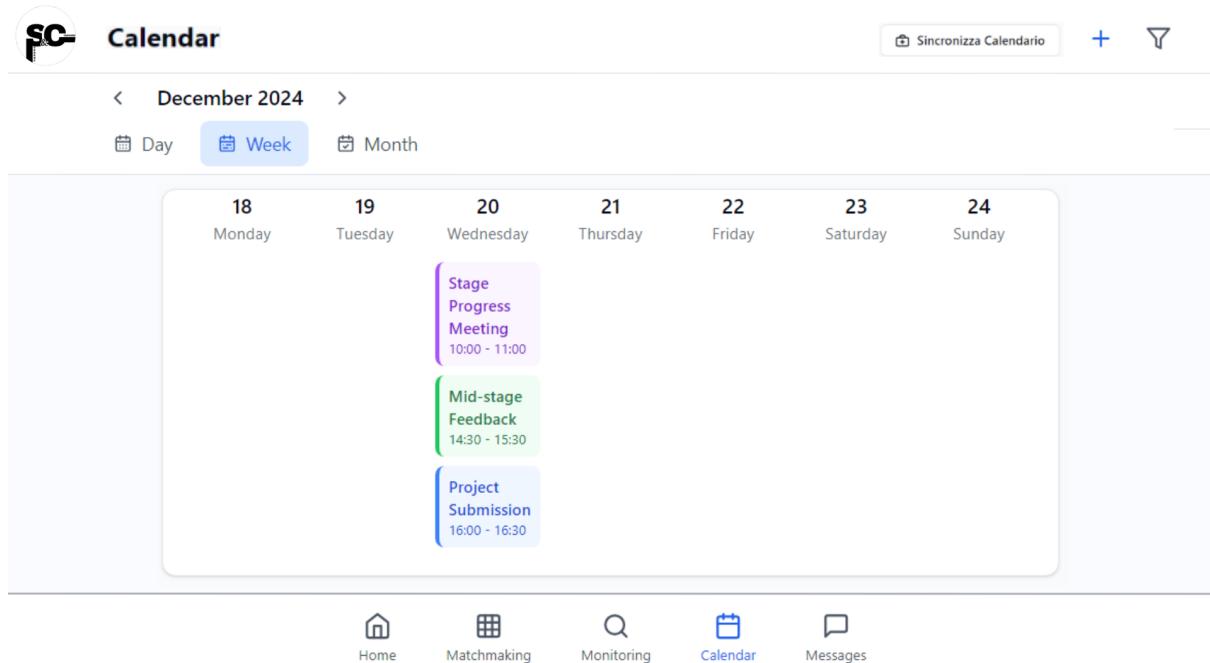


Figure 3.14: Scheduled events for the current week, supporting mid-term planning.

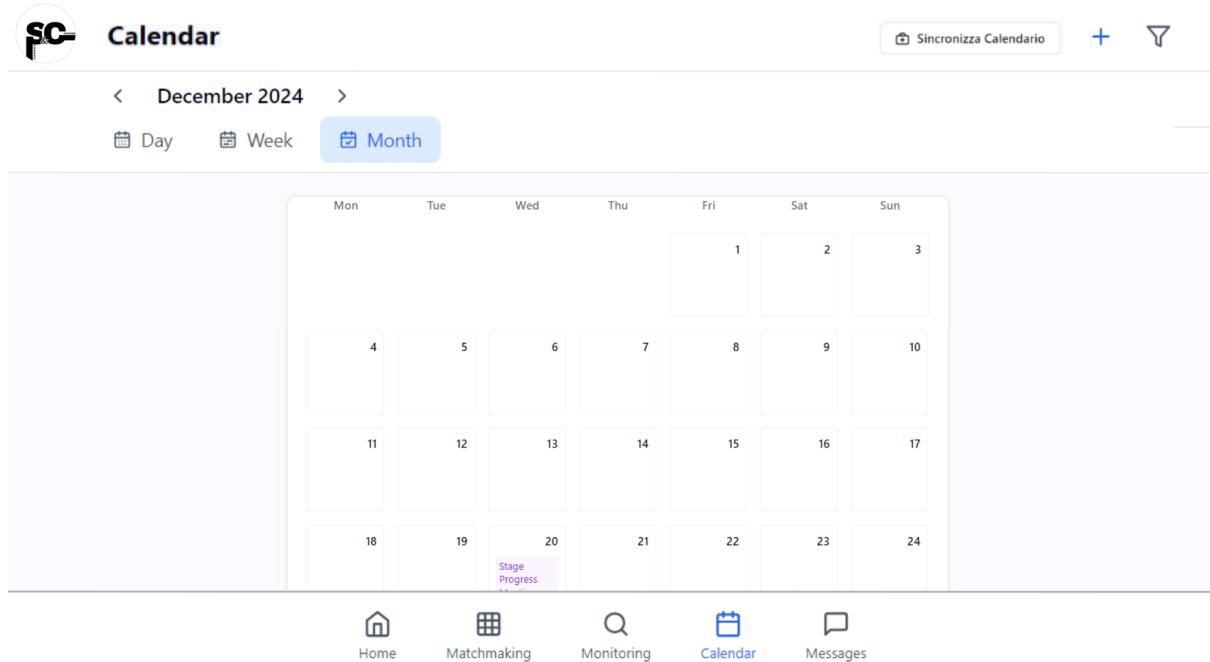


Figure 3.15: Overview of events for the selected month, enabling long-term planning.

Events Planning and Visualization: The calendar provides two interconnected interfaces for managing events: the creation/modification screen and the visualization screen. These interfaces are meticulously designed to ensure intuitive usability, enabling users to efficiently schedule, edit, and review event details while maintaining seamless coordination among all participants involved in the internship process.

The **event creation and modification interface** allows users to input and adjust every crucial detail of an event. The process begins with the *event title*, where users can define a concise and descriptive name for the activity. Flexible options for specifying the *date and time* are available, allowing users to set the specific day and precise start and end times for the meeting. This ensures precision in event scheduling and visibility in the calendar. Participants can be selected from a list of stakeholders, such as students, company tutors, academic tutors, and administrators, ensuring all relevant parties are involved.

Further details can be provided through the *description field*, where users can state the event's purpose, objectives, or planned activities. For physical meetings, users can specify the address in the *location field*; for virtual events, users can specify that the event will include a video call. Selecting this option automatically generates an associated chat, facilitating smooth communication among participants.

To enhance clarity and categorization, the interface includes a *dropdown menu* for selecting event types. The predefined categories include:

- *Meetings*: Marked in purple, these events encompass videoconferences or in-person sessions involving students, company tutors, and academic tutors.
- *Feedback Sessions*: Marked in green, these events focus on reviews and guidance provided by tutors to students.
- *Deliverables*: Marked in blue, these events pertain to project submissions or completions.
- *Other*: For events that do not fall within the predefined categories.

These categories are colored, ensuring quick and easy identification within the calendar.

Additional functionalities include enabling *notifications*, which remind participants of upcoming events through platform alerts or emails. For events marking the conclusion of an internship, a “*Last Event*” flag can be activated. This triggers the system to send final evaluation forms to all involved users, simplifying the completion process. Once all required fields are completed, users can finalize the event by clicking the *confirmation button*, saving it to the calendar and notifying all participants immediately.

The **event visualization interface** provides users with a comprehensive view of an event's details by selecting it directly from the calendar. The top section prominently displays the *event title* and its *category*, aligned with the color-coding scheme. The central section presents detailed information, including the **date and time**, a list of *participants* with their roles, and an extended *description* of the event's objectives or planned activities. For virtual events, the interface includes the *location*, presented as a clickable video conferencing link alongside a shortcut to the associated chat, ensuring easy access.

A key feature is the *attendance tracking system*, which displays the confirmation status of each participant as “Present,” “Pending,” or “Absent.” Users can confirm their attendance directly from this screen through a dedicated button. For event creators, an option to *edit the event* is readily available, redirecting them to the creation/modification interface with pre-filled details for efficient updates.

These interconnected interfaces work cohesively to deliver a seamless experience, ensuring that events are meticulously planned, clearly communicated, and effectively managed. By integrating advanced functionalities such as participant notifications, attendance tracking, and automatic chat generation, the platform significantly enhances organizational capabilities and fosters collaboration across all user roles involved in internships.

The screenshot shows a mobile application interface for creating a new event. At the top, there is a header with the text "SC" and "Calendar" next to a back arrow icon. Below the header is a large white rectangular form titled "Create New Event". The form contains several input fields and sections:

- Event Title:** A text input field with the placeholder "Enter event title".
- Date:** A date input field with the placeholder "gg/mm/aaaa" and a calendar icon. To its right is a time input field with the placeholder "...:--" and a clock icon.
- Category:** A dropdown menu with the placeholder "Select category".
- Participants:** A dropdown menu with the placeholder "Select participants" containing two names: "John Smith" and "Sarah Johnson".
- Description:** A text input field with the placeholder "Enter event description".
- Virtual Meeting:** A checkbox labeled "Virtual Meeting" followed by a toggle switch that is turned on (blue).
- Location:** A text input field with the placeholder "Enter physical location".
- Home Notification:** A toggle switch that is turned off (grey).
- Last Event:** A toggle switch that is turned off (grey). Below this, a small note says "This will trigger the final evaluation process".

At the bottom of the form is a blue button labeled "Create Event". Below the form is a navigation bar with five icons: "Home" (house), "Matchmaking" (grid), "Monitoring" (magnifying glass), "Calendar" (calendar), and "Messages" (speech bubble).

Figure 3.16: Event creation screen: Define title, time, participants, and category.



Calendar



Stage Progress Meeting

Meeting

⌚ December 20, 2024

10:00 - 11:00

▢ Virtual Meeting

[Join Meeting](#)

[Open Chat](#)

- ⌚ Monthly progress review meeting to discuss the advancement of the frontend development internship project. We will review the completed tasks, address any challenges, and plan the next sprint objectives.

⌚ This is marked as the last event of the stage

👤 Participants

John Smith

Company Tutor

✓ Present

Sarah Johnson

Academic Tutor

✓ Present

David Thompson

Student

⌚ Waiting

Emily Wilson

Administrator

✗ Not Present

[Confirm Attendance](#)

[Edit Event](#)



Home



Matchmaking



Monitoring



Calendar



Messages

Figure 3.17: Event visualization screen: View details, attendance, and meeting options.

Messaging Interfaces

The messaging interface is an essential component of the platform, facilitating efficient communication across all user types. It provides tools for managing general conversations, handling video call-related chats, and addressing reported issues. Moreover users can filter messages using categories such as students, companies, and universities, or the proper button, ensuring quick and organized access to relevant conversations.

Specialized chats are automatically created for videocalls scheduled through the calendar and for reported issues, streamlining interactions and improving clarity. These chats are enhanced with integrated features such as video call details, LLM-generated summaries, and issue tracking capabilities. This cohesive design supports effective communication and collaboration, aligning with the platform's goal of seamless user experience.

Messaging: The messaging interface serves as a centralized hub for communication, offering users an efficient and organized way to manage interactions. It simplifies access to specific conversations, enabling effective collaboration and maintaining clear communication across the platform.

The filtering functionality allows users to organize and refine their message view in two primary ways. These options are designed to streamline access to relevant conversations and ensure that users can manage their communications with ease.

At the top left of the interface, users can find three distinct buttons to filter conversations based on the type of participant:

- *Students:* This option displays only messages involving students, helping tutors to focus on student-related matters.
- *Companies:* Selecting this category shows messages exchanged with companies, aiding in discussions about internships, partnerships, or other professional activities.
- *Universities:* This category filters for internal communications within the academic domain, such as discussions between professors on internships development.

Messages involving multiple categories of these users, such as video calls that include students and company tutors, are displayed under all relevant filters. Additionally, users can select two user category buttons simultaneously to view conversations that involve participants from those selected groups, ensuring precise access to mixed-category chats without seeing also the chats with users who belong to only a single group.

On the top right of the interface, the *Filter Button* provides an advanced filtering menu to refine the message view. The available filters are designed to cater to various needs, including:

- *Search by Name:* A dedicated text field for quickly locating conversations with specific users.
- *Date Filter:* A selector that narrows down messages based on when they were sent or received, ideal for tracking recent or historical discussions.

- *Message Type*: Allows users to filter messages by their format, such as text-based updates, video call notifications, or system-generated summaries.
- *Keyword Search*: This field enables users to search for specific terms or phrases within messages, ensuring they can pinpoint relevant content easily.

On the top right, adjacent to the filter button, is the *Report Issue Button*, distinguished by its semi-transparent red color. This button is specifically available for students and company tutors, enabling them to report problems directly. Clicking it opens a dedicated issue reporting workflow, which guides users through the process of documenting and submitting their concerns. Details on this feature will be provided in subsequent sections.

Next to the report issue button is the *Create Message Button*, marked with a prominent blue "+" icon. This feature allows users to initiate new conversations quickly, either with individuals or groups, ensuring effective communication.

The central section of the screen is dedicated to displaying all conversations. Messages are presented in an organized list, dynamically updated based on user-selected filters. Conversations related to reported issues are prioritized at the top of the list and highlighted in red to ensure they are addressed promptly. Additionally, chats generated for scheduled video calls are seamlessly integrated into this view. These special chats, automatically created when a video call is added to the calendar, are displayed in light blue, distinguishing them from regular chats, which appear in light gray. This color-coding facilitates smooth coordination and will be detailed further in the next section.

Through these features, the platform provides a comprehensive communication system that supports users in managing both everyday conversations and critical, time-sensitive interactions, fostering seamless collaboration and efficiency across all user roles.

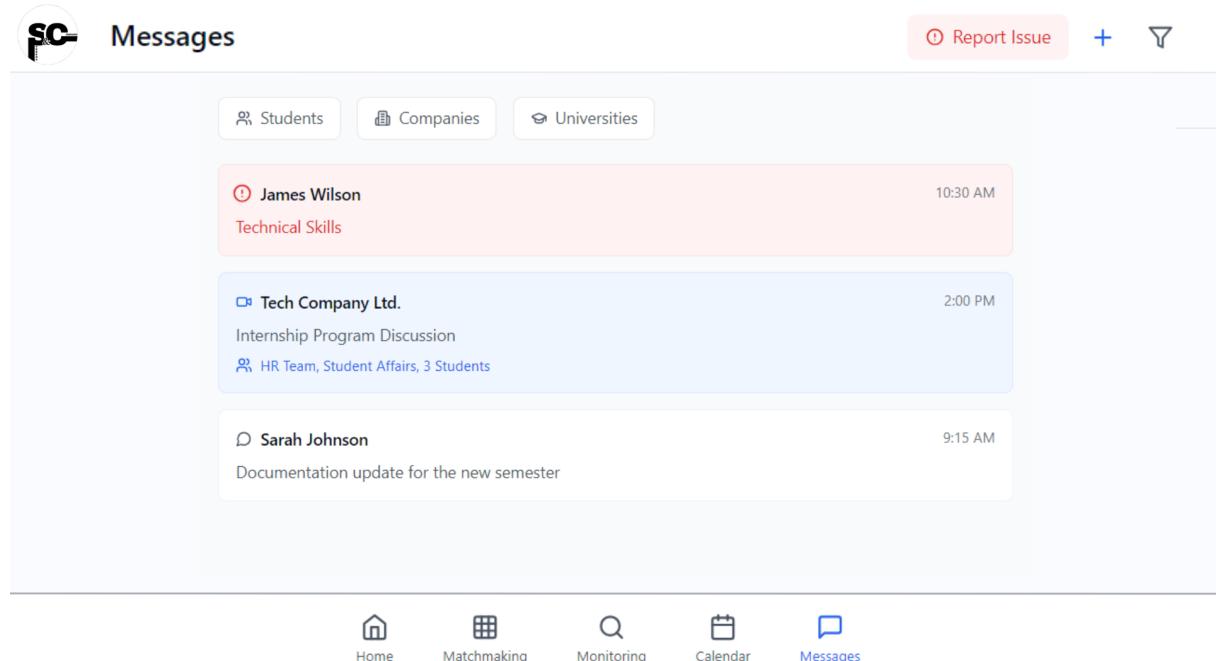


Figure 3.18: Messaging Screen to Create Messages or Report Issues.

Specialized Chats: The chat functionality within the platform is a key component for communication, offering users an intuitive and dynamic space for collaboration. Each chat is structured to enhance interaction, featuring a detailed header bar, a messaging area, and a message creation panel. The header bar displays the participant's name along with their category icon for easy identification. If the conversation involves multiple categories, all relevant icons are shown.

In the central messaging area, users can view the chat history with each message timestamped and marked as read or unread. Automatic updates are also generated to notify users of significant changes, such as rescheduled video calls or participation confirmations. Users can also mark messages as actions by holding them, assigning a deadline for completion. For convenience, a side panel lists participants, pending actions, and shared files, ensuring comprehensive management of communication.

The message creation bar, located at the bottom of the chat, provides tools for composing and sending messages. It includes a text field with formatting options, an attachment button for sharing files like documents and images, and an audio button for sending voice messages. These tools ensure that users have versatile and efficient methods to communicate effectively.

While these features are common to all chats, the platform also supports two specialized chat types, that are *videocall chats* and *issue-related chats*, to address those specific scenarios.

Chats for video calls are automatically generated whenever a video call is scheduled through the calendar. These chats act as a centralized hub for all discussions linked to the scheduled meeting. At the top of the chat interface, a persistent pop-up displays key details of the video call, such as the date, time, and list of participants, along with a button to join the call directly. Messages can be exchanged freely before, during, and after the video call, with the interface supporting file sharing and task management to facilitate collaboration. Additionally, after the video call concludes, the system generates an AI-driven summary that highlights the key discussion points, agreements, and follow-up actions, ensuring that all participants remain aligned and informed about the outcomes.

Chats for issues are automatically initiated whenever a user, either a student or a company tutor, reports a problem using the dedicated issue-reporting feature. These chats always include the academic tutor as a participant, along with the user who reported the issue and other relevant stakeholders. The chat header features an interactive pop-up summarizing the issue's title, category, and description, ensuring all participants are fully aware of the problem at hand. A status indicator tracks the resolution progress, displaying labels such as "In Progress," "Awaiting Response," or "Resolved." Besides these unique functionalities, issue-related chats retain all standard chat features, allowing users to manage issue resolution effectively within a familiar interface.

Through these specialized chats, the platform ensures robust support for critical scenarios, enhancing user experience and facilitating efficient communication tailored to the unique requirements of video calls and issue resolution.

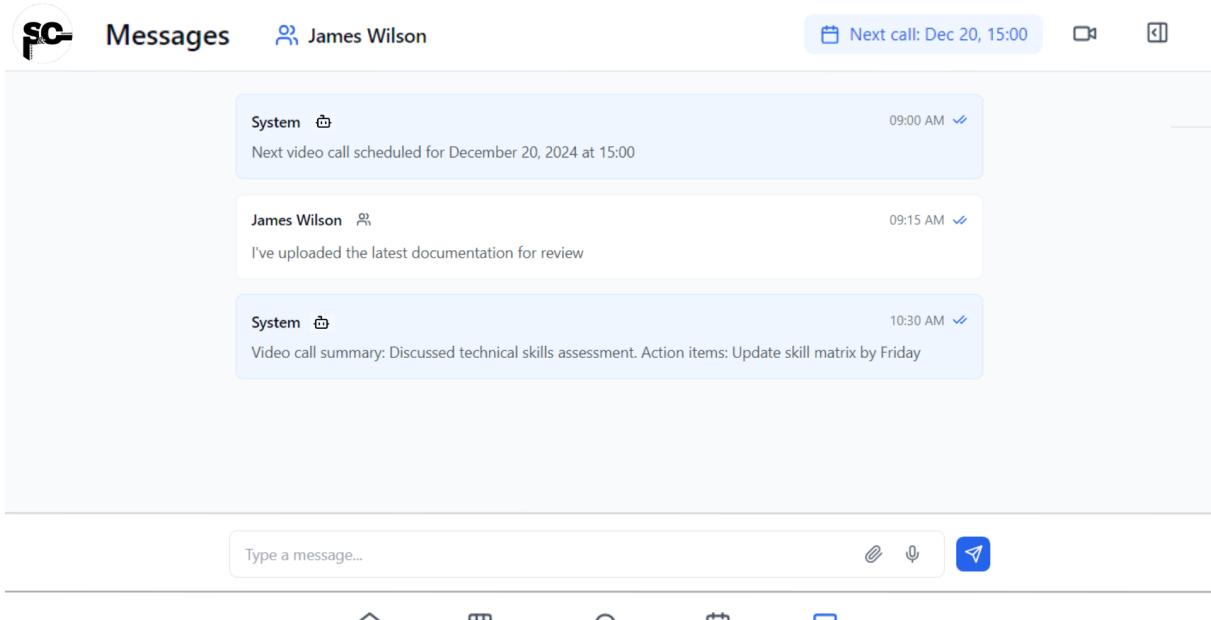


Figure 3.19: Specialized Videocall Chat with Call details and Post-Call Summary.

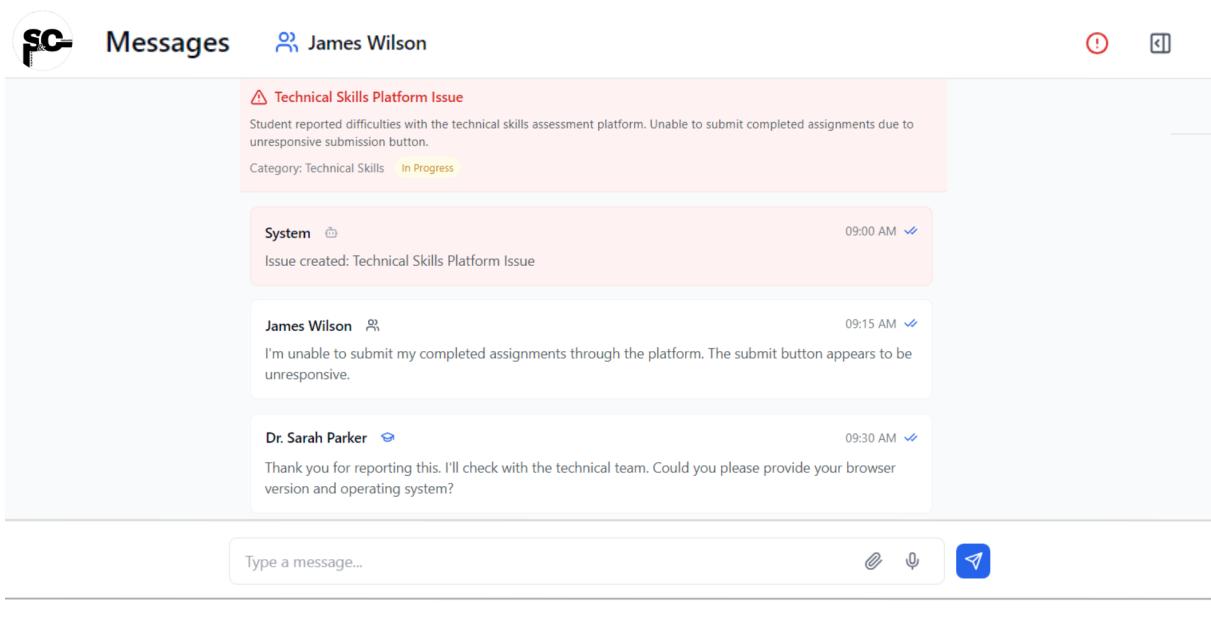


Figure 3.20: Chat for tracking and discussing about complaints.

Complaints Interfaces

The "Complaints Interfaces" section is designed to efficiently handle issues that may arise during internships managed through the Students & Companies (S&C) platform. It provides tools for both reporting and resolving problems, ensuring a structured and transparent process.

Students and company tutors can accurately describe and communicate the issues they encounter, while academic tutors are equipped to analyze these reports, assess their severity, and take appropriate action. This system ensures clear communication, supports effective problem resolution, and safeguards the smooth progress of internships.

Signaling Issues: The *Signaling Issues* interface is exclusively accessible to company tutors and students, providing them with a structured mechanism for reporting and classifying problems encountered during internships. This functionality ensures that all critical information related to an issue is systematically captured, enabling effective resolution and facilitating communication between the relevant stakeholders.

When a user reports a problem, they are required to provide a clear and concise *Title*, summarizing the core of the issue. To enable precise classification and prioritization, the system mandates the selection of a *Severity Category*, which allows for a comprehensive understanding of the problem type and urgency. The available options ensure clarity in classification and are detailed as follows:

- *Communication Issues*: These involve misunderstandings, lack of clarity, or difficulties in establishing effective communication between the involved parties.
- *Technical Competencies*: This category addresses challenges resulting from inadequate technical skills or the inability to resolve specific technical problems.
- *Time Management*: Problems in this category pertain to delays, missed deadlines, or difficulties in adhering to the agreed-upon timeline.
- *Interpersonal Conflicts*: These include conflicts, tensions, or relational difficulties among participants that negatively impact collaboration and productivity.
- *Other*: This allows for the classification of issues that do not fall under the predefined categories but still require attention.

In addition to categorization, users must provide a *Detailed Description of the Problem*. This description is expected to include specific examples, contextual information, and an explanation of the impact the issue has on the internship's progress or outcomes. Such detailed documentation ensures that the nature of the problem is fully understood and addressed appropriately.

Once all required fields are completed, the user can utilize the *Save and Submit* function. This action records the problem in the system and forwards it to the relevant parties, including academic tutors, for evaluation and follow-up actions. The structured process supports transparency, fosters accountability, and enhances the resolution process, ultimately contributing to a better internship experience for company tutors and students.



Report Issue



Issue Details

Issue Title *

Enter a clear and concise title

Category *

Communication

Issues related to misunderstandings, lack of clarity, or communication difficulties between parties

Technical Skills

Difficulties encountered due to lack of technical skills or inability to solve specific technical problems

Time Management

Issues related to missed deadlines, delays, or difficulties in meeting established timelines

Interpersonal Problems

Conflicts or friction between participants, personal relationship difficulties that affect collaboration effectiveness

Other

For any other category not listed above

Detailed Description *

Describe the issue in detail, including specific examples and context

Minimum 50 characters

0 characters

Save and Submit



Home



Matchmaking



Monitoring



Calendar



Messages

Figure 3.21: Interface for reporting issues with detailed categorization.

Managing Issues: The *Managing Issues* interface is designed to provide academic tutors with a comprehensive overview of the selected problems reported by company tutors or students. This interface ensures that all relevant details are accessible to facilitate informed decision-making and effective resolution of the reported issues.

Upon selecting an issue from the table, the system displays the active problem, along with detailed information about the nature of the issue, its severity, and the date it was reported. This clear presentation enables the academic tutor to understand the context and urgency of the problem at hand.

To address the issue, the interface offers actionable controls categorized as follows:

- *Suggested Actions:* Quick-access buttons to initiate communication with the involved parties, including:
 - Calling the company tutor.
 - Chatting with the company tutor.
 - Calling the student.
 - Chatting with the student.
- *Stage Management Actions:* Options to manage the internship based on the severity and resolution of the problem:
 - Terminate: Used when the situation is too severe to continue the internship.
 - Suspend: Allows for a temporary pause to gather additional details or attempt a resolution.
 - Resume: Indicates that the problem has been resolved, and the internship can proceed as planned.

Each action triggers automatic notifications to both the company tutors and the students involved, ensuring transparency and keeping all stakeholders informed of the decisions taken. This structured approach promotes accountability and facilitates the smooth resolution of issues, safeguarding the quality of the internship experience.

The screenshot displays the 'Issue Management' application interface. At the top left is a logo consisting of a stylized 'SC' icon. To its right, the text 'Issue Management' is displayed. Below the header, there are three separate issue cards, each with a rounded rectangular border:

- Unclear Project Requirements** (under 'Technical Skills')
Reported by: John Smith | 2024-03-15
Description
Student reports difficulties in understanding technical requirements for the assigned tasks, leading to implementation delays.
Company Contact: Call, Chat
Student Contact: Call, Chat
Action Buttons: ⚡ Terminate (red), ⏪ Suspend, ⏴ Resume
- Missed Project Deadlines** (under 'Time Management')
Reported by: Alessandro Bianchi | 2024-03-16
Description
Student reports multiple missed deadlines, causing significant delays in project completion.
Company Contact: Call, Chat
Student Contact: Call, Chat
Action Buttons: ⏪ Suspend, ⏴ Resume
- Communication Barriers** (under 'Communication')
Reported by: Laura Verdi | 2024-03-17
Description
Student reports frequent communication barriers, such as unresponsive emails and delayed responses from the company.
Company Contact: Call, Chat
Student Contact: Call, Chat
Action Buttons: ⏪ Suspend, ⏴ Resume

At the bottom of the interface, there is a navigation bar with four items: 'Home' (represented by a house icon), 'Monitoring' (represented by a magnifying glass icon, currently highlighted in blue), 'Calendar' (represented by a calendar icon), and 'Messages' (represented by a speech bubble icon).

Figure 3.22: Interface for managing issues with resolution actions.

General Interfaces

The "General Interfaces" section serves as the backbone of user interaction and system customization within the platform. These interfaces ensure that both individual users and institutional representatives can navigate the platform efficiently.

From the ability to refine personal and institutional details in the settings interface to leveraging the power of a fine-tuned language model for real-time assistance, these tools empower users to make the most of the platform's capabilities. The integration of multilingual support further enhances accessibility, allowing users to switch between languages effortlessly, whether during registration, login, or throughout their engagement with the platform. Moreover, the detailed profile interfaces, whether for users, institutions, or internships, provide a comprehensive view of essential information, facilitating processes such as matchmaking and monitoring, and ensuring that all stakeholders remain informed and connected.

Collectively, the "General Interfaces" underscore the platform's commitment to delivering a highly personalized and efficient user experience, while fostering seamless collaboration and adaptability for all users involved.

Settings: The "Settings" interface serves as a centralized hub for users to manage their profiles and, only for responsible tutors, the details of their affiliated institutions. By integrating all customization options into a single interface, the platform ensures that users can efficiently update and control their personal and institutional information with ease.

For individual users, the interface allows for the management of personal details, ensuring their profile remains accurate and up to date. Users can upload or update their profile picture and modify fields such as their name, phone number, and LinkedIn profile. The institutional email address, while visible for reference, remains fixed to maintain consistency. Furthermore, users can modify their department and role within their organization, crafting a clear representation of their professional identity. A dedicated section for biography enables users to update the information for their career, experiences, and interests, while a flexible space is provided for listing new certifications, awards, and other achievements. This dynamic structure ensures that profiles are both comprehensive and reflective of the changing user's expertise. Users can also manage a list of languages they speak, adding a personal dimension to their profile.

Responsible tutors, who are designated individuals responsible for managing the institutional profile, are granted specific functionalities to ensure the institution's details are accurate and comprehensive. They have the ability to update the organization's logo, official name, and administrative contact details, including phone number, email, and LinkedIn profile. Address fields are provided to maintain accurate location information, covering street, city, postal code, and country. Additionally, responsible tutors can manage domains associated with their institution, ensuring the correct mapping of email accounts. In particular for academic tutors, they can also manage student domains, since this type of user cannot be associated to a company. The interface further supports updates to the institution's sector of operation and size through dropdown menus, simplifying the selection

process. A descriptive field allows tutors to change the institution's mission, specializations, and notable collaborations. Just like user profiles, the institutional section includes a space for listing new certifications and recognitions, ensuring the organization's accomplishments are properly highlighted. These tools collectively empower responsible tutors to maintain an up-to-date and detailed institutional profile, reflecting the organization's identity and scope accurately.

System preferences are designed to provide all users with the ability to customize their interaction with the platform. Notifications can be tailored to individual needs, allowing users to enable or disable updates for messages, internship changes, and calendar events. Additionally, the interface includes an option to switch between light and dark themes, enhancing usability across diverse environments and preferences.

To facilitate smooth interaction, the interface includes key actions such as saving changes to confirm updates and a reset option to revert notifications, theme, and language preferences to their original settings. Users can also delete their account if necessary, with responsible tutors receiving clear warnings about the implications, such as the transfer of institutional management to another collaborator. For institutions, the interface provides options to delete or transfer control of the organization, ensuring flexibility while maintaining accountability.

Overall, the "Settings" interface is designed to offer a seamless and intuitive experience, enabling users to take full control of their profiles and preferences while fostering a personalized and efficient interaction with the platform.

The screenshot displays a user interface for managing profiles, divided into two main sections: Personal Information and Institution Profile.

Personal Information:

- Profile Picture:** A placeholder circular image with dimensions 100x100. An upload icon is present.
- First Name:** Input field
- Last Name:** Input field
- Administrative Phone:** Input field with a phone icon
- Administrative Email:** Input field with an envelope icon
- LinkedIn Profile URL:** Input field with a LinkedIn icon
- Department:** Input field
- Role:** Input field
- Biography:** Text area for career, experiences, and interests.
- Certifications & Awards:** List item: Teaching Certificate (2023) with a delete icon.
- Languages:** List items: English (marked with an asterisk and a delete icon), Italian (marked with an asterisk and a delete icon).

Institution Profile:

- Institution Logo:** A placeholder circular image with dimensions 100x100. An upload icon is present.
- Official Name:** Input field with placeholder "Enter institution name".
- Administrative Phone:** Input field with a phone icon
- Administrative Email:** Input field with an envelope icon

Navigation and other elements include:

- Profile, Institution, Preferences tabs at the top.
- A back arrow and a search icon in the top right corner.
- A "Profile" tab at the bottom of the main content area.
- A "Institution" tab at the bottom of the main content area.

Figure 3.23: Interface for managing personal and institutional profiles.

The screenshot shows the interface for editing institution details and system preferences. At the top, there is a header with a logo, a back arrow, and a search bar labeled "LinkedIn Profile URL". Below the header, there are fields for "Street Address" and "City" (with a location icon), "Postal Code" and "Country", "Operating Sector" (dropdown: University), "Size (Employees/Students)" (dropdown: 1-50 employees), and a "Description" text area asking to describe the institution's mission, specializations, and collaborations. A "Certifications & Awards" section lists "ISO 9001 (2023)" and "Excellence in Education (2022)", each with a delete icon. Below this, a navigation bar includes "Profile", "Institution", and "Preferences" (which is underlined). The "System Preferences" section is titled "Customize your platform experience" and contains sections for "Notifications" (checkboxes for New Messages, Internship Updates, and Calendar Events) and "Theme" (Light and Dark mode buttons, where Light is selected). At the bottom, there are buttons for "Cancel", "Save Changes", "Transfer Management", "Delete Institution" (in red), and "Delete Account" (in red).

LinkedIn Profile URL

Street Address City
Postal Code Country
Operating Sector Size (Employees/Students)
University 1-50 employees

Description
Describe your institution's mission, specializations, and collaborations...

Certifications & Awards + Add New

ISO 9001 (2023) Excellence in Education (2022)

Profile Institution Preferences

System Preferences
Customize your platform experience

Notifications

New Messages

Internship Updates

Calendar Events

Theme

Light Dark

Cancel Transfer Management Delete Institution Delete Account

Figure 3.24: Interface for editing institution details and system preferences.

Chatbot: The "Assistant" interface provides users with a dedicated virtual assistant powered by a fine-tuned Large Language Model (LLM) enhanced with Retrieval-Augmented Generation (RAG) techniques. This design ensures the delivery of precise and contextually relevant responses, significantly reducing hallucinations and enabling the assistant to provide accurate and helpful information tailored to the platform's data and functionalities. The interface is crafted to offer seamless support, addressing user queries and enhancing their overall experience on the platform.

At the core of the interface lies the conversation area, which displays the complete message history from the current session. This central area ensures continuity and allows users to review prior interactions for reference. Positioned at the bottom of the screen is the input section, where users can type messages to pose questions or request assistance. The input field is accompanied by a send button, facilitating the submission of queries directly to the virtual assistant. To further enhance usability, the interface provides clickable suggestions for frequently asked questions. These pre-defined categories help users quickly find answers to common issues without needing to formulate specific questions.

The header of the interface includes two key features. A back button allows users to navigate seamlessly to the previous screen, ensuring an uninterrupted workflow. Additionally, a language change option is available, granting users the flexibility to switch the system's language through a specific interface. This feature emphasizes the platform's commitment to accessibility and user-centric design.

By integrating these functionalities into a cohesive interface, the "Assistant" ensures that users can efficiently seek support, access relevant information, and resolve queries, all while benefiting from the advanced capabilities of the LLM tailored to the platform's unique requirements.

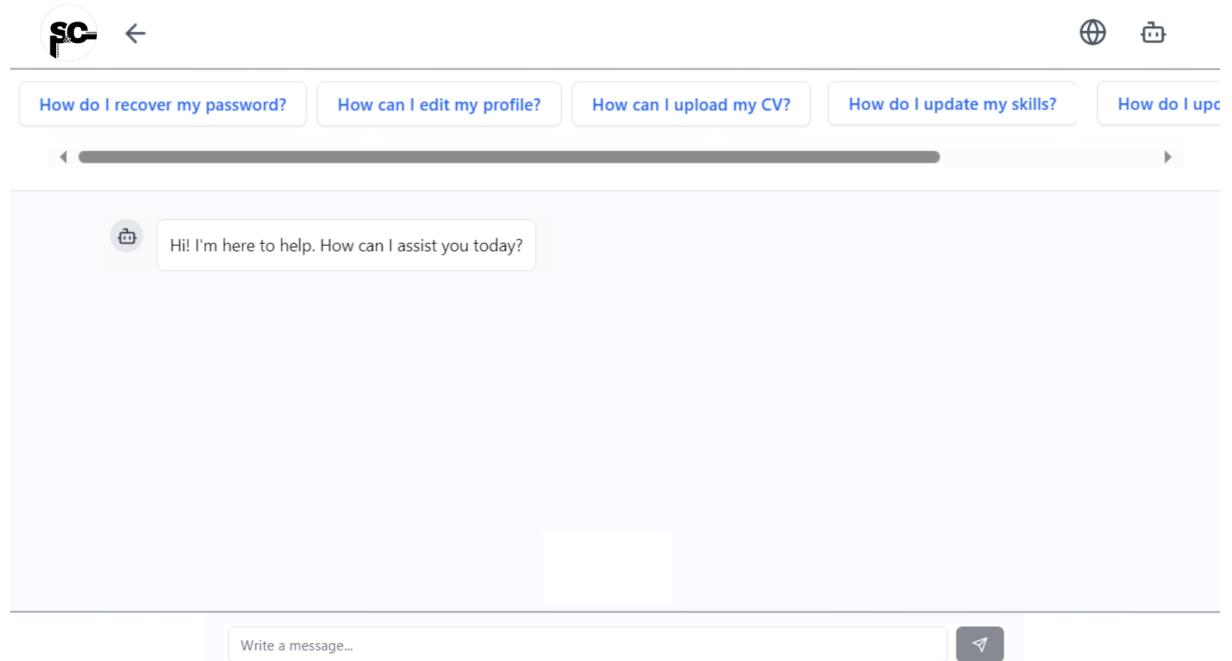


Figure 3.25: Virtual assistant interface supporting user queries and assistance.

Changing Language: The "Language Selection", designed for simplicity and accessibility, ensures that users can effortlessly choose their preferred language, enhancing the overall usability of the platform.

Upon accessing the interface, users are presented with a dropdown menu that overlays the current screen. This menu allows them to select from a list of available languages, including Italian, English, French, Spanish, and German. Each language is visually represented with its respective national flag, providing an intuitive and aesthetically pleasing selection process. The original screen remains partially visible in the background, maintaining context and ensuring a seamless experience.

Once a language is selected, users can confirm their choice by clicking the "Save Language" button. This action immediately updates the platform's interface to reflect the new language setting, providing a responsive and dynamic customization experience. For added convenience, the interface includes a "Back" button, allowing users to return to the previous screen without making changes. Additionally, the interface features an option to access the virtual assistant powered described before.

The "Language Selection" interface exemplifies the platform's commitment to personalization and user-centered design, ensuring that language preferences can be tailored to meet diverse user needs in a simple and effective manner.

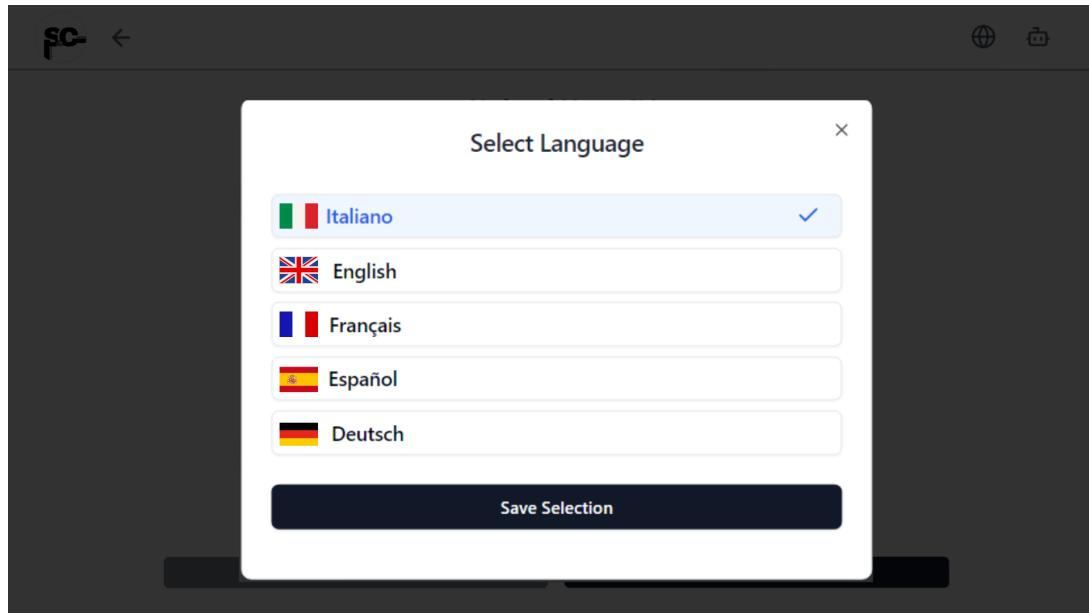


Figure 3.26: Language selection interface for customizing platform settings.

Profiles: The Profile Interfaces provides users with access to detailed information about institutional, user, and internship profiles. Each interface is carefully designed to present relevant data in a clear and organized way, tailored to the needs of users. These profiles ensure transparency, simplify access to essential details, and facilitate informed decision-making during the matchmaking and monitoring processes.

The institutional profile interface showcases the comprehensive details of the selected organization. At the top of the screen, the institution's logo and official name are prominently displayed, establishing a clear identity. Users can access administrative contacts, including the phone number, email, website, and LinkedIn profile, if available. The address section outlines the location of the institution's headquarters, including street, city, postal code, and country. To provide further context, the interface includes dropdown menus for specifying the organization's sector of operation and size, ensuring that users can quickly understand its scope. A descriptive section highlights the institution's mission, specializations, collaborations, and achievements. Additionally, users can review a curated list of certifications, awards, and recognitions that the institution has obtained, showcasing its credibility and accomplishments. A back button is available at the bottom, allowing users to return seamlessly to the previous screen.

The user profile interface offers a detailed overview of an individual's professional and academic background. It prominently displays the user's profile picture, name, and contact information, including phone number, institutional email, and LinkedIn profile, if provided. Users can view the affiliation of the individual, which is clickable to access the corresponding institutional profile. The department and role fields outline the individual's position and organizational context. A biographical section allows users to explore the individual's career, academic experiences, and professional milestones. The interface also provides an organized list of certifications, awards, and recognitions, as well as a section for spoken languages. If a CV has been uploaded, it is accessible directly from the profile; otherwise, a placeholder indicates that no CV has been provided. Reviews from students and tutors, collected upon the completion of internships, further enrich the profile by offering qualitative feedback. Like the institutional profile, this interface includes a back button to return to the previous screen.

The internship profile interface is designed to display all the critical details of the selected internship, ensuring that students, academic tutors, and company tutors have a complete understanding of the opportunity. The header section highlights the title of the internship and its category, immediately conveying the core focus of the position. The central section provides a detailed description of the role, including its objectives and responsibilities, along with a list of specific requirements, such as skills and qualifications. Information on the internship's duration, compensation, and mode of execution (in-person, remote, or hybrid) is presented clearly, with additional details on the physical location, if applicable. Operational details are included at the bottom of the interface, featuring the name of the company tutor responsible for the internship, along with a link to their profile for further context. The application deadline is prominently displayed, ensuring that candidates are aware of submission timelines. Lastly, the interface lists the languages required for the internship, providing clarity on communication expectations. As with other profiles, a back button allows users to navigate back to the previous screen effortlessly.

These profile interfaces collectively enhance user experience by offering clear, detailed, and accessible information, catering to the specific needs of each user group and supporting smooth collaboration and decision-making throughout the platform.

Prof. Robert Anderson

University of Technology
Computer Science • Academic Tutor

Contact Information

- +39 123 456 7890
- m.rossi@university.edu
- [LinkedIn Profile](#)

Biography

Professor of Computer Science with 15 years of experience in academic research and teaching. Specialized in Artificial Intelligence and Machine Learning, with a strong focus on mentoring graduate students and leading research projects.

Certifications & Awards

- Advanced Machine Learning Certification (Stanford University, 2023)
- Best Paper Award - AI Conference 2023 (International AI Society, 2023)

Languages

- Italian (Native)
- English (C1)
- French (B2)

Curriculum Vitae

[View CV](#)

Reviews

5/5 15/01/2024
Excellent mentor, very knowledgeable and supportive
by Student

5/5 20/01/2024
Exceptional teaching methods and deep knowledge of the subject matter. Always available for consultation.
by Graduate Student

Figure 3.27: User profile interface.

 Monitoring



Tech Solutions International
 Information Technology

Contact Information

 +1 (555) 123-4567

 admin@techsolutions.com

 www.techsolutions.com

 LinkedIn Profile

Location

 123 Innovation Avenue
Silicon Valley, 94025
United States

Institution Size

 500-1000 employees

About

Tech Solutions International is a leading provider of innovative software solutions, specializing in enterprise applications and cloud services. With a strong focus on research and development, we collaborate with top universities and have established ourselves as pioneers in AI-driven solutions.

Achievements

 ISO 27001 Information Security
Certification 2024

 Best Workplace Innovation
Award 2023

 Top 50 Tech Companies
Recognition 2023

 Home

 Matchmaking

 Monitoring

 Calendar

 Messages

Figure 3.28: Institution profile interface.

The screenshot shows a detailed view of an internship listing on a platform. At the top, there's a header with a logo and the word "Monitoring". Below the header, the job title "Junior Backend Developer Intern" is displayed, along with a "Programming" category badge. The listing includes the company "Tech Solutions Ltd" and its location "Milan, Italy". Key details like "Duration" (6 months), "Compensation" (800 EUR/month), and "Work Mode" (Hybrid (2 days remote)) are listed. The "Description" section invites applicants to join the backend development team and gain experience with Node.js and PostgreSQL. The "Requirements" section lists qualifications such as a Computer Science degree, basic Node.js knowledge, Git familiarity, database concepts, and problem-solving skills. The "Company Tutor" is identified as Marco Bianchi, a Senior Backend Developer. "Required Languages" include Italian (B2 Required) and English (B2 Required). The "Application Deadline" is set for August 15, 2024. A prominent "Apply Now" button is located at the bottom of the listing.

Junior Backend Developer Intern

Tech Solutions Ltd • Milan, Italy

Duration
6 months

Compensation
800 EUR/month

Work Mode
Hybrid (2 days remote)

Description

Join our backend development team and gain hands-on experience in building scalable web applications. You'll work with modern technologies like Node.js and PostgreSQL, participating in the development of REST APIs and microservices architecture.

Requirements

- Computer Science or related field student
- Basic knowledge of Node.js and REST APIs
- Familiarity with Git version control
- Understanding of database concepts
- Good problem-solving skills

Company Tutor

Marco Bianchi
Senior Backend Developer

Required Languages

Italian (B2 Required) English (B2 Required)

Application Deadline

August 15, 2024

Apply Now

Monitoring

Home Matchmaking Monitoring Calendar Messages

Figure 3.29: Internship profile interface.

3.1.2. Hardware Interfaces

S&C platform is designed to a web-based application that is accessible from a variety of devices. As such, it should not require any specialized hardware beyond standard computing devices.

A user that want to access the platform must have a reliable connection (either Wi-Fi or mobile data) and it should be able to access the platform using any desktop or laptop computer regardless of the operating system (Windows, MAC or Linux). Additionally, any user should be able to access the platform from smartphones and tables running on iOS or Android operating system.

The platform must also be compatible with the most used web browsers such as Google Chrome, Microsoft Edge or Safari without massive differences in terms of performance.

Lastly the platform should be hosted on cloud-based servers that ensure scalability and reliability. There should be also data redundancy on different servers to be used as backup and to deal with some errors that might happens.

S&C should also posses all the ACID properties to ensure Atomicity, Consistency, Isolation and Durability.

Atomicity ensure that a transaction is completed fully or not at all. The idea behind atomicity is that if a transaction fails midway, the system will acknowledge that the transaction was not complete and it will either undo all intermediate changes or retry the operation. As an example, if a student applies for an internship, the system must ensure that all relevant updates either happen entirely or are completely rolled back if an error occurs.

Consistency state that a transaction must transform the system from one valid state to another while preserving the data integrity. For example, consistency ensure that there can not be two students with same email, or a professor can not work for two universities. Consistency guarantees the correctness of the data: if the data is consistent before a transaction it will be consistent after a transaction too.

Isolation ensure that two transactions do not interfere with one another. This is fundamental since in a platform such as S&C multiple transactions may occur simultaneously, like as two or more students applying for an internships at the same time. The idea behind isolation is that a transaction is not affected by the behavior of other concurrent transactions and so it avoid inconsistency to be propagated.

Durability guarantees that once a transaction is successfully completed the changes produced by the transaction are permanent and stored reliably even if there are failures (such as a crash of the system). Durability with redundancy of data ensure that the data is not lost if a server fails. The effect of a transaction that has successfully committed will last “forever” independent of any system fault.

Of course, there is a trade-off since the implementation of the ACID properties require complex database mechanism that may increase operational costs.

3.1.3. Software Interfaces

S&C platform needs to interact with different external software systems and services. It is mandatory to ensure that all integrations comply with security and they include encryption of data with secure authentication mechanism. Also the APIs of the services that interact with S&C needs to handle increasing numbers of users without performance degradation.

University Verification API: a student needs to authenticate and verify if he/she is enrolled to a university. S&C connects with the university and institutional portals through their respective APIs to confirm that a user is a currently enrolled student.

Email Service API: used to facilitate communication. It uses a service to send email such as registration confirmations, interview invitations and other notifications about new opportunities or updates.

Calendar integration APIs: used to synchronize internship-related events with user's personal calendars. S&C needs to be integrated with popular calendar services such as Google Calendar or Apple Calendar with the respective APIs. This is needed so that the user can add interview schedules, deadlines and other important events on his personal calendar.

Video Conferencing API: to facilitate online interviews and virtual meeting between the users of the platform. The API integration with Google Meet should allow automatic generation of meeting links and embedding of conferencing features within the S&C platform.

Feedback and Survey API: used to collect feedback from students and companies about the internship. It should be integrated with survey tools such as SurveyMonkey to distribute questionnaires and gather responses about internship experiences.

Since S&C platform is expected to operate primarily in Europe, where the majority of students seeking internships and companies looking to hire interns are expected to be located, it must comply with EU data protection regulations. Those rules apply to both companies in the EU and those based outside the EU who offer goods or services in the EU. The General Data Protection Regulation (GDPR), describe different situations where a company is allowed to collect or reuse personal information. It is important to implement mechanisms to obtain explicit consent from users for data processing activities and to provide functionalities that allow users to access their data and request deletion.

3.1.4. Communication Interfaces

To ensure a secure data transmission between the user and the server, S&C must obey the HTTPS protocol. All the data exchanged must be encrypted to guarantee privacy and protect sensitive information (credentials, personal information, company data...) from unauthorized access. Also is important to perform regular security updates and monitor to maintain compliance with the standards and to address any emerging threats. Lastly, S&C must follow up with relevant legal and regulatory requirements, such as GDPR or other data protection laws. The platform should regularly review and update its policies

and security measures to stay aligned with any changes in legislation. In the event of legal updates or new regulations, S&C must adapt its systems and processes as soon as possible to remain compliant and protect user data effectively.

3.2. Functional Requirements

This section comprehensively details the Functional Requirements, which are derived from use case diagrams, individual use cases, and their associated sequence or activity diagrams. These elements collectively map out the precise requirements of the system. This structured breakdown is crucial not only as a blueprint for developers, who rely on it to build the system, but also as a guide for testers. It ensures that all functionality is verified against the documented requirements and validated to meet user expectations and project specifications. This rigorous approach is essential for aligning the final product with the initial goals of the project and the needs of the users.

3.2.0 Functional Requirements

Section 3.2.0 encapsulates all the functional requirements associated with the product functionalities defined in Section 2.2. Each requirement is meticulously designed to ensure that every aspect of the system's operation is clear, traceable, and verifiable. This section serves as a comprehensive repository of detailed specifications that developers and testers will use to ensure the system performs as intended, supporting seamless functionality across all user interactions.

Sign Up

- **FR1:** The system must allow users to register by providing a profile photo, personal data (name and surname), contacts (phone number, LinkedIn profile), institutional email, password, department and role, professional biography, certifications, awards, recognitions, languages spoken, and a security question.
- **FR2:** The system must provide a feature for users to upload their Curriculum Vitae (CV) in formats such as PDF or DOCX during the registration.
- **FR3:** The system must extract key information from the uploaded CV (e.g., name, contact information, education, work experience) to pre-fill the user's profile.
- **FR4:** The system must allow users to edit and confirm the accuracy of the pre-filled information in their profile before final submission.
- **FR5:** The system must store uploaded CVs securely and ensure that all personal information is handled in compliance with applicable data protection regulations (GDPR).
- **FR6:** The system must provide clear and helpful error messages if the CV upload fails due to an unsupported format or if the file size exceeds the allowed limit.
- **FR7:** The system should offer step-by-step guidance during the sign-up process to assist users in completing their registration and profile setup.

Log In

- **FR8:** The system must allow users to log in by entering their registered email address and password.
- **FR9:** The system must authenticate the user's credentials against the stored data securely.
- **FR10:** The system must offer a password reset feature, where users can initiate a password reset through a link sent to their registered email address.
- **FR11:** The system must require users to verify their identity via a security question or email verification during the password reset process.
- **FR12:** The system must log all login attempts, successful or failed, and provide an administrative view for monitoring purposes.
- **FR13:** The system must redirect users to their respective dashboard based on their role (student, company tutor, university tutor) upon successful login.
- **FR14:** The system must provide error messages that are clear and instructive if the login fails due to incorrect credentials or other issues.

Edit Profile Information

- **FR15:** The system must allow all registered users to access and edit their profile information.
- **FR16:** The system must ensure that users can update critical profile fields such as contact information, professional biography, department and role, and certifications.
- **FR17:** The system must save changes made by users to their profile information immediately upon confirmation.
- **FR18:** The system must require users to re-authenticate (e.g., password confirmation) before allowing access to edit sensitive information such as email and password.
- **FR19:** The system should provide users with a preview of changes before final submission to ensure accuracy.

Chatbot Communication

- **FR20:** The system must offer a chatbot feature that is accessible from all main interfaces of the platform.
- **FR21:** The system must ensure that the chatbot can handle frequently asked questions related to platform navigation, user account issues, and general inquiries.
- **FR22:** The system must allow the chatbot to guide users through common tasks such as resetting passwords, searching for internships, and navigating to help sections.

- **FR23:** The system should enable the chatbot to escalate issues to a human agent when it cannot provide a sufficient solution or answer.

Change Language

- **FR24:** The system must support multiple languages, allowing users to select their preferred language from a predefined list available within the platform settings.
- **FR25:** The system must apply the selected language to all user interface elements, including menus, dialogues, and help messages, without requiring a restart of the application.
- **FR26:** The system should remember the user's language preference for subsequent logins across different devices.

Create Internships

- **FR27:** The system must allow company tutors to create new internship listings via a dedicated interface within the platform.
- **FR28:** The system must require that all necessary fields, such as internship title, description, required qualifications, duration, compensation, and application deadline, be completed before an internship can be published.
- **FR29:** The system must provide templates and guidelines to assist company tutors in creating detailed and effective internship descriptions.
- **FR30:** The system must validate the information entered by the user to ensure that it meets format and content standards before the internship is saved or published.
- **FR31:** The system should allow company tutors to preview the internship listing as it will appear to potential applicants before finalizing the publication.

Save Internship Draft

- **FR32:** The system must allow company tutors to save their internship listings as drafts before final publication.
- **FR33:** The system must ensure that drafts can be saved automatically at regular intervals while the company tutor is creating or editing the internship.
- **FR34:** The system should provide an option for company tutors to manually save the current state of the internship as a draft at any point during the creation or editing process.
- **FR35:** The system must allow company tutors to access, review, and continue editing their saved drafts from the draft storage area within the platform.
- **FR36:** The system must ensure that only authorized company personnel can access and edit saved drafts.

Internship Search

- **FR37:** The system must provide a search interface for students to find internships using various filters such as location, field, duration, and required skills.
- **FR38:** The system must offer a recommendation engine that suggests internships based on the student's profile, past searches, and application history.
- **FR39:** The system should allow students to save their search criteria or specific internship listings for future reference.
- **FR40:** The system must update the list of available internships in real-time as new opportunities are posted by companies.

Application for Internship

- **FR41:** The system must allow students to apply for internships directly through the platform by submitting required documents and information specified by the internship posting.
- **FR42:** The system must confirm receipt of the application to the student via email or platform notification.
- **FR43:** The system should allow students to track the status of their applications within the platform.

Search for Students

- **FR44:** The system must enable companies to search for potential candidates using criteria such as academic performance, skills, and previous internship experiences.
- **FR45:** The system should provide companies with tools to organize and manage the list of candidates based on their search parameters.
- **FR46:** The system must allow companies to view detailed profiles of students, including their application history and feedback from previous internships.

Accept/Reject Participation in the Selection Process (for Companies)

- **FR47:** The system must allow companies to accept or reject applications from students for internships and notify students of the decision through the platform.
- **FR48:** The system must enable companies to provide feedback or reasons for rejection when declining a student's application, optionally.

Accept/Reject Participation in the Selection Process (for Students)

- **FR49:** The system must allow students to accept or reject participation offers in the selection process from companies.
- **FR50:** The system should notify companies of the student's decision regarding their participation in the selection process.

Communication

- **FR51:** The system must provide a robust communication platform that supports messaging, forums, and email notifications between all users (students, company tutors, and university tutors).
- **FR52:** The system should ensure secure and private communication channels for all users.
- **FR53:** The system must allow users to customize notification settings to manage the frequency and type of notifications they receive.

Accept to be a Tutor

- **FR54:** The system must allow university tutors to receive and respond to requests from companies or the university administration to become a tutor for specific internship programs.
- **FR55:** The system must provide university tutors with details about the internship (responsibilities, duration, expectations) before they accept or decline the tutor role.
- **FR56:** The system should notify the requesting party (company or university administration) about the tutor's decision.

Create and Manage Events

- **FR57:** The system must allow company tutors and university tutors to create and schedule events related to internships, such as interviews, seminars, and deadlines.
- **FR58:** The system must provide tools for managing event attendees, including invitations, RSVP tracking, and automatic reminders.
- **FR59:** The system should integrate with common calendar applications to synchronize event schedules and notify participants accordingly.

Compilation of the First Questionnaire

- **FR60:** The system must enable company tutors to compile and customize a questionnaire for initial candidate screening during the internship application process.
- **FR61:** The system should automate the distribution of the questionnaire to applicants as soon as they apply or are shortlisted.
- **FR62:** The system must collect and organize responses from the questionnaire for review by company tutors to assist in the decision-making process.

Monitor Active Internships

- **FR63:** The system must provide real-time monitoring capabilities for all active internships, allowing users (students, company tutors, university tutors) to view current status, upcoming deadlines, and progress updates.

- **FR64:** The system must allow users to receive alerts and updates about any changes or milestones reached in the internships they are involved in.

Report an Issue

- **FR65:** The system must provide a feature for students and university tutors to report issues related to internships directly through the platform.
- **FR66:** The system should allow users to categorize the type of issue (e.g., administrative, ethical, logistical) and provide a detailed description.

Resolve Issues

- **FR67:** The system must enable university tutors to access reported issues, review details, and work on resolving them.
- **FR68:** The system should provide mechanisms for communication between the reporter (student or tutor) and the resolver (university tutor) to discuss and clarify the issue.
- **FR69:** The system must log all actions taken in the issue resolution process and notify the reporting party upon resolution.

Compilation of the Final Questionnaire

- **FR70:** The system must allow for the compilation of a final questionnaire to be completed by students, company tutors, and university tutors at the end of each internship.
- **FR71:** The system should automate the distribution of the final questionnaire and collect responses to evaluate the overall success and areas of improvement for the internship program.

Real-Time Notifications

- **FR72:** The system must provide real-time notifications for critical updates, such as changes in internship status, new messages or documents, and upcoming deadlines.
- **FR73:** The system should allow users to customize the types of notifications they receive and the mediums (e.g., email, SMS, platform alerts).

Calendar Integration

- **FR74:** The system must integrate with major calendar services (Google Calendar, Outlook, Apple Calendar) to facilitate scheduling and tracking of internship-related events.
- **FR75:** The system should ensure that all events created within the platform are automatically synchronized with the user's personal or professional calendar.

- **FR76:** The system must provide an option for users to view all internship-related events within an integrated calendar on the platform.

3.2.1 Use Case Diagram

3.2.2 Use Cases

3.2.3 Sequence Diagrams

3.2.4 Requirement Mapping

Requirement mapping establishes a structured relationship between the system's goals, functional requirements, and domain assumptions. This process ensures that every goal is adequately addressed through specific functional requirements while also considering the underlying domain assumptions that influence the system's operation.

By mapping goals to their corresponding functional requirements, this section verifies that the system's design and implementation align with its intended objectives. Additionally, connecting these requirements to domain assumptions highlights any contextual or environmental conditions that must be met for the system to function as expected. This systematic approach ensures traceability, clarity, and completeness, providing a robust foundation for verifying and validating the system against its original specifications and real-world constraints.

Table 3.1: Requirement Mapping for G1: Match students with internships that align with their experiences, skills, and attitudes written on their CVs.

Functional Requirements (FR)	Domain Assumptions (D)
FR3: The system must extract key information from the uploaded CV (e.g., name, contact information, education, work experience) to pre-fill the user's profile.	D1: The platform takes whatever you defined as input (if the input is of correct type, format, and within the maximum size).
FR38: The system must offer a recommendation engine that suggests internships based on the student's profile, past searches, and application history.	D4: Companies are assumed to provide genuine internship opportunities.
FR37: The system must provide a search interface for students to find internships using filters such as location, field, duration, and required skills.	D6: Assume that there are no massive modifications on internships policies, job criteria, and academic requirements over time.
FR41: The system must allow students to apply for internships directly through the platform by submitting required documents and information specified by the internship posting.	D2: The platform relies on the domain assumption that the role a user claims reflects their real-world status.
FR44: The system must enable companies to search for potential candidates using criteria such as academic performance, skills, and previous internship experiences.	D3: All companies and universities registered on the platform are legitimate entities operating within the bounds of local laws.
FR42: The system must confirm receipt of the application to the student via email or platform notification.	D8: Every user has their own credentials.

Table 3.2: Requirement Mapping for G2: Match companies with students that might be interested in an internship in that company.

Functional Requirements (FR)	Domain Assumptions (D)
FR44: The system must enable companies to search for potential candidates using criteria such as academic performance, skills, and previous internship experiences.	D3: All companies registered on the platform are legitimate entities operating within the bounds of local laws.
FR38: The system must offer a recommendation engine that suggests candidates based on their profiles, skills, and application history.	D4: Companies are assumed to provide genuine internship opportunities.
FR37: The system must provide a search interface for companies to find students using filters such as education, skillset, and availability.	D7: A user belongs to one category at a time (e.g., a student cannot also be a professor or a company tutor).
FR45: The system should provide companies with tools to organize and manage the list of candidates based on their search parameters.	D8: Every user has their own credentials.
FR46: The system must allow companies to view detailed profiles of students, including their application history and feedback from previous internships.	D2: The platform relies on the assumption that user roles reflect real-world statuses.

Table 3.3: Requirement Mapping for G3: Let companies advertise the internships that they offer.

Functional Requirements (FR)	Domain Assumptions (D)
FR27: The system must allow company tutors to create new internship listings via a dedicated interface within the platform.	D4: Companies are assumed to provide genuine internship opportunities.
FR28: The system must require that all necessary fields, such as internship title, description, required qualifications, duration, compensation, and application deadline, be completed before an internship can be published.	D1: The platform takes input if it is of the correct type, format, and within the maximum size.
FR31: The system should allow company tutors to preview the internship listing as it will appear to potential applicants before finalizing the publication.	D3: All companies registered on the platform are legitimate entities operating within the bounds of local laws.
FR32: The system must allow company tutors to save their internship listings as drafts before final publication.	D7: A user belongs to one category at a time (e.g., a student cannot also be a professor or a company tutor).
FR40: The system must update the list of available internships in real-time as new opportunities are posted by companies.	D6: Assume that there are no massive modifications to internship policies over time.

Table 3.4: Requirement Mapping for G4: Allow students to search for internships proactively and apply for opportunities that match their interests and skills.

Functional Requirements (FR)	Domain Assumptions (D)
FR37: The system must provide a search interface for students to find internships using filters such as location, field, duration, and required skills.	D1: The platform takes input if it is of the correct type, format, and within the maximum size.
FR41: The system must allow students to apply for internships directly through the platform by submitting required documents and information specified by the internship posting.	D2: The platform relies on the assumption that user roles reflect real-world statuses.
FR42: The system must confirm receipt of the application to the student via email or platform notification.	D8: Every user has their own credentials.
FR44: The system must enable companies to search for potential candidates using criteria such as academic performance, skills, and previous internship experiences.	D4: Companies are assumed to provide genuine internship opportunities.

Table 3.5: Requirement Mapping for G5: Offer personalized internship recommendations to students using matching algorithms based on their CVs and profiles.

Functional Requirements (FR)	Domain Assumptions (D)
FR38: The system must offer a recommendation engine that suggests internships based on the student's profile, past searches, and application history.	D4: Companies are assumed to provide genuine internship opportunities.
FR3: The system must extract key information from the uploaded CV (e.g., name, contact information, education, work experience) to pre-fill the user's profile.	D1: The platform takes input if it is of the correct type, format, and within the maximum size.
FR39: The system should allow students to save recommended internships for future reference.	D8: Every user has their own credentials.
FR7: The system should offer step-by-step guidance during the sign-up process to assist users in completing their profile setup.	D9: Each user must have the legal age to register on the platform.
FR20: The system must provide a chatbot feature that offers tips and recommendations for improving student submissions and profile quality.	D2: The platform relies on the assumption that user roles reflect real-world statuses.

Table 3.6: Requirement Mapping for G6: Facilitate interaction and communication between students, companies, and universities to ensure a collaborative environment.

Functional Requirements (FR)	Domain Assumptions (D)
FR20: The system must provide a chatbot feature that supports communication among users by answering common questions and facilitating interactions.	D2: The platform relies on the assumption that user roles reflect real-world statuses.
FR51: The system must provide a messaging platform to enable communication between students, companies, and university tutors.	D8: Every user has their own credentials.
FR52: The system should ensure secure and private communication channels for all users.	D3: All companies and universities registered on the platform are legitimate entities operating within the bounds of local laws.
FR53: The system must allow users to customize notification settings to manage the frequency and type of communications they receive.	D1: The platform takes input if it is of the correct type, format, and within the maximum size.

Table 3.7: Requirement Mapping for G7: Support companies in managing the selection process and tracking the status of applications and selections.

Functional Requirements (FR)	Domain Assumptions (D)
FR47: The system must allow companies to accept or reject applications from students and notify them of the decision.	D4: Companies are assumed to provide genuine internship opportunities.
FR48: The system should enable companies to provide feedback or reasons for rejecting an application, optionally.	D3: All companies registered on the platform are legitimate entities operating within the bounds of local laws.
FR12: The system must allow companies to track the status of applications and selections in real-time.	D8: Every user has their own credentials.
FR8: The system must redirect users to their respective dashboards based on their role (e.g., company tutor) upon successful login.	D7: A user belongs to one category at a time (e.g., a student cannot also be a professor or a company tutor).
FR49: The system must allow students to accept or reject offers to participate in the selection process and notify companies of their decision.	D9: Each student must have the legal age to register and start an internship.

Table 3.8: Requirement Mapping for G8: Enable universities to monitor their students' internships and handle complaints effectively.

Functional Requirements (FR)	Domain Assumptions (D)
FR63: The system must provide real-time monitoring capabilities for university tutors to track the status and progress of students' internships.	D5: Universities are assumed to offer academic support and oversight.
FR65: The system must provide a feature for students to report complaints related to their internships directly to university tutors.	D9: Each student must have the legal age to register and start an internship.
FR67: The system must enable university tutors to access reported complaints, review details, and take appropriate actions to resolve them.	D2: The platform relies on the assumption that user roles reflect real-world statuses.
FR68: The system should facilitate communication between the student and university tutor to clarify and resolve the reported complaint.	D7: A user belongs to one category at a time (e.g., a student cannot also be a professor or a company tutor).

Table 3.9: Requirement Mapping for G9: Collect feedback from students and companies and gather statistical data to improve recommendations and platform features.

Functional Requirements (FR)	Domain Assumptions (D)
FR70: The system must allow students, company tutors, and university tutors to complete a final feedback questionnaire at the end of an internship.	D4: Companies are assumed to provide genuine internship opportunities.
FR71: The system must collect feedback responses and organize the data to evaluate the internship program's success and areas of improvement.	D3: All companies and universities registered on the platform are legitimate entities operating within the bounds of local laws.
FR14: The system should store and analyze collected feedback to enhance recommendation algorithms and platform features.	D6: Assume that there are no massive modifications to internship policies, job criteria, and academic requirements over time.
FR62: The system must ensure the anonymity of feedback submissions to protect user privacy and encourage honest evaluations.	D8: Every user has their own credentials.

Table 3.10: Requirement Mapping for G10: Ensure data security and privacy for all users on the platform.

Functional Requirements (FR)	Domain Assumptions (D)
FR5: The system must store uploaded CVs securely and ensure that all personal information is handled in compliance with applicable data protection regulations (e.g., GDPR).	D3: All companies and universities registered on the platform are legitimate entities operating within the bounds of local laws.
FR62: The system must ensure the anonymity of feedback submissions to protect user privacy and encourage honest evaluations.	D8: Every user has their own credentials.
FR6: The system must provide clear and helpful error messages if the CV upload fails due to unsupported format or file size exceeds the allowed limit, ensuring no data loss.	D1: The platform takes input if it is of the correct type, format, and within the maximum size.
FR53: The system should ensure secure and private communication channels for all users.	D7: A user belongs to one category at a time (e.g., a student cannot also be a professor or a company tutor).
FR13: The system must allow companies, students, and university tutors to securely log in and access their dashboards only after successful authentication.	D2: The platform relies on the assumption that user roles reflect real-world statuses.

3.3. Performance Requirements

Performance is an important factor for any platform. Student&Companies is no different. In order for S&C to stand out from other possible competing platforms and to create a positive user experience, it is fundamental to have a high standard to increase the number of users and keep them loyal to the platform. Delays or slow interactions are correlated with frustration and a poor user experience. Therefore, it is important to have a responsible and reliable platform where both students, companies and professors can have a positive interaction and thus create a robust and active community.

A fast response time is crucial to improve the user experience: it ensures that a student can efficiently search and apply for an internship or get a timely recommendation for an internship. At the same time, a company can quickly communicate with students and review applications without wasting time waiting for a response from the platform.

Since there are different types of interactions a user can have with the S&C platform, it is useful to categorize them based on their complexity.

For basic interactions such as loading the screen, uploading a resume, navigating through different sections, it would be important to have a target response time of at most one second per request. This is because for actions that seem obvious, the user might expects a very fast response time, and if there is a delay, the user may be discouraged from continuing to use the platform.

Instead, for more complex interactions, such as searching for an internship with keywords or receiving personalized generated recommendations, the target response time should be at most three seconds per request. These interactions are more complex and the user may have to wait a little longer than expected because they require more data-intensive operations to complete.

It is also important to remember that the users of the S&C platform may be distributed in different regions, so it is essential to take into account geographical latency to maintain a positive user experience regardless of where the user is located. The servers of the platform should be located in key geographical areas where the traffic can be more intense (close to the main cities and the largest universities).

A problematic period would obviously be when there is a high traffic to the website. An example could be when a company launches a large recruitment campaign or when a university collaborates with companies to promote internships, leading to many students accessing the platform simultaneously. To mitigate the risk of slowing down the response rate of the platform, it would be highly advisable to distribute the traffic across multiple servers, thus preventing a single server from being overwhelmed. In addition, it would be advisable to cache frequently accessed data by using in-memory caching systems.

Scalability is an important performance requirement that should be implemented by S&C. There should be the ability to add more servers to handle increased load without significant downtime and to ensure that the system can scale resources (CPU, memory) on existing servers as needed.

Lastly, to keep the platform in good health, it is important to continually monitor the

platform and to do some performance testing. It is important to track key performance indicators such as response time, CPU usage, memory usage and error rates to assess the health of the system. It is also important to regularly test the performance of the platform under heavy load or traffic to identify and address bottlenecks. By simulating real-world scenarios, you can anticipate potential problems and improve the user experience.

3.4. Design Constraints

3.4.1. Standards Compliance

The S&C platform manages sensitive user information—such as personal data, academic affiliations, and internship details.

Since the platform may be used by users within the European Union and European Economic Area, S&C must comply with GDPR standards. This entails implementing appropriate data processing, consent management and data retention policies.

3.4.2. Hardware Limitations

Since a user may access the platform by using a pc, laptop, table or smartphone, the platform should be optimized for devices with varying processing capabilities.

A fast and stable internet connection is necessary to ensure that the platform is responsive. The system should handle occasional network latency by providing loading indicators and some information to the user.

No highly specialized hardware is required to access the platform. The device should have at least 4 GB of RAM, standard CPU performance for web browsing, sufficient storage for caching, a process such as i5 or i7 and a display with high resolution (at least HD).

3.4.3. Any Other Constraint

The platform must be intuitive and easy to navigate for possibly all users. Use color-coding techniques when needed and clear instructions.

The platform must also deal with scalability, since the amount of data can increase. The design of the platform must allow horizontal and vertical scaling as well as efficient database queries.

3.5. Software System Attributes

This section outlines the essential software quality attributes that the S&C platform must have. These attributes ensure that the system is robust, dependable, and easy to maintain while providing a secure and accessible environment for all users.

3.5.1. Reliability

The system should be reliable in 99% of the cases. Furthermore the platform has to be fault tolerant in order to prevent the propagation of errors and to guarantee a continuous usability of the system.

3.5.2. Availability

Given the global nature of internships and the continuous interaction between students, companies, and universities, the system should ideally be accessible 24 hours a day. Planned maintenance and updates should be scheduled to minimize impact on users and should be planned when it is night time for the vast majority of users. The system must be available the most time possible, with a minimum value of 99.9%.

3.5.3. Security

All communications should use secure protocols (such as SSL protocol) that can be considered a standard on many platforms, also sensitive information (including passwords and personal data) must be encrypted using a public-private key mechanism and stored securely. Every activity performed by a user will be logged to ensure traceability. Lastly different methods aiming to protect the database must be adopted, such as defense against query injections and other potential attacks.

3.5.4. Maintainability

First of all, maintenance is not expected to interfere with normal use of the applications. To facilitate maintainability all the components of the system should be modular which could reduce the effort needed to fix bugs. A clear documentation, both in-code and external is needed (of at least 75% coverage of core functionalities) to ensure that developers can easily understand, maintain, and evolve the system.

Also the system must be designed in such a way that permits future addition of functionalities with minimum effort.

3.5.5. Portability

The platform should be fully functional and responsive across major web browsers and devices. It is important to maintain the platform compatible with the future releases of other new operating systems, devices and web browsers that might be launched and used to access the platform by an user.

4 | Formal Analysis Using Alloy

This chapter represent an abstract model of the S&C platform and it mainly focus on the structural elements of the platform and the relationships between them. Due to the complexity of the platform and time constraint, it was not possible to express all the functionalities and characteristics. Some components (such as calendars, drafts of internships, direct messaging, questionnaires and meeting managements) are not included.

This code is divided in three subsections:

- **Signatures:** defines all the signatures (Students, Companies, Internships,...).
- **Facts:** impose constraints to ensure that the model reflects valid states of the system.
- **Testing Facts:** contains additional facts for testing the alloy code. They can be commented since they do not directly affects the constraints of the S&C platform.

```

1 // ----- SIGNATURES -----
2
3 // USERS // generic user (used for people: Student, CompanyTutor
4 // and Professor)
5 abstract sig User {
6     communicate: set User // users can communicate with a set of
7         other users
8 }
9
10 // STUDENT
11 sig Student extends User {
12     belongsTo: one University, // must be enrolled in exactly
13         one university
14     haveStudentInformation: one StudentInformation_CV, // must
15         have exactly one StudentInformation_CV
16     universityMail: one Email, // must have exactly one
17         university mail
18     visualize: set Internship, // can visualize the internships
19     applies: set Internship, // can apply to internships
20     seeCompanyProblem: set ProblemOfCompany // can see the
21         companyProblem
22 }
```

```

18 // COMPANYTUTOR
19 sig CompanyTutor extends User {
20     workFor: one Company, // must work for exactly one company
21     manages: some Internship, // manage 0, 1 or more internships
22     read: set StudentInformation_CV, // can read students' 
23         StudentInformation_CV
24     evaluations: set InternshipStatus, // can evaluate students
25     see: set ProblemOfStudent, // can see reported problems
26     seeCompanyProblem: set ProblemOfCompany, // new field
27     manageProblemOfCompany: set ProblemOfCompany // new field
28 }
29
30 // PROFESSOR
31 sig Professor extends User {
32     worksFor: one University, // must work for exactly one
33         university
34     see: set ProblemOfStudent, // each professor has a set of
35         problemsOfStudents they can see
36     seeCompanyProblem: set ProblemOfCompany, // each professor
37         has a set of problemsOfSComapny they can see
38     manageProblemOfStudent: set ProblemOfStudent // professors
39         manage problems
40 }
41
42 // COMPANIES
43 sig Company {
44     representBy: some CompanyTutor, // is represented by 0,1 or
45         more companyTutor
46     offerInternships: set Internship, // can offers internships
47         on the platform
48     haveCompanyInformation: one CompanyInformation // each
49         company has one and only one CompanyInformation
50 }
51
52 // INTERNSHIPS
53 sig Internship {
54     offeredBy: one CompanyTutor, // each internship is offered
55         by exactly one companyTutor
56     offeredFor: one Company, // each internship is offered for
57         exactly one company
58     haveInternshipInformation: one InternshipInformation, // each
59         internship has some information
60     terminated: lone Positive // each internship will
61         eventually terminate
62 }
63
64 // UNIVERSITIES
65 sig University {
66     hasStudents: set Student, // each university has some students

```

```

55     haveUniversityInformation: one UniversityInformation, // each
56         university has some information
57     associatedToUni: set Professor, //each university employs
58         some professors
59     monitor: set Student // university monitor students
60 }
61
62 // INTERNSHIPOFSTUDENT
63 sig InternshipStatus {
64     companyTutor: one CompanyTutor, // an internshipStatus has
65         one companyTutor (who accepts or not the internship)
66     internship: one Internship, // the internshipStatus focuses
67         on one specific internship
68     student: one Student, // each internshipStatus focuses on
69         one specific student
70     result: one EvalResult, // each internshipStatus must have a
71         result
72     universityTutor: lone Professor // If result is positive,
73         assign a professor of the student's university
74 }
75
76 // FEEDBACK INTERNSHIP
77 sig FeedbackToInternship {
78     feedbackInternshipFor: one Company, // feedback for exactly
79         one company
80     feedbackInternshipOn: one Internship, // feedback on
81         exactly one internship
82     feedbackInternshipAbout: one InternshipInformation // feedback about exactly one internship information
83 }
84
85 // FEEDBACK STUDENT
86 sig FeedbackToStudent {
87     feedbackStudentAbout: one StudentInformation_CV, // The
88         StudentInformation_CV being reviewed
89     feedbackStudentFor: one Student // The student receiving
90         the feedback
91 }
92
93 // PROBLEM OF STUDENT
94 sig ProblemOfStudent {
95     reportedBy: one Student, // Each problem is
96         reported by exactly one student
97     aboutInternship: one Internship, // Each problem is about
98         exactly one internship
99     terminateInternship: one (Positive + Negative) // terminateInternship points to either Positive or Negative
100 }

```

```

89 // PROBLEM OF COMPANY
90 sig ProblemOfCompany {
91     reportedBy: one CompanyTutor,           // reported by exactly one
92         CompanyTutor
93     aboutInternship: one Internship,        // about exactly one
94         internship
95     terminateInternship: one (Positive + Negative) // the problem
96         leads to a positive or negative termination
97 }
98
99 // ALGORITHM
100 // is the one suggesting all the feedbacks to students and
101 // internships
102 one sig Algorithm {
103     suggestsToStudent: set FeedbackToStudent,
104     suggestsToInternship: set FeedbackToInternship
105 }
106
107 // MISCELLANEOUS
108 sig Email {associatedTo: lone University}
109 sig InternshipInformation {}
110 sig CompanyInformation {}
111 sig UniversityInformation {
112     describesUni: one University
113 }
114 sig StudentInformation_CV {
115     owner: one Student // each haveStudentInformation belongs to
116         one student only
117 }
118 abstract sig EvalResult {}
119 one sig Positive extends EvalResult {} // the result of an
120         evaluation can be positive
121 one sig Negative extends EvalResult {} // or negative
122
123
124
125 // each CompanyTutor works for exactly one company
126 // and each CompanyTutor manages internships offered by their
127 // company
128 fact OneCompanyTutorToOneCompany {
129     all c: Company | all r: c.representBy | r.workFor = c
130     all cr: CompanyTutor | one cr.workFor

```

```

130     all cr: CompanyTutor | cr.manages in
131         cr.workFor.offerInternships
132     }
133
134 // each internship is offered by the correct company
135 fact companyToInternship {
136     all c: Company | all i: c.offerInternships | i.offeredFor = c
137 }
138
139 // each internship is managed by the correct companyTutor
140 fact companyRepToInternship {
141     all cr: CompanyTutor | all i: cr.manages | i.offeredBy = cr
142 }
143
144 // guarantees that each internship offered for a company is the
145 // same company for which the companyTutor works
146 fact InternshipOfferedByCorrectCompanyTutor {
147     all i: Internship | i.offeredFor = i.offeredBy.workFor
148 }
149
150 // each email is assigned to at most one student and must be the
151 // student's university mail
152 fact EmailsAssignedToOnlyOneStudent {
153     all e: Email | lone s: Student | e = s.universityMail
154 }
155
156 // no student can have the same university mail
157 fact UniqueUniversityMails {
158     all disj s1, s2: Student | s1.universityMail != s2.universityMail
159 }
160
161 // every mail is either a student's university mail
162 // and university mail are managed by the university to which the
163 // student belongs
164 fact EmailManager {
165     all e: Email | some s: Student | e = s.universityMail
166     all s: Student | s.universityMail.associatedTo = s.belongsTo
167 }
168
169 // each internship has unique information
170 fact UniqueInternshipInformation {
171     all disj i1, i2: Internship | i1.haveInternshipInformation != i2.haveInternshipInformation
172 }
173
174 // there can not exist an InternshipInformation not linked to an
175 // internship
176 fact AllInformationsLinked {

```

```

172     all d: InternshipInformation | some i: Internship |
173         i.haveInternshipInformation = d
174     }
175
176 // a student has exactly one StudentInformation_CV , and it
177 // belongs only to that student
178 fact StudentOwnsTheirStudentInformation_CV {
179     all s: Student | s.haveStudentInformation.owner = s
180     all disj c1, c2: StudentInformation_CV | c1.owner = c2.owner
181         implies c1 = c2
182 }
183
184 // a student first needs to visualize an internship before
185 // applying
186 fact ApplicationRequiresVisualization {
187     all s: Student, i: Internship |
188         i in s.applies implies i in s.visualize
189 }
190
191 // each university has a unique UniversityInformation
192 fact OneToOneUniversityAndUniversityInformation {
193     all disj u1, u2: University | u1.haveUniversityInformation != u2.haveUniversityInformation
194     all d: UniversityInformation |
195         d.describesUni.haveUniversityInformation = d
196 }
197
198 // a professor works for exactly one university and is employed
199 // by it
200 fact ProfessorWorksForUniversity {
201     all p: Professor | p.worksFor in University
202     all p: Professor | p in p.worksFor.associatedToUni
203 }
204
205 // each professor is employed by exactly one university
206 fact EachProfessorEmployedByOnlyOneUniversity {
207     all p: Professor | one u: University | p in u.associatedToUni
208 }
209
210 // eventually, every internship application will be evaluated by
211 // the companyTutor
212 fact EventuallyEvaluated {
213     all s: Student, i: Internship |
214         i in s.applies implies
215             eventually (
216                 some eval: InternshipStatus |
217                     eval.internship = i and
218                     eval.companyTutor in i.offeredBy and
219                     eval.student = s
220 }
```

```

213     )
214 }
215
216 // an evaluation for an internship application can be done only
217 // by the companyTutor that manages that internship
217 fact ValidInternshipStatus {
218     all eval: InternshipStatus |
219         eval.internship in eval.companyTutor.manages and
220         eval.internship in eval.student.applies
221 }
222
223 // to evaluate an internship, the companyTutor needs to read the
223 // student's StudentInformation_CV first
224 fact IfEvaluatedThenReadStudentInformation_CV {
225     all eval: InternshipStatus |
226         eval.student.haveStudentInformation in
227             eval.companyTutor.read
228 }
229
230 // every university has at least one professor
231 fact EveryUniversityHasAtLeastOneProfessor {
232     all u: University | some u.associatedToUni
233 }
234
235 // an evaluation for an internship can either be positive or
235 // negative
236 fact InternshipStatusResultValidity {
237     all eval: InternshipStatus | eval.result in EvalResult
238 }
239
240 // the companyTutor that evaluates the internship must be the one
240 // who offered the same internship
241 fact InternshipStatusTutorMustBeInternshipOwner {
242     all e: InternshipStatus | e.companyTutor =
243         e.internship.offeredBy
244 }
245
246 // bidirectional between companyTutor and the evaluations
247 fact CompanyTutorInternshipStatusBidirectional {
248     all ct: CompanyTutor | ct.evaluations = { e: InternshipStatus
249         | e.companyTutor = ct }
250 }
251
252 // every internship application of a student must have a
252 // corresponding evaluation (1-to-1)
253 fact EveryApplicationHasInternshipStatus {
254     all s: Student, i: Internship |
255         i in s.applies implies some e: InternshipStatus |
256             e.student = s and e.internship = i

```

```

253 }
254
255 // ensures a companyTutor can only read StudentInformation_CVs of
256 // students they have evaluated
256 fact ReadOnlyEvaluatedStudentInformation_CVs {
257     all ct: CompanyTutor | ct.read =
258         ct.evaluations.student.haveStudentInformation
259 }
260
260 // If evaluation result is Positive, a suitable professor (from
261 // the student's university) must be assigned.
261 // If evaluation result is Negative, no universityTutor is
262 // assigned.
262 fact UniversityTutorAssignment {
263     all eval: InternshipStatus |
264         ((eval.result = Positive) =>
265             (some eval.universityTutor and eval.universityTutor
266                 in eval.student.belongsTo.associatedToUni))
267         and
268         ((eval.result = Negative) => no eval.universityTutor)
269 }
270
270 // define when a University monitors a Student
271 fact UniversityMonitorsStudent {
272     all u: University, s: Student |
273         s in u.monitor iff (
274             s.belongsTo = u and
275             some i: Internship | i in s.applies and
276             some eval: InternshipStatus |
277                 eval.internship = i and
278                 eval.student = s and
279                 eval.result = Positive
280         )
281 }
282
283 // internship mentioned in the feedback is actually offered by
284 // the company in "feedbackFor"
284 fact FeedbackMatchesCompanyOffer {
285     all f: FeedbackToInternship | f.feedbackInternshipOn in
286         f.feedbackInternshipFor.offerInternships
287 }
288
288 // feedbackAbout internship information matches the internship's
289 // information
289 fact FeedbackMatchesInternshipInformation {
290     all f: FeedbackToInternship | f.feedbackInternshipAbout =
291         f.feedbackInternshipOn.haveInternshipInformation
292 }

```

```

293 // at most one feedback per internship
294 fact AtMostOneFeedbackPerInternship {
295     all disj f1, f2: FeedbackToInternship |
296         f1.feedbackInternshipOn != f2.feedbackInternshipOn
297 }
298
299 fact FeedbackToStudentCorrespondence {
300     all fs: FeedbackToStudent | fs.feedbackStudentAbout =
301         fs.feedbackStudentFor.haveStudentInformation
302     all s: Student | one fs: FeedbackToStudent |
303         fs.feedbackStudentFor = s      // a student has exactly one
304         FeedbackToStudent
305 }
306
307
308 // for each internship at most one positive evaluation
309 fact OnlyOnePositiveInternshipStatusPerInternship {
310     all i: Internship | lone e: InternshipStatus | e.internship =
311         i and e.result = Positive
312 }
313
314 // only students with a positive evaluation for that internship
315 // can report a problem
316 fact OnlyStudentsWithPositiveInternshipStatusCanReportProblem {
317     all p: ProblemOfStudent |
318         some eval: InternshipStatus |
319             eval.student = p.reportedBy and
320             eval.internship = p.aboutInternship and
321             eval.result = Positive
322 }
323
324 // communicate only if the evaluation is positive
325 fact PositiveInternshipStatusCommunications {
326     all eval: InternshipStatus |
327         eval.result = Positive implies (
328             let s = eval.student,
329                 t = eval.companyTutor,
330                 p = eval.universityTutor |
331                 // communication between student and companytutor
332                 s in t.communicate and
333                 t in s.communicate and
334                 // communication between student and
335                 // universitytutor
336                 s in p.communicate and
337                 p in s.communicate and
338                 // communication between company tutor and
339                 // universitytutor
340                 t in p.communicate and
341                 p in t.communicate
342             )
343 }

```

```

334 }
335
336 // all feedbacks are connected to the single algorithm
337 fact AllFeedbacksConnectedToAlgorithm {
338     Algorithm.suggeststoStudent = FeedbackToStudent
339     Algorithm.suggeststoInternship = FeedbackToInternship
340 }
341
342 // ensure that every CompanyInformation is linked to exactly one
343 // Company
344 fact AllCompanyInformationsLinked {
345     all ci: CompanyInformation | one c: Company |
346         c.haveCompanyInformation = ci
347 }
348
349 // ensure that no company shares the same CompanyInformation
350 fact UniqueCompanyInformationPerCompany {
351     all disj c1, c2: Company | c1.haveCompanyInformation != c2.haveCompanyInformation
352 }
353
354 // an internship can have at most one problem (0 or 1) of student
355 fact AtMostOneProblemPerInternship {
356     all i: Internship | lone p: ProblemOfStudent |
357         p.aboutInternship = i
358 }
359
360 // restrict communications
361 fact RestrictCommunications {
362     all u, v: User |
363         u in v.communicate implies (
364             some eval: InternshipStatus |
365                 eval.result = Positive and
366                 (
367                     (eval.student = u and eval.companyTutor = v)
368                         or
369                     (eval.companyTutor = u and eval.student = v)
370                         or
371                     (eval.student = u and eval.universityTutor =
372                         v) or
373                     (eval.universityTutor = u and eval.student =
374                         v) or
375                     (eval.companyTutor = u and
376                         eval.universityTutor = v) or
377                     (eval.universityTutor = u and
378                         eval.companyTutor = v)
379                 )
380             )
381 }
382 }
```

```

373
374 // professor can see reported problems of students they tutor
375 fact ProfessorCanSeeReportedProblems {
376     all p: ProblemOfStudent | {
377         some eval: InternshipStatus | (
378             eval.internship = p.aboutInternship and
379             eval.student = p.reportedBy and
380             eval.result = Positive and
381             p in eval.universityTutor.see
382         )
383     }
384 }
385
386 // a companyTutor can see only the problems reported by the
387 // students about an internship they manage
388 fact CompanyTutorSeesOnlyManagedProblems {
389     all p: ProblemOfStudent | {
390         let ct = p.aboutInternship.offeredBy {
391             p in ct.see
392             all otherCT: CompanyTutor - ct | p not in otherCT.see
393         }
394     }
395
396 // companyTutor sees problems of managed internships
397 fact CompanyTutorSeesProblemsOfManagedInternships {
398     all p: ProblemOfStudent |
399         p in p.aboutInternship.offeredBy.see
400 }
401
402 // if a professor sees a problem, then the professor manages that
403 // problem
404 fact ProfessorSeesImpliesManagesProblem {
405     all p: Professor, prob: ProblemOfStudent |
406         prob in p.see implies prob in p.manageProblemOfStudent
407 }
408
409 // there can be at most one ProblemOfCompany per internship
410 fact AtMostOneProblemOfCompanyPerInternship {
411     all i: Internship | lone p: ProblemOfCompany |
412         p.aboutInternship = i
413 }
414
415 // only company tutors with a positive evaluation for an
416 // internship can report a ProblemOfCompany on that internship
417 fact
418     OnlyCompanyTutorsWithPositiveInternshipStatusCanReportProblemOfCompany
419 {
420     all p: ProblemOfCompany |

```

```

416     some eval: InternshipStatus |
417         eval.companyTutor = p.reportedBy and
418         eval.internship = p.aboutInternship and
419         eval.result = Positive
420 }
421
422 // professors, companyTutors and students associated with a
423 // positive evaluation see the ProblemOfCompany
423 fact VisibilityOfProblemOfCompany {
424     all p: ProblemOfCompany | {
425         some eval: InternshipStatus | (
426             eval.internship = p.aboutInternship and
427             eval.companyTutor = p.reportedBy and
428             eval.result = Positive and
429             p in eval.companyTutor.seeCompanyProblem and
430             p in eval.universityTutor.seeCompanyProblem and
431             p in eval.student.seeCompanyProblem
432         )
433     }
434 }
435
436 // if a CompanyTutor sees a company problem, they must also
437 // manage it
437 fact CompanyTutorSeesImpliesManagesProblemOfCompany {
438     all ct: CompanyTutor, prob: ProblemOfCompany |
439         prob in ct.seeCompanyProblem implies prob in
440             ct.manageProblemOfCompany
441
442 // if there is a problem and that problem requires the end of the
443 // internship
443 // then the internship will end
444 fact ProblemForcesTermination {
445     all ps: ProblemOfStudent |
446         (ps.terminateInternship = Positive) =>
447             (ps.aboutInternship.terminated = Positive)
448     all pc: ProblemOfCompany |
449         (pc.terminateInternship = Positive) =>
450             (pc.aboutInternship.terminated = Positive)
451
452 // eventually all internship must come to an end
452 fact EventuallyAllInternshipsTerminate {
453     all i: Internship | eventually (i.terminated = Positive)
454 }
455
456
457
458 // ----- TESTING FACTS

```

```

459 -----  

460 // there should be at least one visualization of an internship  

461 // made by a student  

462 fact AtLeastOneVisualization {  

463     some s: Student | some i: Internship | i in s.visualize  

464 }  

465 // there exists at least some internship application  

466 fact AtLeastOneApplication {  

467     some s: Student | some i: Internship | i in s.applies  

468 }  

469 // minimum count for some signatures  

470 fact {  

471     #Student > 1  

472     #Company > 1  

473     #CompanyTutor > 1  

474     #University > 1  

475     #Professor > 1  

476     #InternshipStatus >1  

477     #ProblemOfStudent >1  

478     #FeedbackToStudent > 1  

479     #FeedbackToInternship > 1  

480     #CompanyInformation > 1  

481     #ProblemOfCompany > 1  

482 }  

483 }  

484 // at least one positive evaluation  

485 fact AtLeastOnePositiveInternshipStatus {  

486     some e: InternshipStatus | e.result = Positive  

487 }  

488 //fact AtMostTwoPositiveEvaluations {  

489 //    # { i: InternshipStatus | i.result = Positive } <= 2  

490 //}  

491 // Each student can have at most one InternshipStatus with a  

492 // Positive result  

493 fact OnePositiveInternshipStatusPerStudent {  

494     all s: Student | lone e: InternshipStatus | e.student = s and  

495         e.result = Positive  

496 }  

497 }  

498 // ----- RUN COMMAND -----  

499 -----  

500 run {} for 10 // but 2 Company, 4 CompanyTutor, 5 Internship, 5  

      StudentInformation_CV, 2 University, 10 Email, 10  

      InternshipInformation, 4 InternshipStatus, 2 EvalResult

```

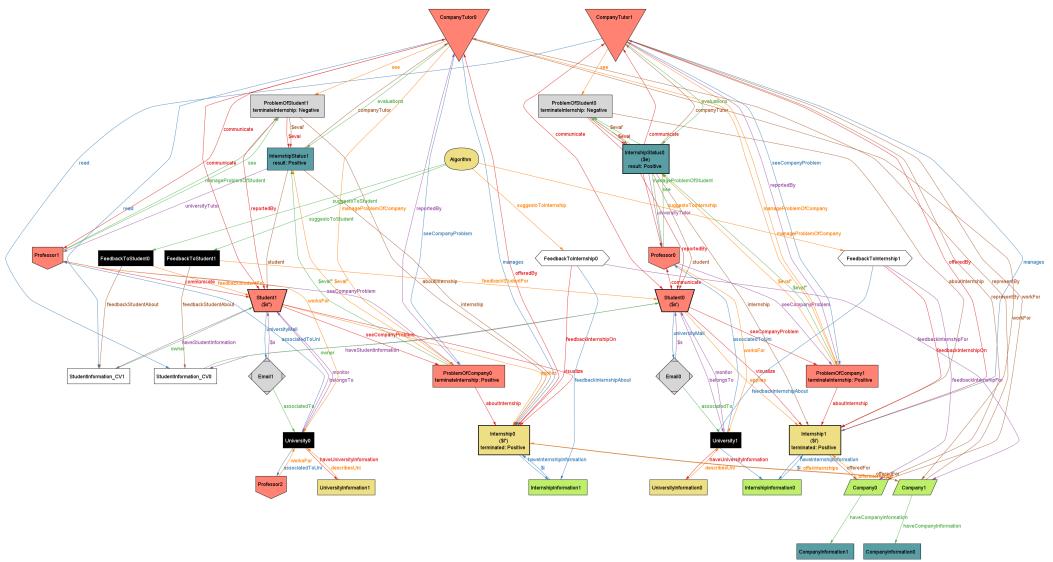


Figure 4.1: Enter Caption

5 | Effort Spent

In this section you will include information about the number of hours each group member has worked for this document.

Acquadro Patrizio

chapter	Effort (In hours)
1	0
2	0
3	0
4	0

Colosio Giacomo

chapter	Effort (In hours)
1	0
2	0
3	0
4	0

Drugman Tito Nicola

chapter	Effort (In hours)
1	0
2	0
3	0
4	0

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