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MILANO 1863

SCUOLA DI INGEGNERIA INDUSTRIALE
E DELL'INFORMAZIONE

Requirement Analysis and Specification Document

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Contents

Contents	i
List of Figures	iv
List of Tables	vii
1 Introduction	1
1.1 Purpose	1
1.2 Scope	2
1.2.1 World Phenomena	4
1.2.2 Machine Phenomena	4
1.2.3 Shared Phenomena	4
1.3 Definitions, Acronyms, Abbreviations	5
1.3.1 Definitions	5
1.3.2 Acronyms	5
1.3.3 Abbreviations	6
1.4 Revision history	6
1.5 Reference Documents	6
1.6 Document Structure	6
2 Overall description	8
2.1 Product perspective	8

2.1.1	Scenarios	8
2.1.2	Domain Class Diagram	11
2.2	Product Functions	11
2.3	User characteristics	14
2.4	Assumptions, dependencies and constraints	15
3	Specific Requirements	16
3.1	External Interface Requirements	16
3.1.1	User Interfaces	16
3.1.2	Company Interfaces	20
3.1.3	Student Interfaces	24
3.1.4	University Interfaces	30
3.1.5	Common Interfaces	31
3.2	Functional Requirements	34
3.2.1	Use Cases Diagram	36
3.2.2	Use Case	37
3.2.3	Requirements mapping	69
3.3	Performance Requirements	72
3.4	Design Constraints	72
3.4.1	Regulatory Polices	72
3.4.2	Hardware Limitations	72
3.4.3	Other Constraints	72
3.5	Software System Attributes	72
3.5.1	Reliability	72
3.5.2	Availability	73
3.5.3	Security	73
3.5.4	Maintainability	73

3.5.5	Portability	73
4	Formal analysis using Alloy	74
5	Effort spent	82
6	Reference	83

List of Figures

2.1	High level Class Diagram	11
3.1	Landing Page	16
3.2	Introduction Page	17
3.3	Choice page	17
3.4	Create account for Companies	18
3.5	Create account for Students	18
3.6	Create account for Universities	18
3.7	Company Sign in	19
3.8	Student Sign in	19
3.9	University Sign in	20
3.10	Company Home page	20
3.11	Company Personal profile	21
3.12	Company - Managing account	22
3.13	Internships management	23
3.14	Applications review	23
3.15	Interview and questionnaire creation	24
3.16	Interview evaluation	24
3.17	Student Home page	25
3.18	Student Personal profile	26
3.19	Student Profile management	27

3.20 Internships lookup	28
3.21 Internship details	28
3.22 Application form	29
3.23 Interview reply	29
3.24 Application status	30
3.25 University Home page	30
3.26 Complaints visualization	31
3.27 Complaints handling	31
3.28 Notifications	32
3.29 Messages	32
3.30 Feedback Request	33
3.31 Complaints sending	33
3.32 Diagram for [UC1]	38
3.33 Diagram for [UC2]	40
3.34 Diagram for [UC3]	42
3.35 Diagram for [UC4]	44
3.36 Diagram for [UC5]	46
3.37 Diagram for [UC6]	48
3.38 Diagram for [UC7]	50
3.39 Diagram for [UC8]	52
3.40 Diagram for [UC9]	54
3.41 Diagram for [UC10]	56
3.42 Diagram for [UC11]	58
3.43 Diagram for [UC12]	60
3.44 Diagram for [UC13]	62
3.45 Diagram for [UC14]	64

3.46	Diagram for [UC15]	66
3.47	Diagram for [UC16]	68
4.1	State 0	78
4.2	State 1	79
4.3	State 2	79
4.4	State 3	79
4.5	State 4	80
4.6	State 5	80
4.7	State 6	81

List of Tables

3.1	User Registration Table	37
3.2	User Login Table	39
3.3	Insert CV Information Table	41
3.4	Update CV Information Table	43
3.5	Create Internship Table	45
3.6	Update Internship Table	47
3.7	Search Internship Table	49
3.8	Submit Application Table	51
3.9	Insert Questionnaire Table	53
3.10	Update Questionnaire Table	55
3.11	Answer Questionnaire Table	57
3.12	Evaluate Application Table	59
3.13	Monitor Internship Table	61
3.14	Write Feedback Table	63
3.15	Write Complaint Table	65
3.16	Handle Complaint Table	67
5.1	Hours spent per person	82

1 | Introduction

1.1. Purpose

As internships become a fundamental part of academic and professional careers, providing students with easier access to opportunities is more important than ever. Traditionally, internship management has relied on fragmented systems, where students struggle to find opportunities, companies face difficulties in attracting the right candidates, and universities have limited visibility into the process.

The Student&Company (S&C) Platform aims to bridge these gaps. It provides a centralized system where students can explore internships, enhance their CVs, and apply with ease. Companies benefit by gaining access to tools to improve their internship postings and efficiently manage applications. Meanwhile, universities can monitor the process, mediate issues, and ensure fair practices.

This platform is designed to create a more equitable, efficient, and user-friendly experience for students, companies, and universities, ensuring a collaborative and successful internship process.

S&C, therefore, intends to serve the following primary goals:

[G1] Allow students to look for internships and stay updated about new opportunities

Students can explore various internship opportunities available on the platform and receive notifications about new listings

[G2] Allow students to improve their CVs

Students can use the platform's tools and suggestions to improve their CVs, making them more appealing to companies

[G3] Allow students to apply for an internship

Students can submit applications for internships directly through the platform, en-

suring a seamless and efficient process

[G4] Allow a company to hire interns

Companies can use the platform to post internship opportunities, evaluate applications, and select the most suitable candidates for their needs

[G5] Allow companies to improve their internship proposals

The platform provides feedback and suggestions to help companies refine their internship descriptions, making them more attractive to applicants

[G6] Allow users to track and monitor the status of the internship

Both students and companies can track the progress of their applications or internship postings, gaining insights into the status and next steps

[G7] Allow users to report feedback and complaints

The platform allows users to provide feedback or report complaints about the internship process, ensuring accountability and resolution

[G8] Allow universities to review and address complaints

Universities can review and address complaints submitted by students or companies and eventually end the process if necessary. This promotes fairness and transparency throughout the internship process

1.2. Scope

The Students&Companies (S&C) platform is designed to facilitate the process of matching university students seeking internships with the companies offering them. The scope of the platform includes providing a centralized, user-friendly interface in which students, companies, and universities can interact to support the internship process from the beginning to the end.

The platform supports three main users: Students, Companies, and Universities, each with specific functionalities.

Student

Their functionalities include:

- **CV Creation:** Upload information to generate a CV that can be improved with

suggestions, making it more appealing for internships.

- **Search Internship:** Browse for internship opportunities that align with their skills and preferences, filtering the options based on given criteria.
- **Internship Application:** Apply for internships that meet their interests.
- **Internship Recommendation:** Visualize internship offers that align with the student's personal interest by leveraging recommender systems.
- **Complaint Submission:** Submit complaints whenever issues arise during the internship process and track their resolution.
- **Progress Tracking:** Monitor the status and progress of ongoing applications and active internships.

Company

Their functionalities include:

- **Internship Posting:** Post detailed internship descriptions, including requirements, skills, and benefits. Receive system-generated suggestions to make internships more appealing to students.
- **Student Recommendation:** Visualize student profiles that align with the company's internship proposal by leveraging recommender systems.
- **Candidate Interviews:** Schedule and carry out interviews through questionnaires with accepted candidates and gather feedback.
- **Candidate Selection:** Select students for hiring based on the outcomes of the interview and the overall selection process.
- **Complaint Submission:** Submit complaints about students' performance or internship-related issues and monitor their resolution.
- **Internship Management:** Track and monitor the status of internships with each student.

University

Their functionalities include:

- **Internship Monitoring:** Oversee the status and progress of university-affiliated students' internships, having access to their feedback and performance metrics.

- **Complaint Handling:** Review and manage complaints, including those requiring intervention or an internship's potential termination.

1.2.1. World Phenomena

[WP1] Student decides to look for an internship

[WP2] Company decides to open a new internship position

1.2.2. Machine Phenomena

[MP1] System collects statistics

[MP2] System updates the status of the matchmaking

1.2.3. Shared Phenomena

World Controlled

[SP1] Student inserts CV informations

[SP2] Company inserts new internship

[SP3] Student searches for internship

[SP4] Student applies for internship

[SP5] User monitors the application process

[SP6] Company approves application

[SP7] Company writes the questionnaire

[SP8] Company sends the questionnaire

[SP9] Student answers the questionnaire

[SP10] Company evaluates the questionnaire

[SP11] Company sends evaluated questionnaire

[SP12] User is notified about changes in the application process

[SP13] Student accepts internship position

[SP14] University monitors internships

[SP15] Student and company complain about the internship

[SP16] University handles complaints

[SP17] University interrupts the internship

[SP18] Student and company provide feedback and suggestions

Machine Controlled

[SP19] Student improves their CV

[SP20] Company improves their internship proposal

[SP21] User receives recommendations based on their preferences

[SP22] Student is notified when an internship that might interest them becomes available

[SP23] Company is notified about the availability of student CVs corresponding to its needs

[SP24] System provides suggestions to improve CVs and project description

[SP25] System asks students and companies to provide feedback and suggestions

1.3. Definitions, Acronyms, Abbreviations

1.3.1. Definitions

- **User:** A term used to refer to any of the three actors interacting with the S&C platform: **Student**, **Company**, and **University**. It is used throughout the document when a feature or functionality applies to all three actor types or when the distinction between actor roles is not critical to the context.

1.3.2. Acronyms

- **S&C:** Students&Companies
- **CV:** Curriculum Vitae
- **UI:** User Interface
- **GDPR:** General Data Protection Regulation
- **CCPA:** California Consumer Privacy Act
- **WCAG:** Web Content Accessibility Guidelines

1.3.3. Abbreviations

- **[G n]**: Goal number n
- **[D n]**: Domain assumption number n
- **[UC n]**: Use Cases number n

1.4. Revision history

- **Version 1.0**: First Release (8/12/24)

1.5. Reference Documents

For this project, we used the following documents:

- Assignment RDD AY 2024-2025
- Software Engineering 2 slides

1.6. Document Structure

- **Section 1: Introduction**

This section provides a summary of the application's context and purpose, highlighting its domain and the shared phenomena it observes and/or controls. Definitions, acronyms, and abbreviations used throughout the document are listed to facilitate understanding. In addition, a changelog is included for document revisions, and an overview of the document's structure is presented, outlining the objectives of each section.

- **Section 2: Overall Description**

This section offers an overview of the structure of the application. It helps to identify the core features and potential stakeholders. The assumptions made regarding the users and their interactions with the application are detailed. To provide clarity, UML diagrams, including Class and State diagrams, and interfaces are introduced to depict the system's entities and functionalities, helping to illustrate how the application operates within its domain.

- **Section 3: Specific Requirements**

This section delves into the application's behavior and requirements. It begins by pre-

senting scenarios that exemplify typical interactions, followed by UML diagrams, such as Sequence and Use Case diagrams, to clarify the operational workflows. The requirements are then categorized into three key areas:

1. Functional Requirements: Detailing the application's essential features and capabilities.
2. Non-functional Requirements: Addressing performance, reliability, and other quality aspects.
3. Interface Requirements: Exploring the application's user interfaces, supported by visual mockups.

- **Section 4: Formal Analysis through Alloy**

In this section, a formal analysis of the problem is presented using the Alloy modeling tool. Requirements and domain assumptions are rigorously defined and tested for consistency within the system. This formal approach ensures that the application's design aligns with its specified goals and supports the integrity of its implementation.

2 | Overall description

2.1. Product perspective

2.1.1. Scenarios

In the following chapter, we present a hypothetical scenario to better illustrate the phenomenon:

Quahog Innovation Company inserts an internship:

- The Quahog Innovation Company, a leader in Integrating AI into different infrastructures, seeks interns who can bring fresh perspectives to their research. Upon learning about the S&C platform, they decide to list their internship opportunity there, hoping to attract enthusiastic candidates eager to collaborate.

Quahog Innovation Company improves its internship proposal:

- As this is the first time the Quahog Innovation Company is offering an internship, they are unsure how appealing their proposal might be. They follow the platform's suggestions to post first and then enhance their posting, aiming to make it more attractive to potential applicants.

Stewie registers on the platform:

- Stewie, a master's student at Cleveland University, needs an internship related to his field of study to support his thesis. After discovering the S&C platform, he decides to use it to find opportunities. He follows the app's guidance to make his CV and personal account. In the end, he is not convinced about the attractiveness of his curriculum and decides to improve it by following the platform's guidance to make it more compelling.

Stewie applies for an internship:

- Once satisfied with the improvements, he starts applying to several internships that not only match his academic background but also fit his interests and long-term

career goals, hoping to gain valuable experience that will support his thesis and future aspirations.

Quahog Innovation Company analyses the applications received:

- After receiving multiple applications, the Quahog Innovation Company begins evaluating candidates. They first filter out applicants who do not meet the prerequisites. Next, they assess the level of interest shown by the remaining candidates, ultimately shortlisting those they believe would bring the greatest value to their organization and match them.

Stewie Checks the Status of His Applications:

- Stewie monitors his applications and finds that while some companies have shown no interest, others have matched him. He also received notifications about new internship opportunities. However, he chooses to proceed with the companies that have expressed interest in his application, as they align better with his aspirations.

The company evaluates and interviews applicants:

- To finalize their decision, the company interviews the students through a structured questionnaire for each specific internship proposed, which all shortlisted candidates have to answer if accepted. In order to make a more informed decision, the interview delves into the technical knowledge required for the role and asks personal questions about their motivations and goals. Candidates respond to the questionnaire through the platform, providing the company with deeper insights.

Stewie receives the questionnaire and answers it

- Stewie while checking the status of his application notices that the one to Quahog Company was positively evaluated and a questionnaire was available to be answered. Excited about the news, Stewie immediately answers all the questions present and sends back the questionnaire, hoping that the company will continue to show interest in him.

The company evaluates the questionnaires and hires the interns:

- After reviewing the questionnaires submitted, Quahog Innovation Company identifies candidates who demonstrate technical skills and a passion for AI integration. Following a thorough evaluation, the company shortlists the candidates they want to hire, including Stewie.

Stewie accepts the position and starts working in the company:

- Stewie receives a notification stating that his questionnaire was evaluated positively and that if interested would be contacted by the company with the messaging system available on the platform. Extremely excited, he accepts and gets contacted by the company to clarify all the final information needed before finally starting his experience at Quohag company.

Complaints handling:

- After starting to work at the company, Stewie noticed a few issues with his internship. As time passes, instead of engaging in meaningful work that aligned with his skills and interests, he was assigned only trivial tasks that seemed far beneath his aspirations. Frustrated by the lack of stimulation, Stewie raises a complaint on the S&C platform. The Cleveland University administration steps in to mediate, contacting the company to address the issue. Prompted by the intervention, the company apologizes and puts Stewie on a new project much closer to his field of interest.

Finalizing the decision:

- With the issues resolved, Stewie feels reassured and continues the internship. Excited to start this new project, he leaves a good review on the platform and looks forward to contributing to the company's innovative projects while gathering valuable information for his thesis and academic growth.

2.1.2. Domain Class Diagram

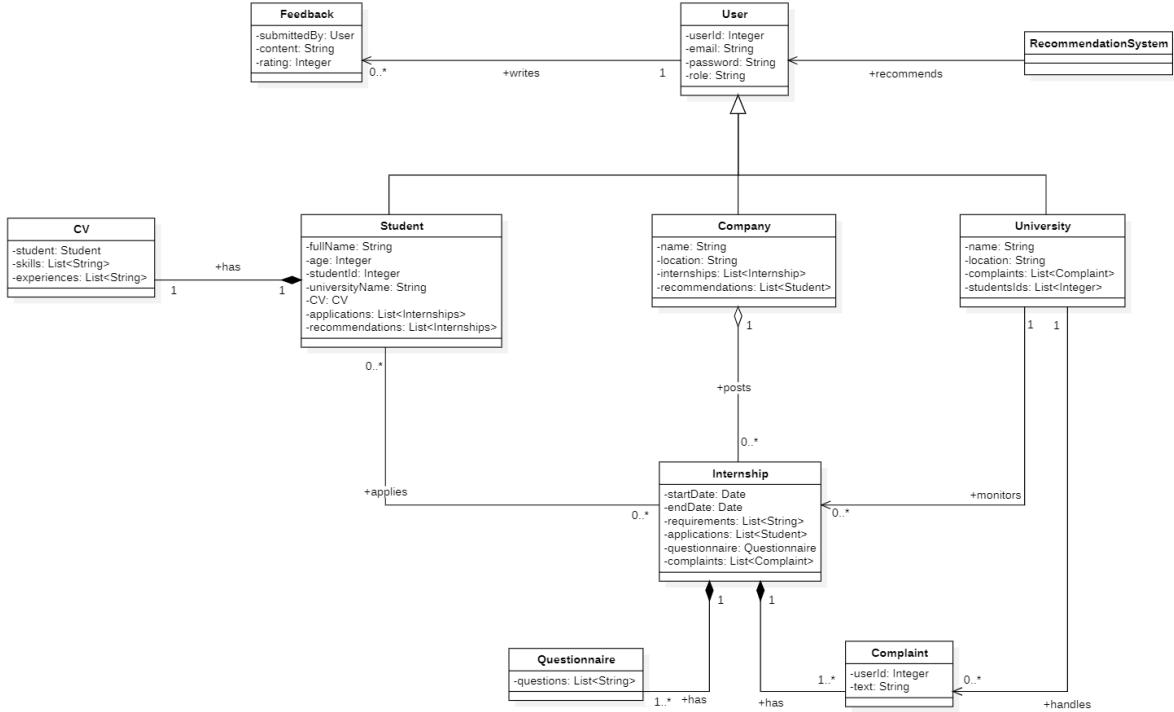


Figure 2.1: High level Class Diagram

2.2. Product Functions

The S&C platform provides a range of functionalities designed to support the internship matching process for students and companies, overseen by universities. The main functionalities are described below.

User Registration

This functionality allows students, companies, and universities to sign up to the S&C platform and create their profiles.

- **User:** Each user selects their type (student, company, or university) and provides the required information to complete the registration process, such as email, password, and other relevant details.

Profile Management

This functionality enables users to manage and enhance their profiles to increase the likelihood of successful matches.

- **Profile Updates:** Students and companies can update their personal information to complete their profiles after registration.
- **CV Creation:** Students can generate their CVs by providing details about their skills, personal experiences, and other relevant information.

Enhancement Suggestions

This feature helps both students and companies improve their profiles and increase their chances to make themselves more appealing to potential matches.

- **CV Improvement:** Students can request suggestions from the system to improve their CVs.
- **Internship Improvement:** Companies can request suggestions from the system to enhance their internship proposals.
- **Questionnaire Improvement:** Companies can request suggestions to improve their questionnaires.

Internship Posting and Search

The platform allows companies to post internships and students to search for opportunities.

- **Internship Creation:** Companies can create detailed internship listings by specifying requirements, skills needed, tasks, compensation, and benefits.
- **Internship Search and Filtering:** Students can browse and filter internships based on criteria such as required skills, duration, location, and compensation.
- **Internship Details View:** Students can thoroughly view details about each internship to assess compatibility with their skills and interests.

Application and Selection Process

This functionality manages applications and the selection process.

- **Application Submission:** Students can apply to internships directly from the

listings and track the status of their applications.

- **Candidate Shortlisting:** Companies can review applications, filter candidates based on qualifications, and shortlist those who meet their requirements.
- **Interview Coordination:** Companies can arrange interviews with shortlisted candidates by using questionnaires.
- **Final Selection and Offer Acceptance:** Companies can send offers to selected students, who can accept or decline the offers through the platform.

Recommendation System

The S&C platform provides a recommendation system to facilitate suitable matches between students and internships.

- **Internship Recommendations for Students:** The platform recommends internships to students based on their profiles.
- **Candidate Recommendations for Companies:** Companies receive recommendations of students whose profiles align with their internship requirements, enabling quick identification of potential matches.
- **Feedback-Driven Refinements:** Both students and companies can provide feedback on recommendations, helping to improve the accuracy and relevance of future matches.

Complaint Management

This functionality supports complaint management to address issues and maintain the quality of the internship process.

- **Complaint Submission:** Students and companies can submit complaints if issues arise during internships. Complaints are logged, tracked, and managed through the appropriate channels.
- **University Intervention:** Universities are notified of complaints and can intervene when necessary, including taking action to resolve or terminate internships if needed.

Progress Tracking

This feature allows students, companies, and universities to monitor the progress of applications and active internships.

- **Application Status Updates:** Students and companies can view and track the status of each application, from submission to final selection.
- **Internship Progress Monitoring:** Once an internship begins, students and companies can monitor ongoing activities and report any issues.
- **University Oversight:** Universities can track students' progress in internships to ensure educational compliance and student welfare.

Notification System

The notification system keeps users informed of critical events and updates.

- **Application and Selection Notifications:** Students are notified of changes in application status, such as interview invitations or selection decisions.
- **Recommendation Alerts:** Students and companies receive alerts for recommended internships or candidate profiles that match their preferences.
- **Complaint and Resolution Updates:** Notifications are sent to relevant parties when complaints are filed or resolved, ensuring transparent communication.
- **Reminder and Follow-Up Alerts:** The system sends reminders for upcoming interviews, deadlines, and other key events to keep users engaged and informed.

In summary, the S&C platform provides a structured, streamlined approach to managing the internship application process from start to finish, including registration, profile management, recommendations, application handling, feedback collection, and progress tracking. This section outlines the essential product functions, organized by feature, providing a clear view of the platform's primary capabilities.

2.3. User characteristics

Student

The student is a person who studies at a university and is interested in applying for and participating in an internship offered by a company. For this reason, they register on the S&C platform, where they can find internships either through an active search or via recommendations. After applying, they must pass an interview with the company offering that position. Once the internship begins, the student can communicate any issues or provide updates to both the university and the company using a chat or a form feature.

Company

The company is interested in hiring students through an internship program. It can post work opportunities on the platform, where students can view them. Afterward, the company can receive feedback from the system to support the recruitment process. Once the student is selected, the company may use the platform to send feedback and file complaints to other users during the internship period.

University

The university is the institution where the student studies. It can review and manage complaints submitted by other users and may decide to interrupt the internship based on these considerations.

2.4. Assumptions, dependencies and constraints

Domain Assumptions

The following assumptions are properties and conditions that the system will take for granted. These assumptions are necessary to ensure the correct behaviour of the platform and to achieve its intended goals.

- [D1] User must consent to personal data extraction and usage
- [D2] User must consent to receiving information
- [D3] Users must provide correct personal information at the moment of registration
- [D4] Student must be enrolled in a university
- [D5] Company must provide correct and clear information about the internships
- [D6] Student can do only one internship at a time
- [D7] University must have students who are actively enrolled in its programs.

3 | Specific Requirements

3.1. External Interface Requirements

3.1.1. User Interfaces

This initial illustration depicts the platform's homepage, where users can choose to log in or sign up. [Figure 3.1]

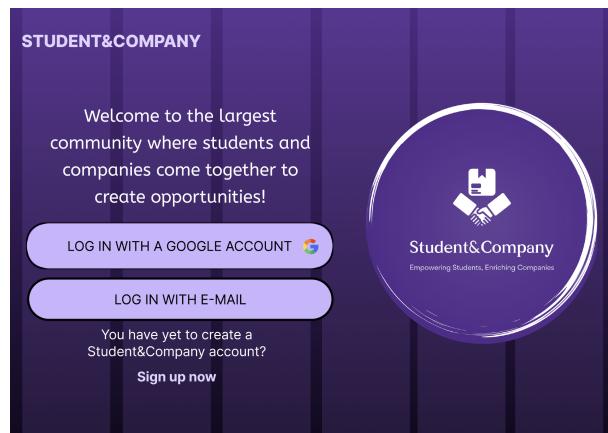


Figure 3.1: Landing Page

The following page shows a description of the platform's objectives after a user signs up. [Figure 3.2]

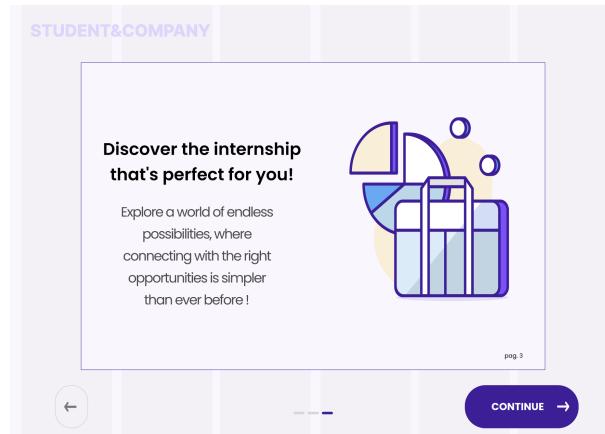


Figure 3.2: Introduction Page

After a user decides to create an account, they will be asked their role as either a student, company or a university. [Figure 3.3]

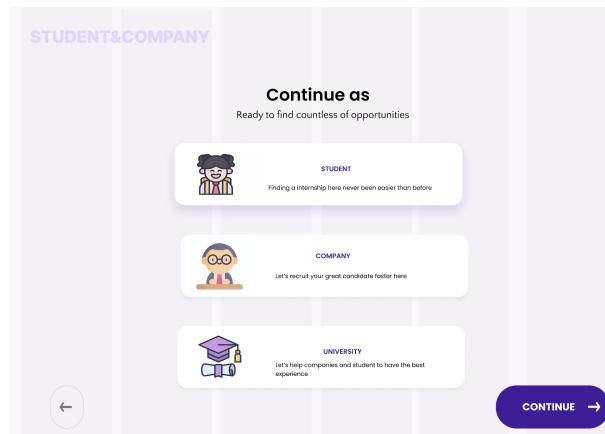
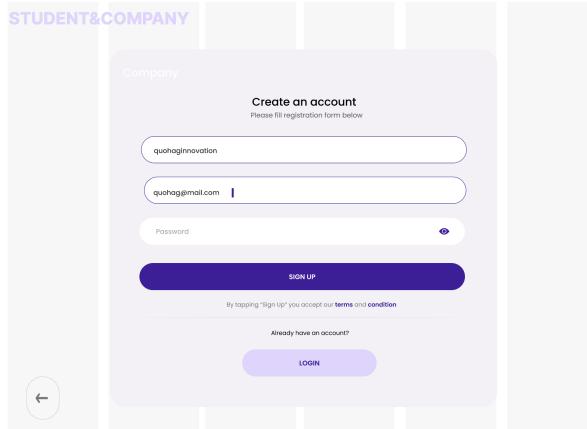


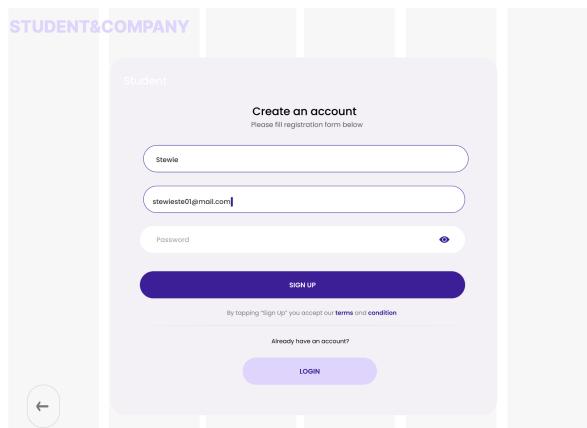
Figure 3.3: Choice page

Depending on the role decided by the user, they will be prompted to input various information that can vary based on the specific role. [Figures 3.5, 3.4, 3.6]



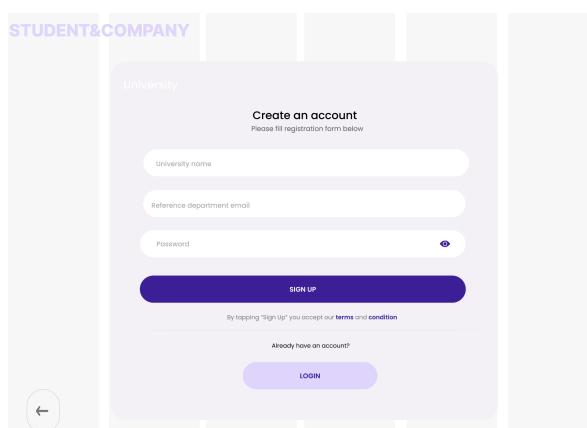
The registration form for companies is titled 'Company'. It includes fields for a company name ('quahaginnovation'), email ('quchag@mail.com'), and password. A 'SIGN UP' button is present, along with a link to terms and conditions and a 'LOGIN' button for existing users.

Figure 3.4: Create account for Companies



The registration form for students is titled 'Student'. It includes fields for a student name ('Stevie') and email ('stewieste01@mail.com'). A 'SIGN UP' button is present, along with a link to terms and conditions and a 'LOGIN' button for existing users.

Figure 3.5: Create account for Students



The registration form for universities is titled 'University'. It includes fields for a university name ('University name') and reference department email ('Reference department email'). A 'SIGN UP' button is present, along with a link to terms and conditions and a 'LOGIN' button for existing users.

Figure 3.6: Create account for Universities

Users with an existing account can access the platform by clicking the appropriate button on the homepage, which directs them to the login page. From there, they can log in using

their username and password or by signing in with their Google or Facebook account. If a user mistakenly selects the login option without having an account, they can simply click the "Create Account" button to navigate to the registration page. [Figures 3.7, 3.8, 3.9]

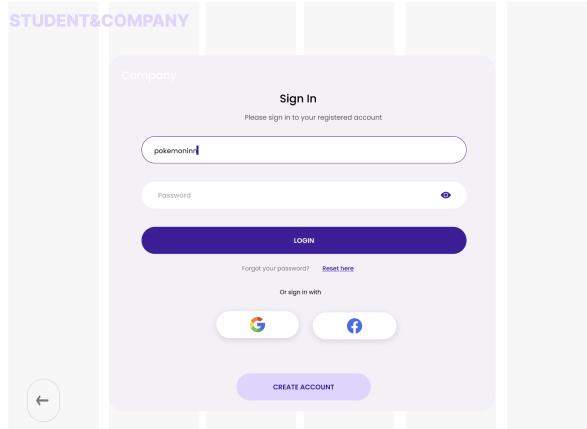


Figure 3.7: Company Sign in

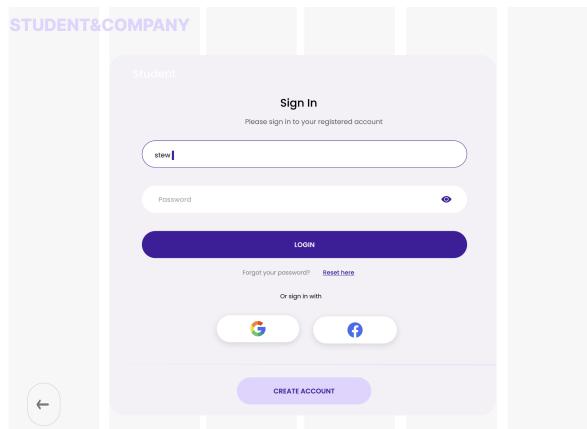


Figure 3.8: Student Sign in

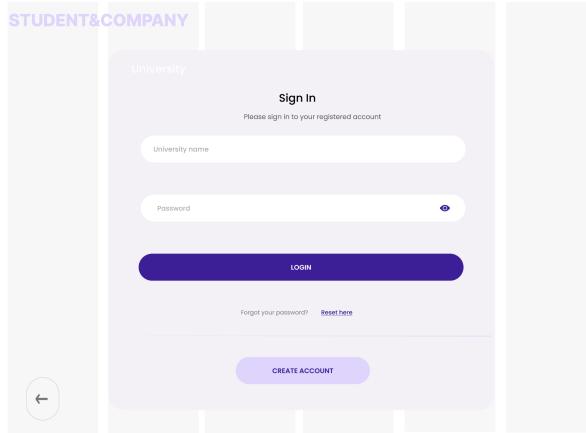


Figure 3.9: University Sign in

3.1.2. Company Interfaces

The company's Dashboard [Figure 3.10] serves as the central hub for all platform operations. From this main page, the company can easily access essential information, including its profile, notifications, proposed internships, and applications submitted by students. Additionally, it allows the company to communicate with students after the internship application process, as well as provide feedback or submit complaints.

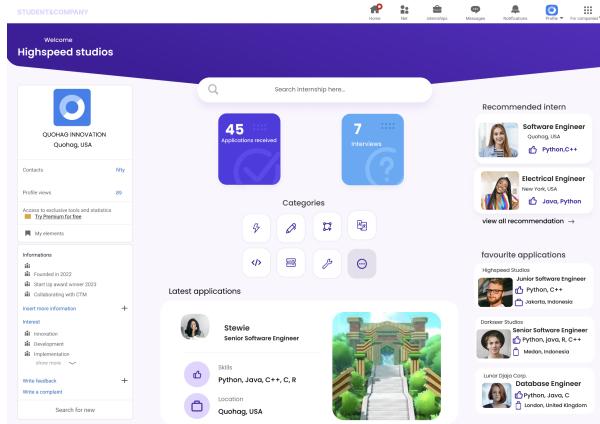


Figure 3.10: Company Home page

Below, we can see the structure of a company's personal profile. It includes key details such as location, field of activity, objectives, and a dedicated section for managing internships. To edit the profile, the company simply clicks on the desired section and follows the platform's guidance. Additionally, the platform offers suggestions to enhance the provided information, making it more appealing to potential viewers[Figures 3.11, 3.12].

3| Specific Requirements

21

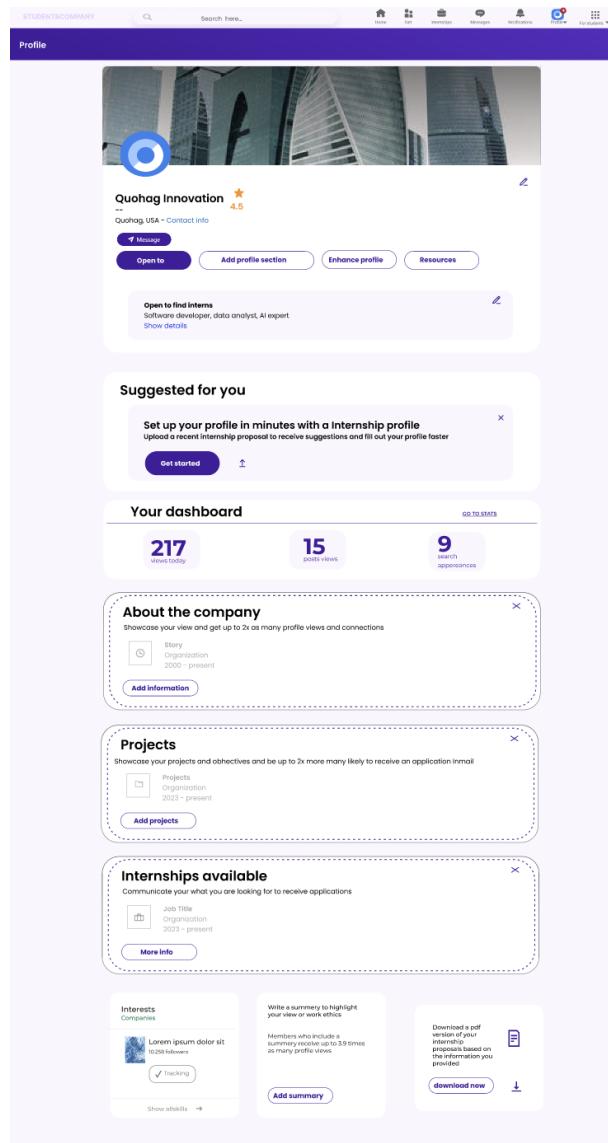


Figure 3.11: Company Personal profile

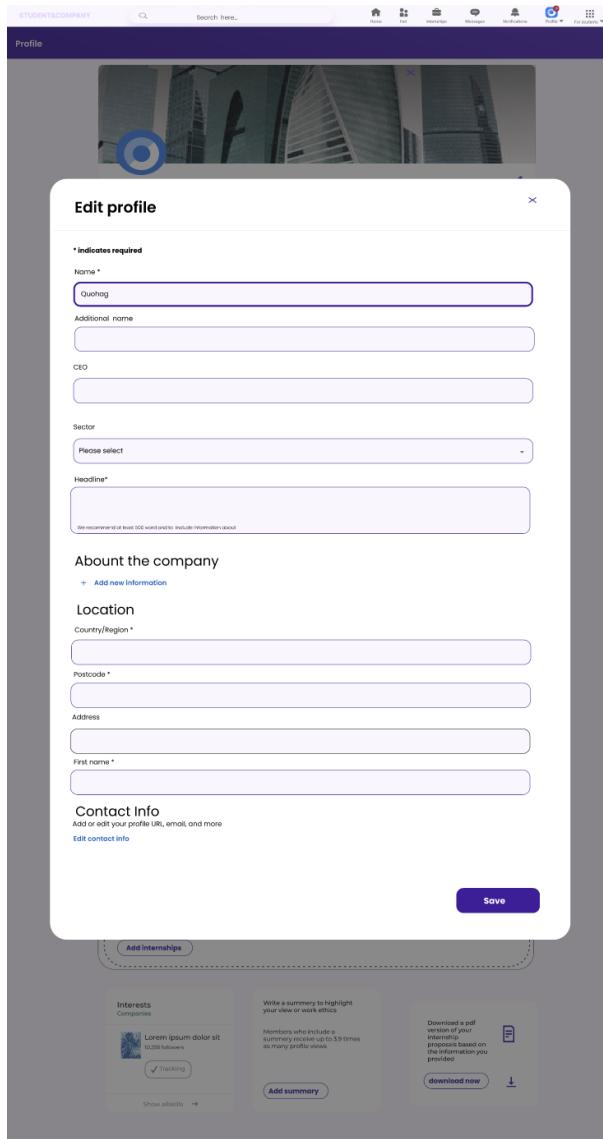


Figure 3.12: Company - Managing account

To edit internship information, the company can click on the designated button within its personal profile. From there, it can manage the internship details while also benefiting from suggestions provided by the platform [Figure 3.13].

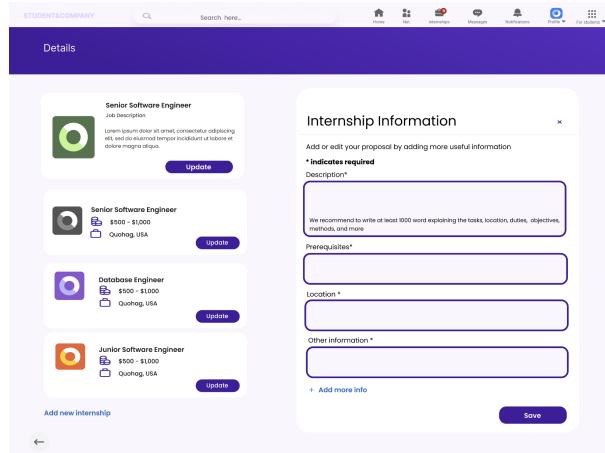


Figure 3.13: Internships management

On the homepage, a company can access the applications section to view all submitted applications. By selecting a specific application, the company can review its details in full, evaluate it positively or negatively, or save it for easier access later [Figure 3.14]

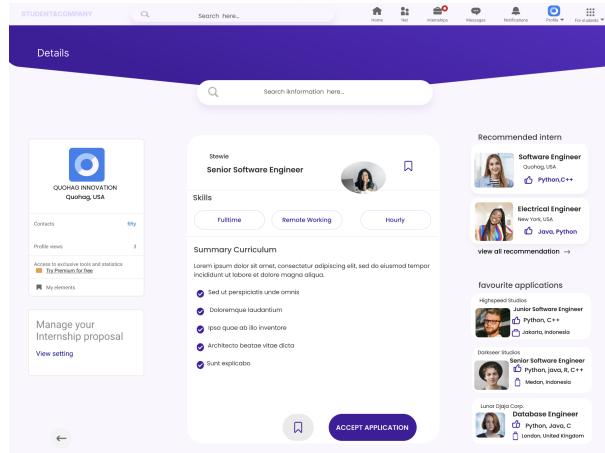


Figure 3.14: Applications review

After positively evaluating an application, the company can interview the applicant using a structured questionnaire tailored for each internship proposal. This questionnaire is created by the company and can be enhanced with suggestions provided by the platform [Figure 3.15].

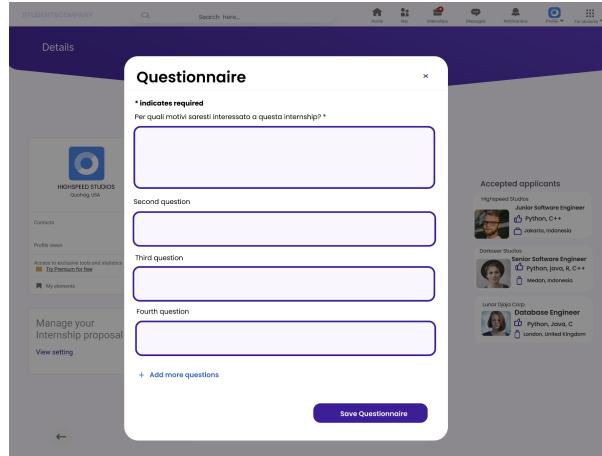


Figure 3.15: Interview and questionnaire creation

Once a student has completed the questionnaire, the company reviews the submitted answers and evaluates the application. The company can either decline it by providing a negative evaluation or accept it, officially initiating the internship [Figure 3.16].

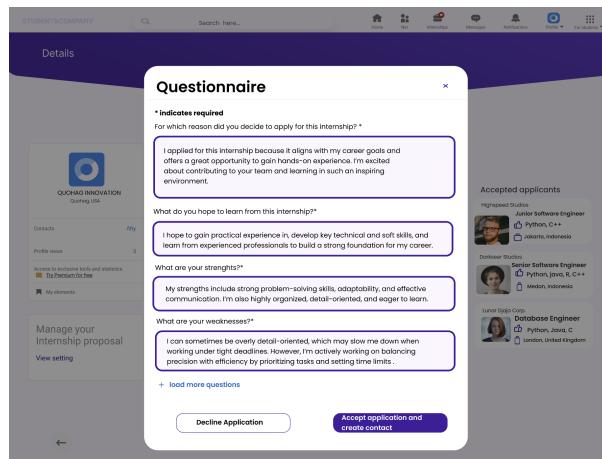


Figure 3.16: Interview evaluation

3.1.3. Student Interfaces

The student dashboard [Figure 3.17] is the centre of all possible operations on the platform. From this main page, the student can have access to all essential information, including their personal profile, notifications, available internships, and applications submitted to companies. In addition, it allows the student to communicate with the company after the internship application process is over, as well as provide feedback or submit complaints.

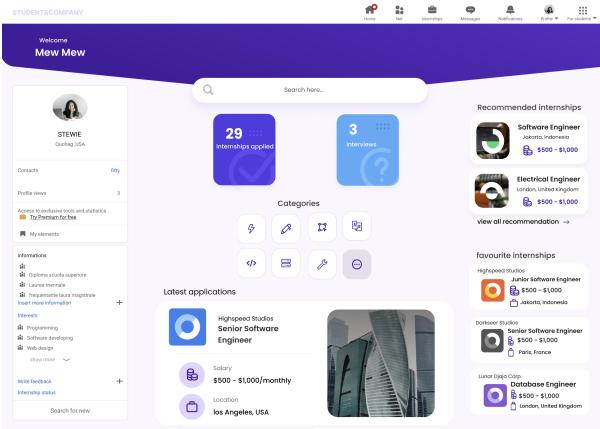


Figure 3.17: Student Home page

In the personal profile section, students can input their personal details as well as information relevant to creating a CV for internship applications. Students have the option to enter this information independently or follow platform suggestions and tips to enhance their CV, making it more appealing to potential employers. The information is organized into sections and will be visible to companies later on.

3| Specific Requirements

26

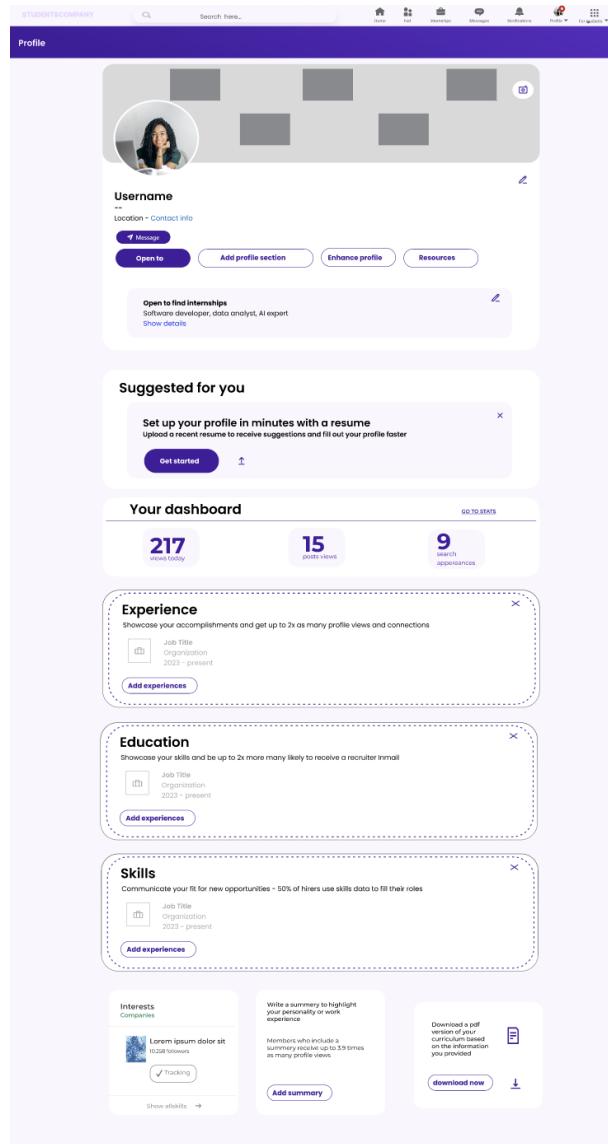


Figure 3.18: Student Personal profile

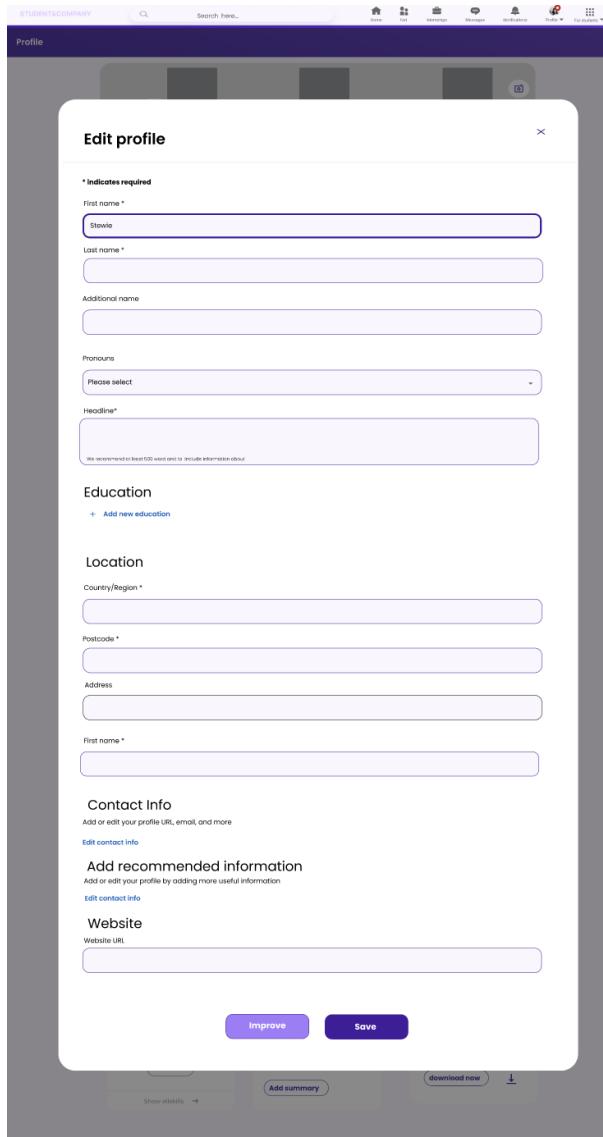


Figure 3.19: Student Profile management

In the search section, students can explore all available internships on the platform. To make the search more relevant and tailored to their personal interests, several filters are provided, allowing students to select internships based on criteria they specify. The internships will be displayed in a list, showing only key details. By clicking on a specific internship, students can view all the information and find the option to apply if they're interested in that particular opportunity.

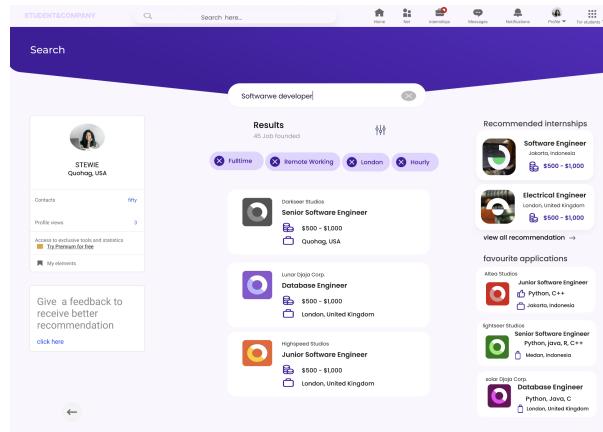


Figure 3.20: Internships lookup

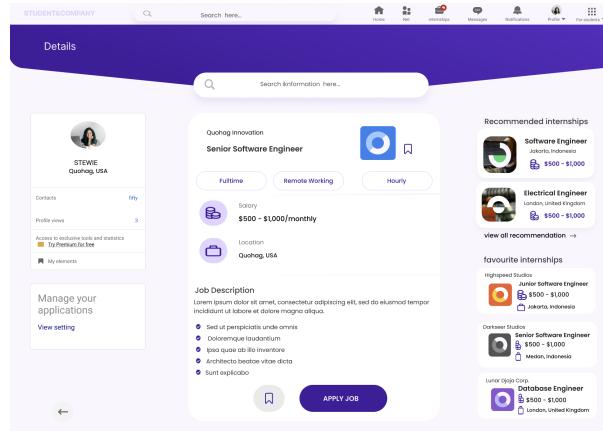


Figure 3.21: Internship details

After clicking the "Apply" button, the student can proceed with the internship application. To complete the application, the student must either upload their CV or consent to share their personal profile information with the company. Additionally, the student will need to provide other personal details, such as their name, surname, and email. Once all the required information is submitted, the student can send the application.

The screenshot shows a web-based application form. At the top, it displays the company name "Highspeed Studios" and the position "Senior Software Engineer". Below this, there's a section for "Agree to share your personal informations or" with an "Upload Resume" field marked as mandatory. The email "henrykonwil@gmail.com" is entered in the email field. A "Phone number" field is present but empty. On the right side, there are links for "General Information", "Special abilities", "Reference", "Terms", "Advertising", "Preferences", "Download App", and "Yet". At the bottom is a prominent blue "APPLY INTERNSHIP" button.

Figure 3.22: Application form

Once an application is submitted and a positive evaluation is received, the interview section will become available on the internship page. The interview is structured as a questionnaire, which is pre-prepared by the company for each specific internship. The student must answer all questions in the questionnaire before submitting it back to the company for final evaluation. Based on this evaluation, the company will make the final decision on whether to proceed with the internship.

The screenshot shows a "Questionnaire" page. It includes a header with a user profile picture and the name "STEWIE". Below the header are sections for "Details", "Contests", "Profile views", "Access to exclusive tools and statistics", "My elements", "Manage your applications", and "View setting". The main area is titled "Questionnaire" and contains four text input fields with placeholder text: "For which reason did you decide to apply for this internship?", "What do you hope to learn from this internship?", "What are your strengths?", and "What are your weaknesses?". Below these fields is a link "+ load more questions". To the right, there's a sidebar titled "Accepted applications" showing two entries: "Highspeed Studios" (Junior Software Engineer, \$500 - \$1,000, Jakarta, Indonesia) and "Dotsense Studios" (Senior Software Engineer, \$500 - \$1,000, Medan, Indonesia). At the bottom is a blue "Answer Questionnaire" button.

Figure 3.23: Interview reply

Throughout the application process, the student will be able to monitor the status of their application and receive notifications whenever there is a change. The status will update based on different stages, including: application sent, awaiting review, evaluated negatively, evaluated positively, interview ready, interview submitted, and interview evaluated.

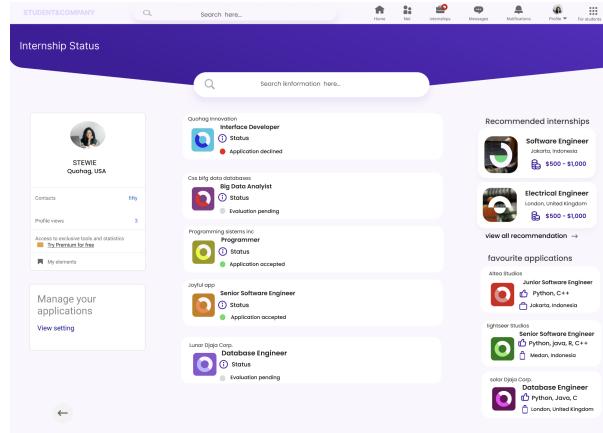


Figure 3.24: Application status

3.1.4. University Interfaces

The university's Dashboard [Figure 3.25] serves as the central hub for all platform operations. From this main page, the university can easily access essential information, including its notifications the personal profiles of the students enrolled, and all complaints sent by both students and companies. Additionally, it allows the university to communicate with students and companies after a complaint has been submitted, allowing for a better resolution of the problems.

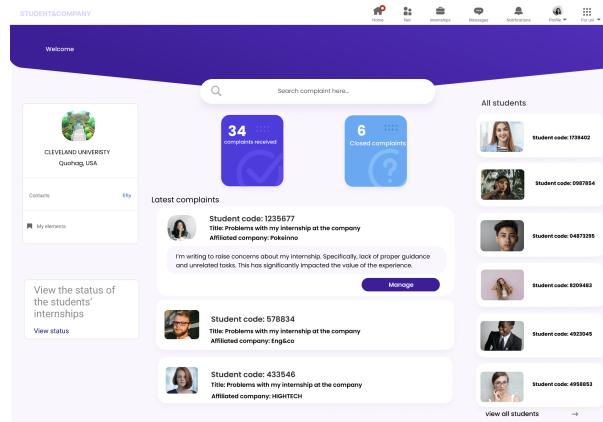


Figure 3.25: University Home page

By clicking on a complaint, the university can respond directly by sending a reply message to the user who submitted it [Figure 3.26].

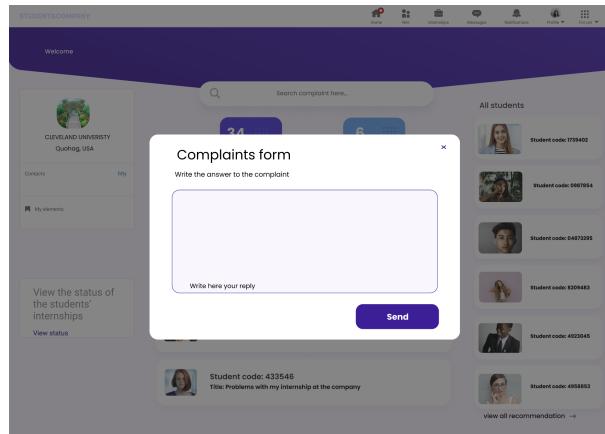


Figure 3.26: Complaints visualization

Complaints are managed through a chat between the university and the involved users, allowing the university to act as an intermediary. This enables the university to assist in resolving the issue or, if necessary, proceed with the conclusion of the internship [Figure 3.27]

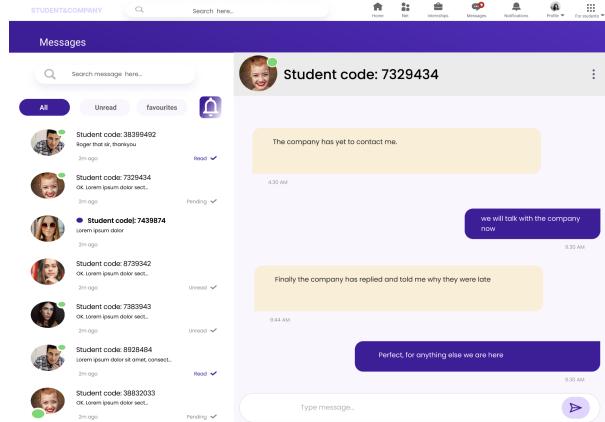


Figure 3.27: Complaints handling

3.1.5. Common Interfaces

By clicking on the designated button, users can view all notifications related to important updates, such as changes in internship details, application status, or new internship opportunities that may be of interest to students [Figure 3.28].

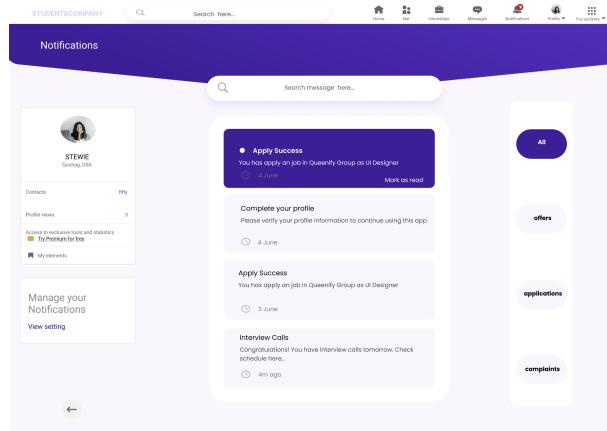


Figure 3.28: Notifications

Users can communicate with each other through a messaging system provided by the platform. Students and companies can interact to discuss internship details, while the university can also use the system to address any complaints or concerns [Figure 3.29].

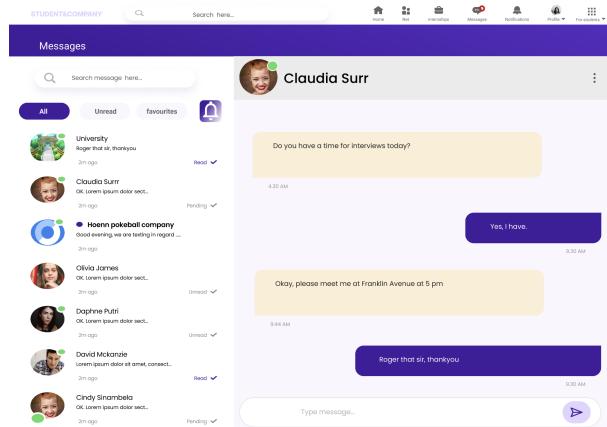


Figure 3.29: Messages

Students and companies can also receive feedback requests about their general experience with the platform, provide their own feedback, or submit complaints regarding the progress of the internship once it has started [Figure 3.30, 3.31]

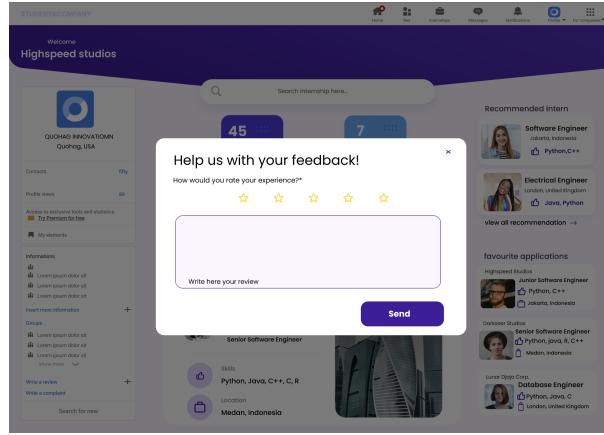


Figure 3.30: Feedback Request

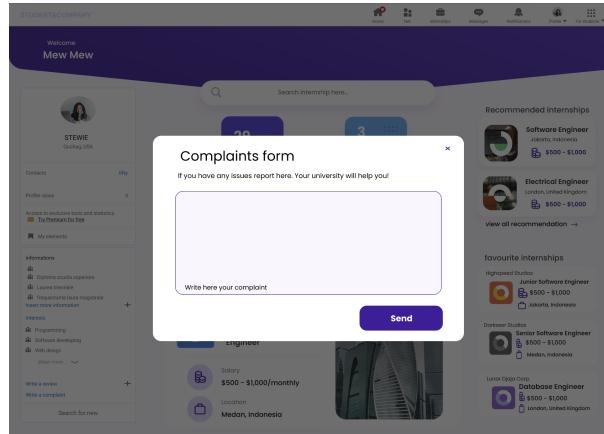


Figure 3.31: Complaints sending

3.2. Functional Requirements

Sign up and log in

- [R1] The system allows unregistered users to sign up
- [R2] The system allows users to log in

Profile management

- [R3] The system allows students to insert personal information for the creation of the CV
- [R4] The system allows companies to insert information for the creation of the internship
- [R5] The system allows users to update their personal profiles
- [R6] The system allows companies to view a student's personal profile
- [R7] The system allows users to retrieve all modified information
- [R8] The system takes information from the student's personal profile
- [R9] The system allows a student to see a company's profile

Application management

- [R10] The system changes the status of the evaluation after updates in the application process
- [R11] The system allows students to accept the outcome of the evaluation
- [R12] The system allows companies to evaluate students' applications

Internship management

- [R13] The system displays all the available internships
- [R14] The system displays all the information of each specific internship
- [R15] The system displays specific internships that better suit a student based on the information provided
- [R16] The system allows students to visualize information about the internship
- [R17] The system allows a registered student to select an internship to apply to

[R18] The system allows users to apply to an internship

[R19] The system allows companies to set up evaluation criteria

[R20] The system allows universities to set up criteria for internship's conclusion

Complaints management

[R21] The system allows users to name other parties involved in the complaint

[R22] The system displays the complaints sent by both students and companies

[R23] The system updates the status of a complaint

[R24] The system allows universities to close an internship

Messages and Notifications

[R25] The system asks users for permission to send messages

[R26] The system generates a message of confirmation after an operation is done

[R27] The system generates a message once the status of the internship changes

[R28] The system allows users to retrieve all messages sent

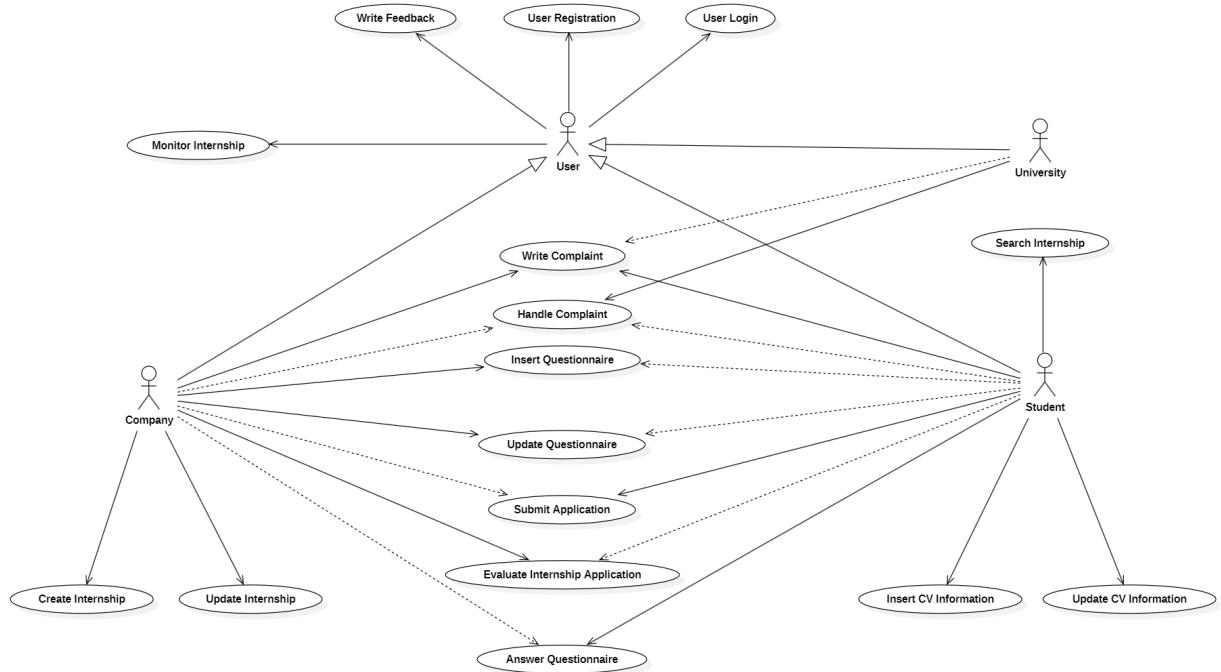
[R29] The system generates suggestions based on the information taken in the platform

Feedback

[R30] The system allows students and companies to provide feedback

[R31] The system generated a feedback request to send to students and companies

3.2.1. Use Cases Diagram



3.2.2. Use Case

User Registration

[UC1]	User Registration
Actors	User
Entry Condition	/
Input	All the necessary information required by the system, like name, password, mail, etc.
Event Flow	<ol style="list-style-type: none"> 1. The user enters on the platform. 2. The user clicks on the "Sign In" button. 3. The user has to choose to create an account as University, Company, or Student. 4. The user fills every section with the required information. 5. The user clicks on the "Register" button. 6. The system notifies the user.
Exit Condition	The account is created by the system.
Output	The user receives a message confirming the creation of the account.
Exceptions	<ul style="list-style-type: none"> • Missing Information: If required fields are not completed, the system prompts the student to fill out all mandatory sections. • Existing Mail: If the mail inserted by the user is already taken, the system prompts an error.

Table 3.1: User Registration Table

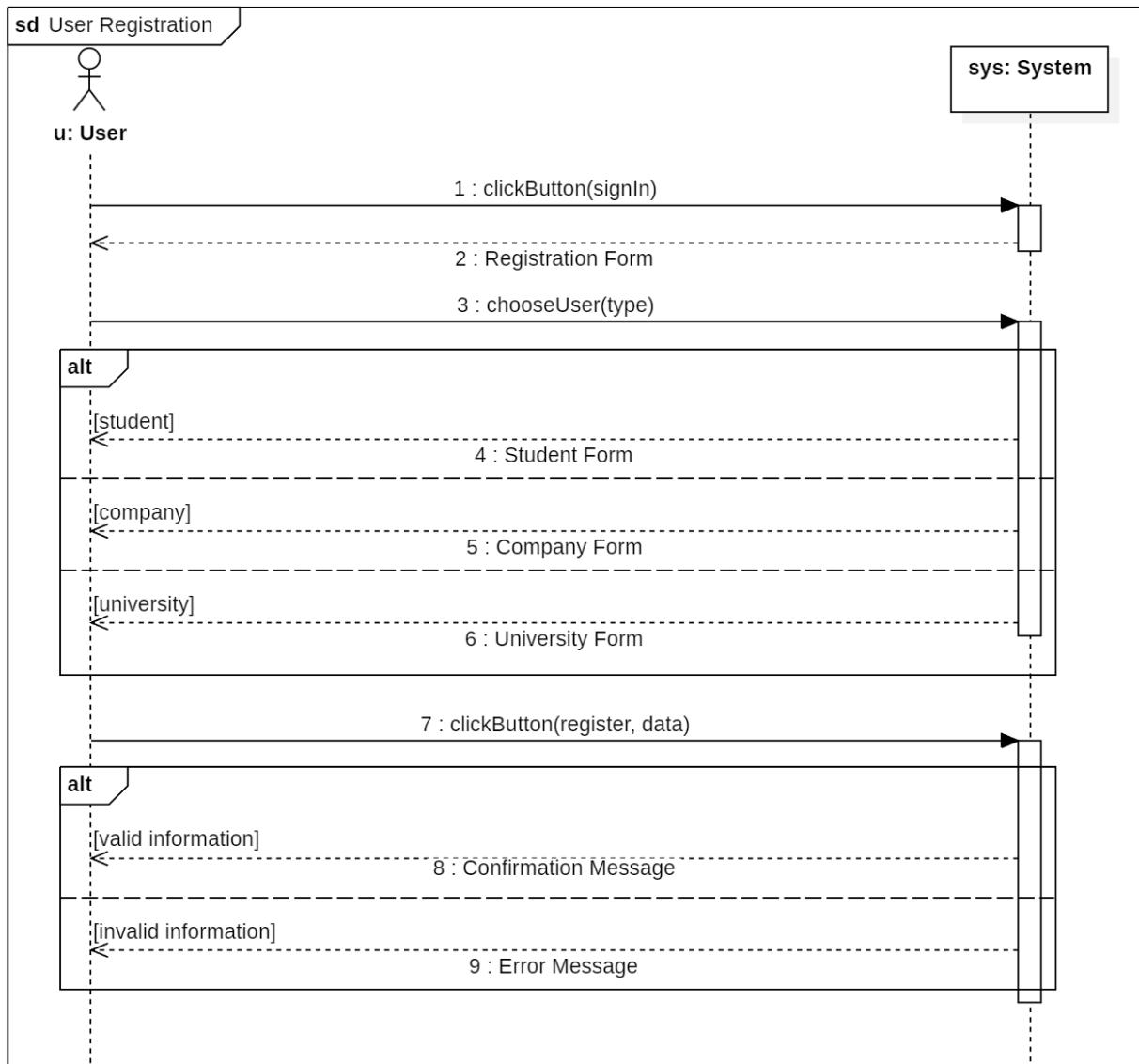


Figure 3.32: Diagram for [UC1]

User Login

[UC2]	User Login
Actors	User
Entry Condition	The user is registered
Input	Mail and passwords associated with the account
Event Flow	<ol style="list-style-type: none">1. The user enters on the platform.2. The user clicks on the "Login" button.3. The user inserts mail and password.4. The user clicks on the "Enter" button.
Exit Condition	User is logged in
Output	/
Exceptions	Wrong information: If the user enters an email or password that is not in the database, the system prompts the user to verify the information entered.

Table 3.2: User Login Table

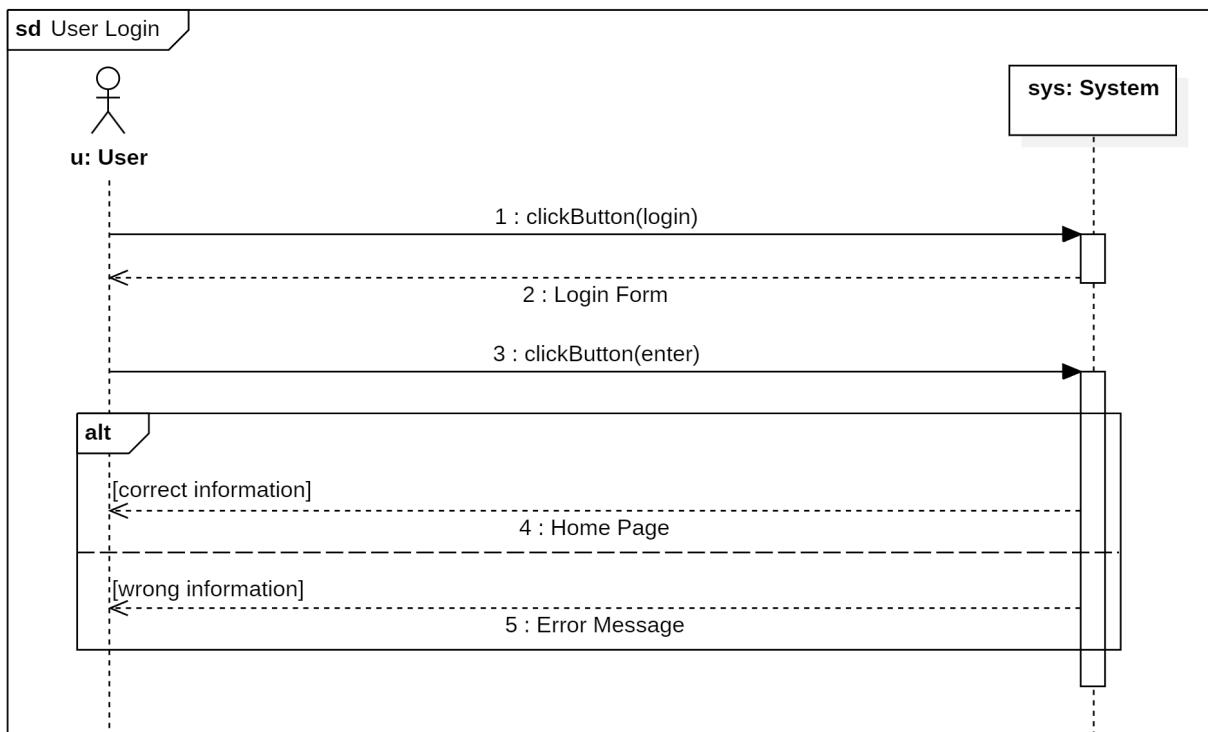


Figure 3.33: Diagram for [UC2]

Insert CV information

[UC3]	Insert CV Information
Actors	Student
Entry Condition	<ul style="list-style-type: none"> • The student is registered. • The student is logged in.
Input	All the necessary information for a CV, such as past experiences, skills, education, certifications, etc.
Event Flow	<ol style="list-style-type: none"> 1. The student accesses his profile page. 2. The student clicks on the "Insert CV" button. 3. The student fills in the sections with the required information (experiences, skills, etc.). 4. If he wants, the student clicks on the "Improve" button. 5. The system provides suggestions to improve the CV. 6. The student makes adjustments based on the suggestions. 7. The student clicks on the "Confirm" button.
Exit Condition	<ul style="list-style-type: none"> • The CV information is successfully saved in the system. • The updated CV is now visible in the student's profile.
Output	A confirmation message is displayed to the student stating that the CV information has been successfully saved.
Exceptions	Missing Information: If required fields are not completed, the system prompts the student to fill out all mandatory sections.

Table 3.3: Insert CV Information Table

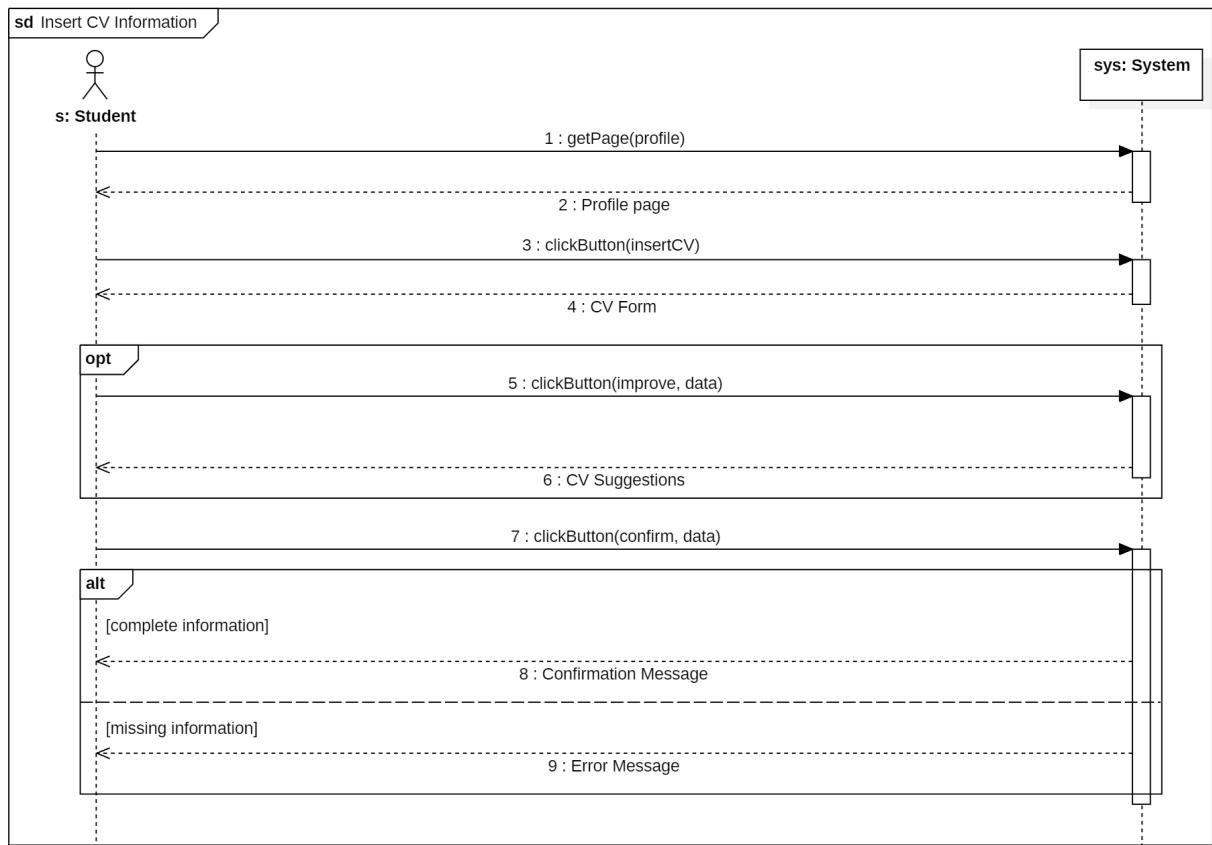


Figure 3.34: Diagram for [UC3]

Update CV information

[UC4]	Update CV Information
Actors	Student
Entry Condition	<ul style="list-style-type: none"> • The student is registered. • The student is logged in. • The student has already inserted all necessary information for their CV.
Input	Updated CV information such as new experiences, skills, certifications, or education details.
Event Flow	<ol style="list-style-type: none"> 1. The student accesses his profile page. 2. The student navigates to the "CV Information" section. 3. The student clicks on the "Update" button. 4. The student updates the relevant sections of the CV (e.g., adding new experiences, updating skills). 5. If he wants, the student clicks on the "Improve" button. 6. The system provides suggestions to improve the CV, based on the new information provided. 7. The student makes adjustments based on the suggestions. 8. The student clicks on the "Confirm" button.
Exit Condition	<ul style="list-style-type: none"> • The updated CV information is successfully saved in the system. • The updated CV is now visible in the student's profile.
Output	A confirmation message is displayed to the student indicating that the CV has been successfully updated.
Exceptions	Missing Information: If required fields are not completed, the system prompts the student to fill out all mandatory sections.

Table 3.4: Update CV Information Table

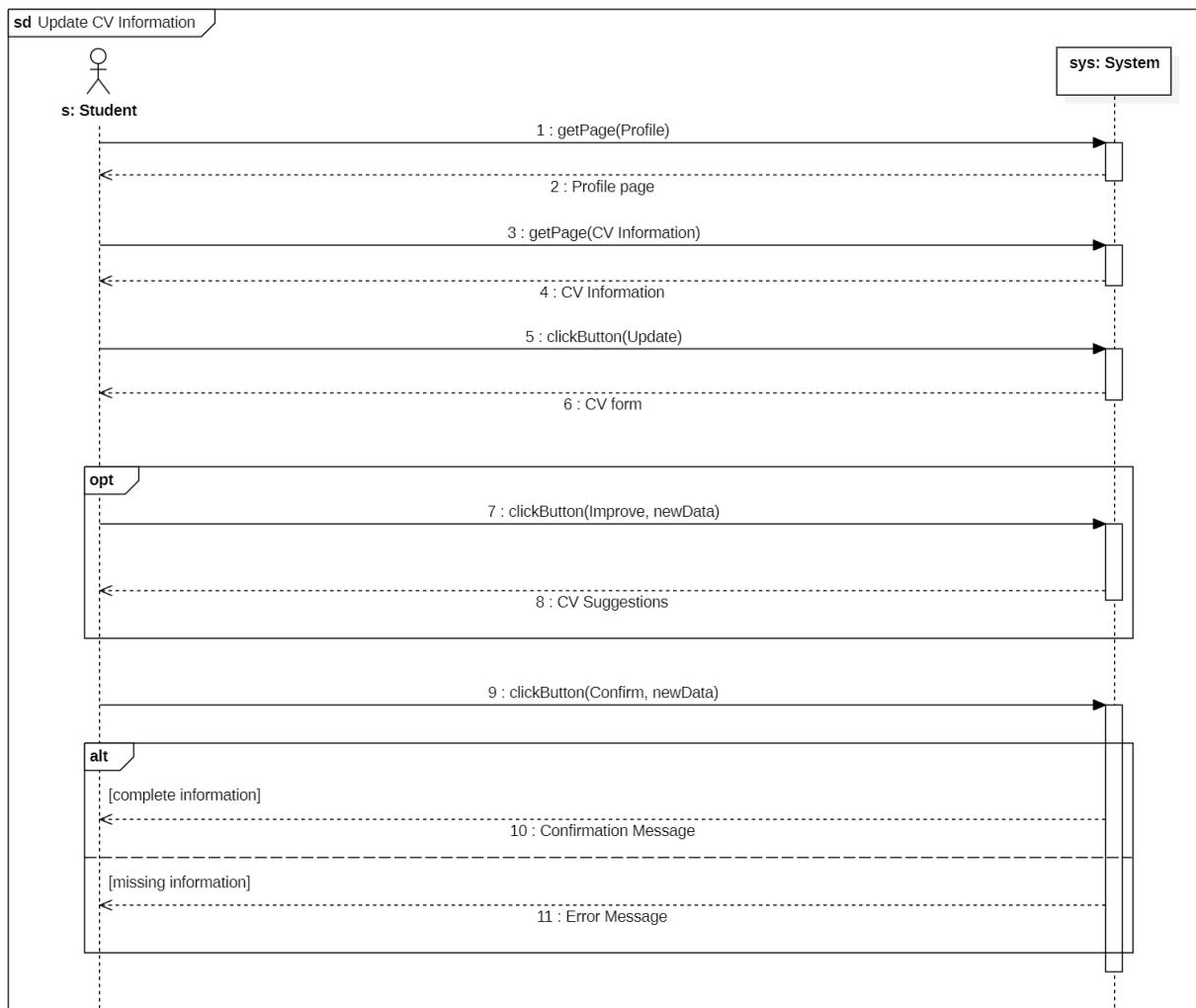


Figure 3.35: Diagram for [UC4]

Create Internship

[UC5]	Create Internship
Actors	Company
Entry Condition	<ul style="list-style-type: none"> • The company is registered. • The company is logged in.
Input	All the necessary information for creating an internship, such as skills needed, pre-requirements, type of job, start and end dates.
Event Flow	<ol style="list-style-type: none"> 1. The company accesses the internship page. 2. The company clicks on the "Add Internship" button. 3. The company fills in the sections with the required information (pre-requirements, type of job). 4. If the company wants, clicks on the "Improve" button. 5. The system provides suggestions to improve the proposal. 6. The company makes adjustments based on the suggestions. 7. The company clicks on the "Save" button.
Exit Condition	<ul style="list-style-type: none"> • The new internship is now visible in the company's profile and accessible on the platform for application.
Output	The company receives a message confirming the creation of the internship.
Exceptions	Missing Information: If required fields are not completed, the system prompts the company to fill out all mandatory sections.

Table 3.5: Create Internship Table

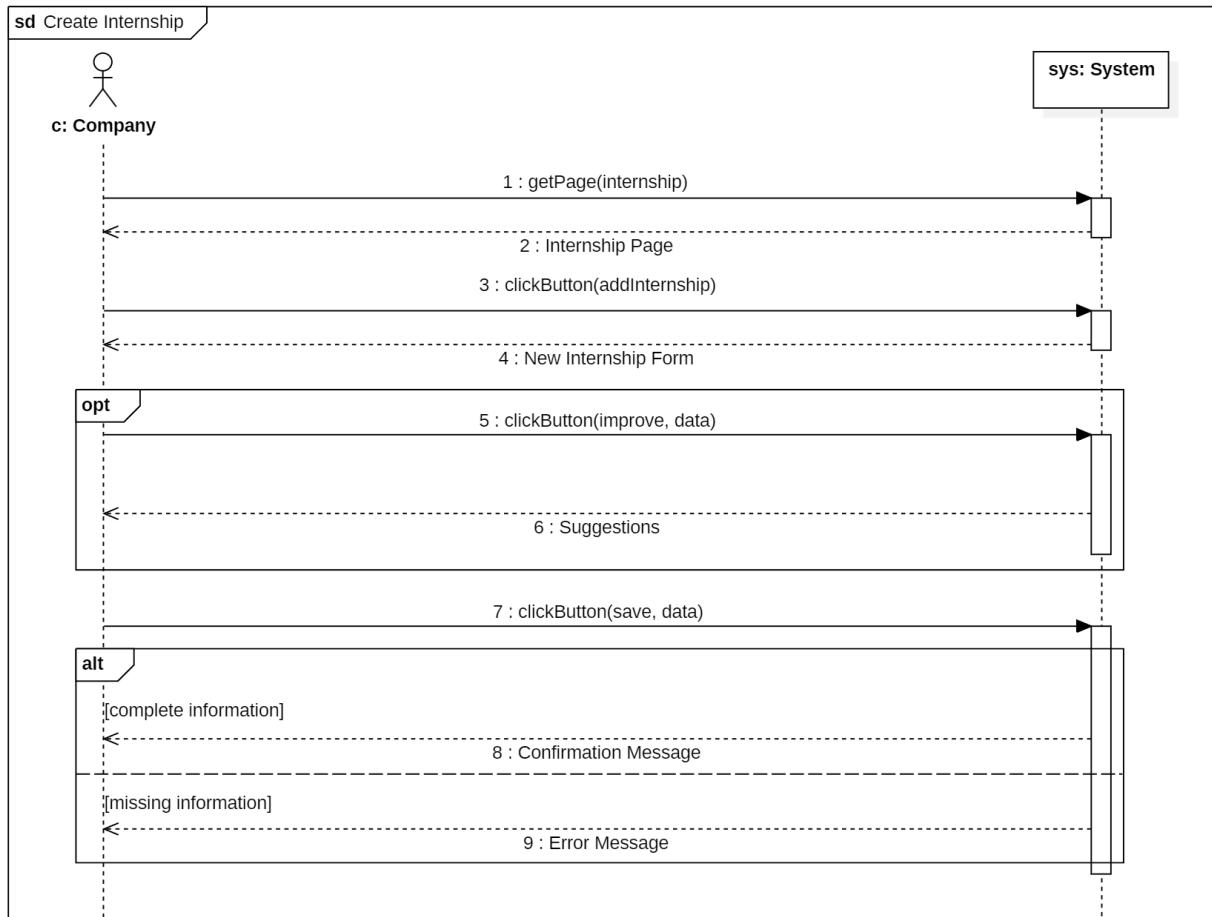


Figure 3.36: Diagram for [UC5]

Update Internship

[UC6]	Update Internship
Actors	Company, Student
Entry Condition	<ul style="list-style-type: none"> • The company is registered. • The company is logged in. • The company has already created the internship. • End date for application is not already expired.
Input	Updated internship information such as skills needed, pre-requirements, type of job, start and end dates.
Event Flow	<ol style="list-style-type: none"> 1. The company accesses its profile page. 2. The company navigates to the "Internship" section. 3. The company clicks on the "Edit Internship" button. 4. The company updates the relevant sections of the internship (e.g., modifies dates, location, or pre-requirements). 5. The company clicks "Save" to confirm the changes. 6. The system notifies all students that already submitted the application about the changes.
Exit Condition	<ul style="list-style-type: none"> • The updated internship is now visible in the company's profile.
Output	<ul style="list-style-type: none"> • A confirmation message is displayed to the company indicating that the internship has been successfully updated. • The students that already submitted the application for it are notified about the changes.
Exceptions	Missing Information: If required fields are not completed, the system prompts the company to fill out all mandatory sections.

Table 3.6: Update Internship Table

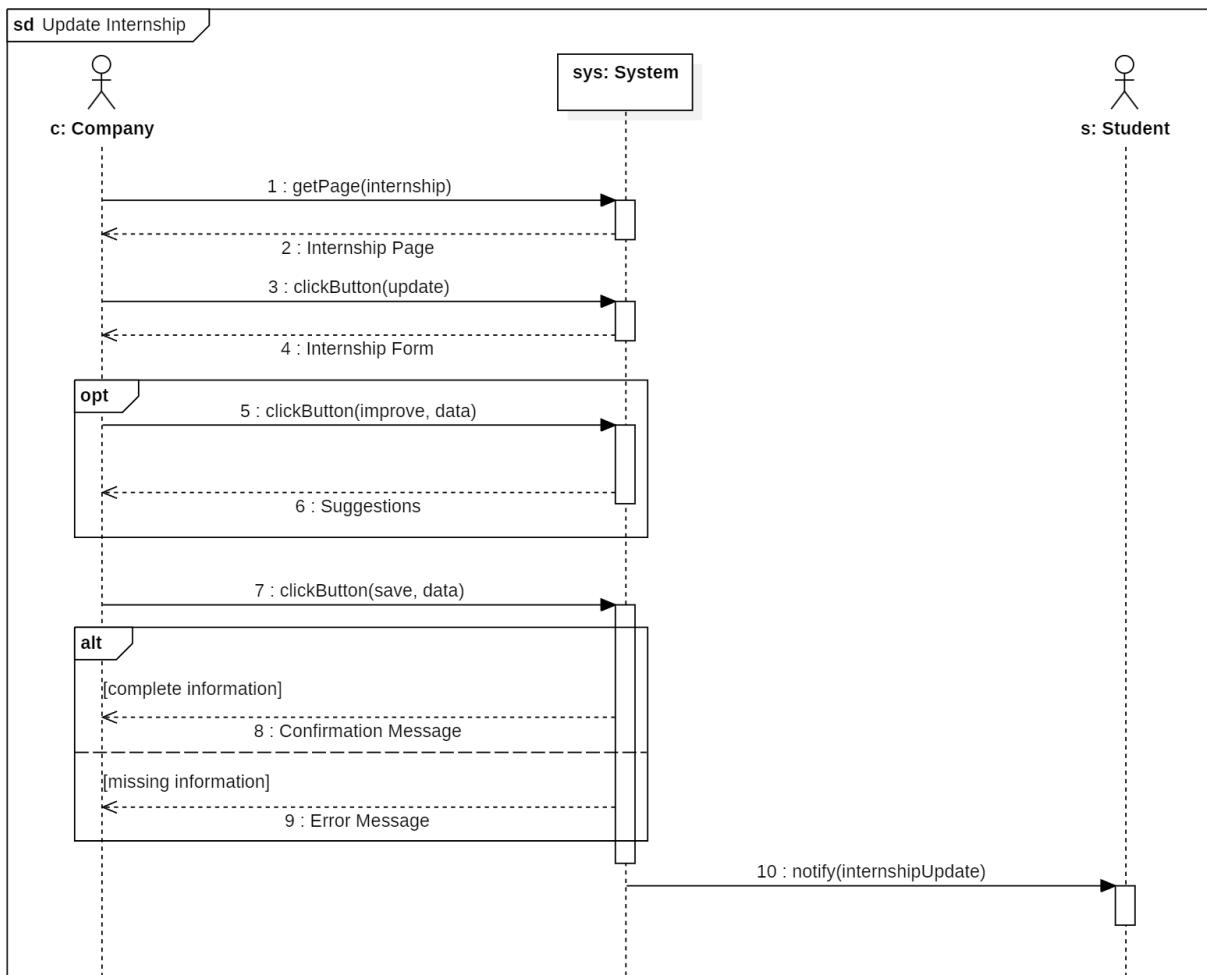


Figure 3.37: Diagram for [UC6]

Search Internship

[UC7]	Search Internship
Actors	Student
Entry Condition	<ul style="list-style-type: none"> • The student has registered. • The student is logged in.
Input	<ul style="list-style-type: none"> • Search criteria such as preferred location, required skills, duration, and type of internship. • Keywords related to specific interests or roles the student wants to explore.
Event Flow	<ol style="list-style-type: none"> 1. The student navigates to the internship page. 2. The student enters search criteria, such as location, industry type, and duration, or uses keywords to find specific roles of interest. 3. The student clicks on the "Search" button. 4. The system displays a list of internships that match the student's search criteria.
Exit Condition	<ul style="list-style-type: none"> • The student receives a list of internships that match their search criteria or recommendations from the system.
Output	A list of internships matching the student's search criteria and system recommendations are displayed to the student.
Exceptions	<ul style="list-style-type: none"> • No Matching Internships: If no internships match the student's criteria, the system displays a message indicating that there are no available opportunities and suggests changing the search criteria.

Table 3.7: Search Internship Table

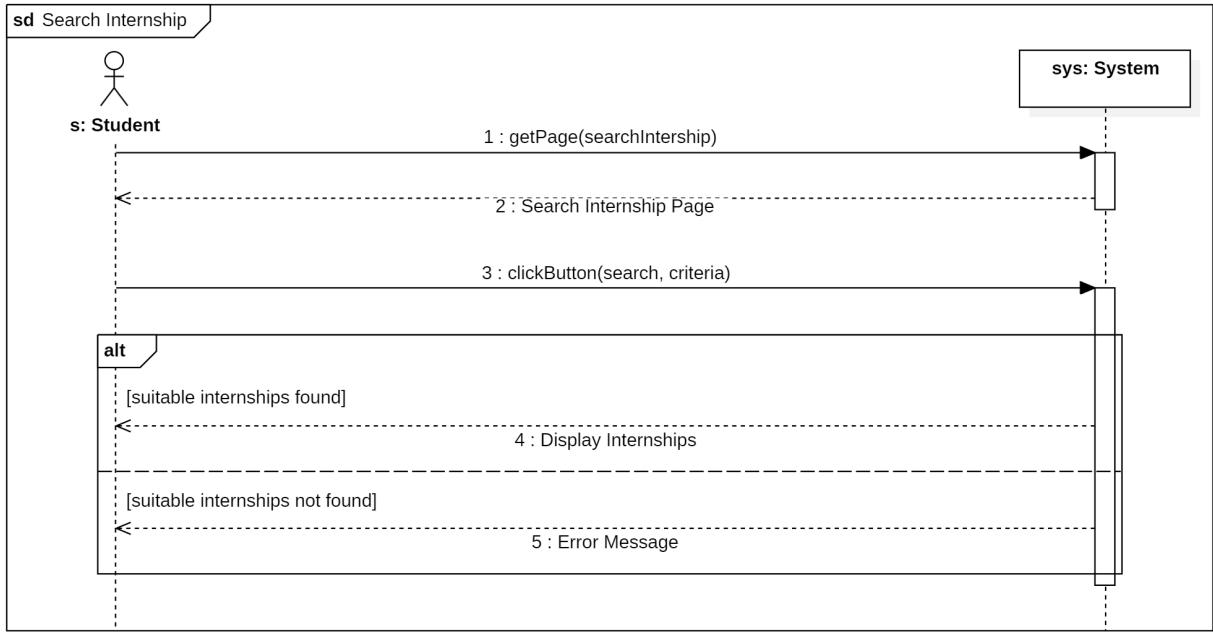


Figure 3.38: Diagram for [UC7]

Submit Application

[UC8]	Submit Application
Actors	Student
Entry Condition	<ul style="list-style-type: none"> • The student has registered. • The student is logged in. • The student has completed their profile with the CV information.
Input	Information for the internship (such as motivational letter, etc.).
Event Flow	<ol style="list-style-type: none"> 1. The student select the internship they want to apply for. 2. The student clicks on the "Apply" button. 3. The student fills out the form for the application. 4. The student click on the "Submit" button. 5. The system saves the application and notifies the company.
Exit Condition	<ul style="list-style-type: none"> • The application is successfully submitted.
Output	The student is notified of the successful submission.
Exceptions	<ul style="list-style-type: none"> • Missing Requirements: If the student does not satisfy the requirements of the internship, an exception is raised. • Incomplete Application: If the application contains missing or incomplete information, the system highlights the missing parts and suggests to the student the mandatory sections to complete.

Table 3.8: Submit Application Table

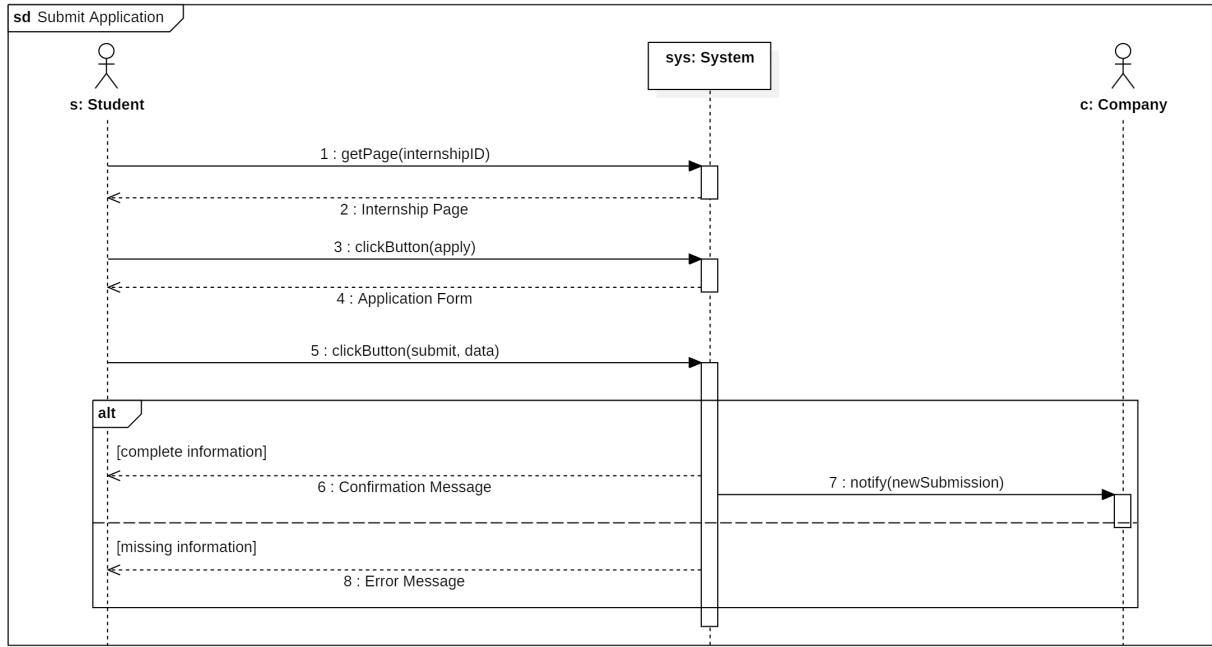


Figure 3.39: Diagram for [UC8]

Insert Questionnaire

[UC9]	Insert Questionnaire
Actors	Company, Student
Entry Condition	<ul style="list-style-type: none"> • The company is registered. • The company is logged in. • Time for internship application is expired.
Input	All necessary questions to understand the skills and requirements of the candidates.
Event Flow	<ol style="list-style-type: none"> 1. The company accesses the internship page. 2. The company clicks on the "Insert New Questionnaire" button. 3. The company fills in the sections with the necessary questions. 4. If the company wants, clicks on the "Improve" button. 5. The system provides suggestions to improve the quality of questions. 6. The company makes adjustments based on the suggestions. 7. The company clicks on the "Save" button. 8. The system notifies all students who submitted the application about the availability of the questionnaire.
Exit Condition	The new questionnaire is now visible in the internship section.
Output	<ul style="list-style-type: none"> • A confirmation message is displayed to the company indicating that the questionnaire has been successfully uploaded. • The students who submitted the application for it are notified about the availability of the questionnaire.
Exceptions	Missing Information: If required fields are not completed, the system prompts the company to fill out all mandatory sections.

Table 3.9: Insert Questionnaire Table

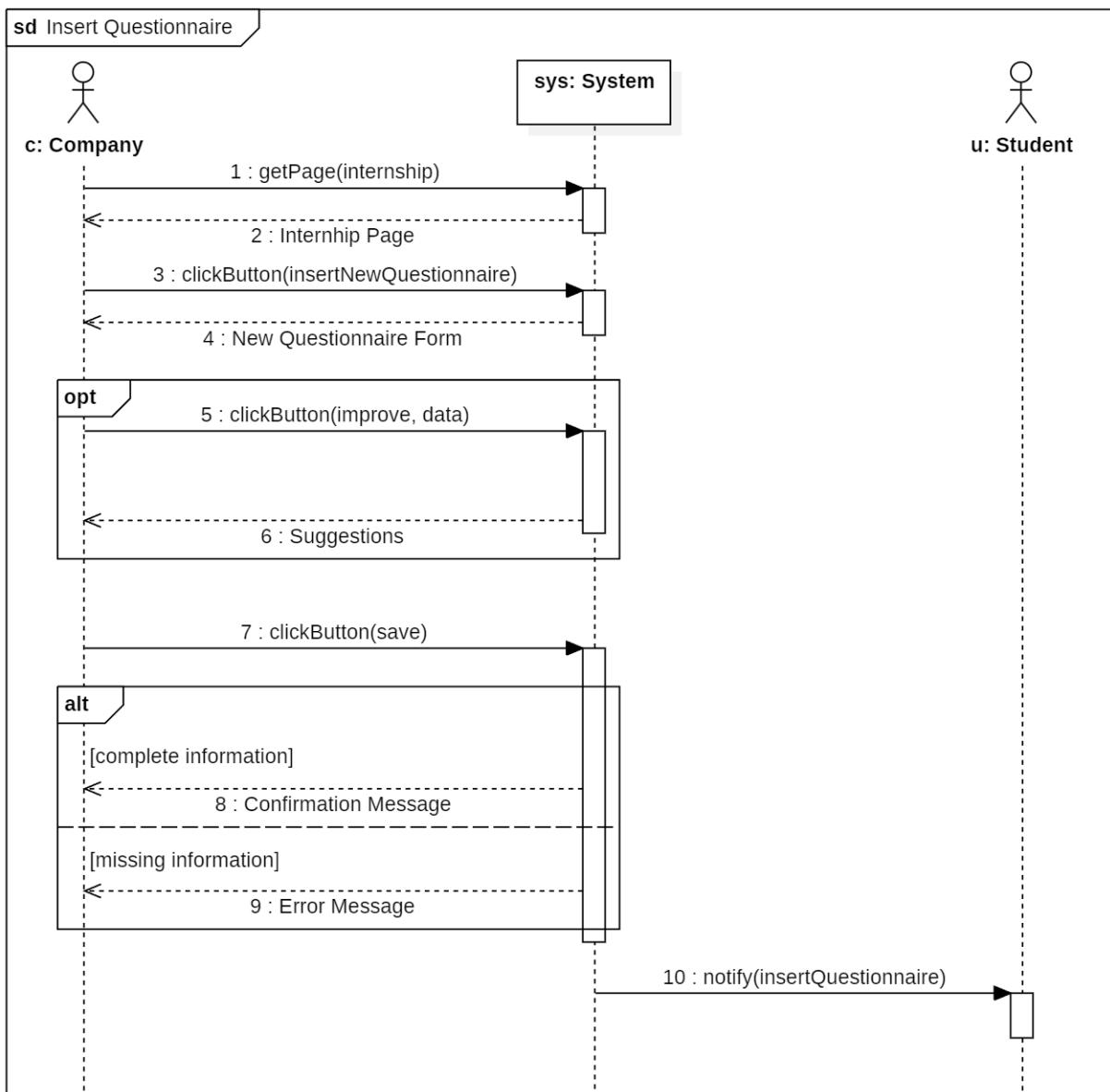


Figure 3.40: Diagram for [UC9]

Update Questionnaire

[UC10]	Update Questionnaire
Actors	Company, Student
Entry Condition	<ul style="list-style-type: none"> • The company is registered. • The company is logged in. • Questionnaire is already live on the platform.
Input	All necessary questions to update to understand the skills and requirements of the candidates.
Event Flow	<ol style="list-style-type: none"> 1. The company accesses the internship page. 2. The company clicks on the "Update" button. 3. The company fills in the sections with the necessary questions. 4. If the company wants, clicks on the "Improve" button. 5. The system provides suggestions to improve the quality of questions. 6. The company makes adjustments based on the suggestions. 7. The company clicks on the "Save" button. 8. The system notifies all students who submitted the application about the changes to the questionnaire.
Exit Condition	The updated questionnaire is now visible in the internship section.
Output	<ul style="list-style-type: none"> • A confirmation message is displayed to the company indicating that the questionnaire has been successfully updated. • The students who submitted the application for it are notified about the changes to the questionnaire.
Exceptions	Missing Information: If required fields are not completed, the system prompts the company to fill out all mandatory sections.

Table 3.10: Update Questionnaire Table

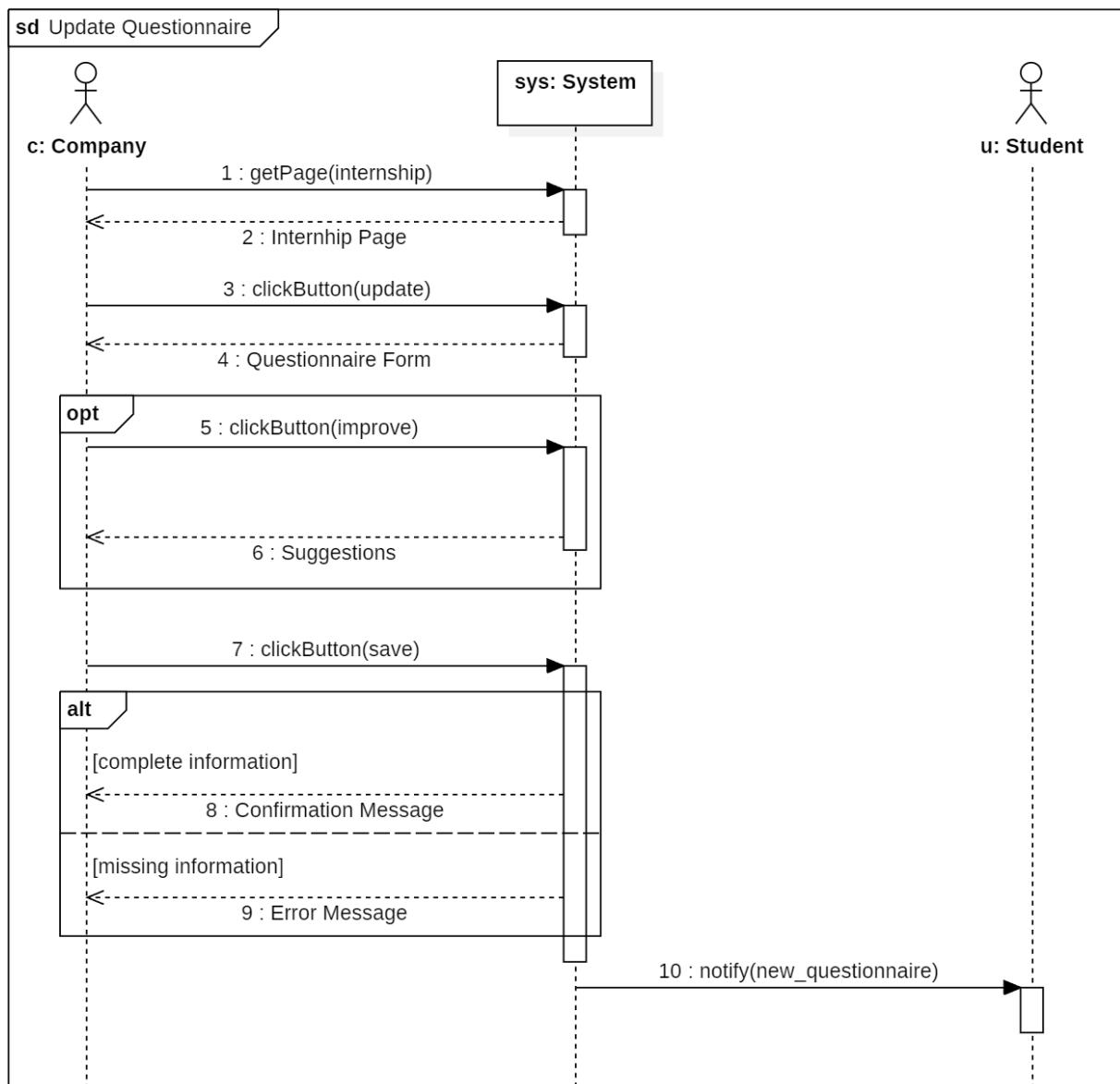


Figure 3.41: Diagram for [UC10]

Answer Questionnaire

[UC11]	Answer Questionnaire
Actors	Student, Company
Entry Condition	<ul style="list-style-type: none"> • The student is registered. • The student is logged in. • The student must have received a positive evaluation from the company. • The company must have posted the questionnaire.
Input	Answers to the questionnaire.
Event Flow	<ol style="list-style-type: none"> 1. The student navigates to the internship page. 2. The system shows the list of internships for which the student applied. 3. The student clicks on the specific internship they are interested in. 4. The student clicks on the "Answer Questionnaire" button. 5. The student answers all the questions in the questionnaire. 6. The student clicks on the "Submit" button. 7. The system saves the form and notifies the company.
Exit Condition	<ul style="list-style-type: none"> • The questionnaire has been fully answered. • The questionnaire has been successfully submitted.
Output	Confirmation message to the student that the questionnaire has been fully answered and sent to the company.
Exceptions	<ul style="list-style-type: none"> • Incomplete Information: If required fields are missing, the system prompts the student to complete all mandatory sections.

Table 3.11: Answer Questionnaire Table

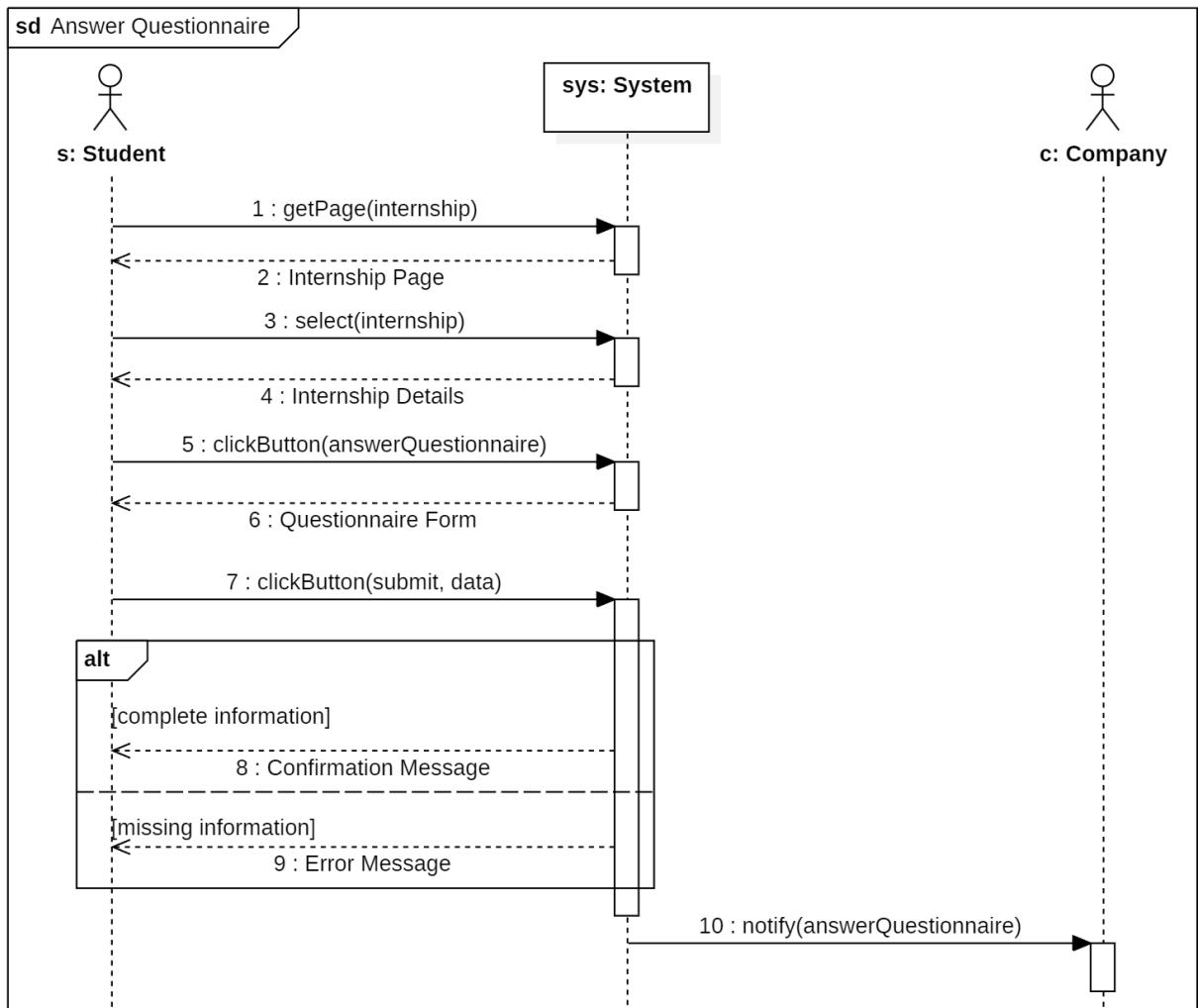


Figure 3.42: Diagram for [UC11]

Evaluate Application

[UC12]	Evaluate Applications
Actors	Company, Student
Entry Condition	<ul style="list-style-type: none"> • The company is registered on the platform. • The company is logged in. • The company has already posted an internship position.
Input	/
Event Flow	<ol style="list-style-type: none"> 1. The company navigates to the internship page. 2. The company selects the internship for which it wants to evaluate the applications. 3. The system shows the list of applications received for the internship. 4. The company selects an application to review the candidate details. 5. The system displays the candidate's profile, CV, and other submitted documents. 6. The company clicks on the "Manage" button. 7. The company decides whether to reject the application, schedule an interview or to shortlist the candidate. 8. The company clicks on the "Save" button. 9. The students are notified with the decision of the company.
Exit Condition	<ul style="list-style-type: none"> • The internship application status is updated. • The students are notified.
Output	For each application, the new status is shown (e.g., "rejected," "pending interview," etc.).
Exceptions	<ul style="list-style-type: none"> • No Applications Available: If no applications are available, the system displays a message indicating that there are no applications to evaluate.

Table 3.12: Evaluate Application Table

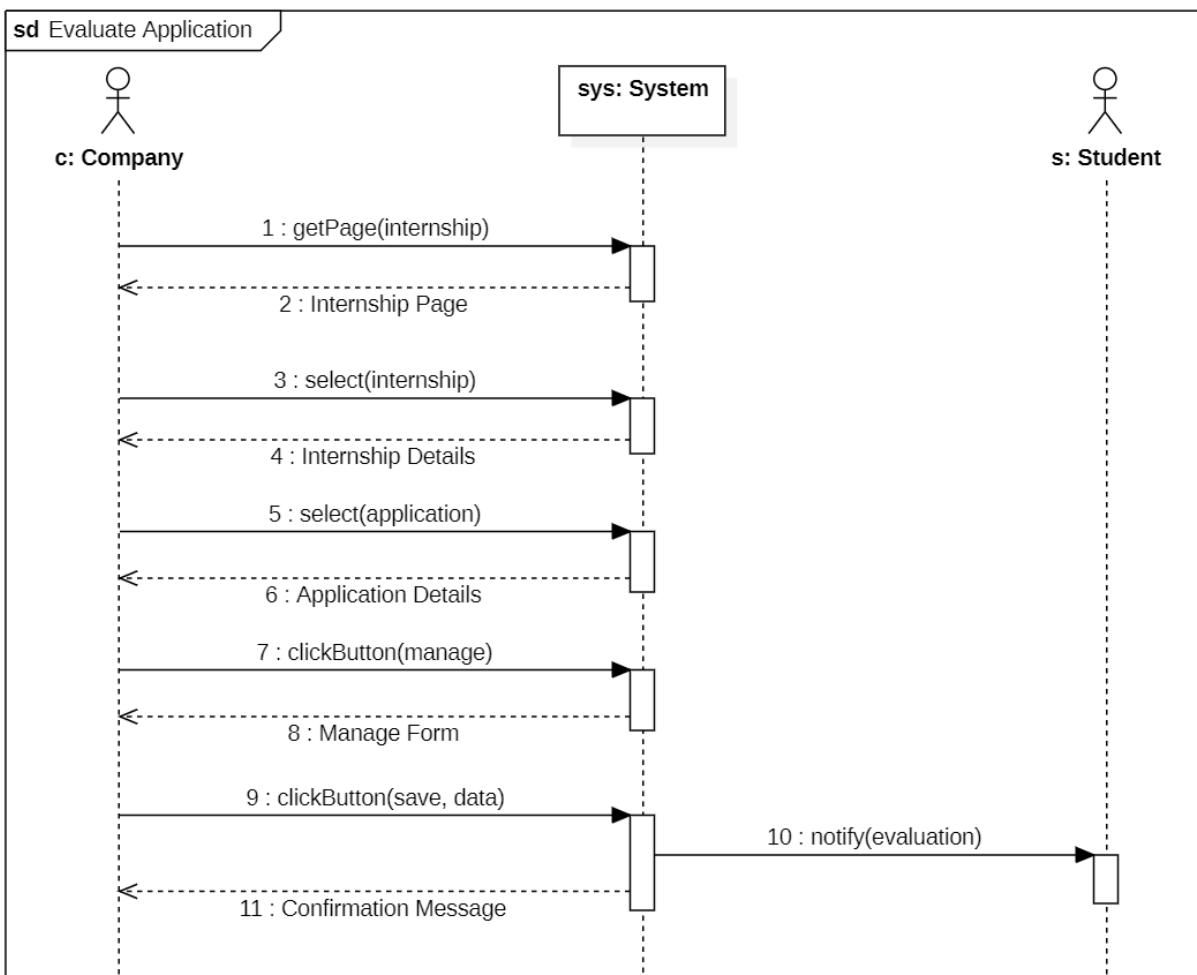


Figure 3.43: Diagram for [UC12]

Monitor Internship

[UC13]	Monitor Internship
Actors	User
Entry Condition	<ul style="list-style-type: none"> • The user has registered. • The user is logged in. • The student has applied for an internship.
Input	/
Event Flow	<ol style="list-style-type: none"> 1. The user navigates to the internship page. 2. The system shows the list of internships for which the student applied. 3. The student selects the specific internship they are interested in. 4. The system displays all the information regarding the internship.
Exit Condition	<ul style="list-style-type: none"> • The student visualizes the information they are interested in.
Output	The information are displayed.
Exceptions	/

Table 3.13: Monitor Internship Table

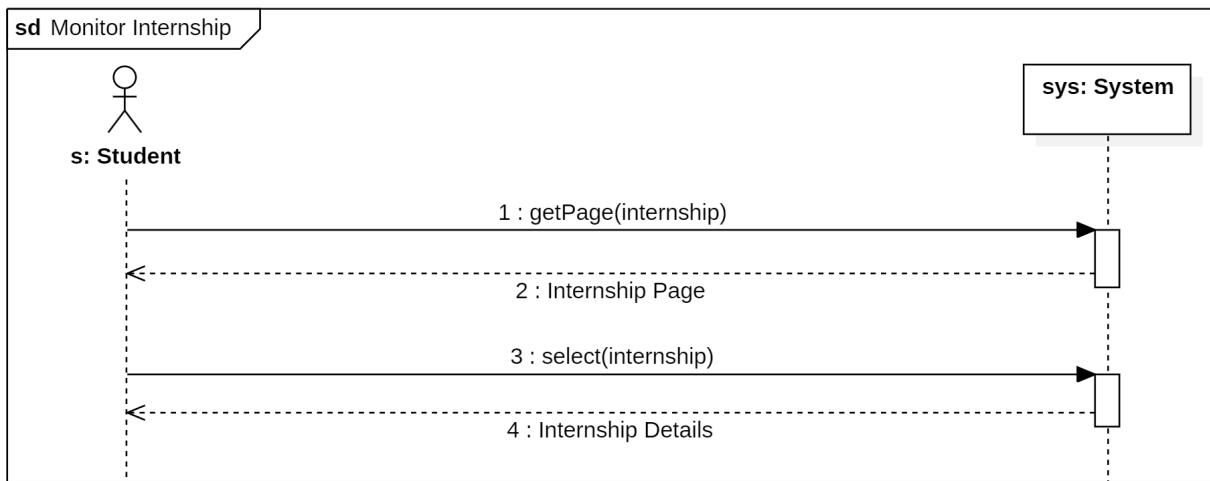


Figure 3.44: Diagram for [UC13]

Write feedback

[UC14]	Write Feedback
Actors	User
Entry Condition	<ul style="list-style-type: none"> • The user has registered. • The user is logged in.
Input	Information about the problem to report.
Event Flow	<ol style="list-style-type: none"> 1. The user navigates to the home page. 2. The user clicks on the "Write Feedback" button. 3. The user fills out the form for the feedback. 4. The user clicks on the "Send" button.
Exit Condition	<ul style="list-style-type: none"> • The feedback is sent.
Output	A confirmation message is displayed to the user indicating that the feedback has been successfully sent.
Exceptions	Missing Information: If required fields are not completed, the system prompts the user to fill out all mandatory sections.

Table 3.14: Write Feedback Table

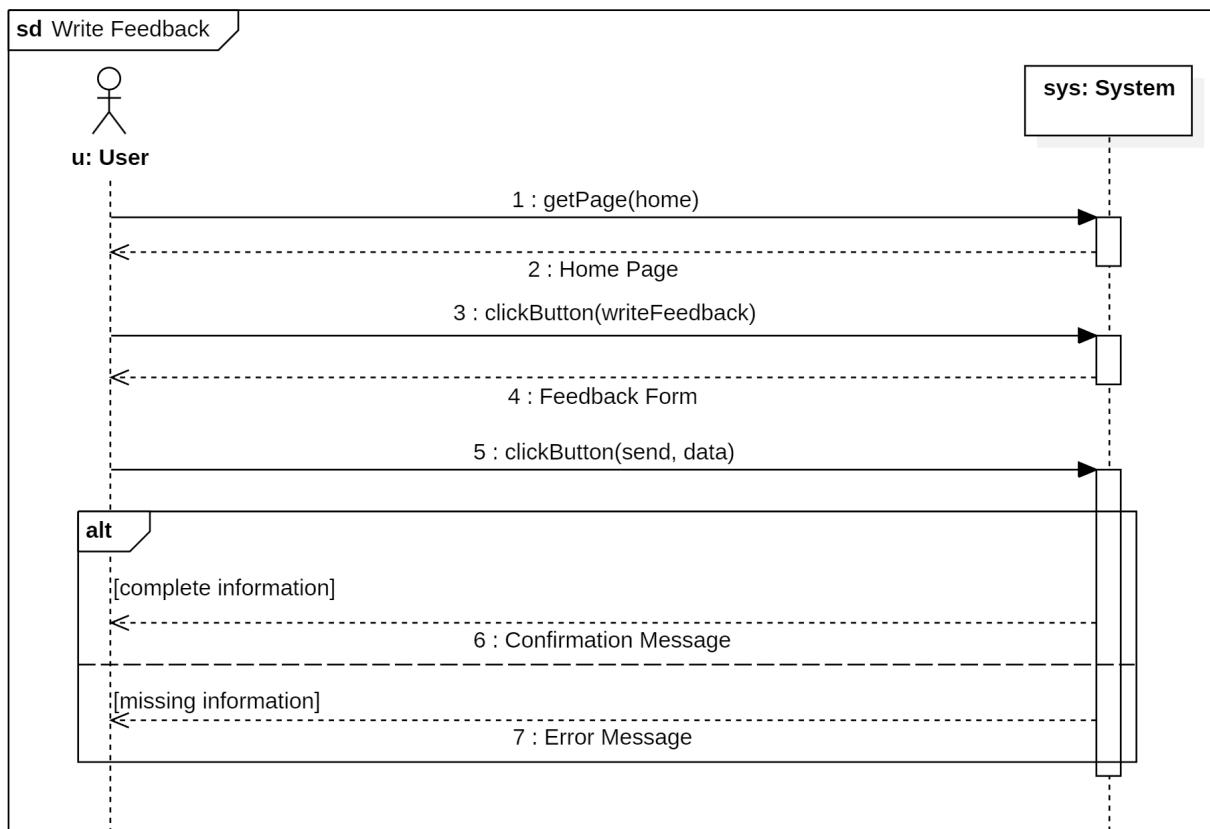


Figure 3.45: Diagram for [UC14]

Write Complaint

[UC15]	Writes Complaint
Actors	Student, University
Entry Condition	<ul style="list-style-type: none"> • The student is registered on the platform. • The student is logged in. • The student is currently involved in an ongoing internship.
Input	Details of the complaint (e.g., description of the issue, affected parties, date, etc.).
Event Flow	<ol style="list-style-type: none"> 1. The student navigates to the internship page. 2. The student clicks on the "Write Complaint" button. 3. The system displays the complaint form. 4. The student fills in the complaint details. 5. The student clicks on the "Send" button. 6. The university receives a notification about the new complaint.
Exit Condition	<ul style="list-style-type: none"> • The new complaint is successfully saved in the system. • The university is notified.
Output	Confirmation message to the student that the complaint has been submitted successfully.
Exceptions	/

Table 3.15: Write Complaint Table

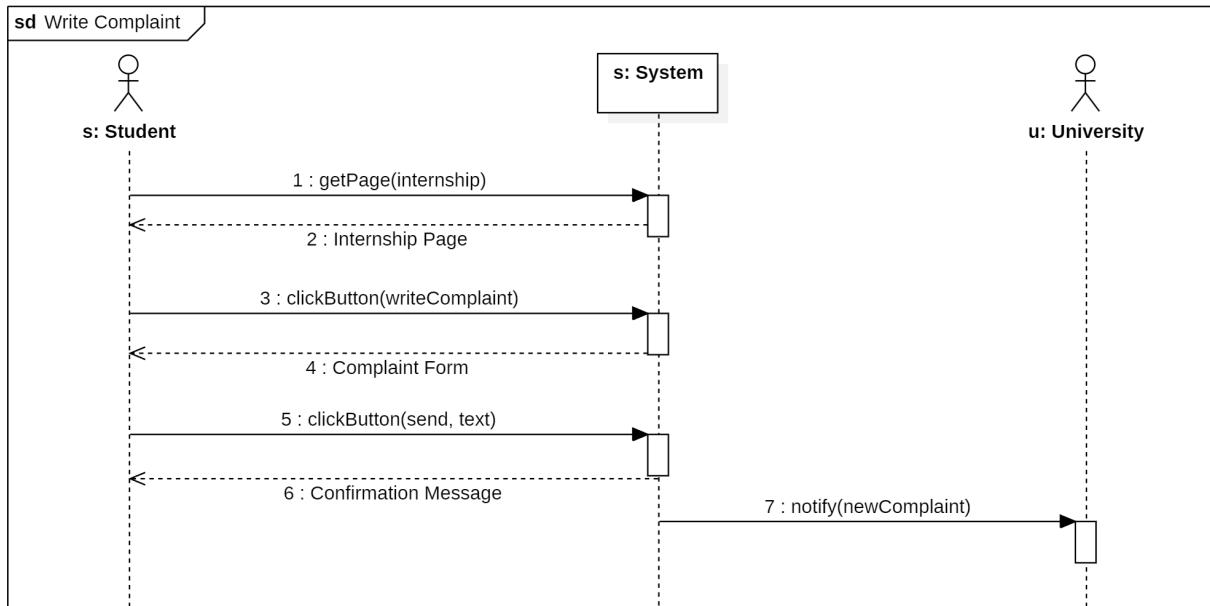


Figure 3.46: Diagram for [UC15]

Handle Complaint

[UC16]	Handle Complaints
Actors	University, Student, Company
Entry Condition	<ul style="list-style-type: none"> The university has a student that is currently involved in an internship.
Input	Reply to the complaint.
Event Flow	<ol style="list-style-type: none"> The university opens the complaints page on the platform. The university clicks on the "Manage" button of a specific complaint to handle. The system displays the complaint options. The university handles/replies to the complaint. The university clicks "Submit" to send the reply to the involved parties.
Exit Condition	<ul style="list-style-type: none"> The complaint has been handled. The reply to the complaint has been sent to the involved parties.
Output	Confirmation message to the university that the reply to the complaint has been submitted successfully.
Exceptions	<ul style="list-style-type: none"> No Complaints Available: If no complaints are available, the system displays a message indicating that there are no complaints to handle.

Table 3.16: Handle Complaint Table

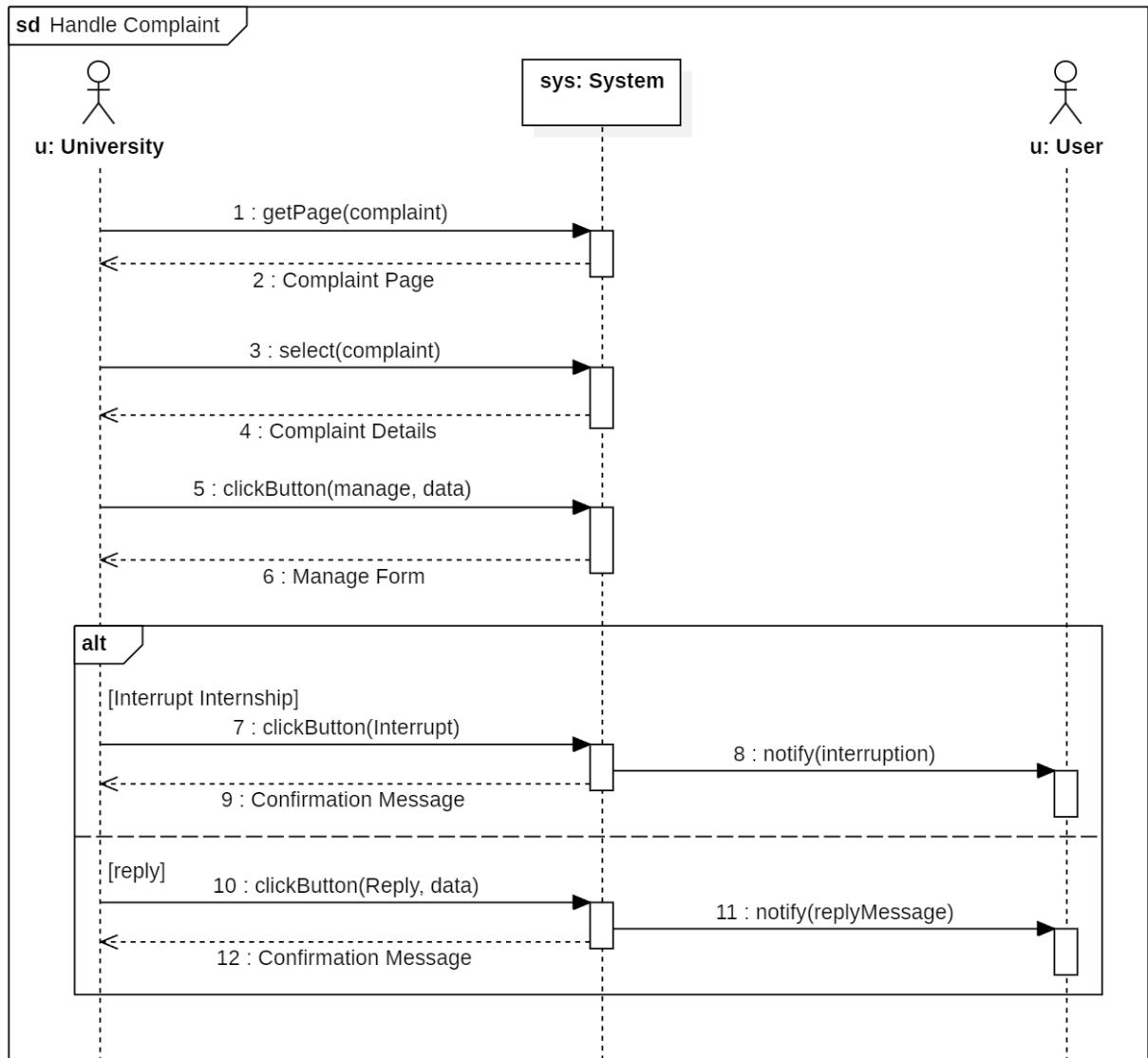


Figure 3.47: Diagram for [UC16]

3.2.3. Requirements mapping

This section offers a brief summary of the objectives, clearly defining the specific requirements and underlying assumptions related to each goal.

[G1] Allow students to look for internships and stay updated about new opportunities

- **R1** - The system allows unregistered users to sign up
- **R2** -The system allows users to log in
- **R8** - The system takes information from the student's personal profile
- **R9** - The system allows a student to see a company's profile
- **R13** - The system displays all the available internships
- **R14** - The system displays all the information of each specific internship
- **R15** - The system displays specific internships that better suit a student based on the information provided
- **R25** - The system asks users for permission to send messages
- **D1** - User must consent to personal data extraction and usage
- **D2** - User must consent to receiving information
- **D3** - User must have a device able to connect to the internet
- **D4** - Student must be enrolled in a university

[G2] Allow students to improve their CVs

- **R3** - The system allows students to insert personal information for the creation of the CV
- **R5** - The system allows users to update their personal profiles
- **R7** - the system allows users to retrieve all modified information
- **R29** - The system generates suggestions based on the information taken in the platform
- **D1** - Student must be enrolled in a university
- **D2** - User must have a device able to connect to the internet

[G3] Allow students to apply for an internship

- **R16** - The system allows students to visualize information about the internship
- **R17** - The system allows a registered student to select an internship to apply to
- **R18** - The system allows users to apply to an internship
- **R26** - The system generates a message of confirmation after the operation is done
- **D1** - User must consent to personal data extraction and usage
- **D2** - User must consent to receiving information
- **D3** - User must have a device able to connect to the internet
- **D4** - Student must be enrolled in a university

[G4] Allow a company to hire interns

- **R1** - The system allows unregistered users to sign up
- **R2** -The system allows users to log in
- **R6** - The system allows companies to view student's personal profile
- **R10** - The system changes the status of evaluation after updates in the
- **R19** - The system allows companies to set up evaluation criteria application process
- **D1** - User must consent to personal data extraction and usage
- **D2** - User must consent to receiving information
- **D3** - User must have a device able to connect to the internet

[G5] Allow companies to improve their internship proposals

- **R4** - The system allows companies to insert information for the creation of the internship
- **R5** - The system allows users to update their personal profiles
- **R7** - The system allows users to retrieve all modified information
- **R29** - The system generates suggestions based on the information taken in the platform
- **D1** - User must have a device able to connect to the internet

[G6] Allow users to track and monitor the status of the internship

- **R10** - The system changes the status of evaluation after updates in the application process
- **R11** - The system allows students to accept the outcome of the evaluation
- **R12** - The system allows companies to evaluate students' applications
- **R25** - The system asks users for permission to send messages
- **R27** - The system generates a message once the status of the internship changes
- **D1** - User must consent to personal data extraction and usage
- **D2** - User must consent to receiving information
- **D3** - User must have a device able to connect to the internet
- **D4** - Student must be enrolled in a university

[G7] Allow users to report feedback and complaints

- **R21** - The system allows users to name other parties involved in the complaint
- **R22** - The system asks users for permission to send messages
- **R26** - The system generates a message of confirmation after the operation is done
- **R28** - The system allows user to retrieve all messages sent
- **R30** - The system allows students and companies to provide feedback
- **R31** - The system generated a feedback request to send to students and companies
- **D1** - User must have a device able to connect to the internet
- **D2** - Student must be enrolled in a university

[G8] Allow universities to review and address complaints

- **R1** - The system allows unregistered users to sign up
- **R2** -The system allows users to log in
- **R20** - The system allows universities to set up criteria for internship's conclusion
- **R22** - The system displays the complaints sent by both students and companies
- **R23** - The system updates the status of a complaint
- **R24** - The system allows universities to close an internship
- **D1** - Student must be enrolled in a university

3.3. Performance Requirements

The system must guarantee high performance to support a large number of users, including students, companies, and universities, while ensuring a smooth and seamless user experience. To achieve this, the system is expected to exhibit a swift response time, ideally no more than one second, to prevent delays that might hinder students from submitting applications or companies from managing internships effectively. In cases where the user's Internet connection is slow, response times may increase noticeably. In addition, the system must efficiently handle interactions such as CV generation, internship recommendations, and feedback management while ensuring smooth and seamless processing of data. The manageable workload of the platform is supported by its focussed scope, as complex operations such as interviews and submissions rely on predefined data structures rather than real-time computation.

3.4. Design Constraints

3.4.1. Regulatory Policies

The system guarantees accessibility and cross-browser compatibility by adhering to open web standards (HTML, CSS, and JavaScript). It complies with data protection regulations such as the GDPR and CCPA to handle data securely. The platform meets WCAG accessibility standards and ensures consistent performance across browsers like Chrome, Firefox, Safari, and Edge.

3.4.2. Hardware Limitations

All that is required in terms of hardware is a computer with an internet connection.

3.4.3. Other Constraints

There are no other specific requirements needed for the use of the platform.

3.5. Software System Attributes

3.5.1. Reliability

The system should reduce downtime to the greatest extent possible, enabling users to continuously search for new opportunities and track all necessary information without

interruption.

3.5.2. Availability

Availability is important, and the system must ensure 98% uptime to guarantee that users can access the platform whenever needed.

3.5.3. Security

Security is critical for the system due to the sensitive personal information it handles. As such, all operations are designed to be authorized. Encryption and the SSL protocol ensure a secure communication channel. Additionally, the system adheres to security standards, including those set by the Open Web Application Security Project (OWASP), to protect against common web application vulnerabilities such as SQL injection, cross-site request forgery (CSRF), and cross-site scripting (XSS).

3.5.4. Maintainability

The system will be developed following the best software engineering practices to ensure its maintainability and scalability over time. It is designed to facilitate the integration of future functionalities with minimal effort, allowing easy expansion. The selected design techniques will focus on ensuring a high level of reusability, making it easier to adapt the system as new requirements emerge.

3.5.5. Portability

The system is engineered with a focus on easy portability, ensuring it can adapt to changes in hosting databases or hardware components. Designed to be fully compatible with most operational systems, it also offers accessibility through any web browser. This flexibility ensures the system remains highly portable. Moving forward, it is crucial to maintain compatibility with future updates, as well as any new operating systems or devices.

4 | Formal analysis using Alloy

Here we present the specification of the system described above using Alloy. The goal of this specification is to model a system that ensures the integrity and correctness of constraints related to internship applications, student eligibility, and system behaviors.

The specification is structured around a set of signatures: users, students, companies, internships, and universities. Each entity is defined with its attributes and relationships. For instance, students are modeled as users with additional attributes like their applied internships, current internship work, CV, and associated university.

Facts are also introduced to define constraints. These includes that no two users can share the same email, a student cannot apply for an internship without a CV, and only one student can work in a given internship at a time. Additional constraints verify that students can only be rejected from internships they have previously applied to, and historical rules ensure that a CV always belongs to a single student throughout the system's lifecycle.

We used predicates to define dynamic operations such as students applying for internships, starting work, or being rejected. A global "eventsFact" encapsulates the control flow of these operations to maintain consistency within the system.

Finally, a world predicate establishes initial conditions for the system, such as ensuring there are more than two students, companies, and internships in the environment

```
////////////////////////////// SIGNATURES //////////////////////////////

abstract sig User {
    email: one Mail,
}

sig Student extends User {
    var applied: set Internship,
```

```

        var work: lone Internship,
        var cv: lone CV,
        university: one University
    }

sig Internship {
    at: one Company,
    var rejected: set Student
}

sig Company extends User {}
sig University extends User {}

sig Mail {}
var sig CV {}

////////////////// CONSTRAINTS //////////////////////////////

// Internship's constraints

// Only one student can work in a single internship
fact OneStudentxInternship {
    all i: Internship | lone s: Student | i in s.work
}

// If a student is rejected from an internship,
// they must have applied to it
fact RejectedimpliesApplied {
    all i: Internship | all r: i.rejected | i in r.applied
}

// A student can only work in an internship
// if they previously applied to it
fact PreviouslyAppliedifWorking {
    always (all s: Student | all i: Internship | i in s.work
        implies once before i in s.applied)
}

// A student can only be rejected from an internship

```

```

// if they previously applied to it
fact PreviouslyAppliedifRejected {
    always (all s: Student | all i: Internship | s in i.rejected
            implies once before i in s.applied)
}

// User's Constraints

// No two users can have the same email address
fact noSameMail {
    all m: Mail | one u: User | m in u.email
}

// Student's constraints

// A student cannot apply for an internship without a CV,
// and each student can have only one CV
fact studentCV {
    always (all s: Student | s.cv = none implies no s.applied)
}

// Every student must have a unique CV
fact noCV {
    always (all s: Student | s.cv != none
            implies always (s.cv != none))
    always (all c: CV | one s: Student | c in s.cv)
}

// Historical constraint: Every CV must have belonged
// to exactly one student
fact historicalCV {
    always (all c: CV | one s: Student | historically c in s.cv)
}

////////////////////////////// PREDICATES ///////////////////////////////

// Control flow events to define the system's behavior
fact eventsFact {
    world
}

```

```

    always (
        all s: Student | stutterStudent[s] or
        (some i: s.applied | startWork[s, i]) or
        (some i: Internship - s.applied | applyInt[s, i])
    )
    always (
        all i: Internship | stutterInternship[i] or
        (some s: applied.i | rejStudent[s, i])
    )
    always (
        some s: Student | stutterCV[s]
    )
}

// Nothing changes for a student
pred stutterStudent[s: Student] {
    s.applied' = s.applied
    s.work' = s.work
}

// Nothing changes for a student's CV
pred stutterCV[s: Student] {
    s.cv' = s.cv
}

// Nothing changes for an internship
pred stutterInternship[i: Internship] {
    i.rejected' = i.rejected
}

// A student starts working on an internship
pred startWork[s: Student, i: Internship] {
    s.cv != none
    i in s.applied
    s.work' = i and s.work = none
    s.applied' = s.applied
    s not in i.rejected'
    all s2: Student - s | i in s2.applied
    implies s2 in i.rejected'
}

```

```

}

// A student applies for an internship
pred applyInt[s: Student , i: Internship] {
    s.work = none
    all st: Student - s | i not in st.work
    s.applied' = s.applied + i
    s.work' = s.work
}

// A student is rejected from an internship
pred rejStudent[s: Student , i: Internship] {
    s.work = none
    all st: Student - s | i not in st.work
    i.rejected' = i.rejected + s
}

// World constraints to initialize the system
pred world {
    #Student > 2
    #Company > 2
    #Internship > 2
    #Student.cv = 0
}
run {} for 10

```

Examples

In this scenario, there are two companies: one is offering three internships, while the other is offering a single internship. We also have three students studying at the same university.

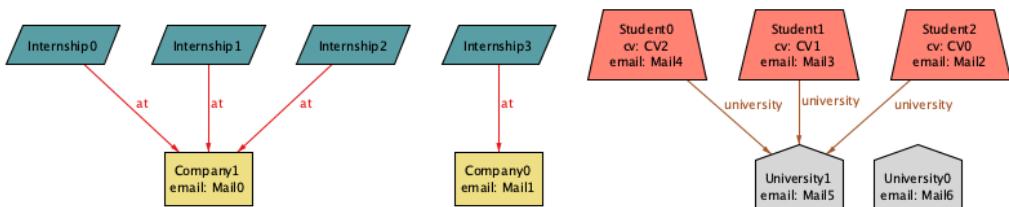


Figure 4.1: State 0

At the first step Student0 applies for Internship0.

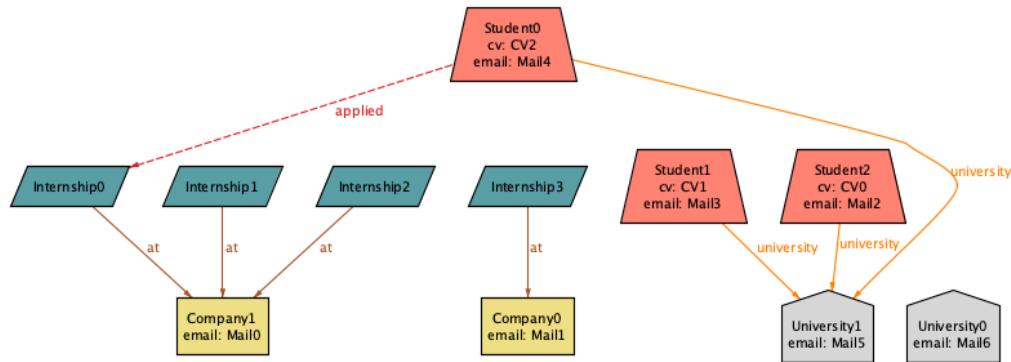


Figure 4.2: State 1

At the second step, Student2 applies for Internship1 but gets rejected.

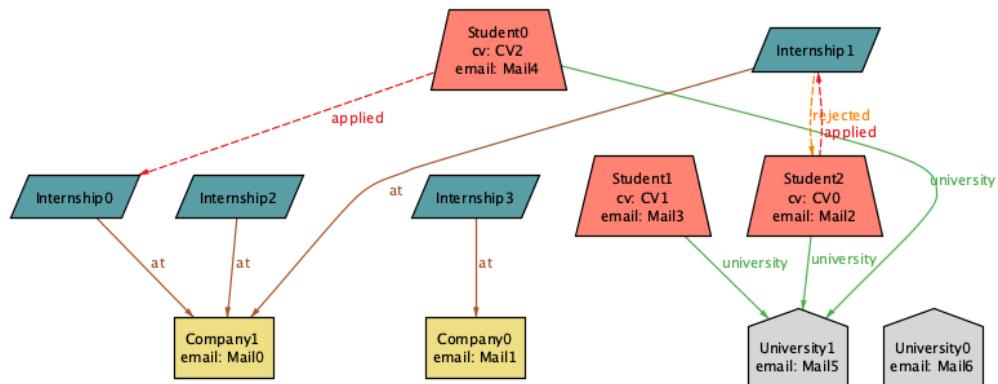


Figure 4.3: State 2

At the third step, Student0 applies for Internship3 while Student2 applies for Internship0

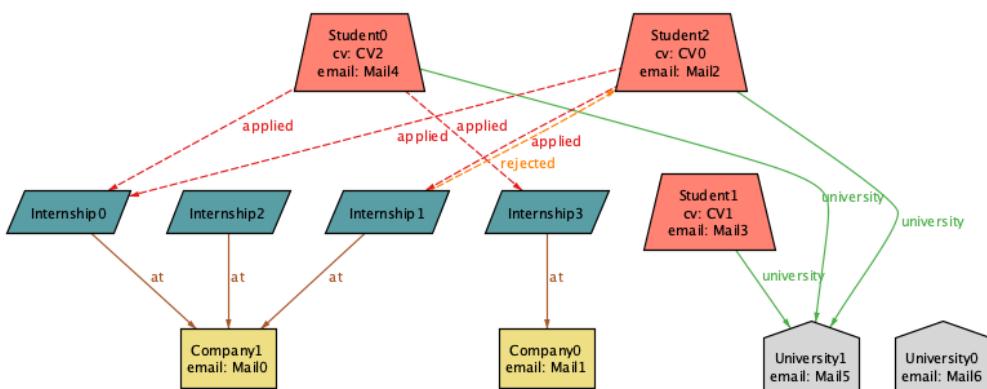


Figure 4.4: State 3

At the fourth step, Student0 gets accepted and starts working on Internship3.

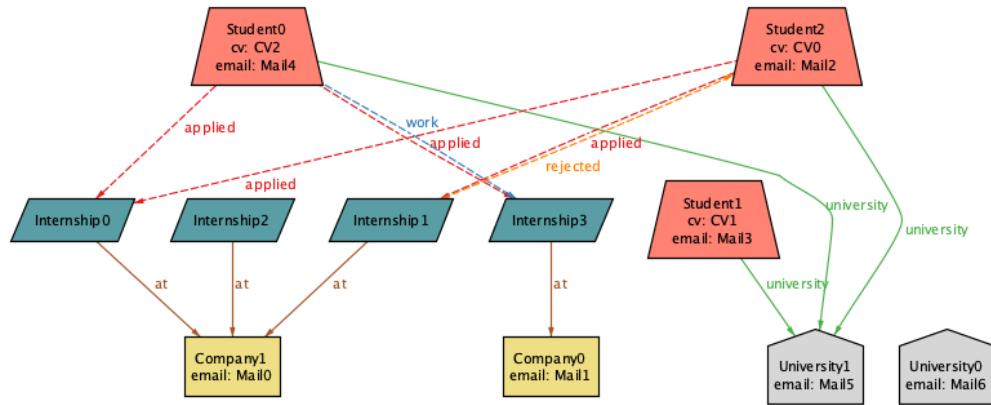


Figure 4.5: State 4

At the fifth step, Student2's application to Internship0 gets rejected.

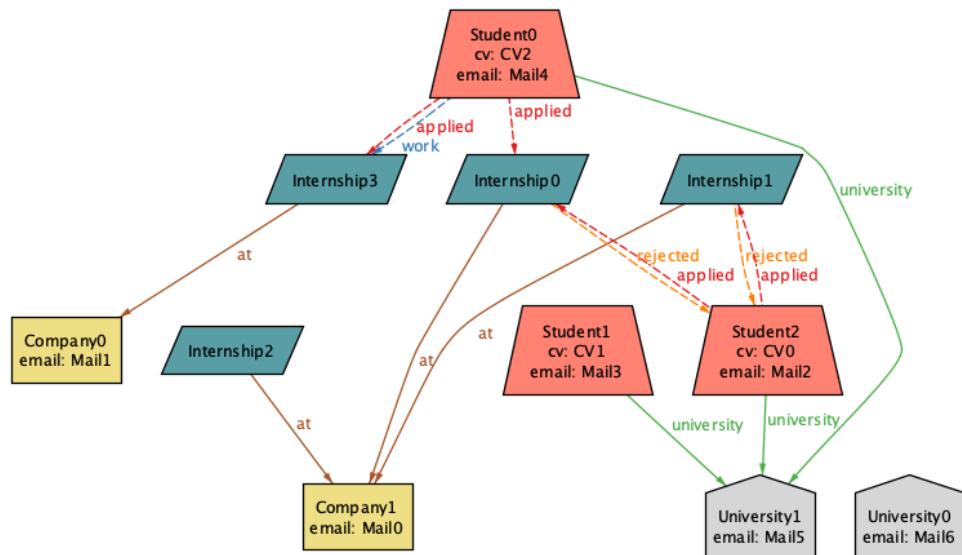


Figure 4.6: State 5

At the sixth step, Student1 applies for Internship0

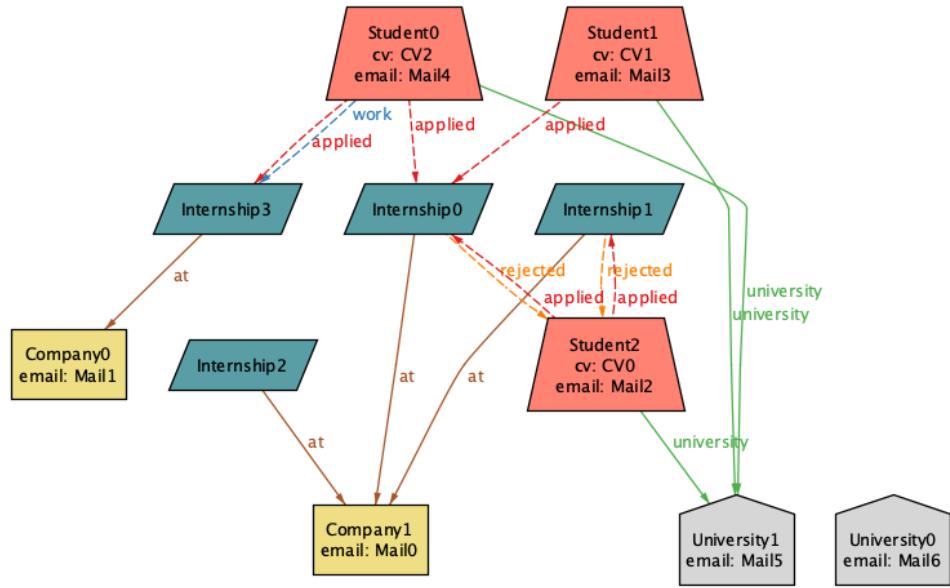


Figure 4.7: State 6

5 | Effort spent

	David Gadiaga	Andrea Pesciotti	Simone Somazzi
Section 1	7	6	5
Section 2	10	9	7
Section 3	16	18	15
Section 4	2	2	8

Table 5.1: Hours spent per person

6 | Reference

In the RASD-Document we have used the following references:

Websites that have a similar use case:

- **LeetCode**
- **GitHub**

Websites used for the mockups:

- **Figma**

Websites used for the diagrams:

- **StarUML**