**COMPUTER INFORMATION SYSTEM**

**KING ABDULLAH II SCHOOL OF INFORMATION TECHNOLOGY**

**THE UNIVERSITY OF JORDAN**

**January/2024**

TERO

# Training management System

**Project Supervisors**

**Dr. Heba Khadrawi – Dr. Tamara Almaraabeh**

| Name | Student ID |
|---|---|
| Akram Jaghoub | 0202069 |
| Ghazal Alosta | 0205993 |
| Rand Abbad | 0203691 |
| Mohammad Nader | 0204686 |

# ABSTRACT

This project aims to create a web-based platform that bridges the gap between academia and industry. The platform serves as a hub for students and companies to interact with each other, and access training courses, and internship opportunities. The project addresses the need for practical skills alignment, effective communication, and streamlined management within the educational landscape. By leveraging modern technologies and user-centered design principles, this platform aims to empower students and companies to achieve a better educational experience and impactful industry collaborations.

# ACKNOWLEDGEMENT

We extend our heartfelt gratitude to all those who contributed to the successful completion of this project. Our sincere thanks go to our mentors and instructors for their invaluable guidance and insights throughout the journey. We express our appreciation to the students, companies, and managers who actively participated in the elicitation process, providing valuable feedback that shaped the platform's features. The continuous support of our colleagues, friends, and families played an instrumental role in motivating us during challenging phases. This project stands as a testament to the collective effort and dedication of everyone involved.

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# CHAPTER ONE: INTRODUCTION

## 1.1 Preamble

In modern education, hands-on training is key. Many universities now require students to get real-world experience before they graduate. But there's a challenge: How do students find the right training opportunities, and how do companies find these students?

This is where our project comes in. Tero is a simple online platform that connects students looking for training with companies that have opportunities. Students can browse through company listings and apply directly. Companies, in turn, can post their training roles and review applications easily. In short, the Training Management System makes the whole training process smoother and more connected for students and companies.

To personify our project and create a relatable connection for users, we've introduced an imaginary character named Tero, a friendly and resourceful bird with distinctive features that mirror the essence of our web platform. Tero embodies the platform's ability to connect students and companies seamlessly.

Tero's story begins in the vast landscape of digital education, where he discovered a passion for bringing together aspiring students and forward-thinking companies. Known for his ability to navigate through challenges with grace and precision, Tero became the ambassador for our Training Management System. As Tero soars through the virtual realm, he carries with him the collective aspirations of students seeking real-world experiences and the ambitions of companies eager to discover fresh talent. Enabling users to explore training opportunities effortlessly. Tero's journey reflects the transformative impact our project aims to achieve, fostering collaboration and opening new horizons for both students and companies in the realm of hands-on education.

## 1.2 Project Motivation

The emergence of a competitive job market requires students to possess not only academic excellence but also practical skills that align with industry requirements. In response to this demand, the motivation behind this project is to design a user-friendly web application that facilitates seamless communication between students and companies. The primary aim is to create a platform where students can register for training courses that are essential for their graduation. This web application aims to bridge the gap between academia and industry by offering a streamlined process for companies to offer and manage mandatory training courses, enabling students to acquire real-world skills and experiences.

By providing students with the opportunity to engage with companies through training courses that are integral to their academic journey, this project seeks to enhance students' employability upon graduation. Furthermore, companies benefit by having direct access to a pool of motivated students who are committed to enhancing their skill sets. This interaction between students and companies is expected to create a mutually beneficial relationship that connects academic goals with real-world industry requirements.

## 1.3 Problem Statement

Graduates frequently lack practical skills due to a divide between academic learning and industry needs. Companies find it tough to locate candidates with both theoretical and practical know-how. Current systems fall short in gathering feedback for course enhancement, facilitating communication between students and companies, and centralizing training course offerings. Additionally, university professors struggle to effectively monitor students during their training periods, highlighting a clear need for a comprehensive solution.

## 1.4 Project Aim and Objectives

**Project Aim:**

To develop a web application that bridges the gap between students seeking real-world training and companies looking to offer such opportunities, thereby fostering skill development and talent discovery.

**Project Objectives:**

1. Design a robust course management system allowing companies to introduce training courses that align with the academic curriculum and industry demands.
2. Facilitate a platform where students can discover and enroll in these training courses, thereby gaining practical experience and enhancing their employability.
3. Foster seamless communication between students and companies within the platform to promote understanding and collaboration.

## 1.5 Project Scope

Tero is envisioned as a comprehensive, responsive web application tailored for students who are interested in IT, companies, and university instructors. Designed to bridge the gap between students seeking compulsory training opportunities and companies offering them, it facilitates course postings, and enrollments, and offers seamless communication tools. Moreover, Tero provides dedicated interfaces for user profiles and feedback, focusing on digital interactions and course management.

## 1.6 Project Software and Hardware Requirements

- **Software Requirements:**

    1. **Web Development Frameworks:** We will use Java Spring Boot for backend development, HTML/CSS/Bootstrap & JavaScript for frontend development, and Thyme-leaf for the communication between the two.

    2. **Database Management System:** We will use a MySQL relational database.

    3. **Version Control System:** We will use Git and GitHub for tracking changes in the software's source code.

    4. **Containerization and Deployment:** Docker is for containerizing the application ensuring consistent behavior across different environments.

- **Hardware Requirements:**

    1. **Workstations**: Computers with sufficient processing power and memory for the development team.

    2. **Network Infrastructure:** High-speed internet connection for seamless development, testing, and content upload.

## 1.7 Project Limitations

These limitations provide clarity regarding what Tero will not encompass, helping to manage expectations and focus on its core functionalities.

1. **No Third-Party Integrations:** The system will not integrate with third-party platforms or services. It will operate as a standalone web application without connections to external systems, databases, or APIs.

2. **Non-Web Platforms Excluded:** Tero will not extend its functionality to non-web platforms, such as mobile apps or desktop applications. It is primarily designed as a web-based platform accessible via web browsers.

3. **Scope of Communication:** The system facilitates communication between students and companies primarily for collaboration, information exchange, and feedback related to training. It is not intended for broader social networking or personal communication purposes.

4. **Limited Resource Allocation:** The project has defined constraints, including budget, timeline, and technical expertise. Scope changes must align with these limitations and undergo review.

## 1.8 Project Expected Output

Upon completion, Tero will stand as an efficient web-based platform optimized for both desktop and mobile interfaces. Tero aims to bridge the divide between students seeking industrial training opportunities and companies offering these essential experiences. The platform will offer distinct interfaces tailored for students and companies. Companies can post and manage their training positions, while students can browse, select, and directly apply.

## 1.9 Project Schedule

The estimated project schedule is illustrated in Table 1.

**Table 1: Project Schedule**

| Task | Task Name | Start Date | End Date | Duration (WD) | Dependencies |
|---|---|---|---|---|---|
| **T1** | Data Gathering | 16/7/2023 | 20/7/2023 | 5 | - |
| **T2** | Project Planning | 23/7/2023 | 30/7/2023 | 6 | T1 |
| **T3** | Feasibility Study | 31/7/2023 | 3/8/2023 | 4 | T2 |
| **T4** | Requirements Specifications | 2/8/2023 | 10/8/2023 | 7 | T2 |
| **T5** | System Analysis and Design | 11/8/2023 | 21/8/2023 | 7 | T4 |
| **T6** | Graphical User Interface Design | 15/8/2023 | 24/8/2023 | 8 | T4 |
| **T7** | Implementation | 9/10/2023 | 18/12/2023 | 51 | T5, T6 |
| **T8** | Verification and Validation | 19/12/2023 | 01/01/2024 | 7 | T7 |
| **T9** | Modification and Calibration | 05/01/2024 | 10/01/2024 | 7 | T8 |
| **T10** | Delivery | 11/01/2024 | 11/01/2024 | 1 | T9 |

The PERT diagram for the project schedule is illustrated in Figure 1. A PERT diagram is a project management tool that uses nodes and arrows to show tasks, their dependencies, and time estimates. It helps plan projects by identifying critical tasks and the project's overall timeline.

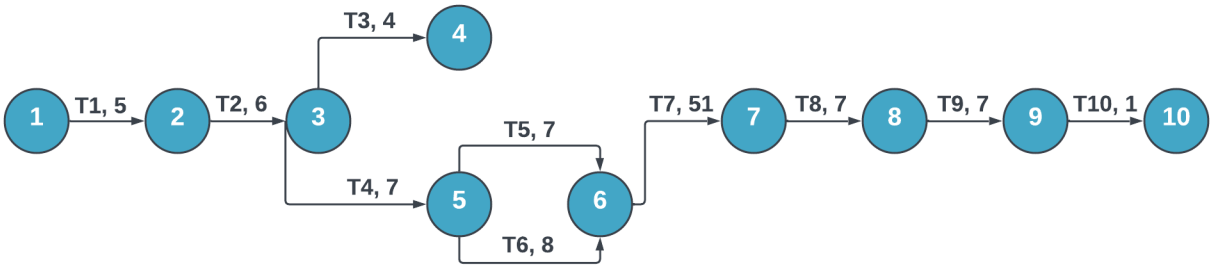


**Figure 1: Pert Diagram**

We can detect from the PERT diagram that the critical path is 92 working days, and the critical activities are T1, T2, T4, T6, T7, T8, T9, and T10, meaning that any delay on one of these critical activities will cause the entire project to get delayed.

The Gantt Chart can be found in Figure 2. A Gantt chart is a visual project management tool that displays tasks, their durations, and their relationships over a timeline. It helps track project progress, allocate resources, and manage project schedules.

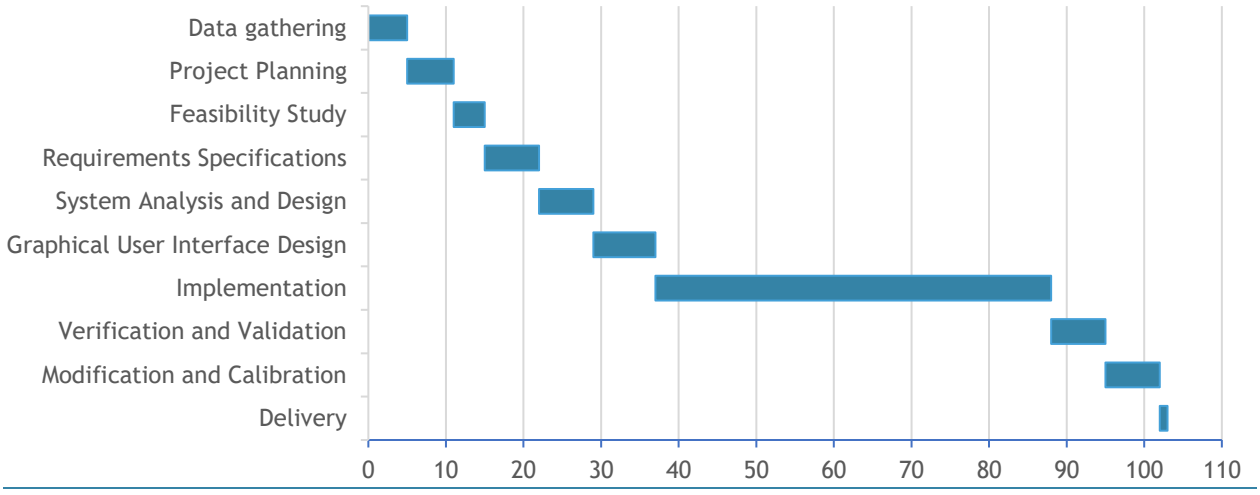


**Figure 2: Gantt Chart**

## 1.10 Report Outline

- **Chapter One** sets the foundation, discussing the project's background, motivation, problem statement, objectives, scope, technical needs, limitations, expected results, and schedule.
- **Chapter Three** delves into the project's feasibility, the methods used to gather requirements, the targeted users, and both functional and non-functional requirements.
- **Chapter Four** presents the project's blueprint, showcasing various diagrams that detail system interactions, structures, and user interface designs. These diagrams include context diagram, data flow diagram, entity relationship diagram, use case diagram, sequence diagrams, and class diagram.
- **Chapter Five** focuses on the actual construction of the system. It typically describes the programming languages, frameworks, and databases used, in this case, java, Spring Boot, and MySQL.
- **Chapter six** discusses System Testing and Installation, Heuristic and Cooperative Evaluation will be explained, we will proceed afterward to discuss our Requirements Validation and Completeness, and finally, System Installation
- **Chapter Seven** presents the Project Conclusion and Future Work, we will also summarize our Overall Weaknesses and Strengths, in addition to our Future Work Plan.

# CHAPTER THREE: SYSTEM REQUIREMENTS ENGINEERING AND ANALYSIS

## 3.0 Introduction

This chapter delves into the crucial phase of system requirements engineering and analysis. This stage is foundational to the project, ensuring that the platform we develop aligns with the needs and expectations of its users. By conducting a thorough feasibility study, employing various requirements elicitation techniques, and defining both functional and non-functional requirements, we aim to create a blueprint that will guide the design and development phases.

## 3.1 Feasibility study

### 3.1.1 Technical Feasibility

Tero relies on several technical factors to function properly. Some of these technical feasibility aspects include:

1. **Hardware Requirements**: Tero aims to be accessible to students and companies. It should be designed to work on common hardware configurations typically found in universities and organizations, such as desktop computers, laptops, tablets, and smartphones. Additionally, it should not have overly demanding hardware requirements to ensure accessibility to a wider audience.

2. **Software Requirements:** The software stack should be selected with compatibility and scalability in mind. It should include reliable and well-established technologies for

web development and database management. The system should be developed using frameworks and libraries that are known for their stability and scalability.

3. **Data Availability:** Tero heavily relies on accurate and up-to-date data, including user profiles, job advertisements, and application records. Data should be securely stored, regularly backed up, and subject to data integrity checks to prevent errors or corruption.

Technical feasibility was measured by performing a technical assessment of the system, which gave insights into the availability of resources, compatibility, and scalability. Based on the technical assessment of the system, it was determined that Tero is technically feasible and has the potential to be developed and implemented successfully. To prove this further, a prototype can be developed to test the system in a controlled environment. This will help identify any potential technical issues and allow for adjustments to be made before implementing the system on a larger scale.

### 3.1.2 Operational Feasibility

To assess the operational feasibility of Tero, we conducted surveys and interviews with key stakeholders, including students and companies involved in the training process. We also closely examined the current methods and processes used for training management within universities and organizations, identifying potential areas for improvement.

Based on the feedback and observations we received, we found that Tero is operationally feasible. The system's user interface is intuitive and easy to navigate, and it provides students with accurate and up-to-date relevant job advertisements and internship opportunities. Additionally, the system's maintenance and updating can be easily managed by the IT staff.

### 3.1.3 Economic Feasibility

The economic feasibility of Tero was analyzed by conducting a cost-benefit analysis of the project. The cost-benefit analysis involved calculating the total costs of developing and maintaining the system against the benefits that the system would bring to the organization.

- **Cost**

Starting with the cost, cost can be classified into development cost and operating cost. Development cost includes the salaries of the development team, as well as the cost of hardware and software.

**Table 2: Development costs: Team salary**

| Role | Cost per hour (USD) | Hours Worked | Total Cost (USD) |
|---|---|---|---|
| Project Manager | 30 | 50 | 1500 |
| Quality Assurance | 20 | 15 | 300 |
| Software Architect | 30 | 10 | 300 |
| UI/UX Designer | 25 | 30 | 750 |
| Business Analyst | 20 | 15 | 300 |
| Marketing | 20 | 5 | 100 |
| Technical Writer | 20 | 10 | 200 |
| Database Administrator | 20 | 40 | 800 |
| **Grand Total** | | | **4250** |

Table 3: Development costs: Hardware & Software

| Type | Description | Quantity | Unit Price (USD) | Total Price (USD) | Note |
|---|---|---|---|---|---|
| **HW** | Computers | 4 | 1000 | 4000 | To write and test code |
| **HW** | Server Infrastructure | 1 | 4000 | 4000 | To host the system and for DBMS |
| **HW** | **Netw**ork Infrastructure | 1 | 100 | 100 | High-speed internet connection |
| **SW** | Database Management System | 1 | 400 | 400 | To store user profiles, job advertisements, and application records. |
| **SW** | Web Development Framework | 1 | 0 (Many frameworks are open source and free) | 0 | Framework for developing the web application. |
| **SW** | Frontend Framework/Library | 3 | 0 (Many frameworks are open source and free) | 0 | To build user interface |
| **SW** | Development Tools (IDE, Version Control, CI/CD Tools) | 3 | 0 (Many development tools are open source or have free versions) | 0 | Essential tools for development and collaboration. |
| **SW** | Testing and Quality Assurance Tools | 1 | 0 Open-source testing frameworks are available) | 0 | For app Validation and Verification |
| **SW** | Cloud Services | As needed | Varies (Based on usage) | _ | Cloud services for hosting and scalability |
| **Grand Total** | | | | **8500** | |

Table 4: Operating Costs

| Description | Average cost per year (USD) |
|---|---|
| Utility | 200 |
| Maintenance and Repair | 1000 |
| Updates and Enhancements | 800 |
| Marketing and Advertising | 800 |
| **Total** | **2800** |

- **Benefit**

The benefit of Tero is mostly intangible benefit, such as improved student experience, enhanced administrative efficiency, and an elevated institutional reputation as a technology-driven educational provider. These intangibles, though challenging to quantify monetarily, play a pivotal role in creating a positive training environment. While the potential for revenue generation exists, it may come at the expense of user satisfaction, prompting a choice between financial gains, and prioritizing a superior user experience. For a cost-benefit analysis, exploring tangible benefits like reduced administrative costs or increased partnerships is advisable, but the inherent value of intangible benefits remains paramount in evaluating the project's impact.

Table 5: Benefit Costs

| Description | Average benefit per year (USD) |
|---|---|
| In-App Advertisements | 2000 |
| Premium Features | 800 |
| Data Monetization | 500 |
| Sponsorship Opportunities | 1500 |
| **Total** | **4800** |

- **Cost-Benefit Analysis**

After calculating the cost and benefit, Economic Feasibility can now be assessed using Payback Analysis, Return on Investment, and Net Present Value.

Tero's total development cost is equal to 6670USD. Assuming a 10 percent discount rate, the estimated net operating cost and estimated net benefits over five years of operation is:

**Table 6: TMS estimated net cost and benefit over five years.**

| Year | Estimated Net Operating Cost (USD) | Estimated Net Benefit (USD) |
|---|---|---|
| **0** | 6670 | 0 |
| **1** | 2400 | 4800 |
| **2** | 2600 | 5000 |
| **3** | 2700 | 5200 |
| **4** | 2850 | 5250 |
| **5** | 3000 | 5500 |

This is used to compute total present value of costs and total present value of benefits:

**Table 7: Total Present Value of costs**

| Cost | Discount Factor | PV Cost |
|---|---|---|
| 6670 | 1.000 | 6670.00 |
| 2400 | 0.909 | 2181.60 |
| 2600 | 0.826 | 2147.60 |
| 2700 | 0.751 | 2027.70 |
| 2850 | 0.683 | 1946.55 |
| 3000 | 0.621 | 1863.00 |
| **Total** | | 16836.45 |

**Table 8: Total Present Value of Benefits**

| Benefit | Discount Factor | PV Benefit |
|---|---|---|
| **0** | 1.000 | 0 |
| **4800** | 0.909 | 4363.20 |
| **5000** | 0.826 | 4130.00 |
| **5200** | 0.751 | 3905.20 |
| **5250** | 0.683 | 3585.75 |
| **5500** | 0.621 | 3415.50 |
| **Total** | | 19399.65 |

As shown above, the total present value of benefits is more than the total present value of costs after five years of operating Tero, providing proof that Tero is economically feasible. Moreover, the Return on Investment (ROI) can be calculated:

Lifetime ROI = 15.20%

Annual ROI = 3.04%

This indicates that the project has the potential to generate a positive return on investment over its lifetime. While the economic benefits of the project may not be immediate or significant, they are the cherry at the top when compared to all the other intangible benefits Tero provides.

### 3.1.4 Schedule Feasibility

To ensure schedule feasibility, a detailed project plan was developed, outlining each task and its timeline. This project plan will be regularly reviewed and updated throughout the project to ensure that it remains on track and within the planned timeline. Many other methods were also used, such as, Gantt chart, PERT diagram and critical path analysis.

Based on the estimated timeline for each task, it was determined that the platform can be completed within the given timeline, if there are no major delays or unexpected issues, thus proving its Schedule feasibility.

### 3.1.5 Legal Feasibility

To ensure Tero's legal feasibility, Tero will comply with all relevant laws and regulations regarding data privacy, security, and intellectual property. The system will collect and use data only with the user's consent and will take all necessary measures to protect user data from unauthorized access or misuse. Additionally, the system will be designed to respect copyright laws and intellectual property rights of third parties, with these measures in place, Tero is considered legally feasible.

## 3.2 Requirements Elicitation Techniques

### 3.2.1 Survey

Our survey was designed to capture an understanding of the students' challenges, preferences, and expectations regarding Arabic language learning. It combined a mix of open-ended questions, which provided insights into students' personal experiences and challenges, and multiple-choice questions, which offered structured feedback on preferred features, content formats, and learning methods.

We distributed the survey to a sample of students who have a passion for IT, aiming to collect insights that will inform the subsequent phases of system design and implementation. This data will be instrumental in tailoring Tero to meet the specific needs and expectations of its users, ensuring that the final product aligns seamlessly with their requirements. The survey questions and their corresponding responses can be found in Appendix A.

### 3.2.2 Interview

An interview was conducted with Dr. Mousa Alakhras on August 10, 2023, to gain a deeper understanding of the challenges, preferences, and needs of stakeholders, including students and companies involved in the training process. The interview questions and their answers can be found in Appendix B.

### 3.2.3 Observation

During our observation sessions, we focused on students who have a passion for IT. One of the most prominent observations was the communication challenges faced by students in interacting with companies involved in the training process. Simple exchanges, such as discussing training opportunities or conveying inquiries, frequently posed difficulties. Many students were observed resorting to various communication tools and methods, underscoring the need for effective communication within the platform. These observations emphasize the significance of providing clear and user-friendly communication features, in addition to the core functionalities, to facilitate seamless interaction between students and companies within the system.

## 3.3 Targeted Users

- The proposed web application will cater to the following user groups:

1. **Students:** Individuals seeking to enhance their practical skills and engage in training courses relevant to their academic journey.
2. **Companies:** Organizations looking to offer and manage training courses, connect with motivated students, and potentially identify future employees.

### 3.4.1 Functional Requirements Definition

- ✓ User:

1. Sign Up
2. Login.
3. Forgot Password.
4. Two-factor authentication (2FA)
5. View Profile.
6. Manage Profile.
7. Change Password.
8. Logout.

- ✓ Student:

1. View Advertisements.
2. Search And Filter Advertisements.
3. View Description.
4. Apply Job.
5. View Notifications
6. Mark Notification as Read
7. View Community Feedback
8. Provide Feedback
9. Edit Feedback.
10. Delete Feedback.

- ✓ Company:
    1. Post Ads.
    2. View Notifications.
    3. Mark Notification as Read
    4. View Advertisements.
    5. Search and Filter Advertisements.
    6. Edit Ads.
    7. Delete Ads.

- ✓ Admin:
    1. View Dashboard.
    2. View Users.
    3. Delete Users.
    4. View Advertisements.
    5. Search and Filter Advertisements.
    6. Approve/Reject Advertisement.
    7. View Community Feedback
    8. Approve/Reject Feedback Post.

## 3.5 Functional Requirements Specification

**Table 9: Users Functional Requirements**

| FR ID | Functional Requirement | Description |
|---|---|---|
| **Student** | | |
| **FR1** | Sign Up | Upon initiating the registration process, students will encounter a sign-up interface requesting specific details. They'll be prompted to provide a unique email address, first name, last name, a secure password, their major, and the university they attend. Once these fields are accurately filled, they can successfully create their account and will be redirected to the student dashboard. If any required information is missing or incorrect, an error message will appear, directing the student to make the necessary corrections. |
| **FR2** | Login | Upon accessing the platform, students will encounter a login interface where they are prompted to enter their registered email and password. If the provided credentials are valid, students will be authenticated through (2FA) and if it was a successful process, they will be granted access to their personalized dashboard and features. If either the email or password is incorrect, an error message will appear, instructing the student to re-input the correct details. |
| **FR3** | Forgot Password | When students can't recall their password, they can initiate this process from the login interface. By entering their registered email. Following the provided steps, they can securely set a new password and re-access their account. If the submitted email isn't linked to an existing account, a clear message will inform them that the email is incorrect. |
| **FR4** | Two-Factor Authentication (2FA) | Upon successful login, students receive a time-sensitive verification code which lasts for 3 minutes at their registered email. They must input this code in the provided 2FA interface on the platform to confirm their identity. If the code is correct, they gain full access to their account. If the code expires, they are redirected to enter their emails again and request a new verification code, and if it was entered incorrectly an error shows to enter the correct verification code. |
| **FR5** | View Profile | Once logged in, students will spot a profile icon in the top corner. Clicking on it unveils a dropdown showing their full name and their profile icon, directly below this summary, a “Manage Profile” button is present along with “Logout” button. |
| **FR6** | Manage Profile | Upon selecting the "Manage Profile" option, students are navigated to a detailed profile page displaying their current information. This interface provides two tabs one for profile details and the other is for changing the student’s password, the profile details have editable fields for the major, university affiliation, and also, they can add additional information like their phone number, address, and graduation year. Changes can be made directly, with a dedicated 'Save Changes' button ensuring updates are captured. |

| | | |
|---|---|---|
| **FR7** | Change Password | On the "Manage Profile" page, there's a "Change Password" tab. Here, students can update their password. They need to input their current password, a new password, and confirm the new password. The system performs validations on these fields, and any necessary error messages are displayed directly on the form. To complete the password update, students can click on the "Save Changes" button. |
| **FR8** | View Advertisements | As soon as students enter the interface, they will be presented with various advertisements from different companies. Each advertisement will highlight the company promoting the job which will include the following fields company name, along with the job title, number of interns required, job duration, postdate, job type, work mode, job image, view description button. |
| **FR9** | Search And Filter Advertisements | Located at the top header of the advertisement board, there is a search bar, enabling students to search for specific companies and job titles. Adjacent to the search bar, in the same header area, are various filtering options. These filters allow for sorting by job type, including on-site, remote, or hybrid, as well as by work mode, such as full-time or part-time. Through these search and filter functionalities, students can efficiently narrow down and customize the advertisements displayed according to their specific queries and preferences. |
| **FR10** | View Description | Each job widget on the student's interface has a "View Description" button. Clicking this button takes the student to a page detailing the job's specifics. On this page, students can read the full job description and click an "Apply" link to reach out to the company directly. |
| **FR11** | Apply Job | Within the "View Ad" page, students are presented with an "Apply" button alongside the detailed job description. By clicking on this button, they are seamlessly redirected to the company's application page, enabling them to initiate their job application process directly. |
| **FR12** | View Notifications | In the student interface, the top navigation bar features a notification icon, displaying the number of notifications. Clicking on this icon reveals a dropdown menu listing the notifications, which are typically alerts from the admin regarding feedback approvals or rejections. Each notification is clickable. When clicked, a prompt appears to confirm marking the notification as read, after which it is automatically deleted. |
| **FR13** | Mark Notification as Read | In the 'View Notifications' tab of the student's dashboard, students will see the number of unread notifications. Upon clicking this tab, a dialog box will appear, giving the user the option to mark each notification as read or leave it as unread. |
| **FR14** | View Community Feedback | Within the student dashboard, there is a dedicated tab labeled 'Community'. This section will display the feedback provided by other students. |
| **FR15** | Provide Feedback | In the community dashboard, students will have the opportunity to share their experiences with companies through a feedback system. This feature will include a form where students can input the name |

| | | |
|---|---|---|
| | | of the company, provide their detailed comments, and assign a rating based on their personal experience. |
| **FR16** | Edit Feedback | In the feedback section, a "pencil" icon will be displayed alongside each post. Clicking on this icon will initiate the post editing process, allowing students to update their feedback, including changes to the chosen company's name, their comment, or the rating they have provided. |
| **FR17** | Delete Feedback | In the feedback section, each post will feature a "trash" icon. When a user clicks on this icon, it will start the process to delete the post. The user will be prompted to either confirm the deletion or cancel the action, ensuring intentional and careful management of feedback content. |
| **FR18** | Logout | When the "Logout" option is selected which is presented in the user profile tab in top of the page, the system immediately terminates the student's active session and redirects them to the main login page. |
| **Company** | | |
| **FR19** | Sign Up | Upon initiating the registration process, companies will encounter a sign-up interface requesting specific details. They'll be prompted to provide a unique email address, a secure password , company name, and the company's phone number. Once these fields are accurately filled, they can successfully create their account and access the company's Interface. If any required information is missing or incorrect, an error message will appear, directing the company to make the necessary corrections. |
| **FR20** | Login | Upon accessing the platform, companies will encounter a login interface where they are prompted to enter their registered email and password. If the provided credentials are valid, companies will be authenticated through (2FA) and if it was a successful process, they will be granted access to their personalized dashboard and features. If either the email or password is incorrect, an error message will appear, instructing the company to re-input the correct details. |
| **FR21** | Forgot Password | When companies can't recall their password, they can initiate this process from the login interface. By entering their registered email. Following the provided steps, they can securely set a new password and re-access their account. If the submitted email isn't linked to an existing account, a clear message will inform them that the email is incorrect. |
| **FR22** | Two-Factor Authentication (2FA) | Upon successful login, companies receive a time-sensitive verification code which lasts for 3 minutes at their registered email. They must input this code in the provided 2FA interface on the platform to confirm their identity. If the code is correct, they gain full access to their account. If the code expires, they are redirected to enter their emails again and request a new verification code, and if it was entered incorrectly an error shows to enter the correct verification code. |
| **FR23** | View Profile | Once logged in, companies will spot a profile icon in the top corner. Clicking on it unveils a dropdown showing their company's name |

| | | |
|---|---|---|
| | | and their profile icon, directly below this summary, a “Manage Profile” button is present along with “Logout” button. |
| **FR24** | Manage Profile | Upon selecting the "Manage Profile" option, companies are navigated to a detailed profile page displaying their current information. This interface provides two tabs one for profile details and the other is for changing the company’s password, the profile details have editable fields for the phone number, and also, they can add additional information like their address, number of employees, and establishment year. Changes can be made directly, with a dedicated 'Save Changes' button ensuring updates are captured. |
| **FR25** | Change Password | On the "Manage Profile" page, there's a "Change Password" tab. Here, companies can update their password. They need to input their current password, a new password, and confirm the new password. The system performs validations on these fields, and any necessary error messages are displayed directly on the form. To complete the password update, students can click on the "Save Changes" button. |
| **FR26** | View Notifications | In the company interface, the top navigation bar features a notification icon, displaying the number of notifications. Clicking on this icon reveals a dropdown menu listing the notifications, which are typically alerts from the admin regarding advertisement approvals or rejections. Each notification is clickable. When clicked, a prompt appears to confirm marking the notification as read, after which it is automatically deleted. |
| **FR27** | Mark Notification as Read | In the 'View Notifications' tab of the company dashboard, students will see the number of unread notifications. Upon clicking this tab, a dialog box will appear, giving the user the option to mark each notification as read or leave it as unread. |
| **FR28** | View Advertisements | As soon as a company enters their interface, they will be presented with various advertisements from that they had posted if any exists if no ads are posted, a message displays: “No advertisements available”. Each advertisement will highlight the company’s information for the specific job they are viewing, which will include the following fields company name, job title, number of interns required, job duration, postdate, ad status, job type, work mode, and view description button. And on top of each advertisement a three-dotted icon is shown and upon pressing it two options are shown either to delete or edit a specific advertisement. Advertisements will also be colored based on the status of the ad. |
| **FR29** | Search and Filter Advertisements | At the top of the advertisement board, within the header area, a search bar and a job status filter are prominently featured. The search bar allows the companies to search for specific job titles. Additionally, right next to the search bar, a filter based on job status is available, offering options such as 'Pending', 'Approved', and 'Rejected'. Utilizing these tools, companies can effectively filter and tailor the display of advertisements according to their specific queries and preferences. |

| | | |
|---|---|---|
| **FR30** | Post Ads | Within the company's dashboard, the "Post Ads" button is prominently positioned at the top, inviting companies to promote their openings. Upon clicking, companies are presented with a meticulously designed form. This form requests essential details: the job position title, the number of interns or students required, the duration of the internship, and selections for job type (full-time or part-time), work mode (online, on-site, or hybrid), job image, and job description. Upon finishing a post job button is presented and when pressing it first we ensure necessary validations are made on the form fields and a success message when it is posted successfully. |
| **FR31** | Edit Ads | For those with active advertisements, each ad is presented in a widget format within the three-dotted menu on each ad. Upon clicking on it an edit ad option is shown. Clicking this shows a form with pre-filled values of the advertisement being edited so that companies can modify based on their preferences. After making changes, they can save updates using the "Submit Changes" button. |
| **FR32** | Delete Ads | For those with active advertisements, each ad is presented in a widget format within the three-dotted menu on each ad. Upon clicking on it a delete ad option is shown. Clicking this shows a confirmation message to the company if it wants to continue with the operation or not. After clicking on confirm deletion the advertisement is successfully deleted with a success message being displayed on screen. |
| **FR33** | Logout | When the "Logout" option is selected which is presented in the user profile tab in top of the page, the system immediately terminates the company's active session and redirects them to the main login page. |
| **Admin** | | |
| **FR34** | Login | Upon accessing the platform, the admin will encounter a login interface where they are prompted to enter their database credentials. If the provided credentials are valid, the admin will be granted access to their personalized dashboard and features. If their credentials are incorrect, an error message will appear, instructing the admin to re-input the correct details. |
| **FR35** | View Users | This section which is under the “Users” tab displays users and their specific details in the system. The details presented include the user's profile icon, email, name, role, join date, and an 'action' column featuring a delete button. Users are distributed across the pages through pagination. |
| **FR36** | View Dashboard | The admin's primary dashboard includes a comprehensive data summary of the system. This summary features the total number of users, companies, and students, along with the count of new users and advertisements added in the last 24 hours. Additionally, there is a table listing users with their details, specifically focusing on those added in the last 24 hours. |
| **FR37** | Delete Users | In the admin's interface, under the "Users" tab, there's an 'action' column featuring a delete icon. Clicking this icon prompts a confirmation message, asking the admin to either proceed with or |

| | | |
|---|---|---|
| | | cancel the deletion. If the deletion is confirmed, the user is removed from the system, and a success message is displayed on screen. |
| **FR38** | View Advertisements | In the admin's interface an "advertisements" tab is shown in which it will include all the advertisements that were posted by different if any exists if no ads are posted, a message displays: "No advertisements available". Each advertisement will highlight the company's information for the different jobs the admin will be viewing, which will include the following fields company name, job title, number of interns required, job duration, postdate, ad status, job type, work mode, and view description button. And on top of each advertisement a three-dotted icon is shown and upon pressing it two options are shown either to reject or approve a specific advertisement. Advertisements will also be colored based on the status of the ad. |
| **FR39** | Search and Filter Advertisements | At the top of the advertisement board, within the header area, a search bar and a job status filter are prominently featured. The search bar allows the admin to search for specific job titles and companies. Additionally, right next to the search bar, a filter based on job status is available, offering options such as 'Pending', 'Approved', and 'Rejected'. Utilizing these tools, the admin can effectively filter and tailor the display of advertisements according to their specific queries and preferences. |
| **FR49** | Approve/Reject Advertisement | Within the three-dotted menu, there will be "Approve" and "Reject" options. Selecting this trigger, a confirmation message to either proceed with or cancel the advertisement approval or rejection. Upon confirmation, the advertisement's color turns green, and red on rejection. Then a notification is sent to the company whose ad was approved or rejected. If the advertisement has already been approved or rejected, an error message is displayed, indicating that the ad has already received approval. |
| **FR41** | View Community Feedback | Within the admin dashboard, there is a dedicated tab labeled 'View Community Feedback'. This section will display the feedback provided by students. Each feedback entry will be accompanied by options for the administrator to either approve or reject the feedback post. |
| **FR42** | Approve/Reject Feedback | Within each feedback post, there is a "Approve" and "Reject" option. Selecting this trigger, a confirmation message to either proceed with or cancel the post approval or rejection. Upon confirmation, the feedback status is changed, and a notification is sent to the student whose post was approved or rejected. If the post has already been rejected, an error message is displayed, indicating that the post has already received rejection. |
| **FR43** | Logout | When the "Logout" option is selected which is presented in the left bar of the screen, the system immediately terminates the admin's active session and redirects them to the main login page. |

## 3.6 Non-Functional Requirements

**Table 10: Nonfunctional Requirements**

| NFR ID | Non-Functional Requirement | Description |
|---|---|---|
| **NFR1** | Security | The system should implement authentication mechanisms to ensure that only authorized users can access the application, and it uses Two factor Authentication (2FA) to be certain of the user's identity. Passwords are hashed before being stored in the database to ensure integrity. |
| **NFR2** | Performance | Upon interacting with the platform, students will experience responsive load times. Pages will be rendered within a designated timeframe, irrespective of user numbers. The system will be designed to process user requests quickly, it will use optimized algorithms and data structures to improve performance. |
| **NFR3** | Usability | User interfaces will be designed with simplicity and clarity in mind to meet usability and user experience standards. Clear instructions will accompany features, ensuring ease of use for both technical and non-technical users, while also considering factors such as font size and color contrast. |
| **NFR4** | Compatibility | The platform will function seamlessly across various modern operating systems, delivering a consistent experience. This compatibility will guarantee that students can engage with the platform using their preferred devices. |
| **NFR5** | Reliability | The application should maintain high availability, minimizing downtime and disruptions. Backup and recovery mechanisms should ensure data integrity in case of failures. |
| **NFR6** | Maintainability | The platform will be easily managed, updated, and enhanced over time. The codebase will be well-organized, modular, and follow best practices. Clear documentation, including code comments and user manuals, will be provided to aid developers, administrators, and users in understanding and utilizing the system effectively. |

## 3.7 Summary

in this chapter, we've taken the first steps in planning Tero. We started by making sure the project is feasible from various angles. We gathered information from our users through

surveys, interviews, and observations. We then outlined what the system should do (functional requirements) and how it should perform (non-functional requirements).

# CHAPTER FOUR: SYSTEM DESIGN

## 4.1 Introduction

Chapter Four delves into the design aspects of Tero. After having established a solid foundation of requirements in the previous chapter, we now transition into visualizing and structuring these requirements to create a coherent and user-friendly system. This chapter will introduce various design methodologies and tools, from data flow diagrams that map out the system's processes to entity-relationship diagrams that detail the relationships between different data entities. Additionally, we'll explore the user experience and interface design, ensuring that our platform is not only functional but also intuitive and engaging for its users.

## 4.2 Context Diagram

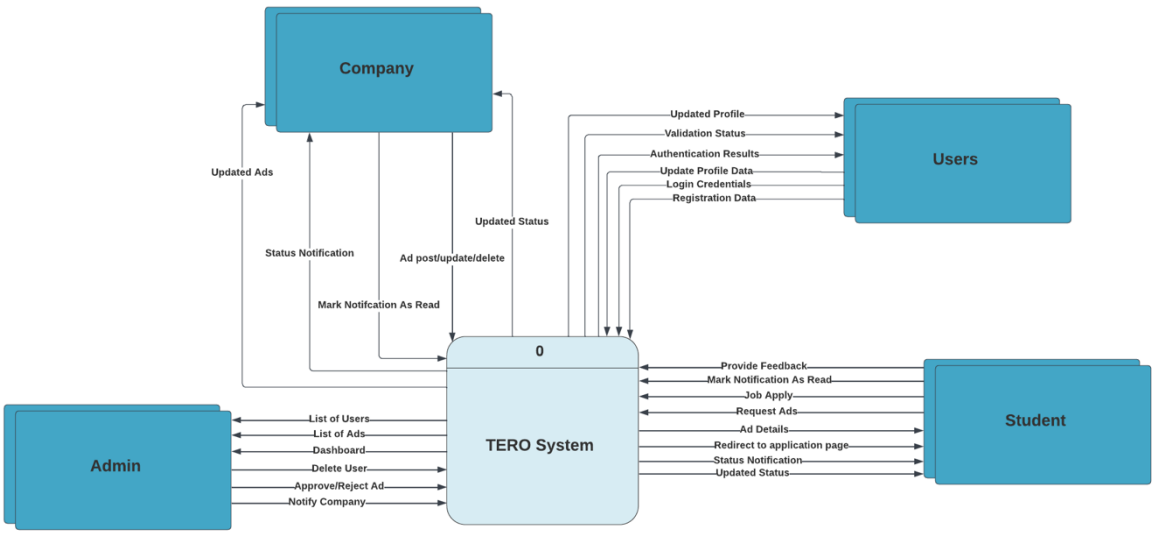


**Figure 3: Context Diagram**

## 4.3 Data Flow Diagram (DFD)

- **Student, Company, and Admin**

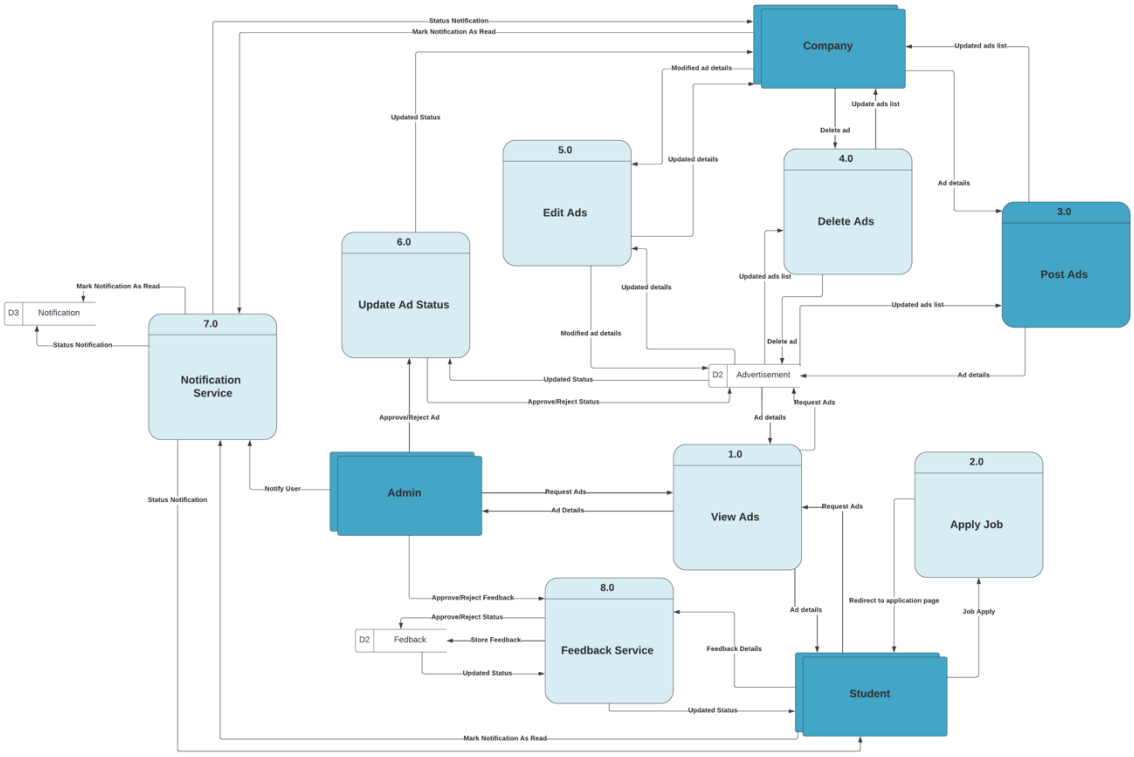


**Figure 4: Data Flow Diagram – Student & Company & Admin**

- **Admin and Users**

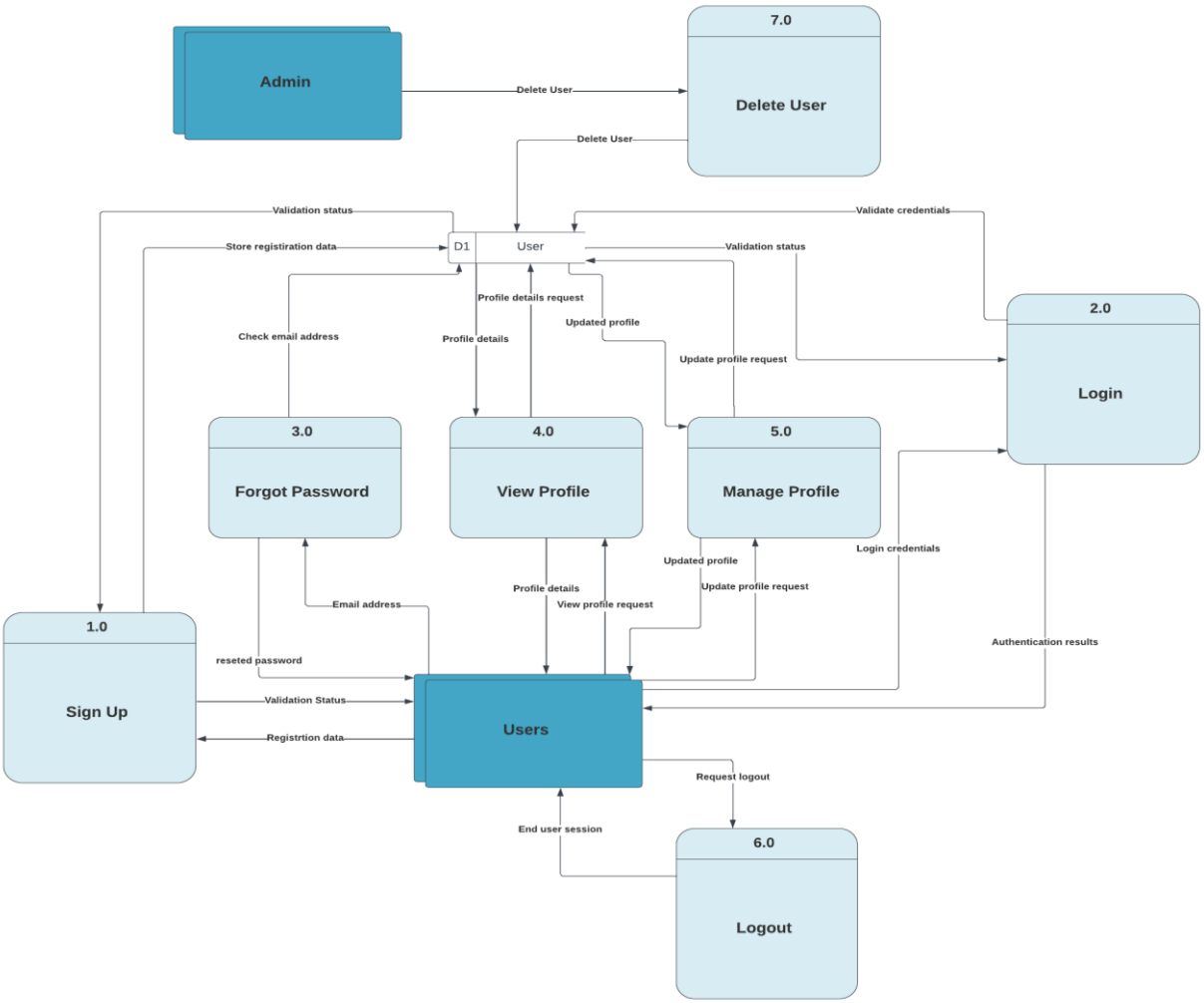


**Figure 5: Data Flow Diagram – Admin & Users**

## 4.4 Entity Relationship Diagram (ERD)

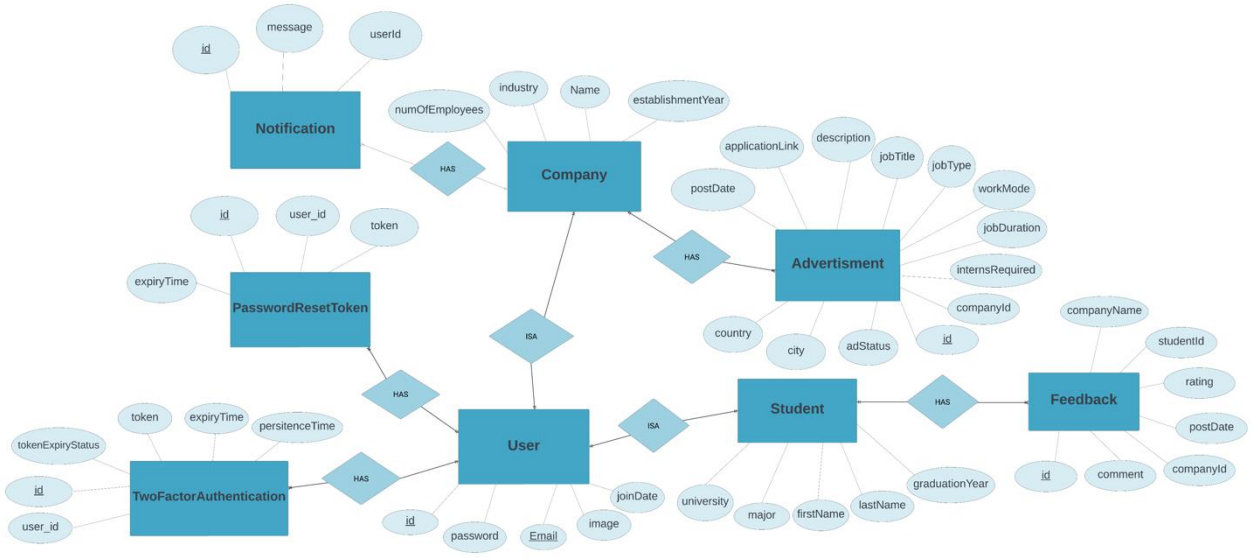


**Figure 6: Entity Relationship Diagram**

## 4.5 UML Use Case Diagram

### 4.5.1 Student Use Case Diagram

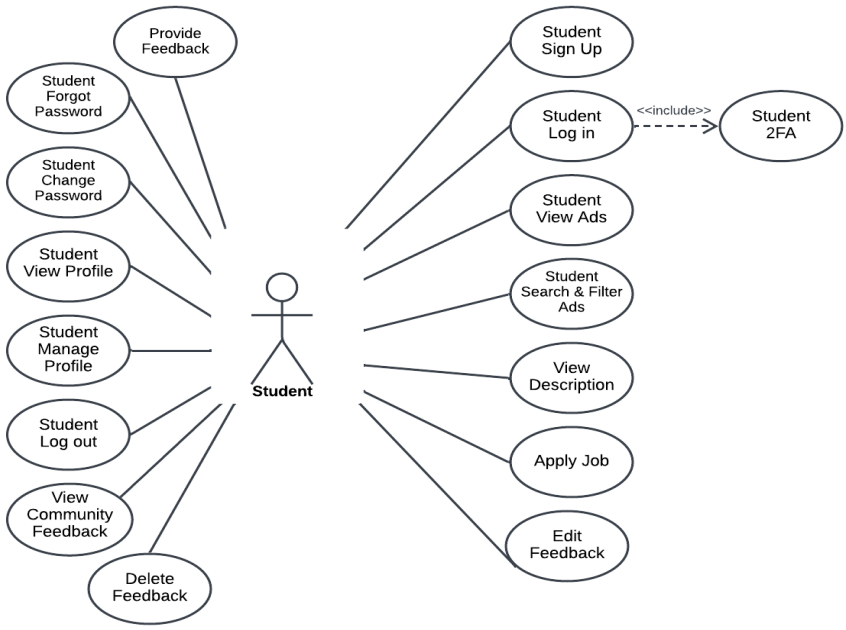


**Figure 7: Student Use Case Diagram**

### 4.5.2 Company Use Case Diagram

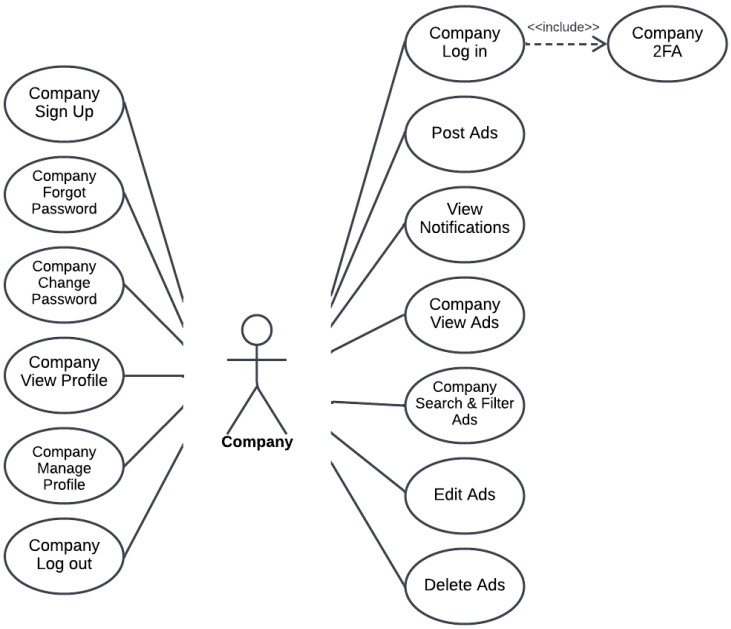


**Figure 8: Company Use Case Diagram**

### 4.5.3Admin Use Case Diagram

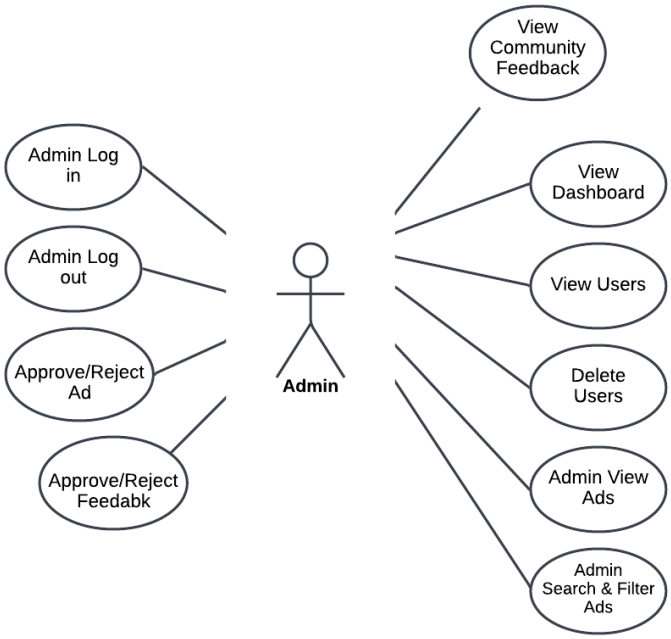


**Figure 9: Admin Use Case Diagram**

## 4.6 UML Sequence Diagram

### 4.6.1 Student

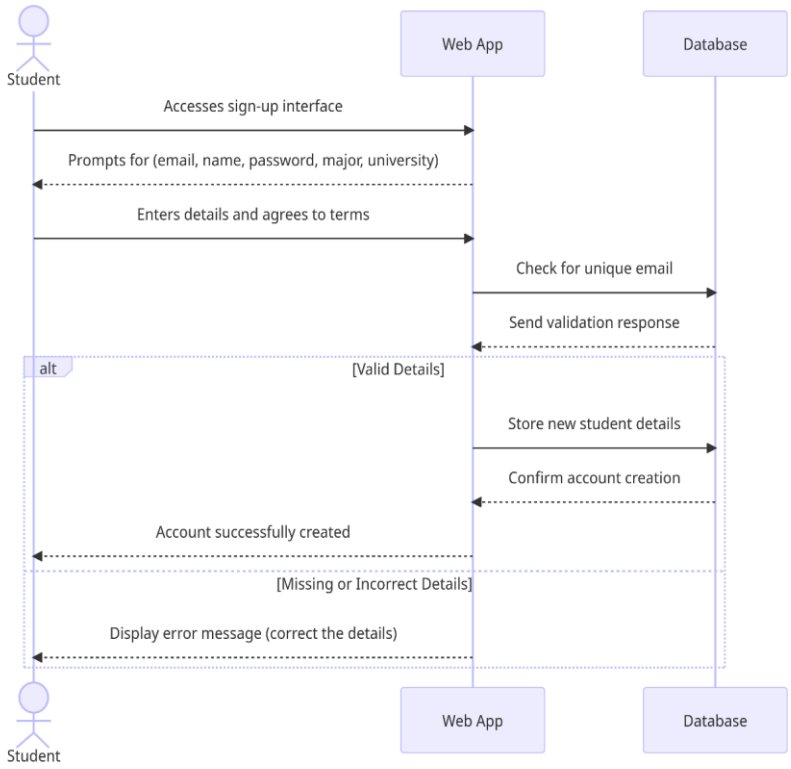


**Figure 10: Student Sign-Up Sequence Diagram**

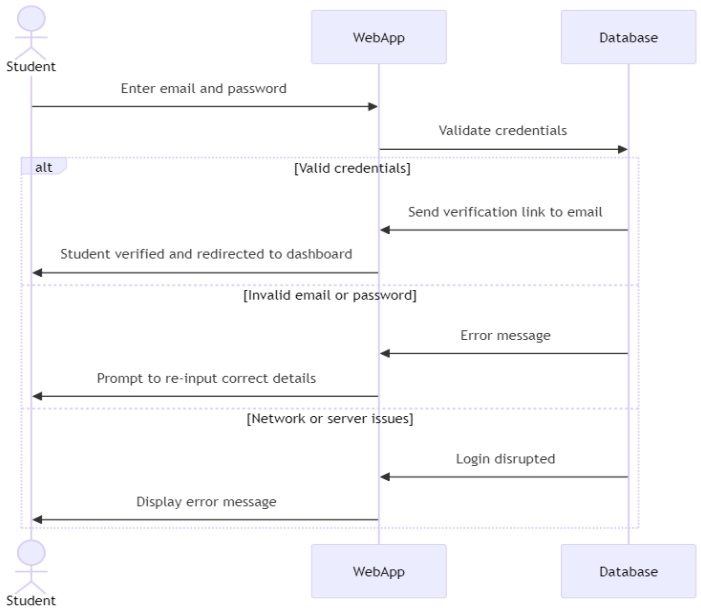


**Figure 11: Student Login Sequence Diagram**

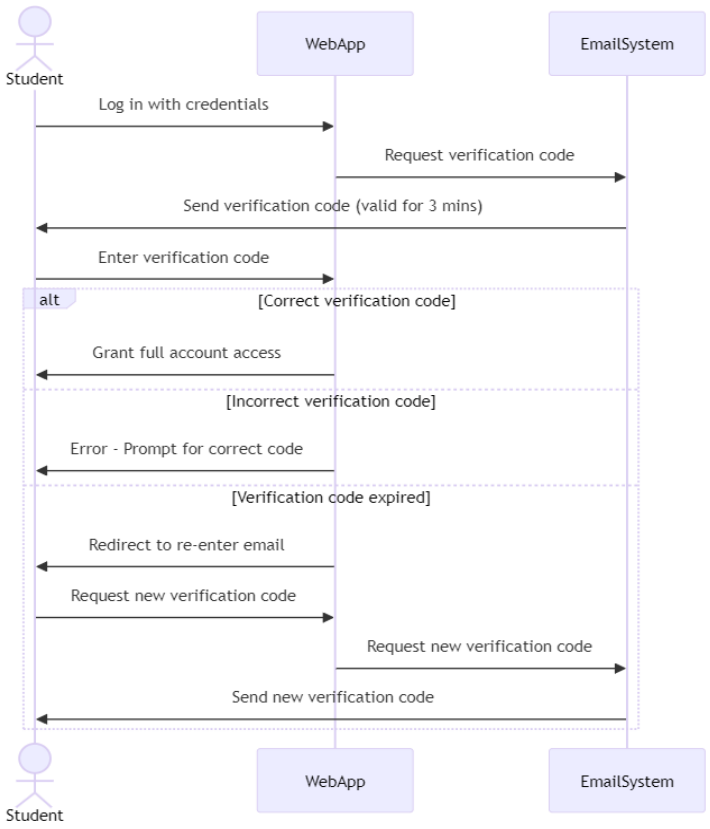


**Figure 12: Student 2FA**

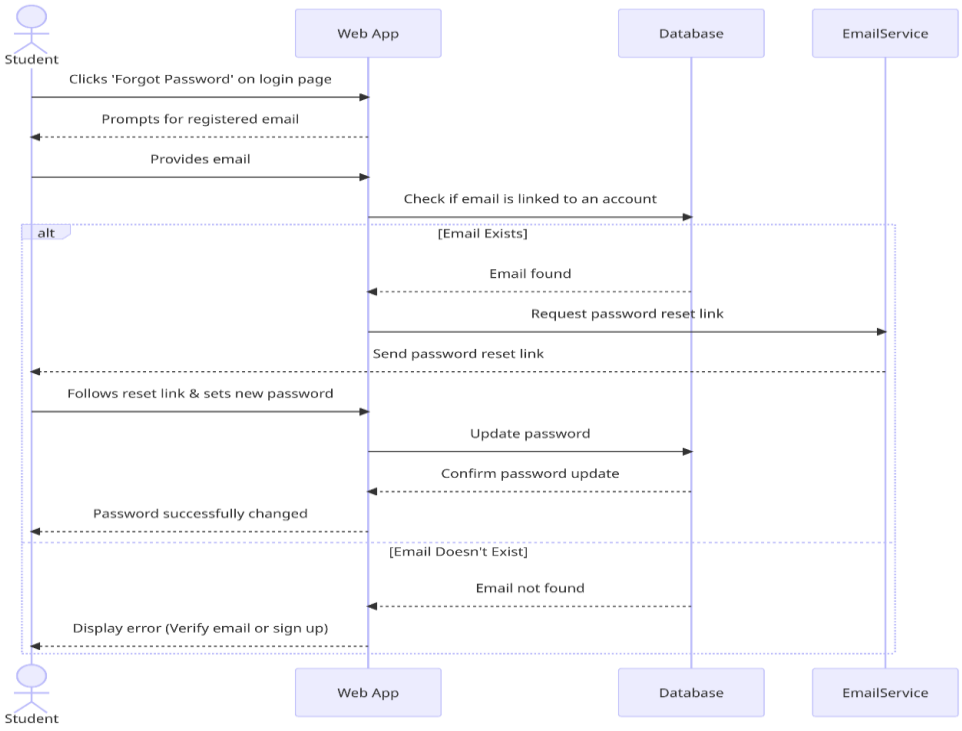


**Figure 13: Student Forgot Password Sequence Diagram**

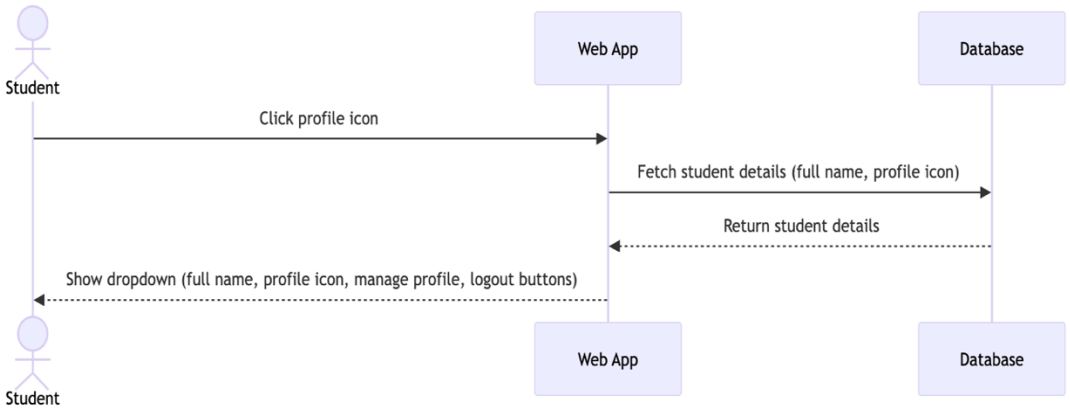


**Figure 14: Student View profile Sequence Diagram**

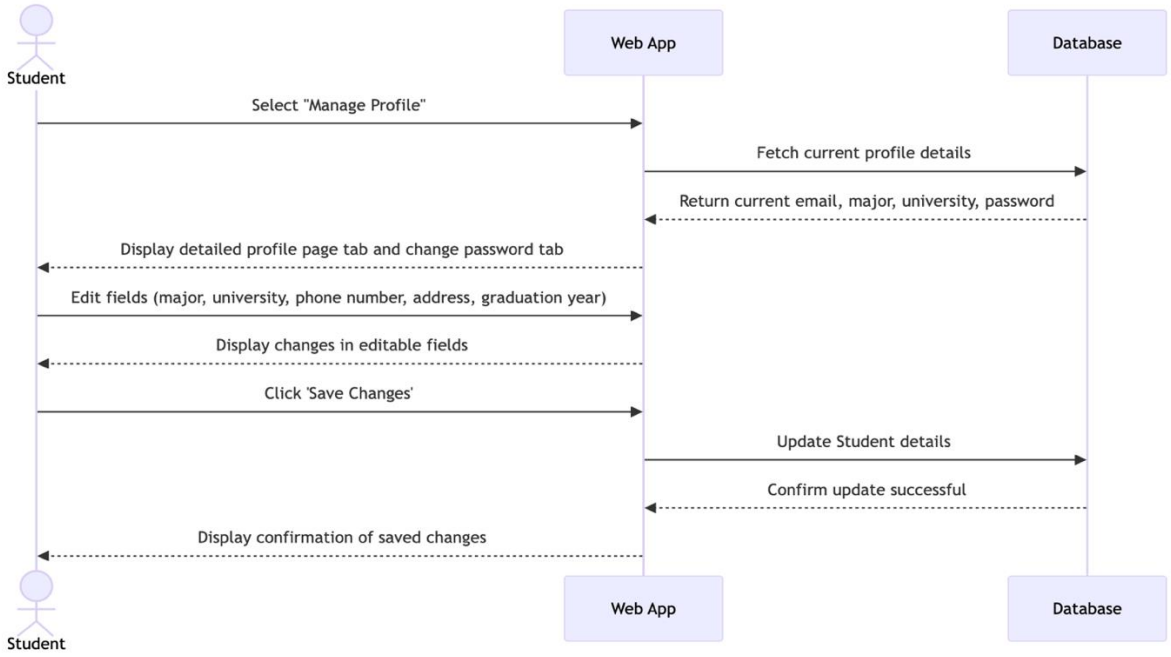


**Figure 15: Student Manage Profile Sequence Diagram**

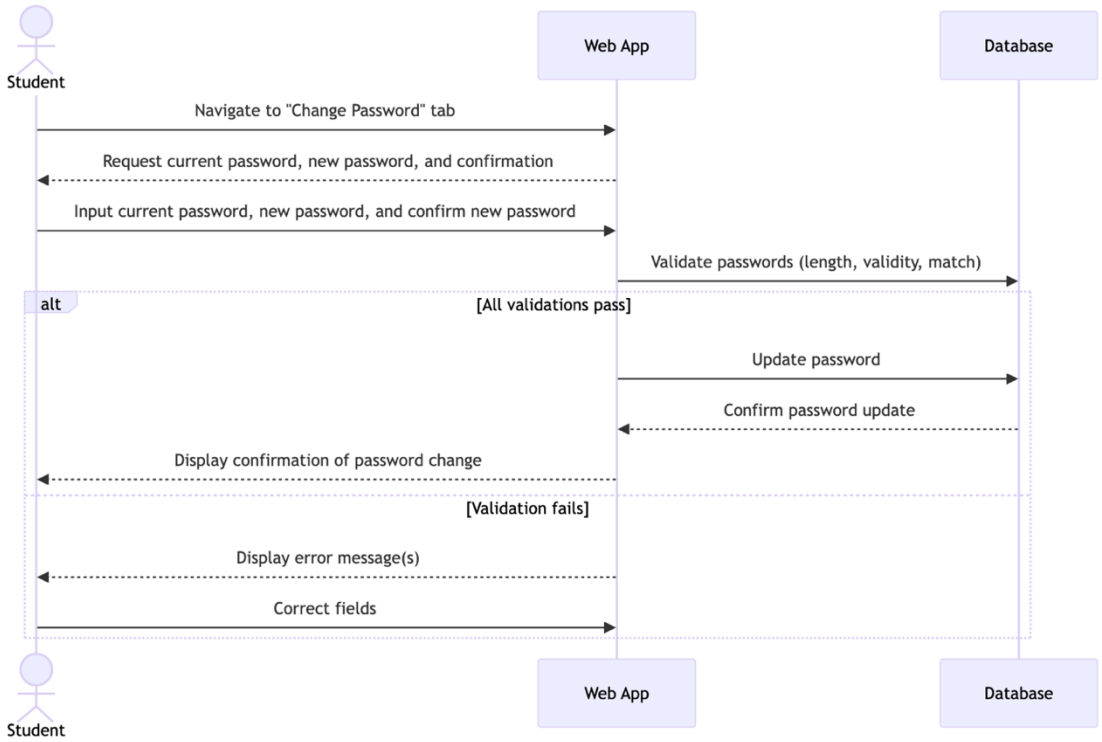


**Figure 16: Student Change Password Sequence Diagram**

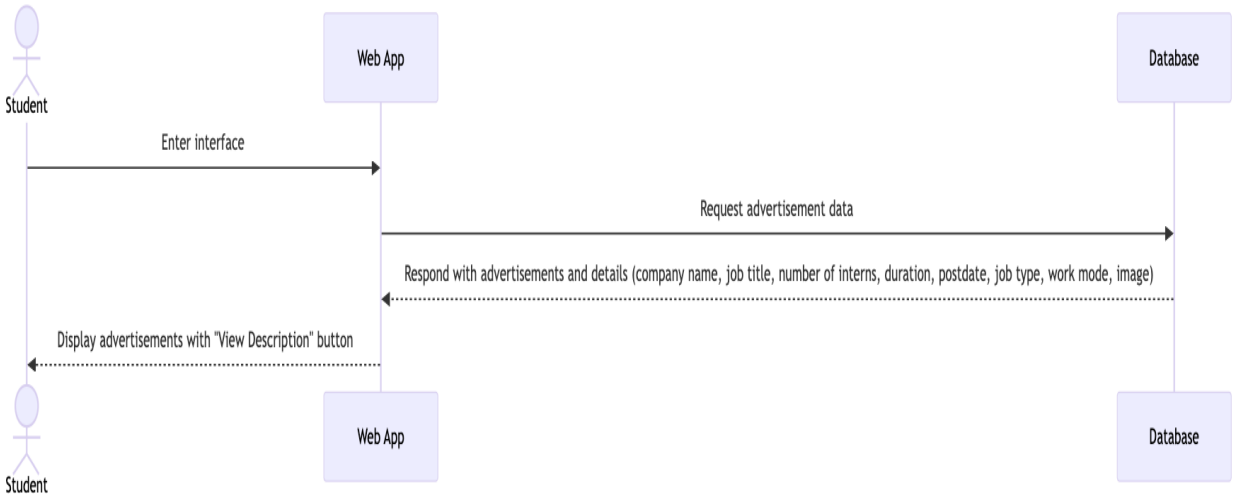


**Figure 17: Student View Advertisements Sequence Diagram**

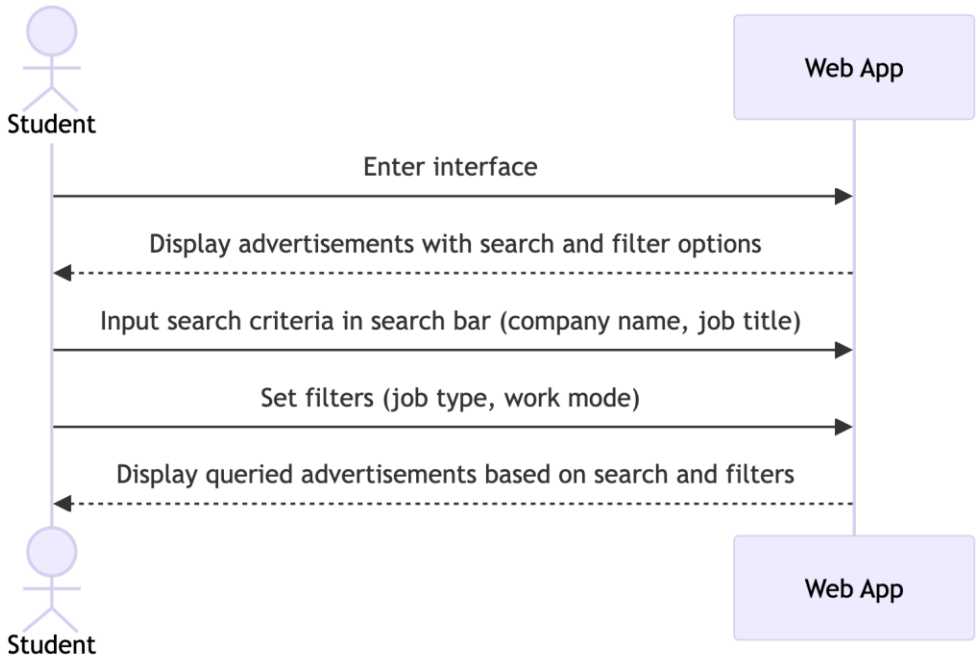


Figure 18: Student Search and Filter Advertisements Sequence Diagram

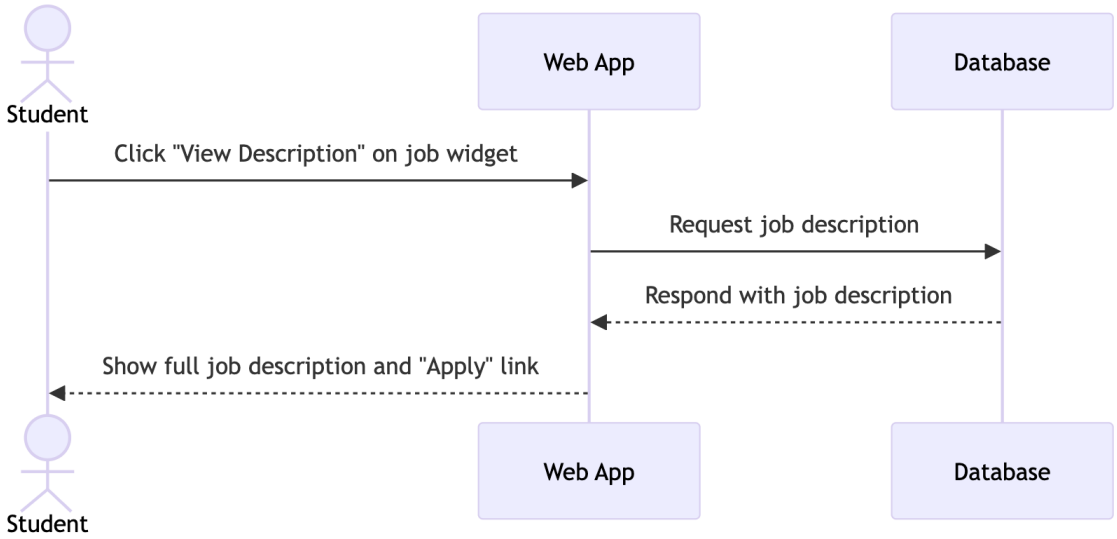


Figure 19: Student View Description Sequence Diagram

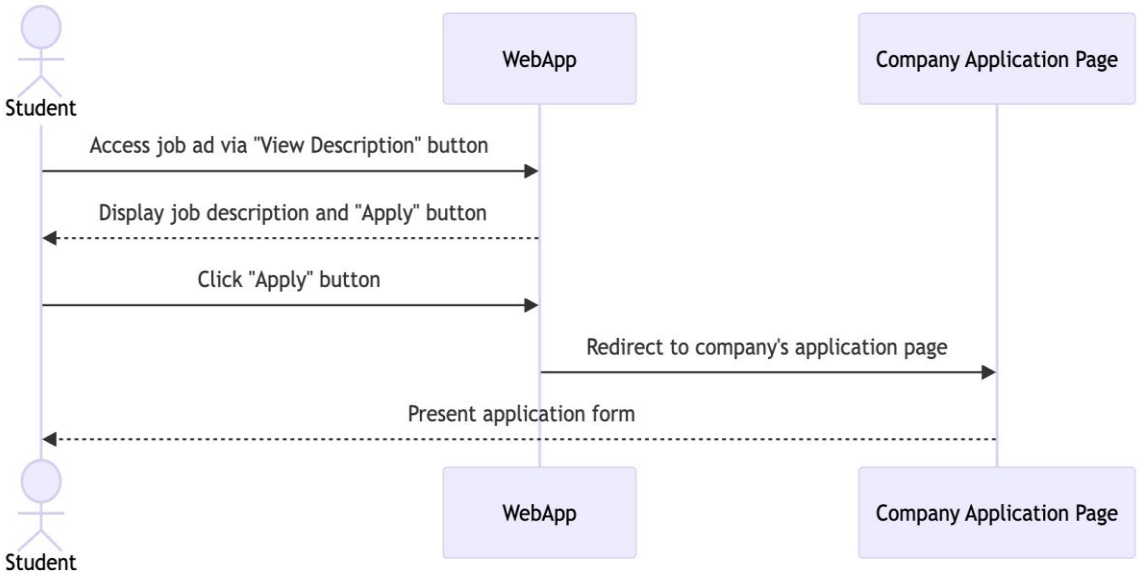


**Figure 20: Student Apply Job Sequence Diagram**

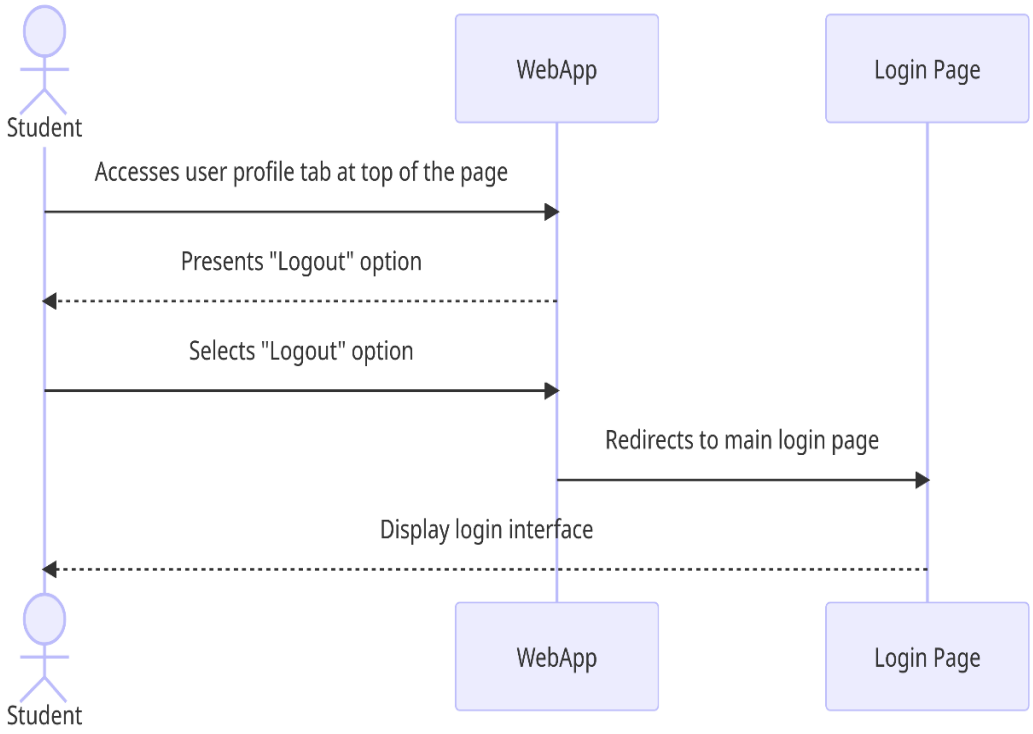


**Figure 21: Student Logout Sequence Diagram**

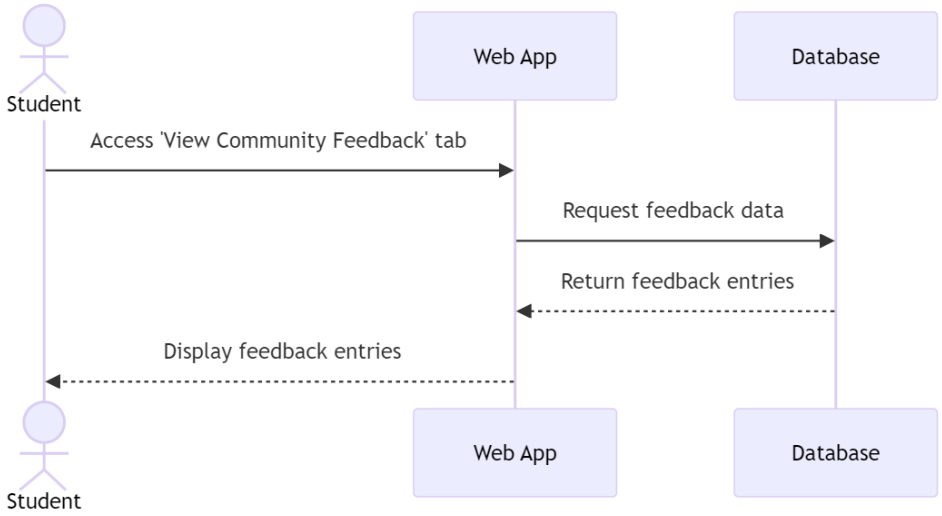


**Figure 22: Student View Community Diagram**

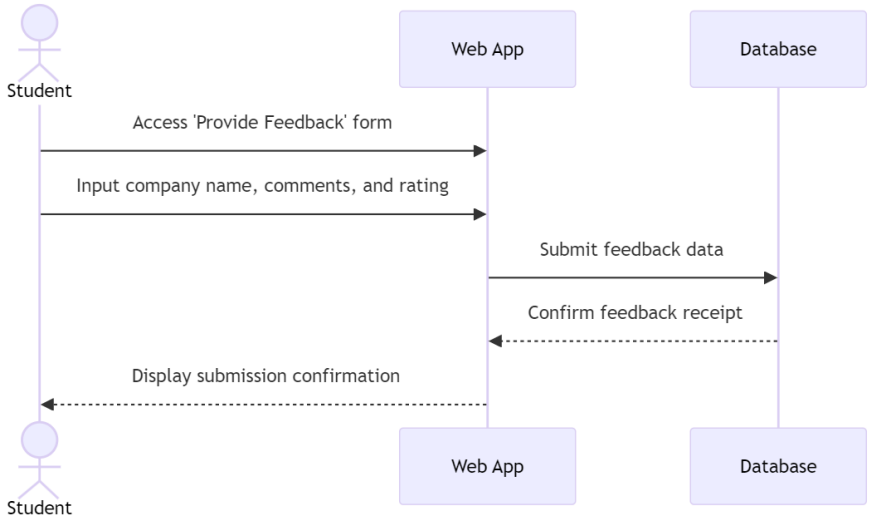


**Figure 23: Student Provide Feedback Diagram**

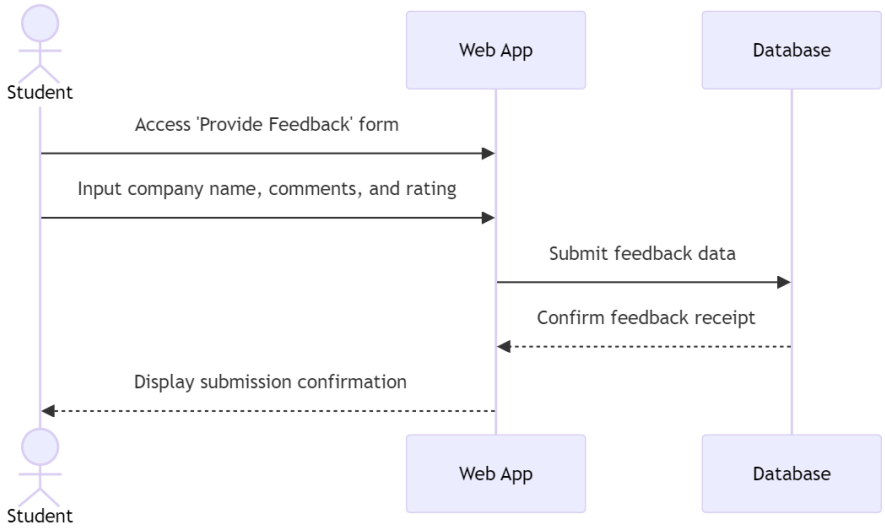


**Figure 24: Student Edit Feedback Diagram**

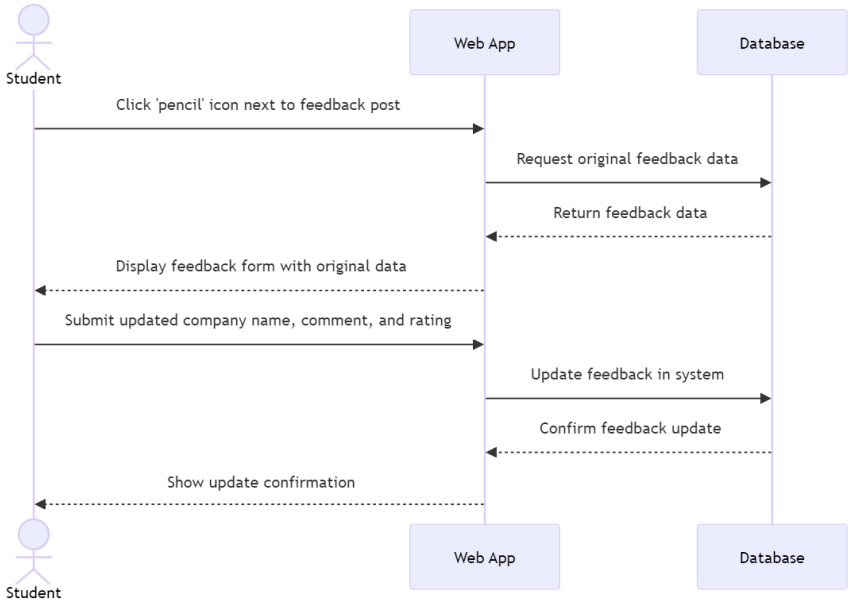


**Figure 25: Student Delete Feedback Diagram**

### 4.6.2 Company

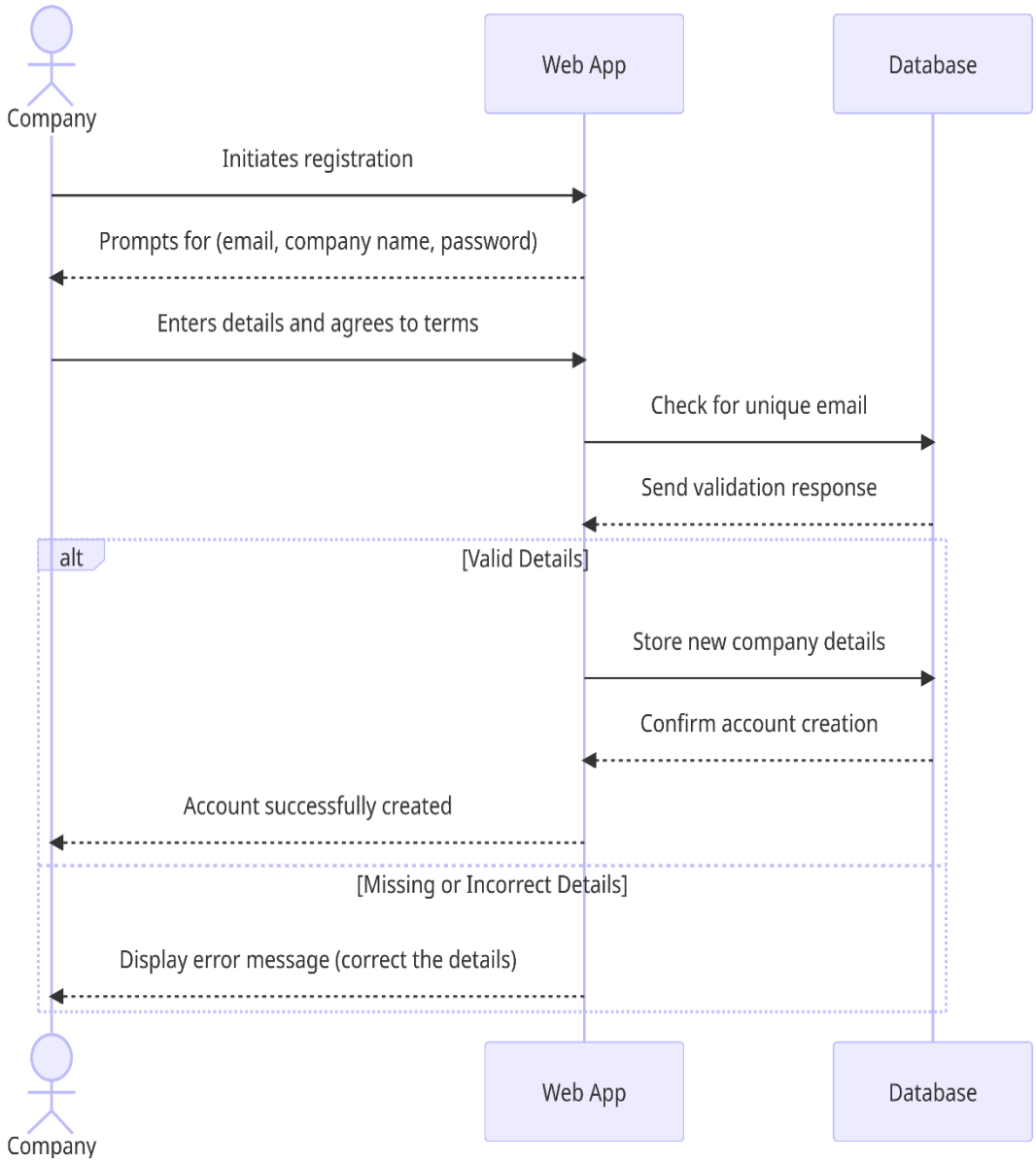


**Figure 26: Company Signup Sequence Diagram**

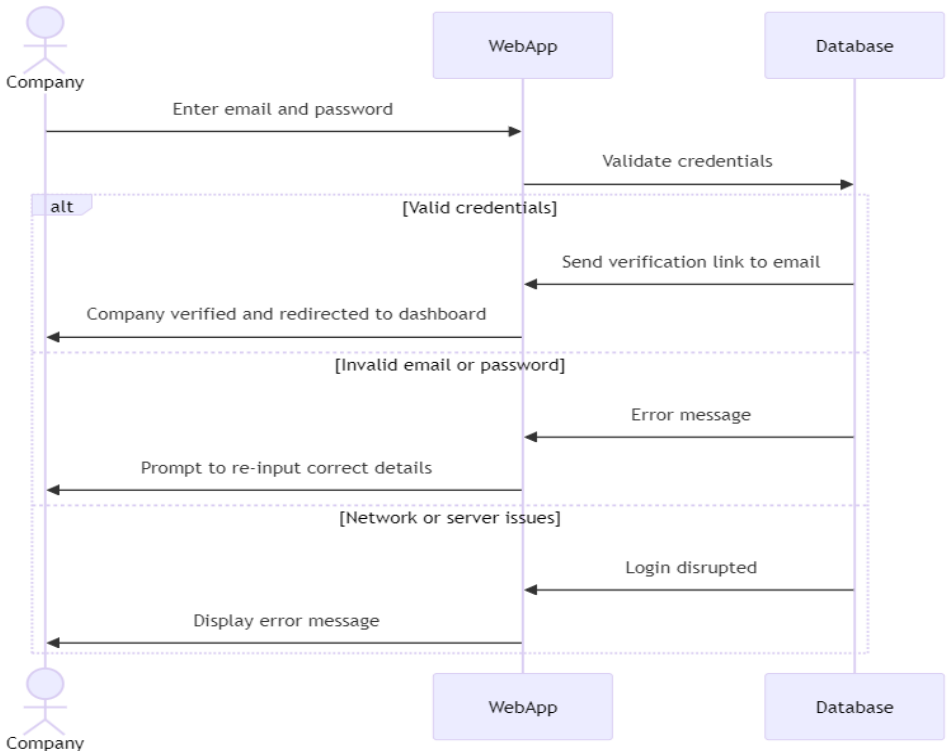


**Figure 27: Company Login Sequence Diagram**

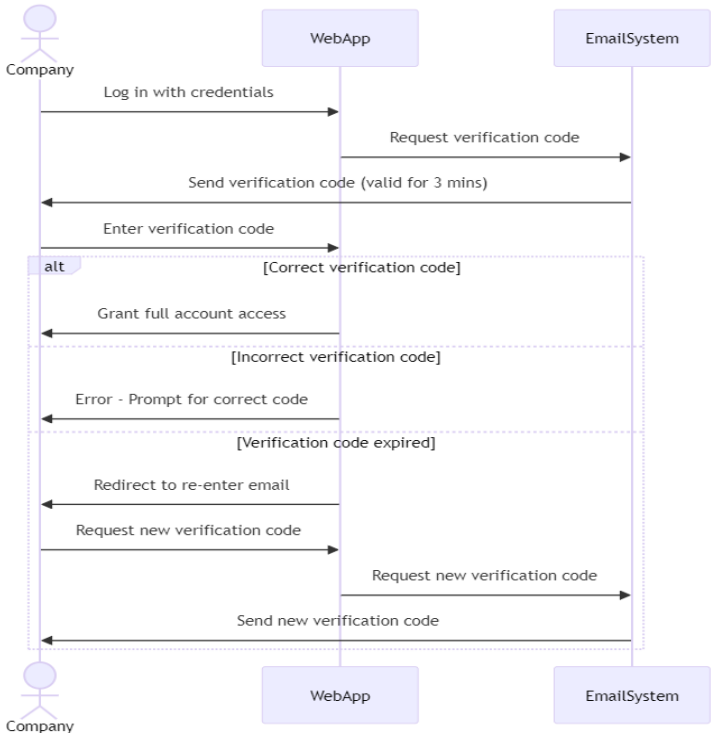


**Figure 28: Company 2FA**

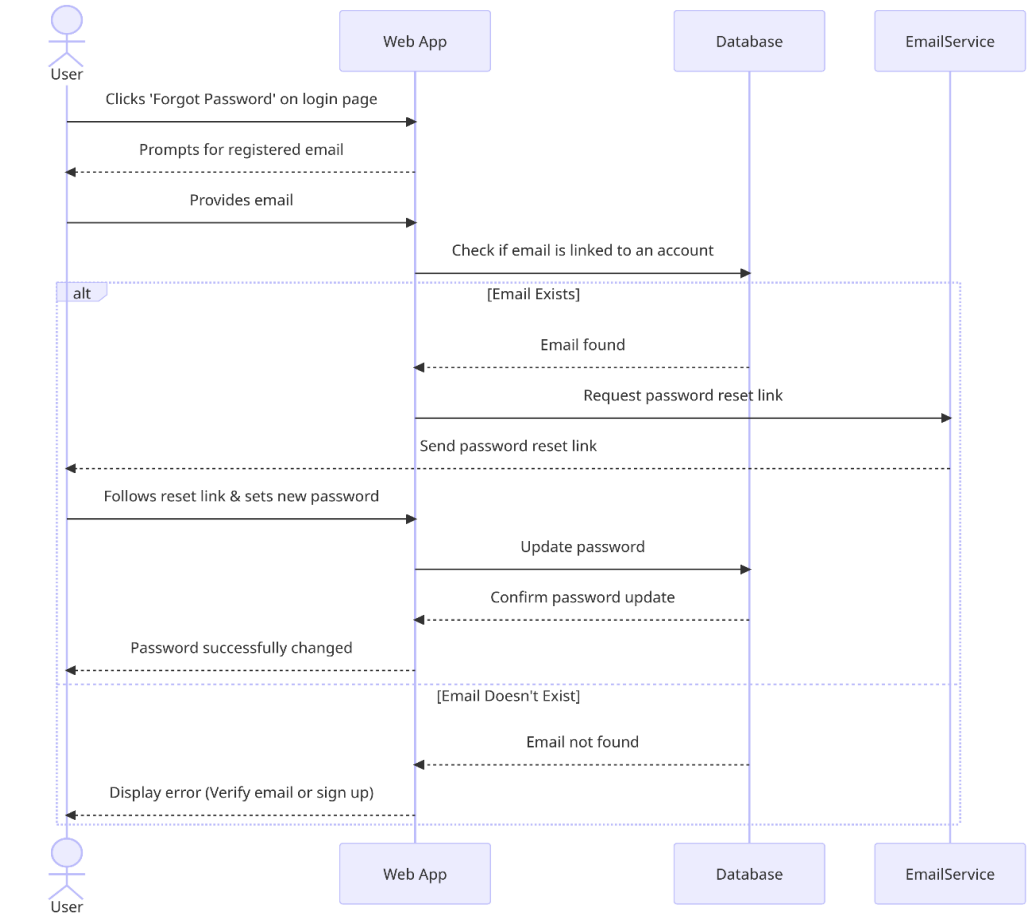


**Figure 29: Company Forgot Password Sequence Diagram**

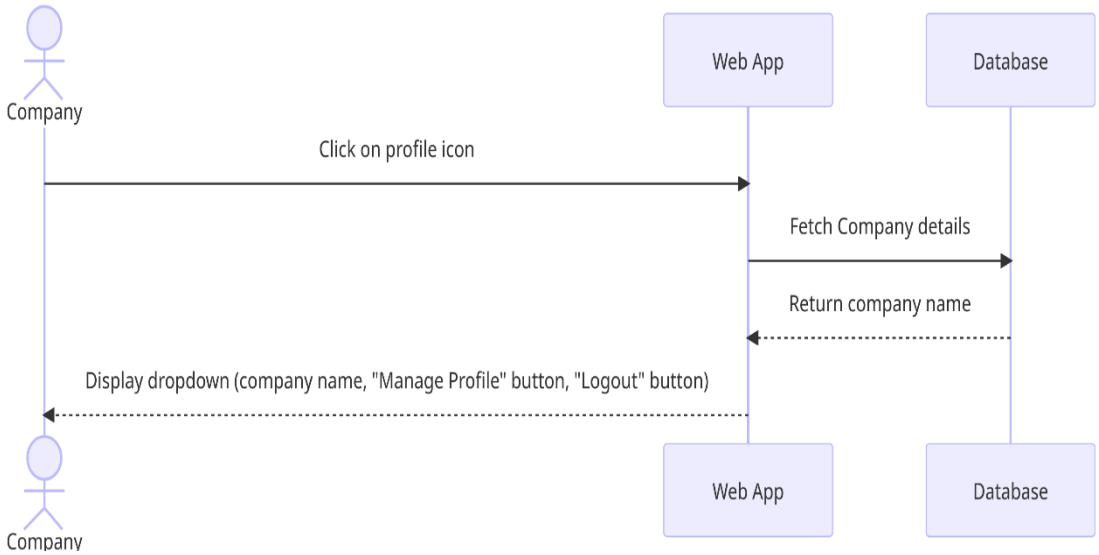


**Figure 30: Company View Profile Sequence Diagram**

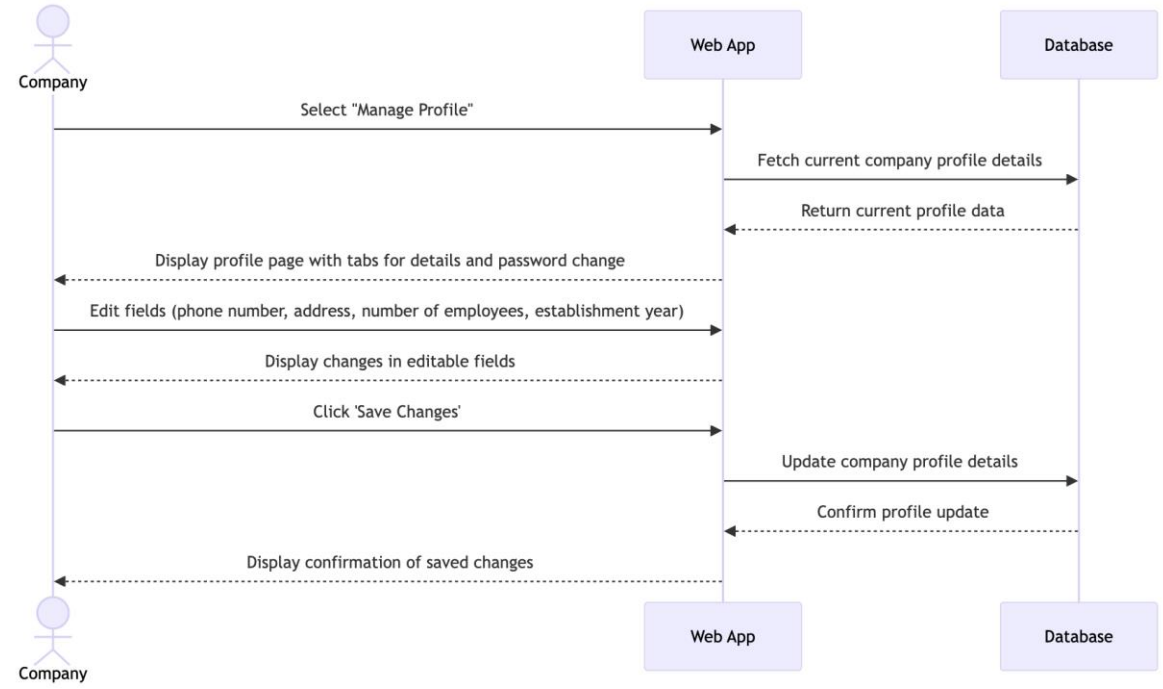


**Figure 31: Company Manage Profile Sequence Diagram**

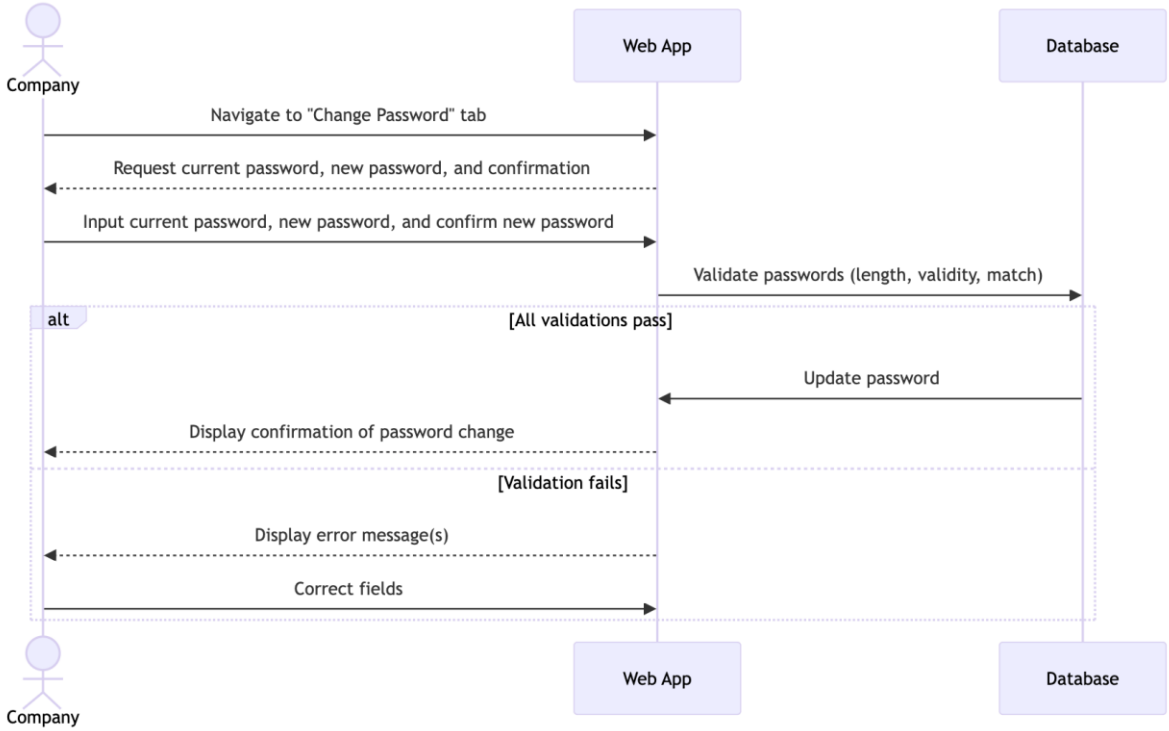


**Figure 32: Company Change Password Sequence Diagram**

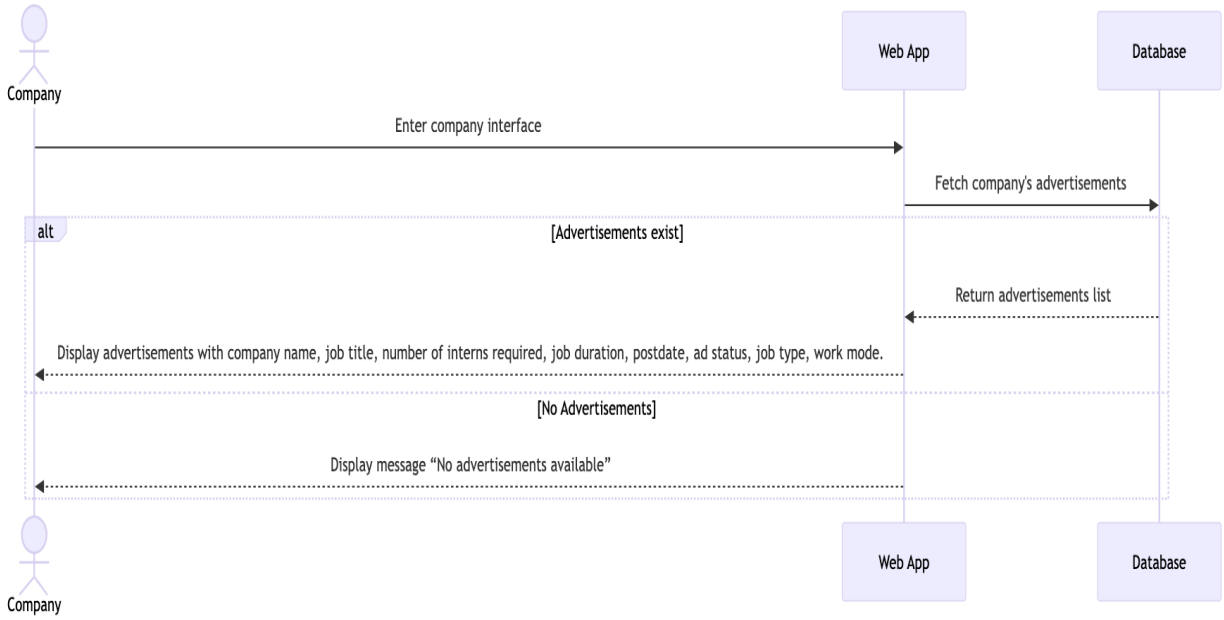


**Figure 33: Company View Advertisements Sequence Diagram**

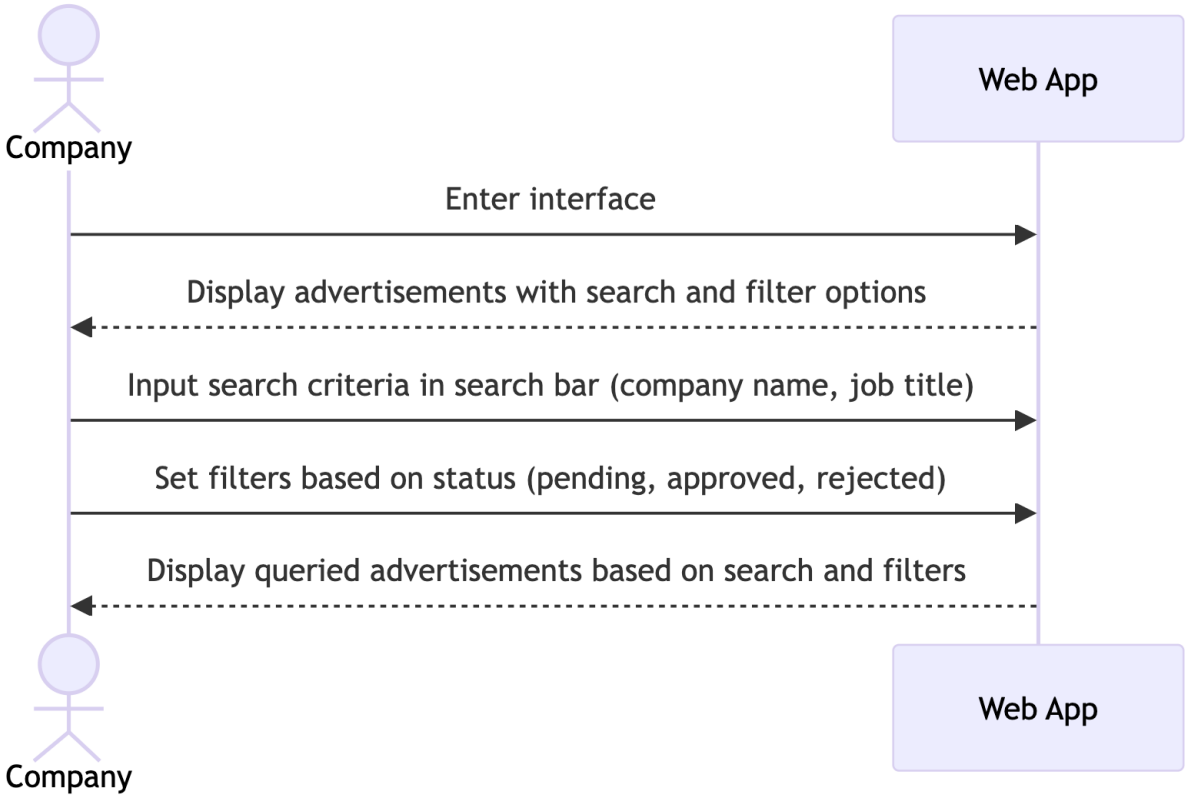


**Figure 34: Company Search and Filter Advertisements Sequence Diagram**

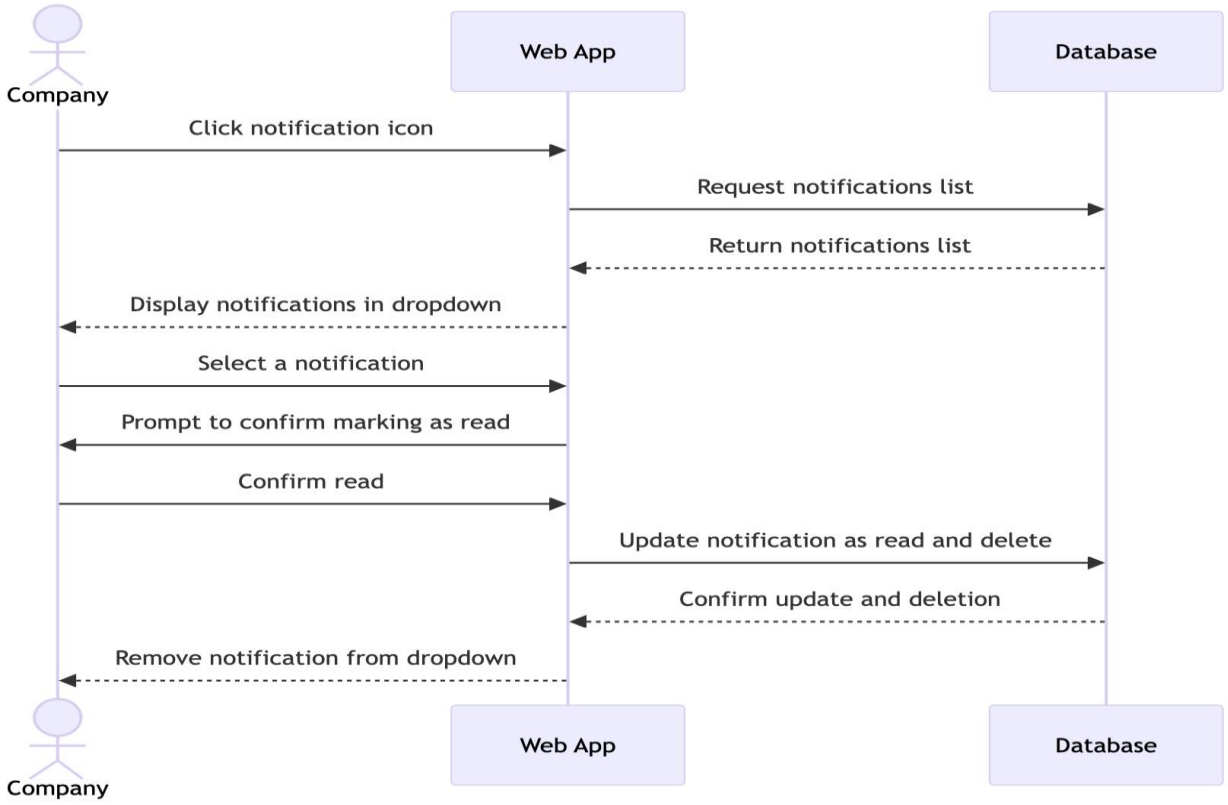


**Figure 35: Company View Notifications Sequence Diagram**

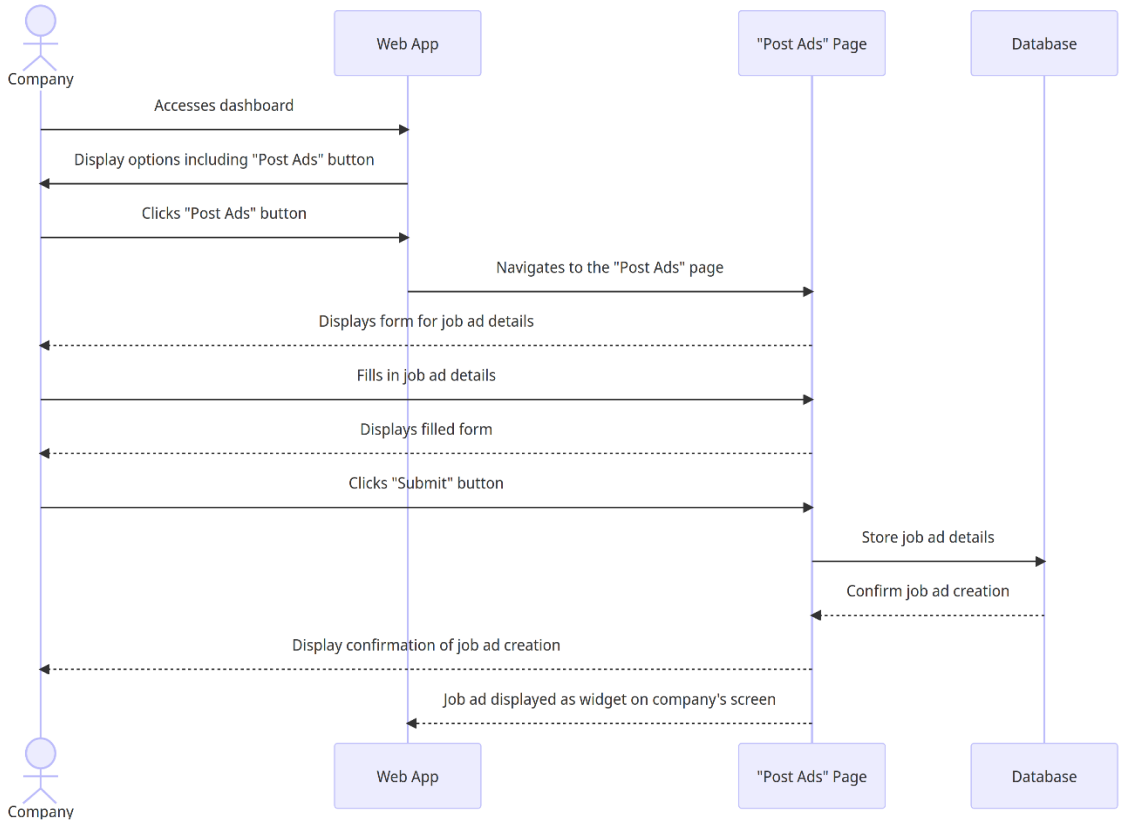


**Figure 36: Company Post Ad Sequence Diagram**

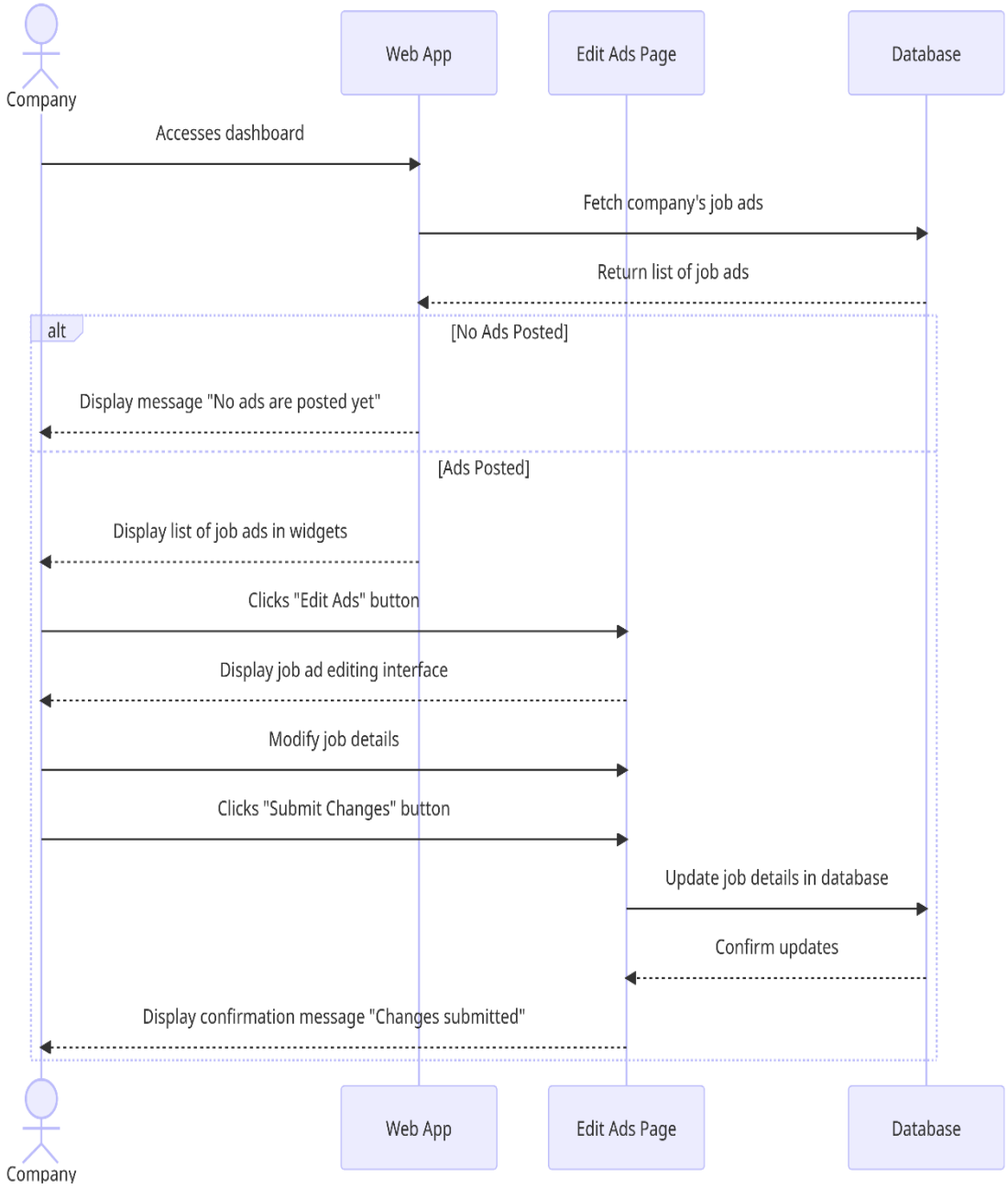


**Figure 37: Company Edit Ad Sequence Diagram**

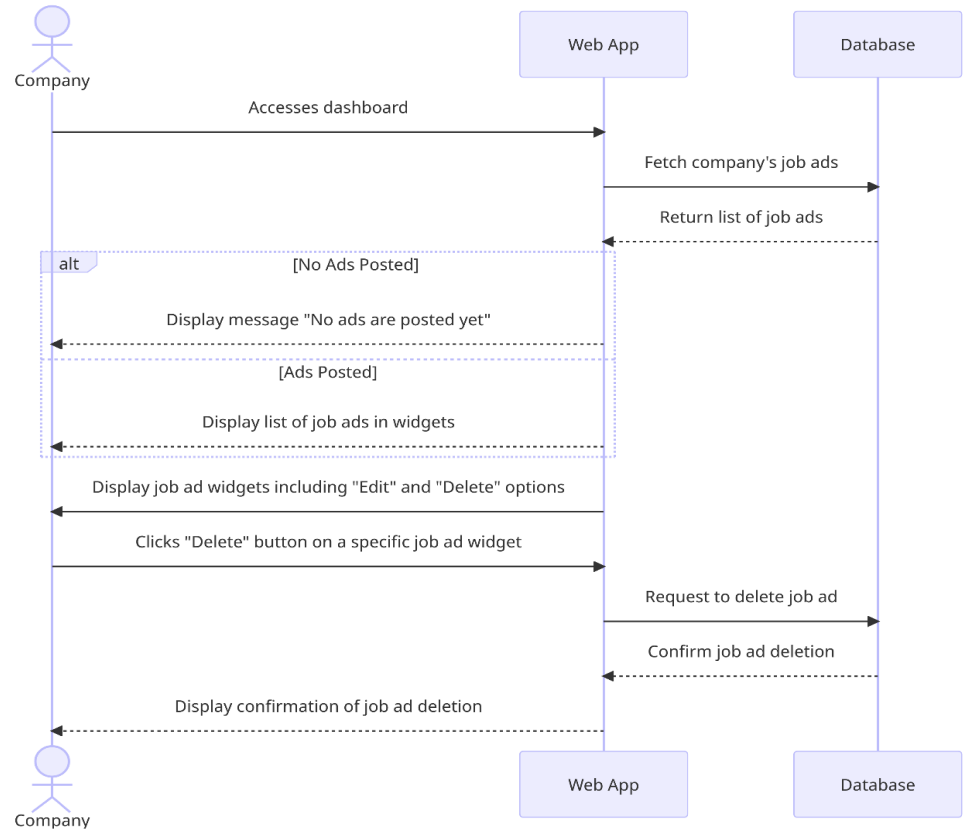


**Figure 38: Company Delete Ad Sequence Diagram**

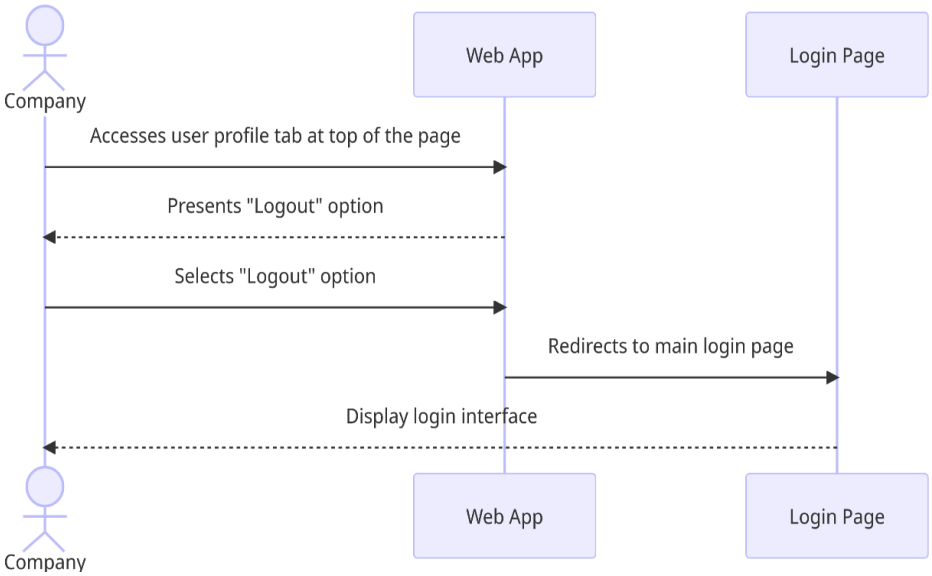


**Figure 39: Company Logout Sequence Diagram**

### 4.6.3 Admin

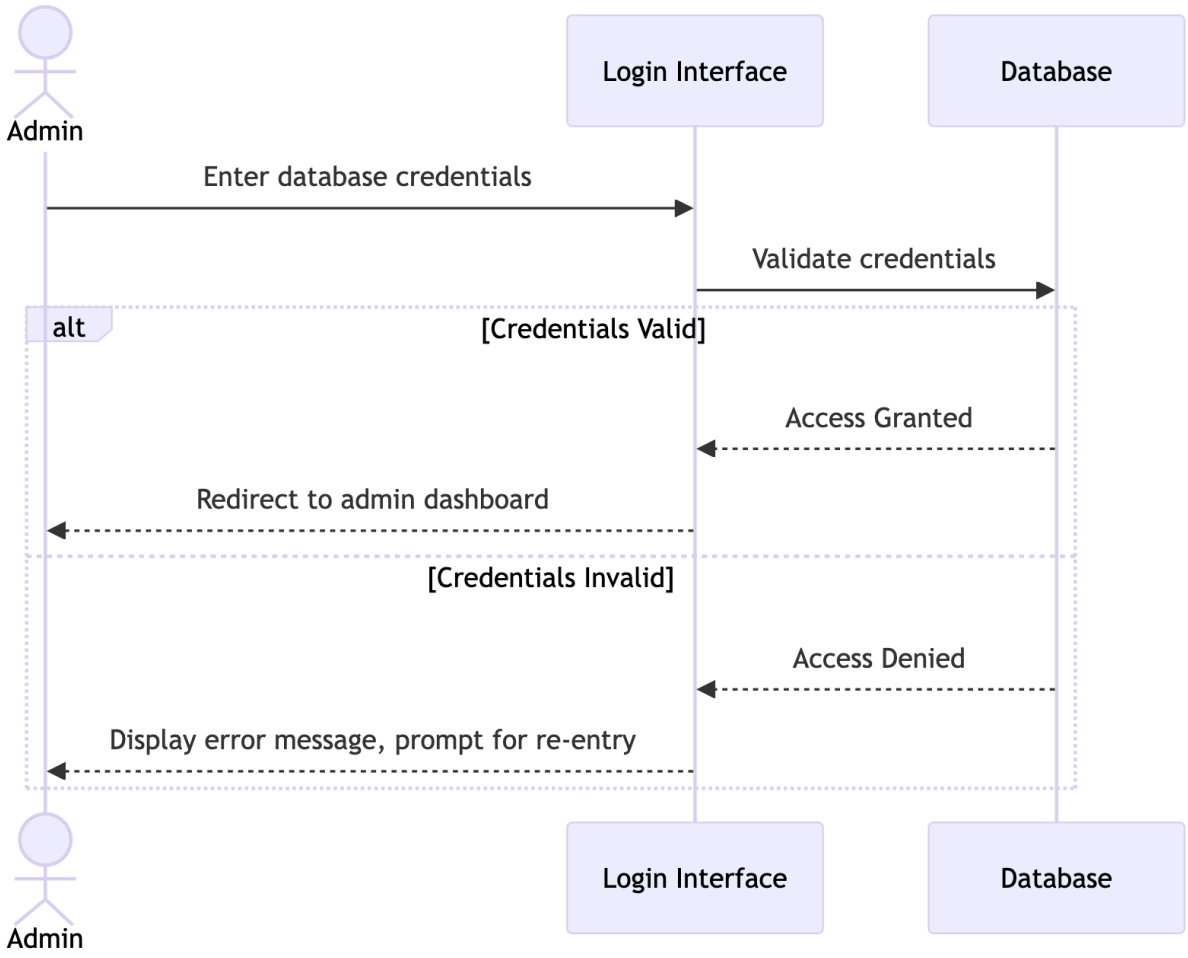


**Figure 40: Admin Log in Sequence Diagram**

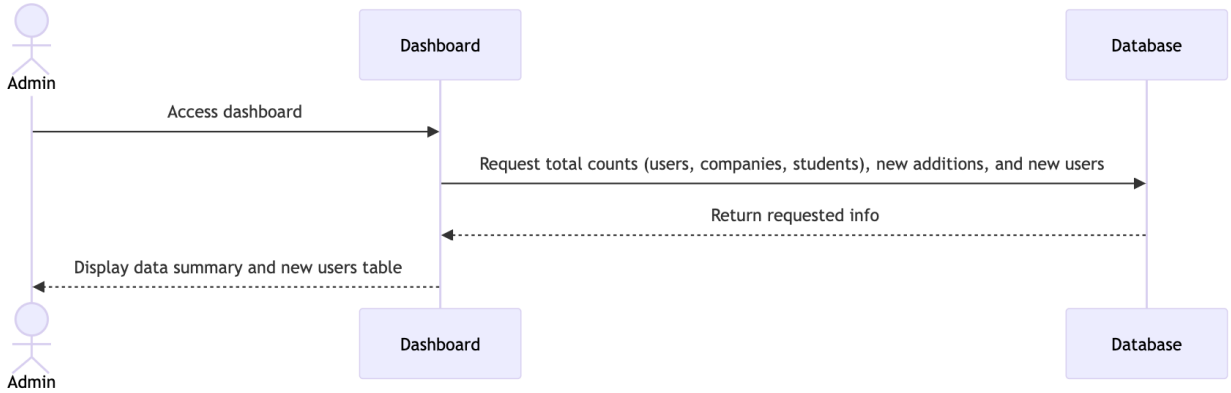


**Figure 41: Admin View Dashboard Sequence Diagram**

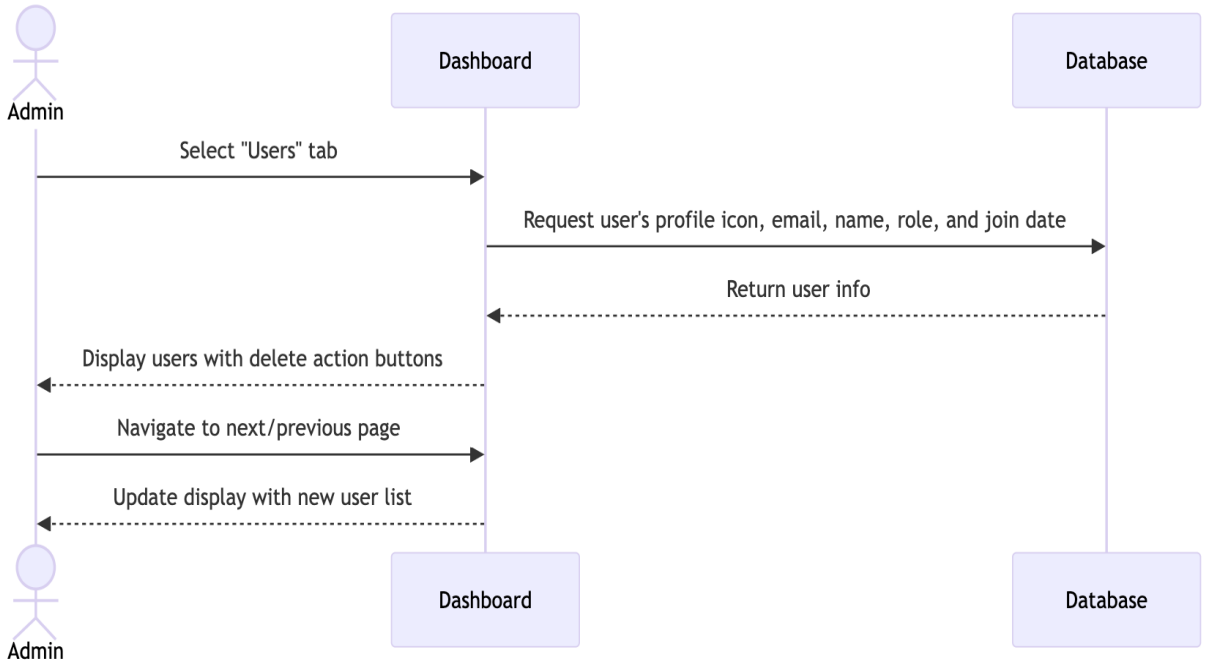


Figure 42: Admin View Users Sequence Diagram

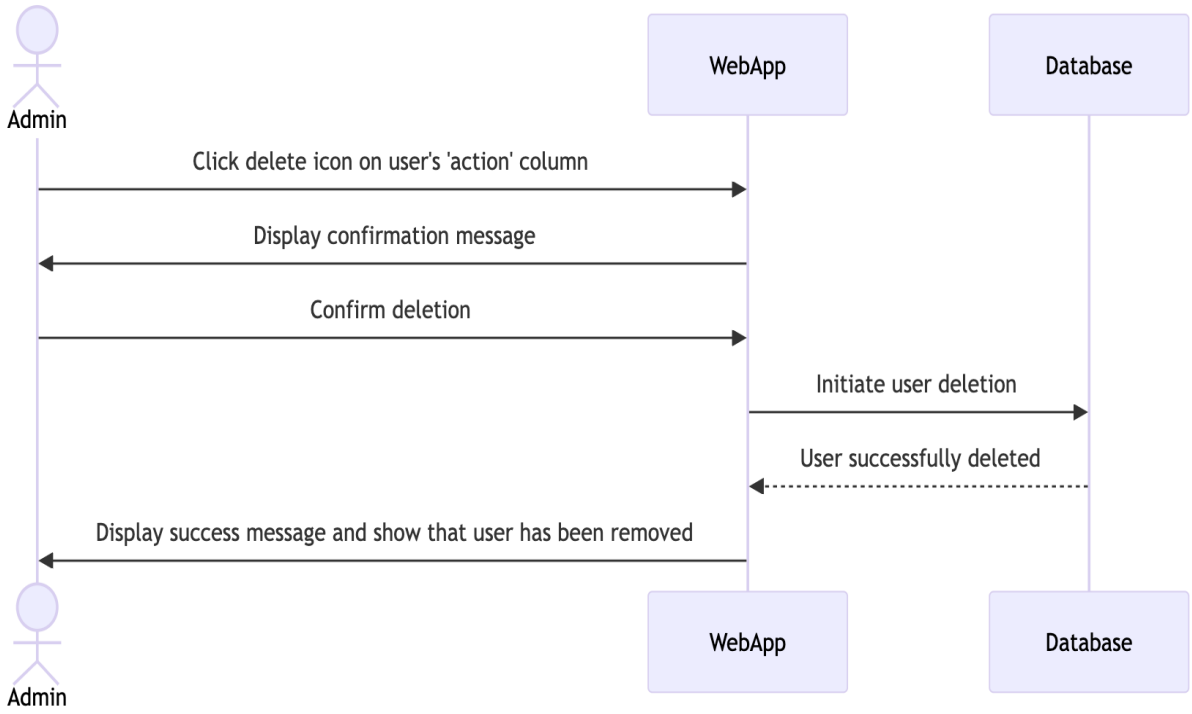


Figure 43: Admin Delete Users Sequence Diagram

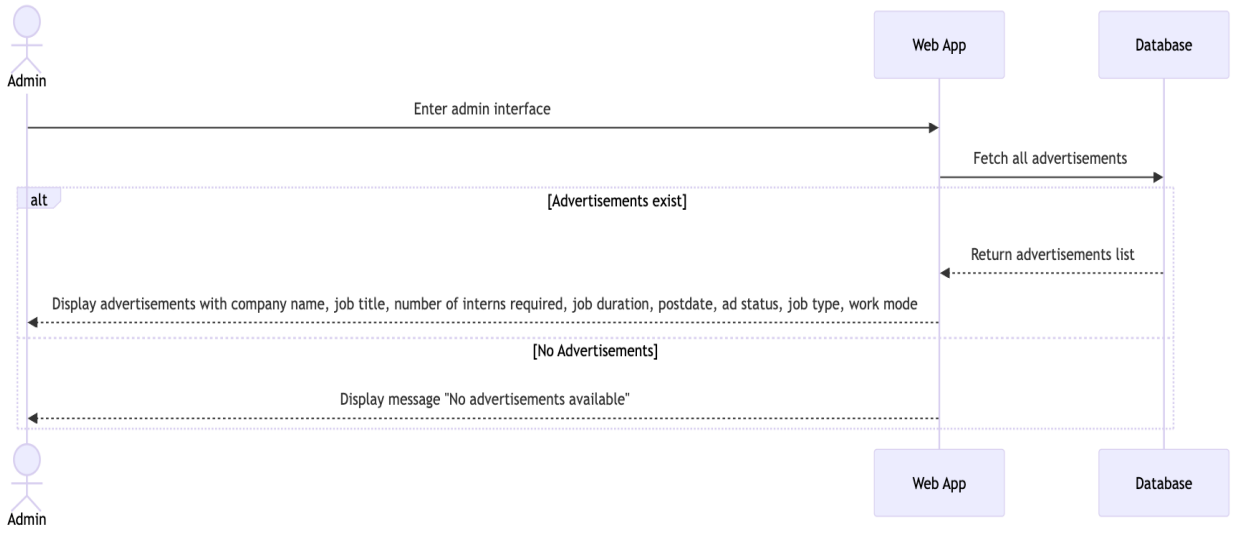


**Figure 44: Admin View Advertisements Sequence Diagram**

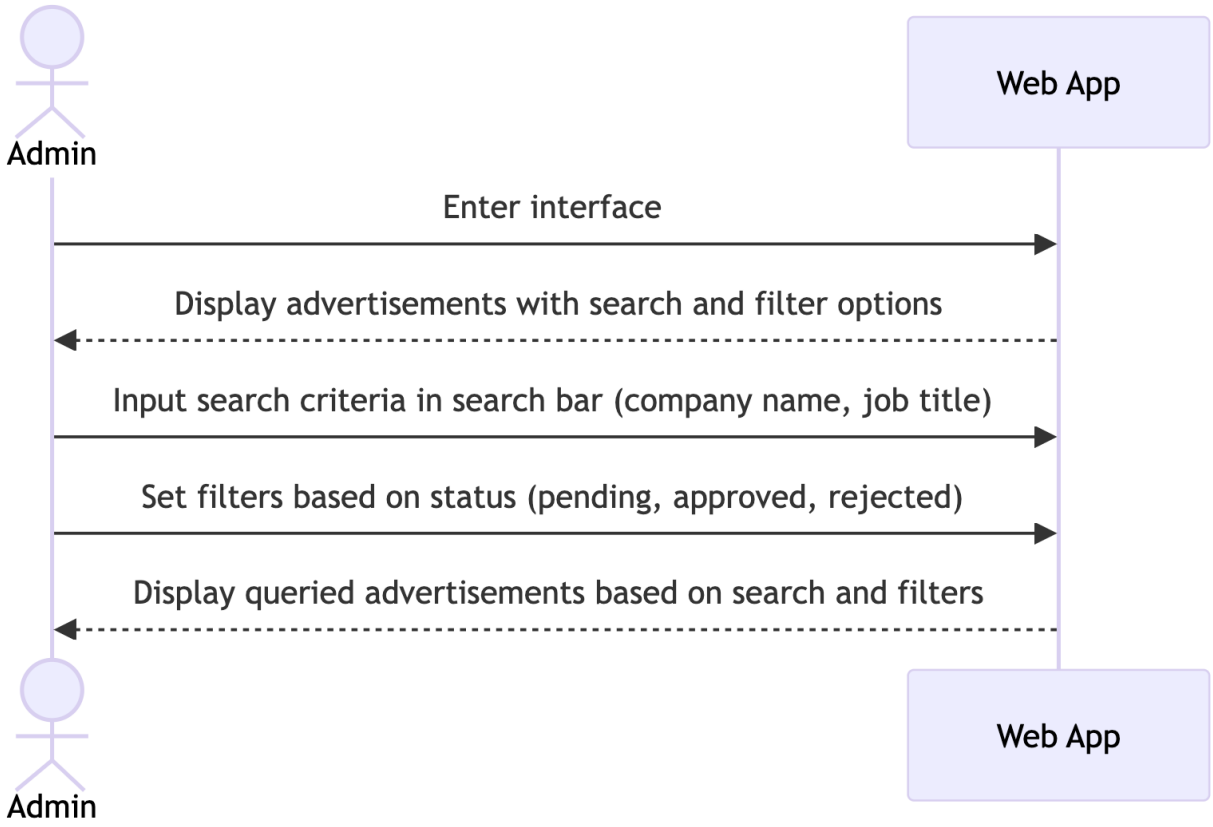


**Figure 45: Admin Search and Filter Advertisements Sequence Diagram**

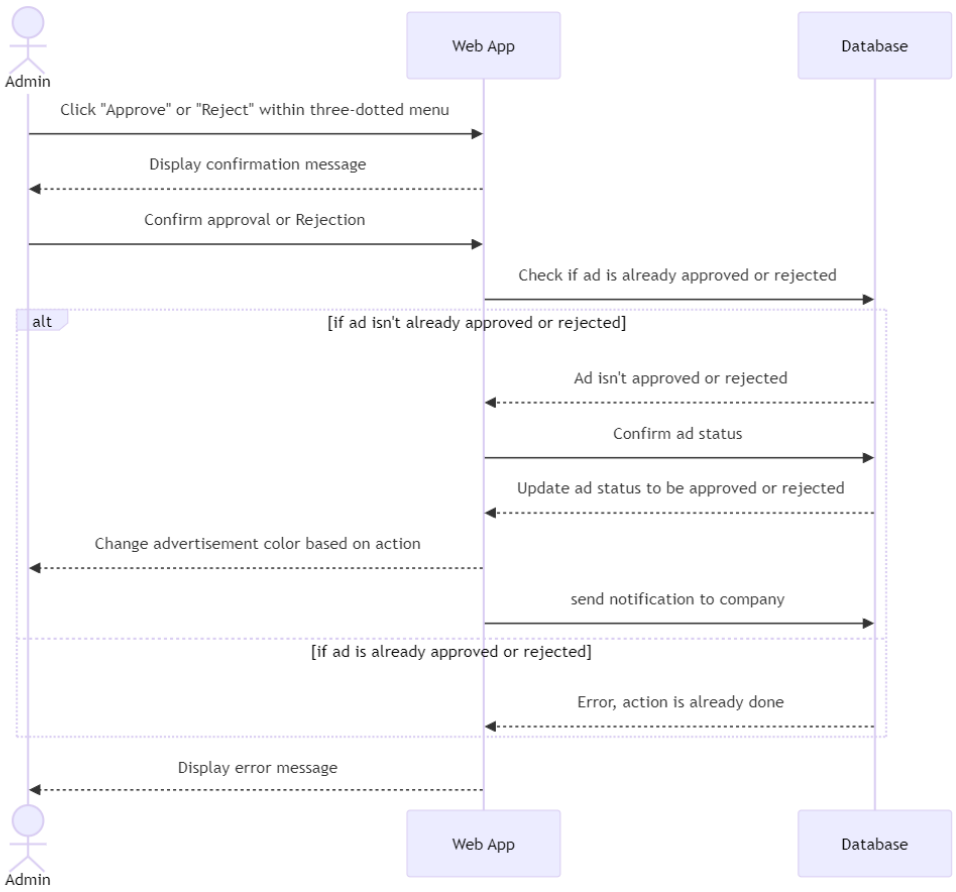


**Figure 46: Admin Approve/Reject Advertisement Diagram**

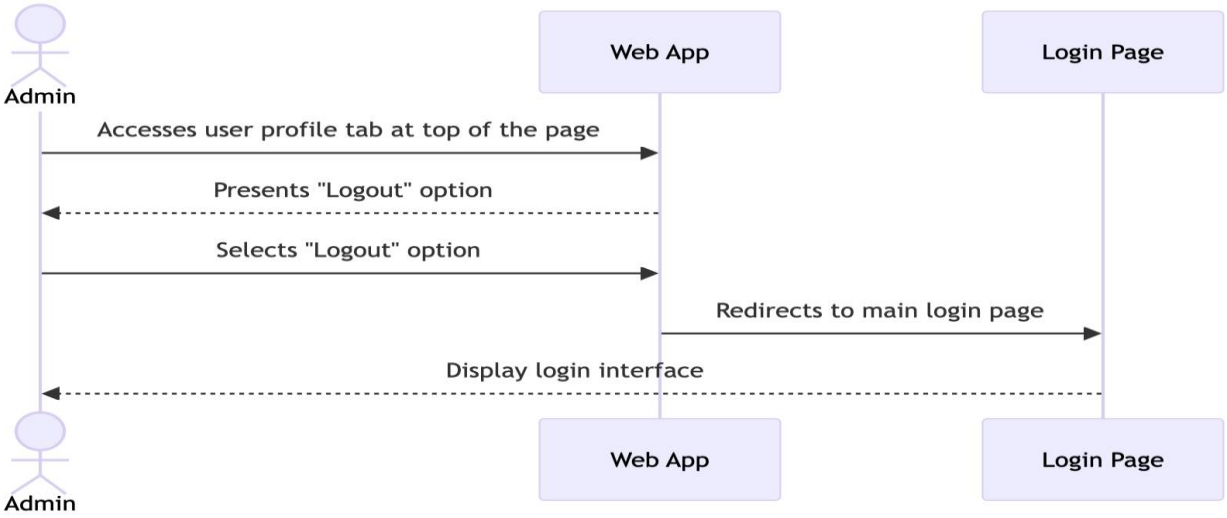


**Figure 47: Admin Log Out Sequence Diagram**

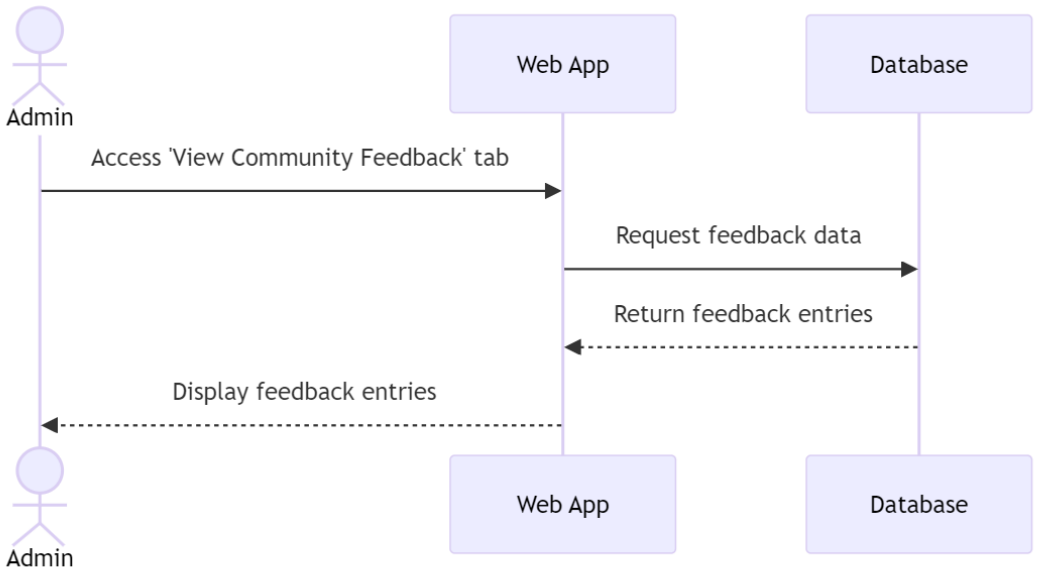


**Figure 48: Admin View Community**

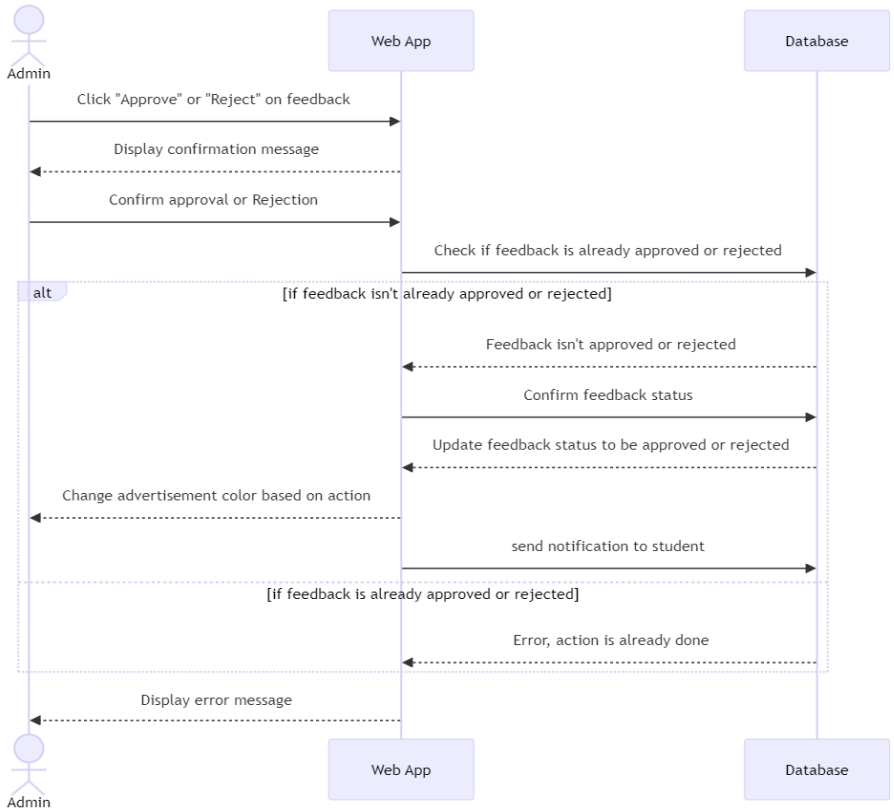


**Figure 49: Admin Approve/Reject Diagram**

## 4.7 UML Class Diagram

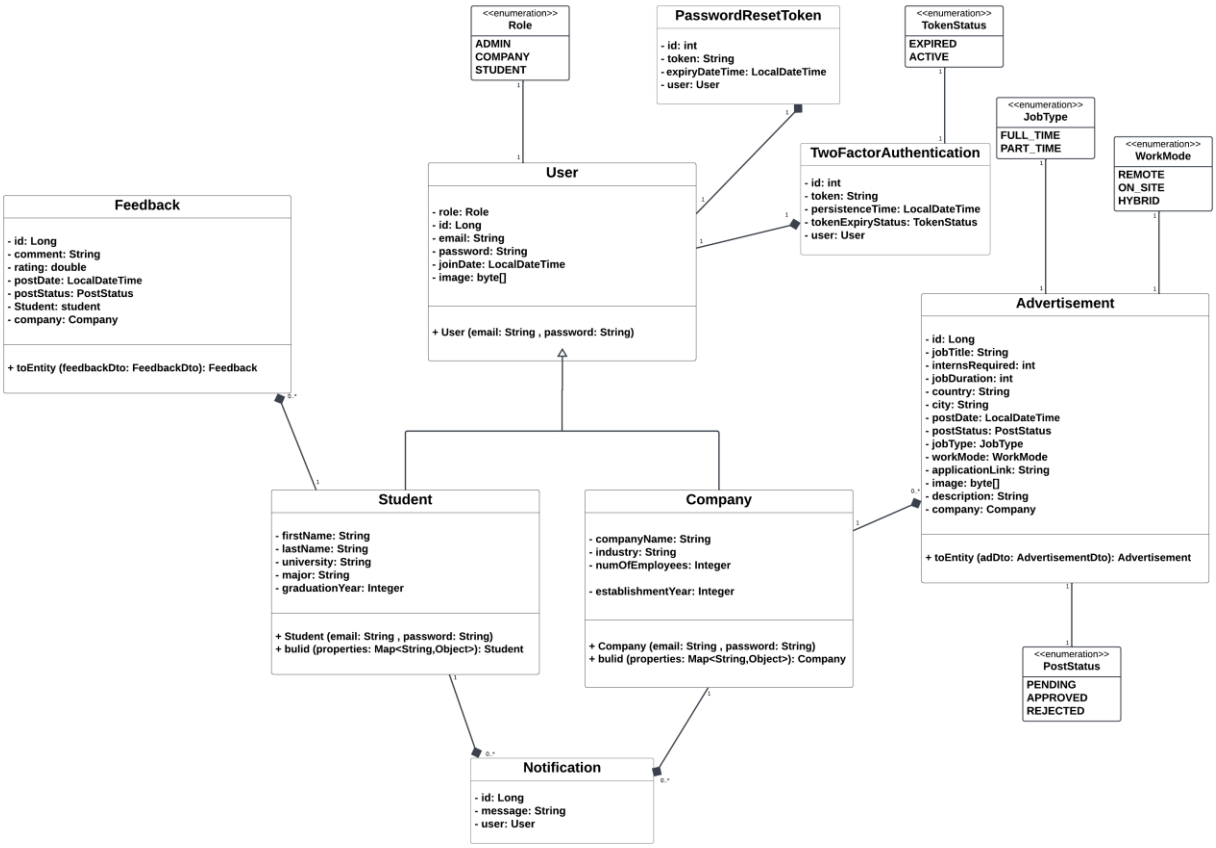


**Figure 50: UML Class Diagram**

## 4.8 Graphical Use Interface (GUI) Design

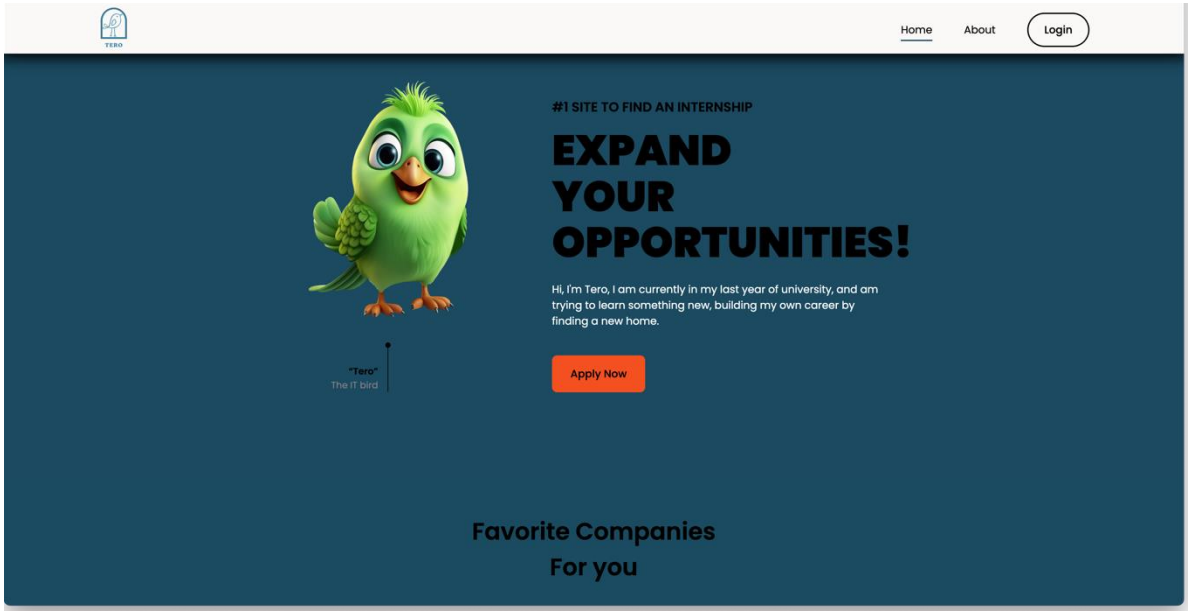


**Figure 51: Home Page**

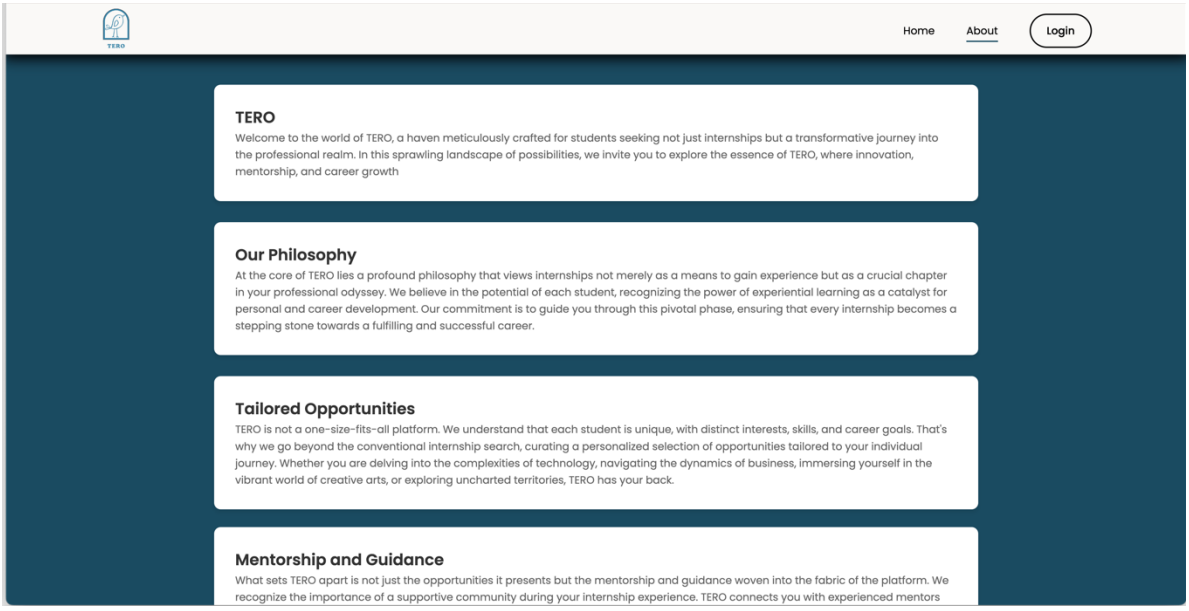


**Figure 52: About Page**

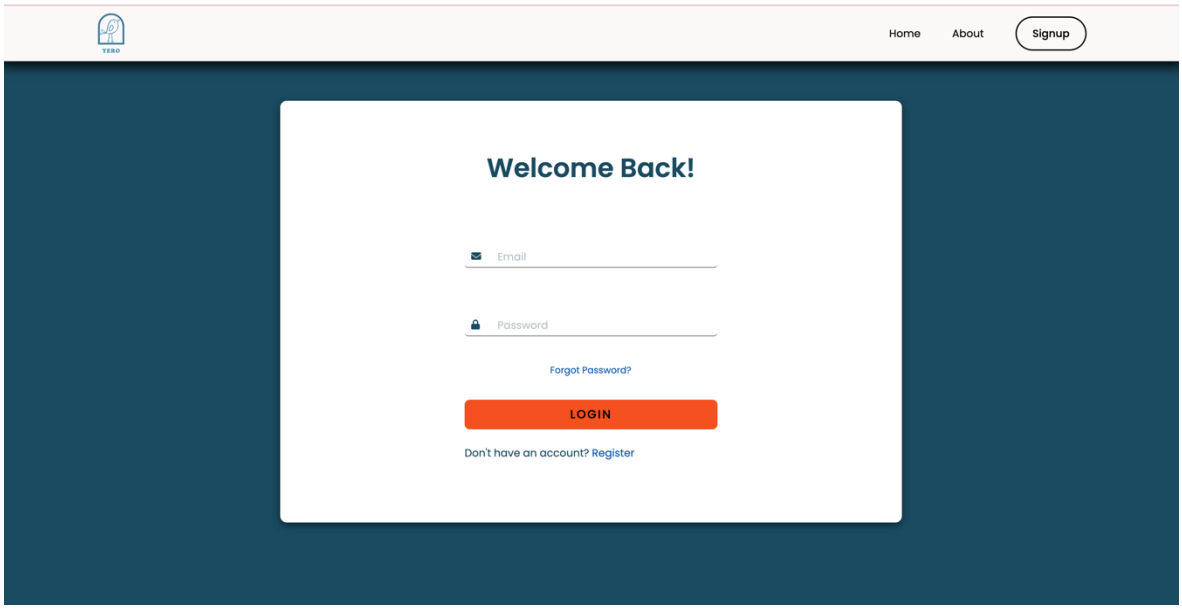


**Figure 53: Login Page**

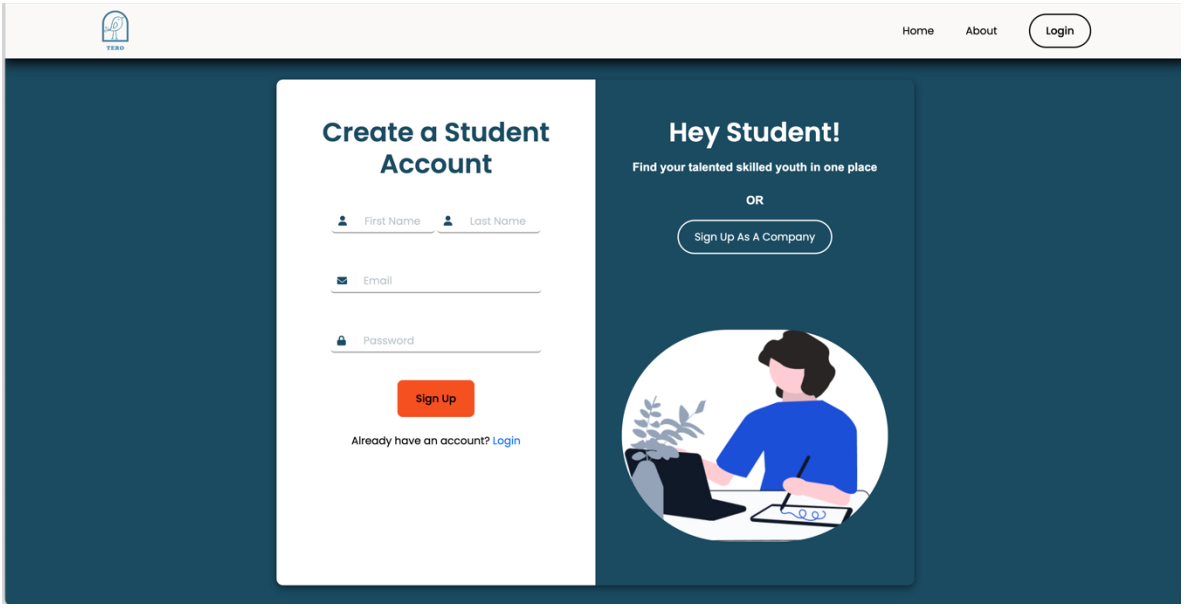


**Figure 54: Sign Up Page – Student**

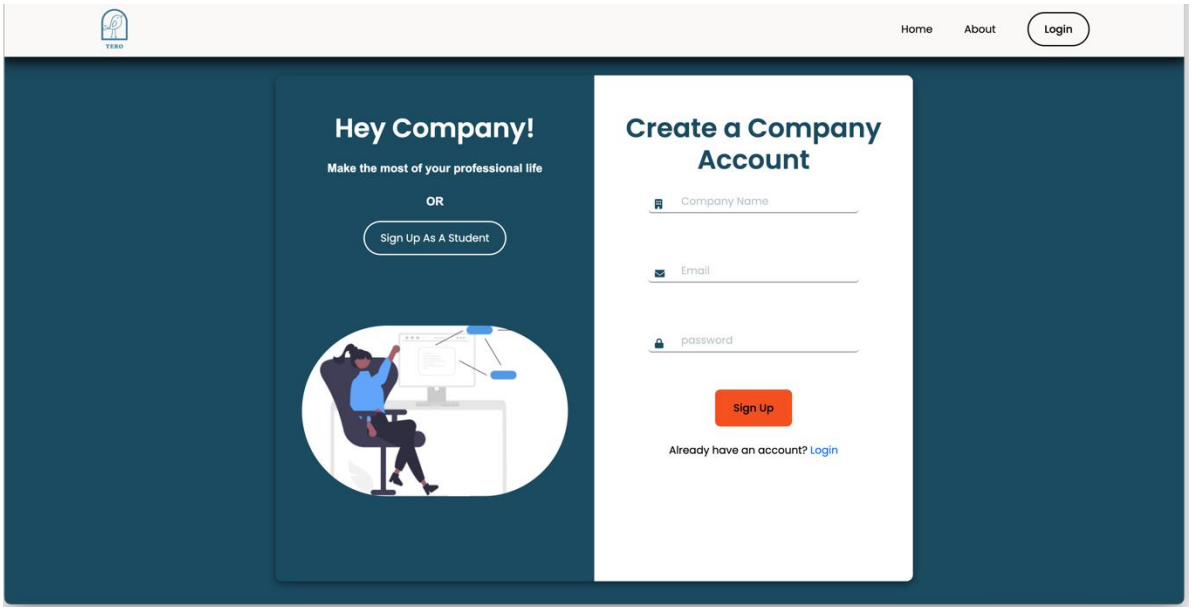


**Figure 55: Sign Up Page – Company**

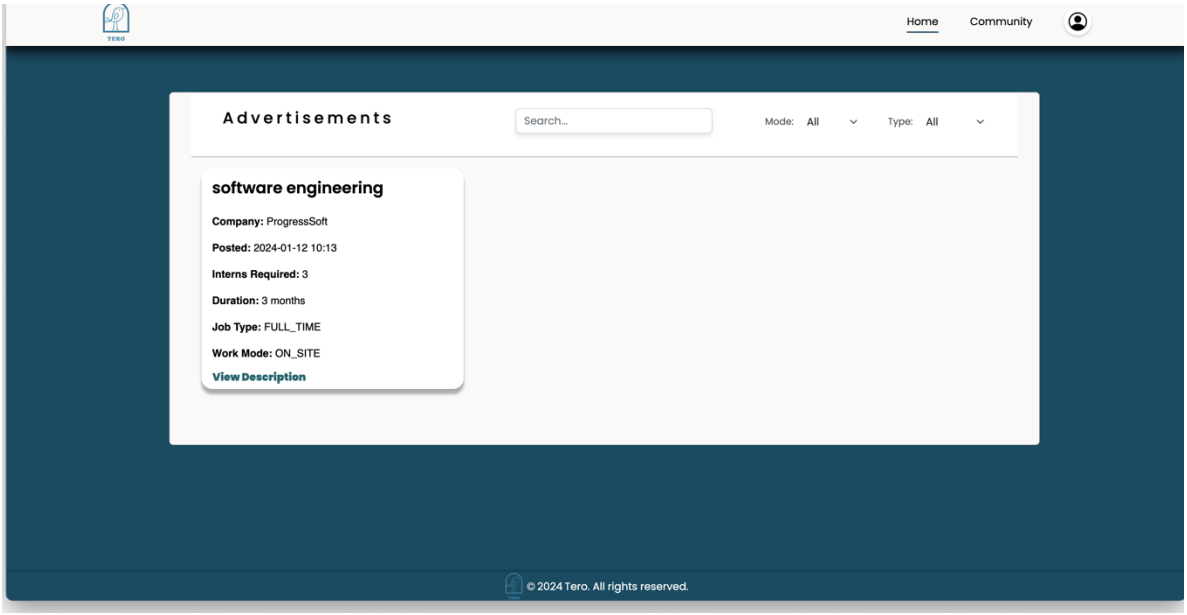


**Figure 56: Student-Dashboard Page**

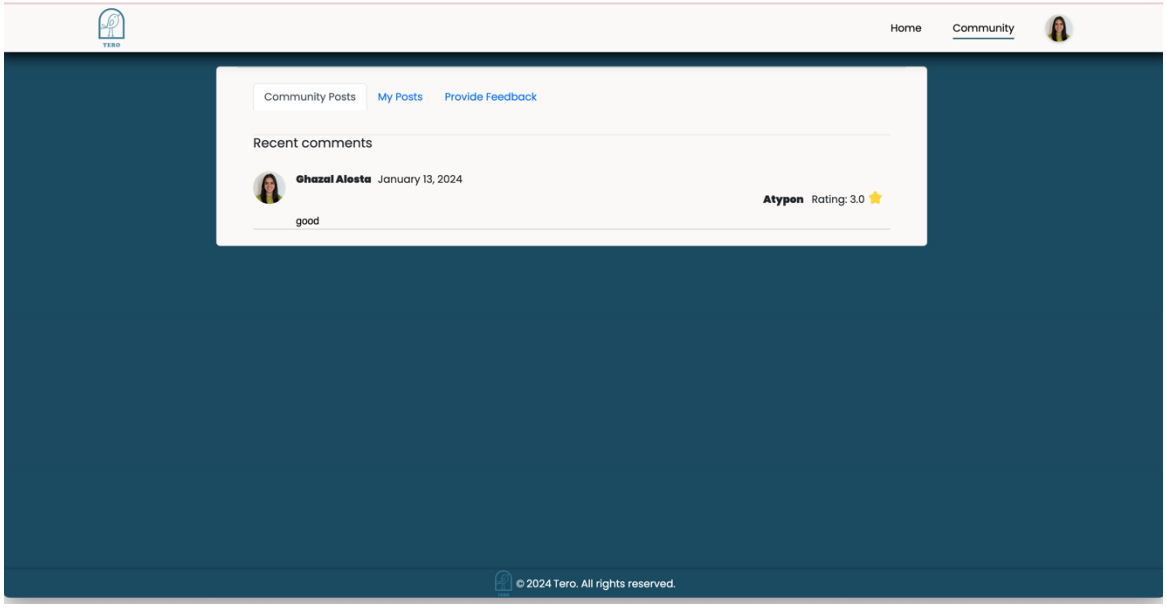


**Figure 57: Student Community - Community Posts**

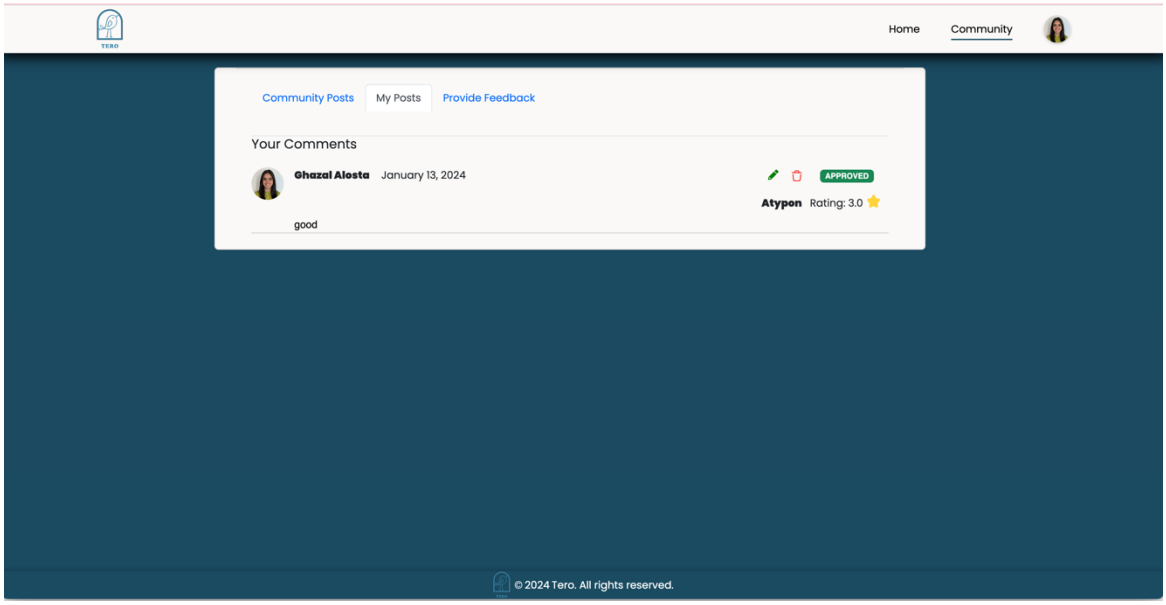


**Figure 58: Student Community - My Posts**

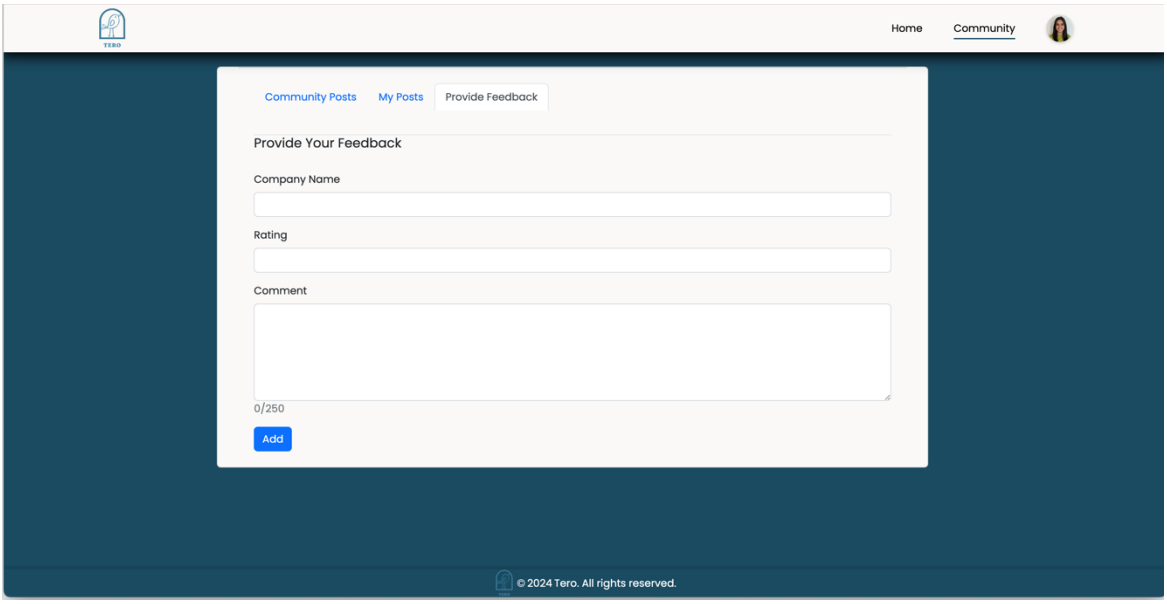


**Figure 59: Student Community - Provide Feedback**

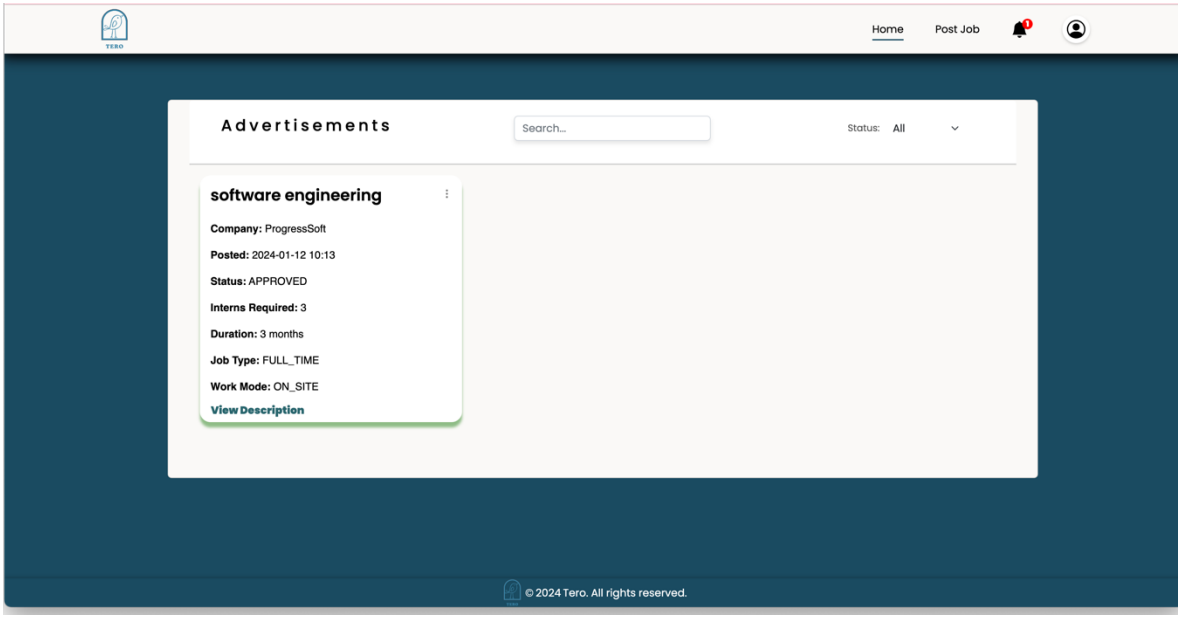


**Figure 60: Company-Dashboard Page**

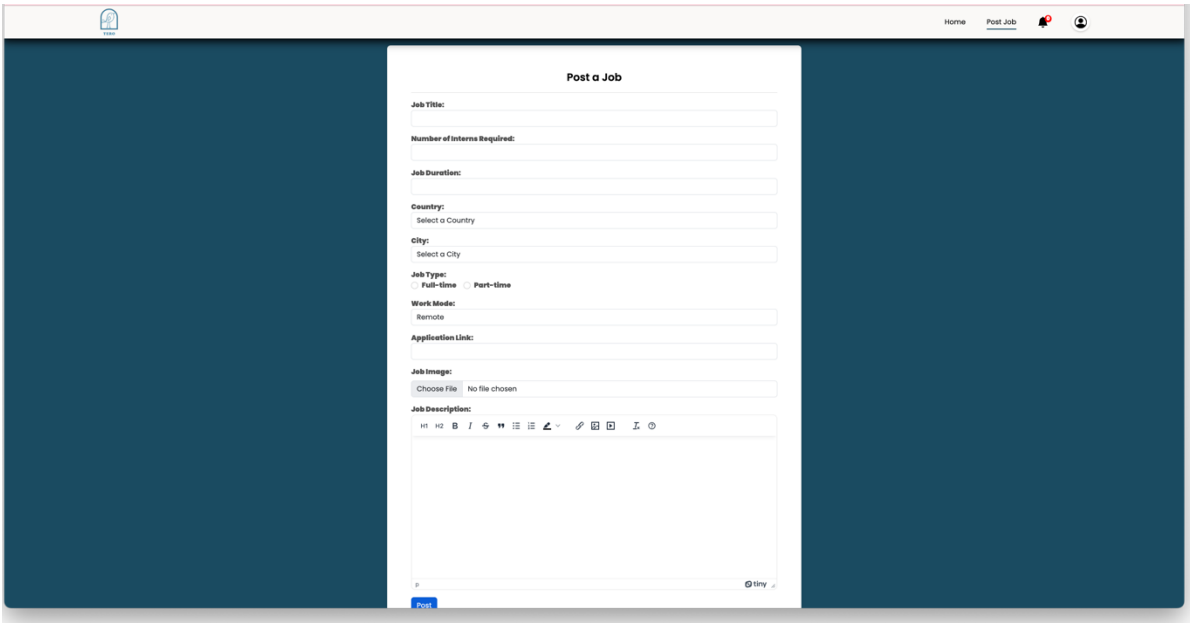


**Figure 61: Post Job Page**

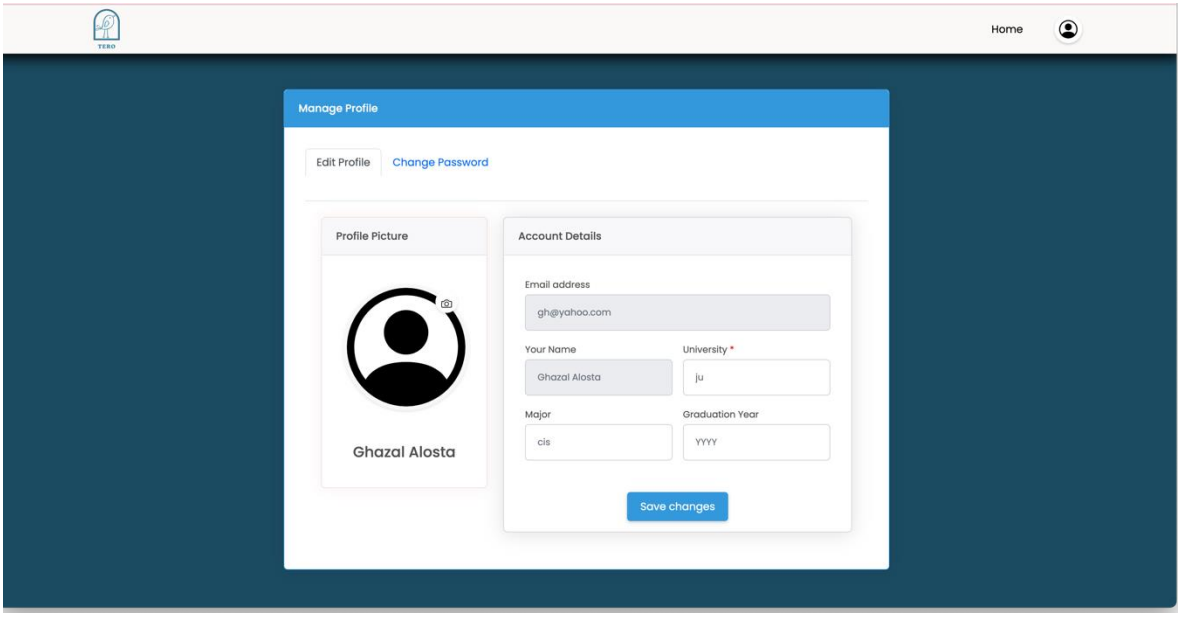


**Figure 62: Manage Profile – Student**

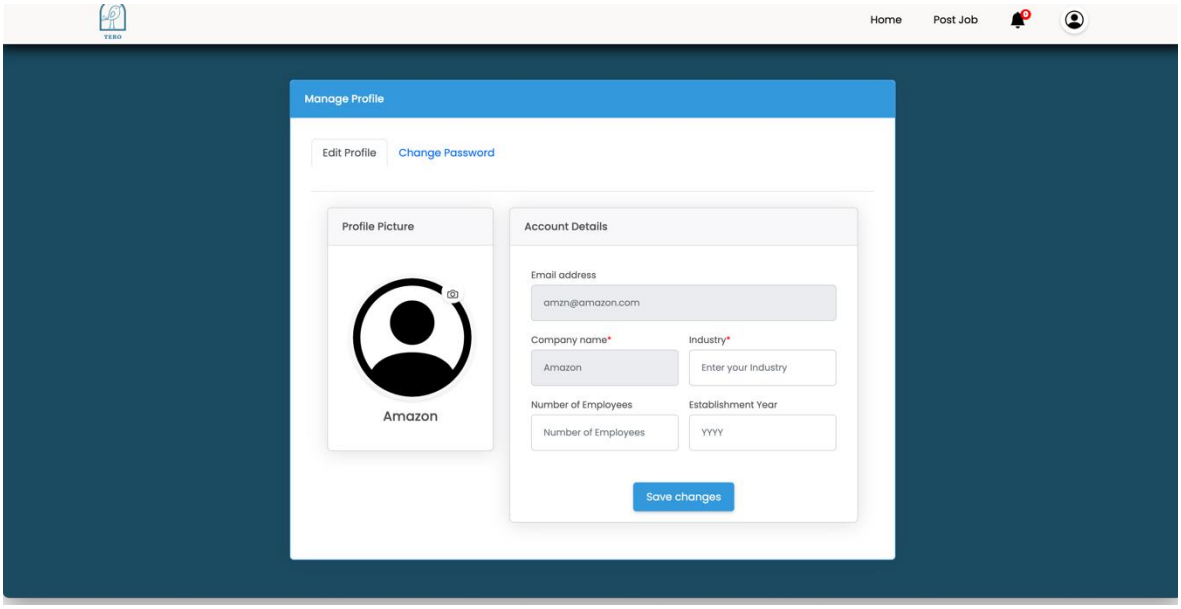


**Figure 63: Manage Profile - Company**

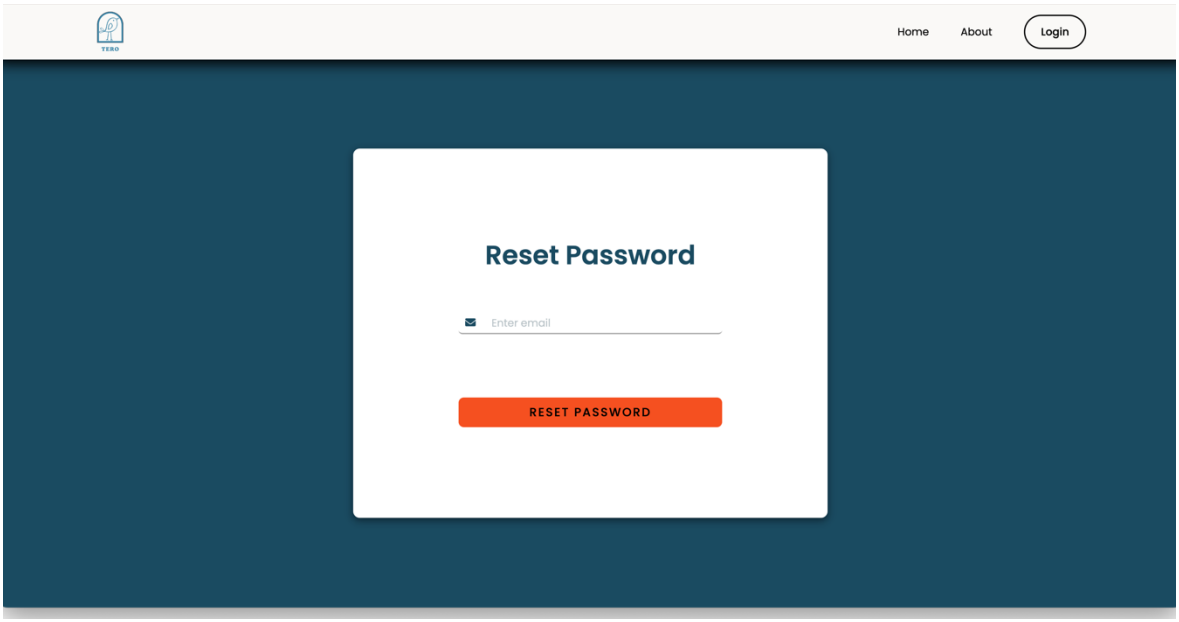


**Figure 64: Reset Password Page**

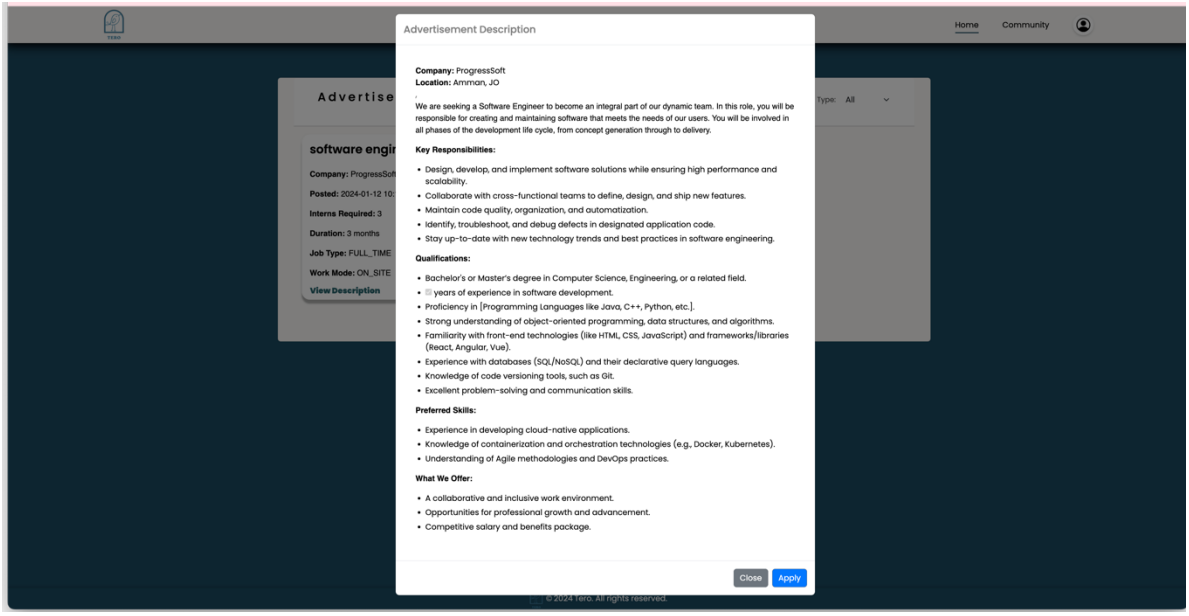


**Figure 65: Student Dashboard Page - View Ad Description**

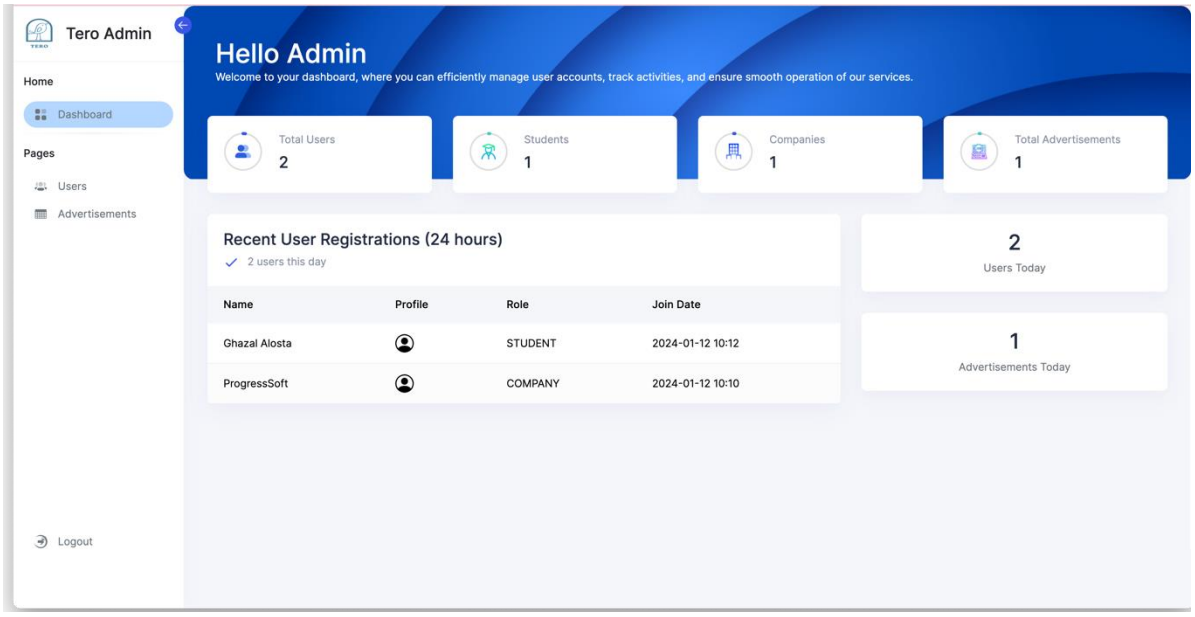


**Figure 66: Admin Dashboard page**

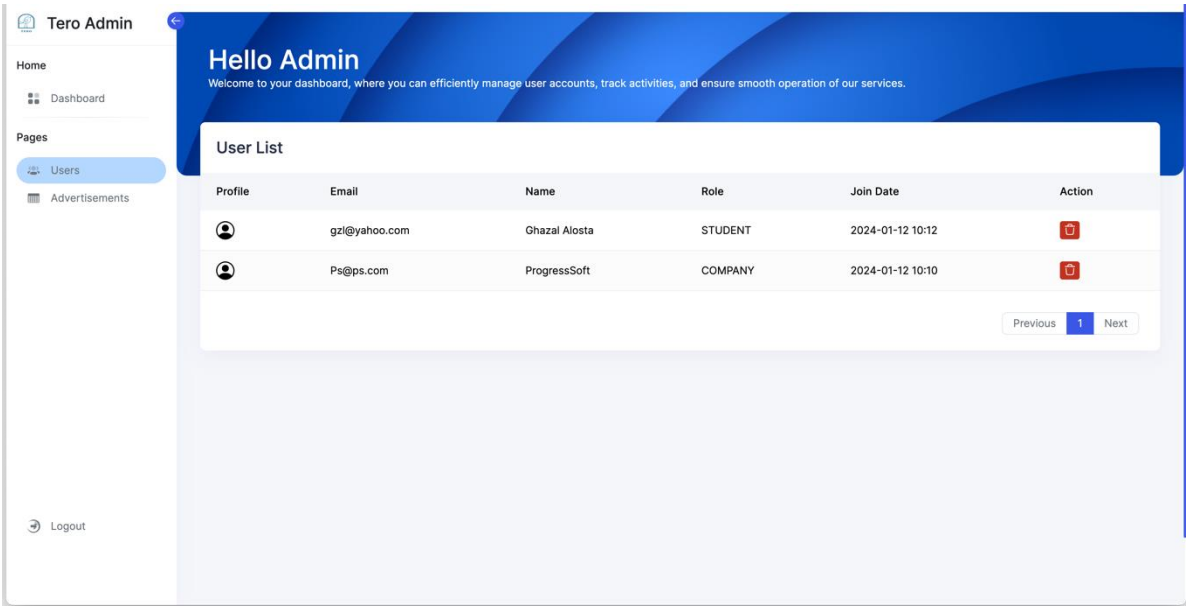


**Figure 67: Admin Page - Users**

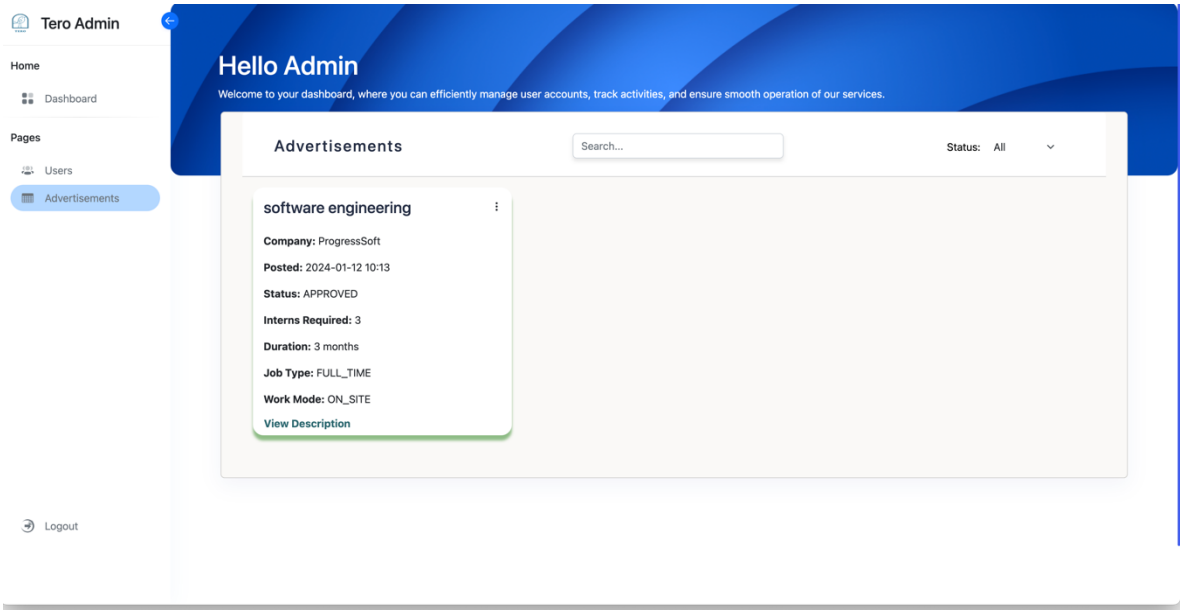


**Figure 68: Admin Page – Advertisement**

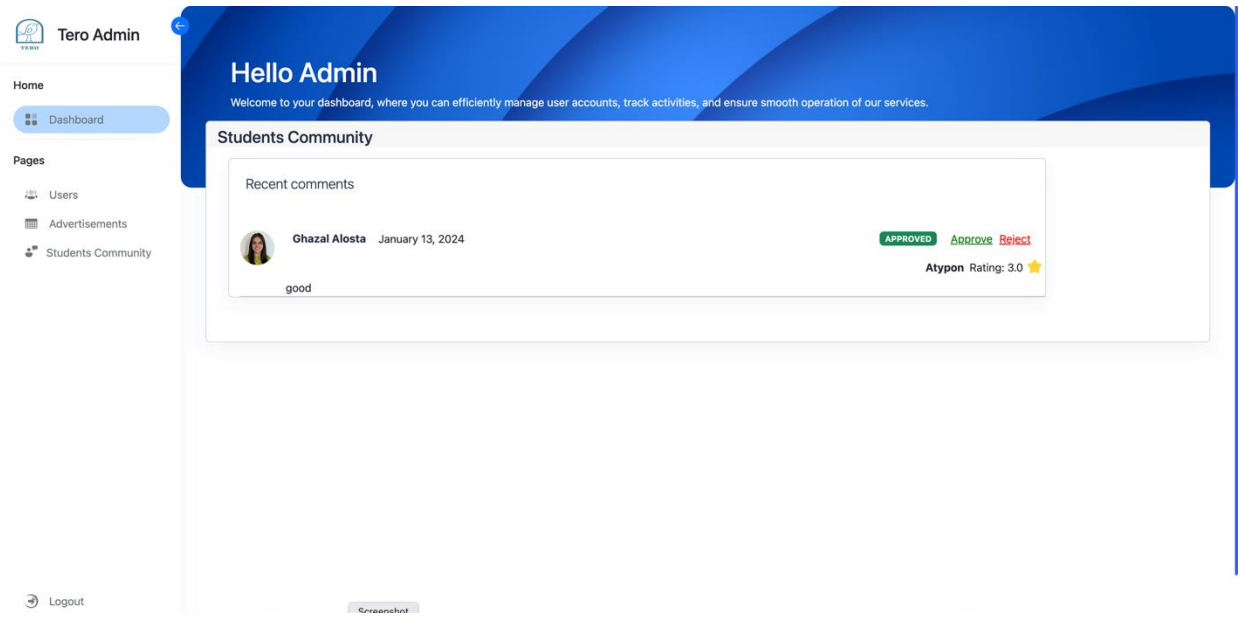


**Figure 69: Admin Page - Student Community**

## 4.9 summary

Chapter Four marks a crucial phase where we intricately designed our system. We kick-started by defining the scope and importance of system design. We then crafted a context diagram, offering a bird's-eye view of our application's interactions.

Data Flow Diagrams (DFDs) visualized data pathways, highlighting student-company, instructor-course, and manager-trainee interactions. Our Entity Relationship Diagram (ERD) meticulously organized entities like students and companies, and courses for efficient database management.

Leveraging Unified Modeling Language (UML), we depicted roles and actions through Use Case Diagrams. Sequence and Class Diagrams unraveled dynamic interactions and structural hierarchies, providing a blueprint for implementation.

# CHAPTER FIVE: SYSTEM IMPLEMENTATION

## 5.1 Introduction

This chapter describes the database implementation and the graphical user interface implementation.

## 5.2 Database Implementation

### 5.2.1 Database Schema

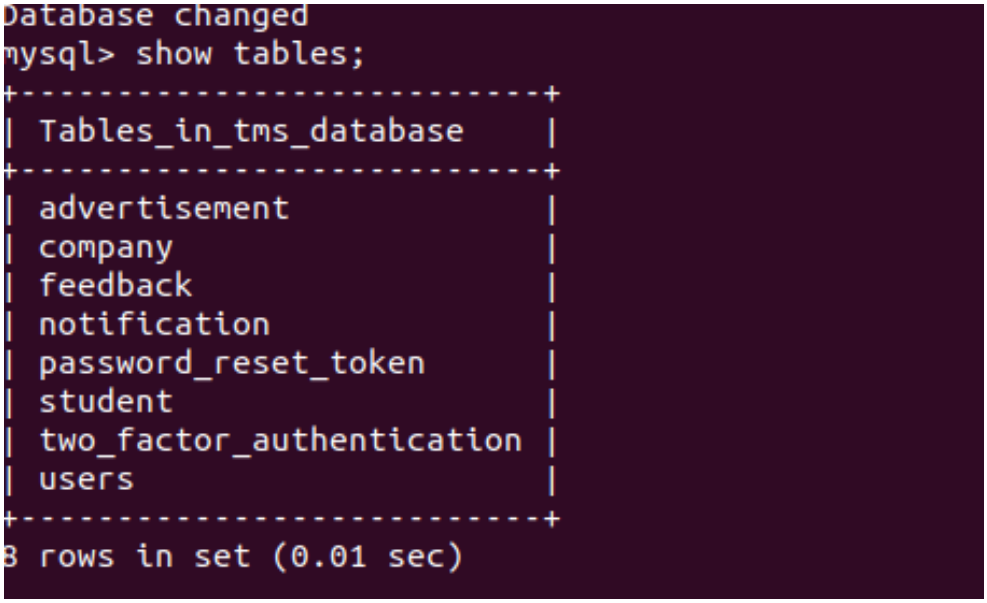


**Figure 70: Database Schema**

### 5.2.2 Database Implementation

- **User:**

```
2 inheritors  AkramJaghoub
@Entity
@Data
@NoArgsConstructor
@AllArgsConstructor
@Builder
@Inheritance(strategy = InheritanceType.JOINED)
@Table(name = "users")
public class User {

    @Enumerated(EnumType.STRING)
    public Role role;
    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;
    private String email;
    private String password;
    private LocalDateTime joinDate;
    @Column(columnDefinition = "LONGBLOB")
    private byte[] image;
```

**Figure 71: User Database Implementation**

- **Student:**

```
@Entity
@Data
@NoArgsConstructor
@AllArgsConstructor
@Builder
@Inheritance(strategy = InheritanceType.JOINED)
public class User {

    @Enumerated(EnumType.STRING)
    public Role role;
    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;
    private String email;
    private String password;
    private LocalDateTime joinDate;
    @Column(columnDefinition = "LONGBLOB")
    private byte[] image;
```

**Figure 72: Student Database Implementation**

- **Company**

```java
@Entity
@Getter
@Setter
@NoArgsConstructor
public class Company extends User {

    private String companyName;
    private String industry;
    private Integer numOfEmployees;
    private Integer establishmentYear;
    private double rating;
```

Figure 73: Company Database Implementation

- **Advertisement**

```java
@Data
@NoArgsConstructor
@AllArgsConstructor
@Builder
@Entity
public class Advertisement {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String jobTitle;

    private int internsRequired;

    private int jobDuration;

    private String country;

    private String city;

    private LocalDateTime postDate;

    @Enumerated(EnumType.STRING)
    private PostStatus postStatus;
```

Figure 74: Advertisement Database Implementation

- **Notification**

```java
@Data
@Entity
@Builder
@NoArgsConstructor
@AllArgsConstructor
public class Notification {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;
    private String message;
    @ManyToOne
    private User user;
}
```

**Figure 75: Notification Database Implementation**

- Feedback

```java
@Entity
@Data
@NoArgsConstructor
@AllArgsConstructor
@Builder
public class Feedback {
    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private long id;

    @ManyToOne
    private Student student;
    @ManyToOne
    private Company company;
    @Column(columnDefinition = "LONGTEXT")
    private String comment;
    private double rating;
    private LocalDateTime postDate;
    private PostStatus status;
```

**Figure 76: Feedback Database Implementation**

- Password Reset

```
@Entity
@Getter
@Setter
public class PasswordResetToken {
    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY
    private int id;

    private String token;
    private LocalDateTime expiryDateTime;

    @ManyToOne
    private User user;
}
```

**Figure 77: Password Reset Database Implementation**

- Two-Factor Authentication

```
@Entity
@Getter
@Setter
public class TwoFactorAuthentication {
    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private int id;

    private String token;
    private LocalDateTime persistenceTime;
    private LocalDateTime expiryTime;

    @Enumerated(EnumType.STRING)
    private TokenStatus tokenExpiryStatus;

    @ManyToOne
    private User user;
}
```

**Figure 78: Two-Factor Authentication Database Implementation**

### 5.3 Graphical User Interface (GUI) Implementation

In our project, we utilized Java for its robustness and Spring Boot for its efficiency in setting up web applications. Spring Boot's features like RESTful services and security were especially beneficial. For the database, we chose MySQL for its high performance and seamless integration with Java through Spring Data JPA. This combination ensured a scalable, maintainable, and efficient implementation.

This is the GitHub Link for the project code: https://github.com/AkramJaghoub/Training-management-system

### 5.4 Summary

This chapter shows all the implementation details for the “Training Management System” including database, and graphical user interface implementation.

## CHAPTER SIX: SYSTEM TESTING AND INSTALLATION

### 6.1 Introduction

This chapter focuses on the testing and installation phases of the Tero project. Two critical evaluation methods, the Heuristic Evaluation Test and the Cooperation Evaluation Test, are employed to ensure the system's usability and functionality. Section 6.1 provides an introduction, followed by an elaboration on the Heuristic Evaluation in Section 6.2 and the Cooperative Evaluation in Section 6.3. The chapter concludes with a discussion on system installation in Section 6.4 and a summary in Section 6.5.

## 6.2 Heuristic Evaluation

Heuristic evaluation is usability experts review your user interface such as lists, combo boxes, and database connection, and compare it against accepted usability principles. This evaluation was performed on our web-based application by Three Information Technology (IT) experts who examined the interface and judged its compliance with recognized usability principles known as heuristics. Kindly find the actual Heuristic Evaluation forms of our application included in Appendix C.

**Table 11: Lists of Heuristics for Usability Evaluation and their Descriptions**

| Heuristic Numbering Scheme | Frequency | Ratio (%) |
|---|---|---|
| **H1** | 6 | 0.074 |
| **H2** | 4 | 0.078 |
| **H3** | 5 | 0.075 |
| **H4** | 9 | 0.15 |
| **H5** | 8 | 0.116 |
| **H6** | 5 | 0.092 |
| **H7** | 9 | 0.121 |
| **H8** | 5 | 0.072 |
| **H9** | 5 | 0.072 |
| **H10** | 10 | 0.15 |
| **Total** | **66** | **100%** |

- **Summary of Violations by Severity Rating for participants will be listed below in tables:**

**Table 12: Summary of Violations by Severity Rating for Participant (1).**

| Severity Rating | Frequency | Ratio (%) |
|---|---|---|
| **0** | 14 | 0.20 |
| **1** | 6 | 0.08 |
| **2** | 15 | 0.23 |
| **3** | 9 | 0.15 |
| **4** | 22 | 0.33 |
| **Total** | **66** | **100%** |

Table 13: Summary of Violations by Severity Rating for Participant (2).

| Severity Rating | Frequency | Ratio (%) |
|---|---|---|
| **0** | 11 | 0.14 |
| **1** | 6 | 0.11 |
| **2** | 15 | 0.23 |
| **3** | 15 | 0.23 |
| **4** | 19 | 0.28 |
| **Total** | 66 | 100% |

Table 14: Summary of Violations by Severity Rating for Participant (3).

| Severity Rating | Frequeny | Ratio (%) |
|---|---|---|
| **0** | 12 | 0.21 |
| **1** | 24 | 0.31 |
| **2** | 11 | 0.17 |
| **3** | 10 | 0.16 |
| **4** | 9 | 0.14 |
| **Total** | 66 | 100% |

## 6.3 Cooperative Evaluation

After using the system and answering Tero test, please indicate the extent to which you agree or disagree with each of the following statements regarding your experience with the system.

Table 15: Participants Details.

| No. | Criteria | Participant 1 | Participant 2 | Participant 3 |
|---|---|---|---|---|
| **1.** | **Gender** | Female | Male | Male |
| **2.** | **Age** | 21 | 21 | 24 |
| **3.** | **Educational Level** | B.A in BIT | B.A in CIS | B.A in CS |
| **4.** | **Programmer Taken** | Hala | Nizar | Mahmoud |
| **5.** | **Institution** | University of Jordan | University of Jordan | University of Jordan |

### 6.3.1 Pre-Evaluation Procedures

Prospective Tero undergoing Pre-Evaluation Procedures are contacted via telephone to assess their willingness to participate in the evaluation process. A concise overview of the evaluation's objectives and procedures related to Tero is provided to participants 10 minutes before the commencement of the evaluation. Additionally, participants are encouraged to review an introductory document that outlines specific tasks to be completed during the evaluation. Clear instructions are given, urging participants to vocalize their thought processes when encountering any challenges within the system. It is emphasized that each task performed is closely monitored and timed throughout the evaluation process.

### 6.3.2 Evaluation Procedures

During the evaluation session, a moderator accompanied the users to do the cooperative evaluation. A comment shown in Appendix B was used by the moderator to write down the comments of each user for each task. Users were helped when they faced serious problems performing the tasks. The following tables show the comments from prepared by the moderator for each participant.

Table 16: Cooperative Evaluation for Tero for Participant (1).

| No. | Test | Time Taken to Complete the Task |
|---|---|---|
| **A. Administrator** | | |
| **1** | Login | 8s |
| **2** | Logout | 10s |
| **3** | View Dashboard | 7s |
| **4** | View Users | 10s |
| **5** | Delete Users | 10s |
| **6** | View Advertisements | 10s |
| **7** | Search and Filter Advertisements | 8s |
| **8** | Approve Advertisement | 10s |
| **9** | Login | 8s |
| **B. Student** | | |
| **1** | Sign Up | 30s |
| **2** | Login | 8s |
| **3** | Logout | 10s |
| **4** | Forgot Password | 10s |
| **5** | Two-Factor Authentication (2FA) | 10s |
| **6** | View Profile | 8s |
| **7** | Manage Profile | 10s |
| **8** | Change Password | 8s |
| **9** | View Advertisements | 10s |
| **10** | Search And Filter Advertisements | 9s |
| **11** | View Description | 5s |
| **12** | Apply Job | 8s |
| **C. Companies** | | |
| **1** | Sign Up | 30s |
| **2** | Login | 8s |
| **3** | Logout | 5s |
| **4** | Forgot Password | 10s |
| **5** | Two-Factor Authentication (2FA) | 10s |
| **6** | View Profile | 10s |
| **7** | Manage Profile | 8s |
| **8** | Change Password | 10s |
| **9** | Post Ads | 8s |
| **10** | View Notifications | 10s |
| **11** | View Advertisements | 9s |
| **12** | Search and Filter Advertisements | 5s |
| **13** | Edit Ads | 5s |
| **14** | Delete Ads | 8s |

Table 17: Cooperative Evaluation for Tero for Participant (2).

| No. | Test | Time Taken to Complete the Task |
|---|---|---|
| **A. Administrator** | | |
| **1** | Login | 10s |
| **2** | Logout | 6s |
| **3** | View Dashboard | 7s |
| **4** | View Users | 10s |
| **5** | Delete Users | 6s |
| **6** | View Advertisements | 10s |
| **7** | Search and Filter Advertisements | 10s |
| **8** | Approve Advertisement | 6s |
| **9** | Login | 10s |
| **B. Student** | | |
| **1** | Sign Up | 20s |
| **2** | Login | 10s |
| **3** | Logout | 6s |
| **4** | Forgot Password | 10s |
| **5** | Two-Factor Authentication (2FA) | 10s |
| **6** | View Profile | 8s |
| **7** | Manage Profile | 10s |
| **8** | Change Password | 10s |
| **9** | View Advertisements | 10s |
| **10** | Search And Filter Advertisements | 9s |
| **11** | View Description | 5s |
| **12** | Apply Job | 10s |
| **C. Companies** | | |
| **1** | Sign Up | 20s |
| **2** | Login | 10s |
| **3** | Logout | 5s |
| **4** | Forgot Password | 10s |
| **5** | Two-Factor Authentication (2FA) | 10s |
| **6** | View Profile | 10s |
| **7** | Manage Profile | 8s |
| **8** | Change Password | 10s |
| **9** | Post Ads | 8s |
| **10** | View Notifications | 10s |
| **11** | View Advertisements | 9s |
| **12** | Search and Filter Advertisements | 5s |
| **13** | Edit Ads | 5s |
| **14** | Delete Ads | 8s |

Table 18: Cooperative Evaluation for Tero for Participant (3).

| No. | Test | Time Taken to Complete the Task |
|---|---|---|
| **A. Administrator** | | |
| **1** | Login | 8s |
| **2** | Logout | 6s |
| **3** | View Dashboard | 7s |
| **4** | View Users | 12s |
| **5** | Delete Users | 6s |
| **6** | View Advertisements | 12s |
| **7** | Search and Filter Advertisements | 8s |
| **8** | Approve Advertisement | 6s |
| **9** | Login | 8s |
| **B. Student** | | |
| **1** | Sign Up | 20s |
| **2** | Login | 8s |
| **3** | Logout | 6s |
| **4** | Forgot Password | 12s |
| **5** | Two-Factor Authentication (2FA) | 12s |
| **6** | View Profile | 8s |
| **7** | Manage Profile | 10s |
| **8** | Change Password | 10s |
| **9** | View Advertisements | 10s |
| **10** | Search And Filter Advertisements | 9s |
| **11** | View Description | 5s |
| **12** | Apply Job | 10s |
| **C. Companies** | | |
| **1** | Sign Up | 20s |
| **2** | Login | 8s |
| **3** | Logout | 5s |
| **4** | Forgot Password | 10s |
| **5** | Two-Factor Authentication (2FA) | 10s |
| **6** | View Profile | 8s |
| **7** | Manage Profile | 8s |
| **8** | Change Password | 11s |
| **9** | Post Ads | 10s |
| **10** | View Notifications | 10s |
| **11** | View Advertisements | 9s |
| **12** | Search and Filter Advertisements | 5s |
| **13** | Edit Ads | 5s |
| **14** | Delete Ads | 8s |

**Table 19: Task Completion Times in Seconds***6.3.3 Post-Evaluation Procedures*

After completing the cooperative evaluation, participants were given a post-test, questionnaire to fill in, which is shown in Appendix C. This questionnaire was important to capture their thoughts and feelings about Tero while they were still fresh. The questionnaire was then followed by a short interview and discussion, which mainly focused on the initial modified design of the Tero. The table shows the responses of the 3 participants to the post-test questionnaire.

**Table 20: Participants' Responses to the Post-Test Questionnaire.**

| No. | Statement | Participant 1 | Participant 2 | Participant 3 | Average |
|---|---|---|---|---|---|
| **1** | Is the system stable? | 5 | 4 | 3 | **4** |
| **2** | Is the system easy to use? | 5 | 5 | 4 | **4.6** |
| **3.** | Does the functionality of the system achieve user's needs? | 5 | 3 | 4 | **4** |
| **4.** | Does the system accomplish all the required goals? | 5 | 5 | 4 | **4.6** |
| **5.** | Is the system's interface well designed? | 4 | 4 | 5 | **4.3** |
| **6.** | Does the system contain some errors? | 4 | 5 | 4 | **4.3** |
| | **Average** | **4.6** | **4.3** | **4** | **4.3** |

## 6.4 Requirements Validation and Completeness

Validation is the process of confirming the completeness and correctness of requirements.

Validation also ensures that the requirements:

1. Achieve stated business objectives.
2. Meet the needs of stakeholders.
3. Are clear and understood by the developers.

Tero has achieved the requirements put before developing it, from functional to non-functional requirements, in a very clear way for its developers, and in an easy way of use for users, but for further work it is seen that other languages may be added in the application to give easier access for people with their mother tongue language.

## 6.5 System Installation

1. **IntelliJ**
2. **Docker.**
3. **Lucid chart.**

## 6.6 Summary

This chapter showed an intestine testing and evaluation for Tero. The heuristic evaluation was conducted system with 3 expert users.

The Heuristic and cooperative evaluation have also shown competitive and acceptable performance for the system indicating that the system is easy to use and has fewer usability problems.

# CHAPTER SEVEN: PROJECT CONCLUSION AND FUTURE WORK

## 7.1 Introduction

Our project introduces a user-friendly web platform that connects students and companies, making it easy for them to collaborate on training courses and internship opportunities. The goal is to enhance practical skills, improve communication, and simplify management between academia and industry.

## 7.2 Overall Weaknesses

A key challenge is ensuring accurate verification of students' practical skills. It's also crucial to prioritize data security to maintain trust in the platform.

## 7.3 Overall Strengths

The platform stands out by offering a central space for students to register for important training courses and companies to manage them efficiently. This approach fosters a mutually beneficial relationship, enhancing students' employability and providing companies access to motivated individuals.

## 7.4 Future Work

To improve, the project can gather feedback to enhance courses continually. Strengthening communication channels between students and companies and implementing tools for professors to monitor student progress during training will contribute to a more comprehensive solution. Exploring emerging technologies can also enhance the platform's capabilities.

## 7.5 Summary

This chapter highlights project strengths and weaknesses, emphasizing a commitment to improvement and adaptation. The project aims to bridge the gap between academia and industry, providing a valuable platform for practical skills development and meaningful connections.

# Appendices

## APPENDIX A

- **Student**

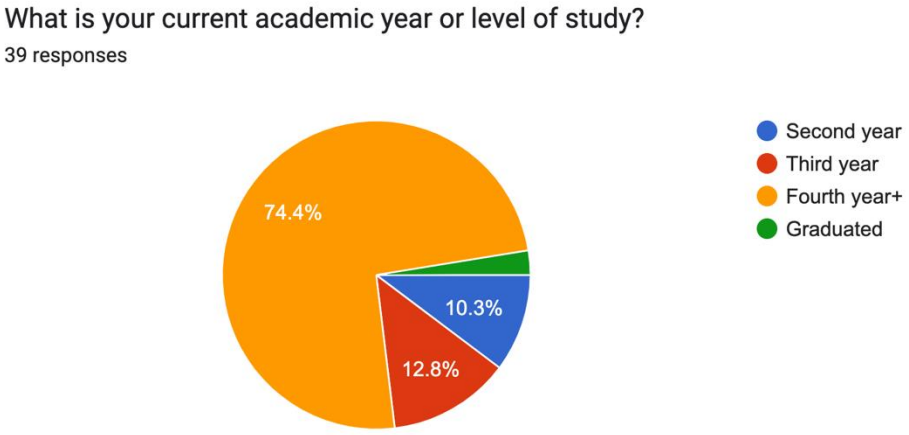


**Figure 79: Question 1**

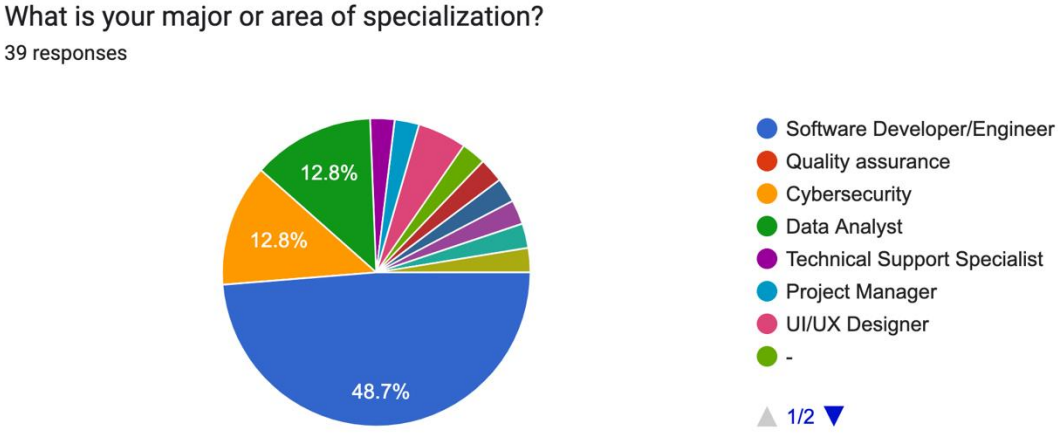


**Figure 80: Question 2**

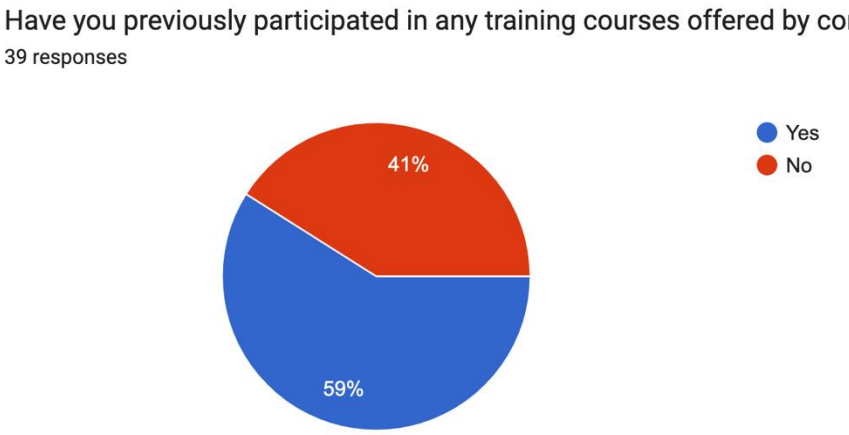


Figure 81: Question 3

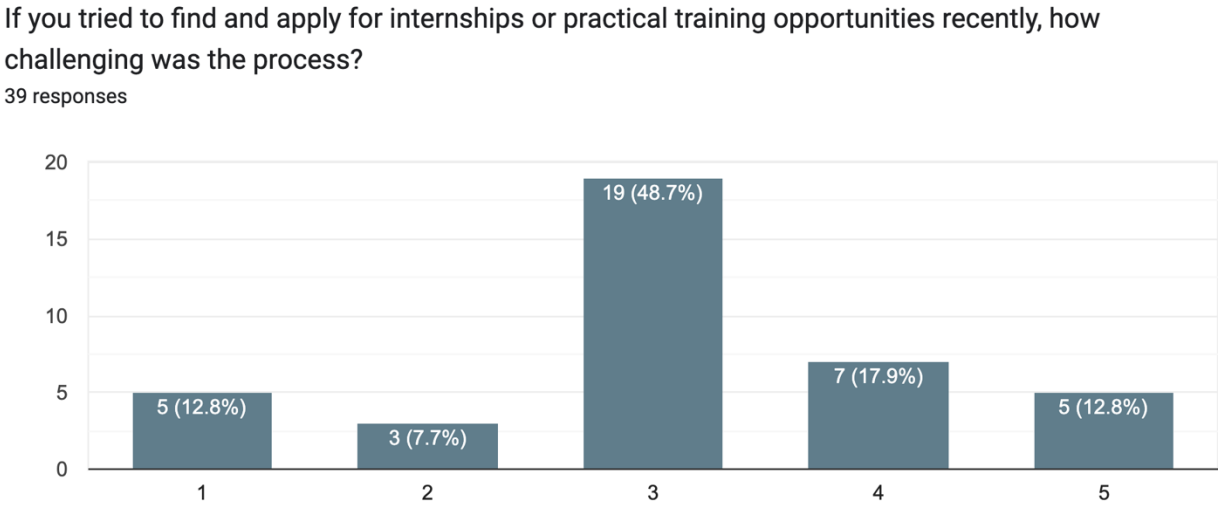


Figure 82: Question 4

How likely are you to view and apply for a training opportunity advertised by a company through a web platform that complements your academic curriculum?

39 responses

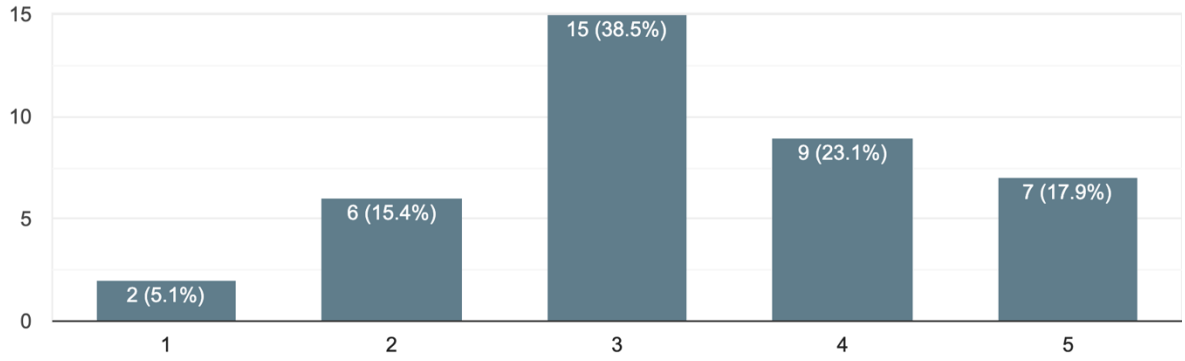


**Figure 83: Question 5**

In your opinion, what do you think is the primary functionality you expect from a plate form for landing an internship ?

39 responses

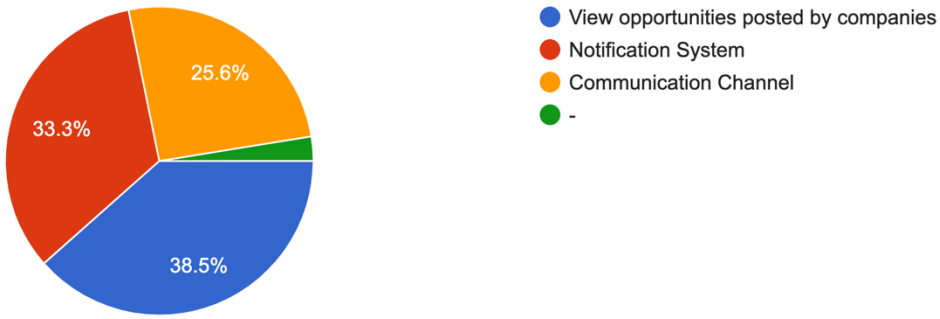


**Figure 84: Question 6**

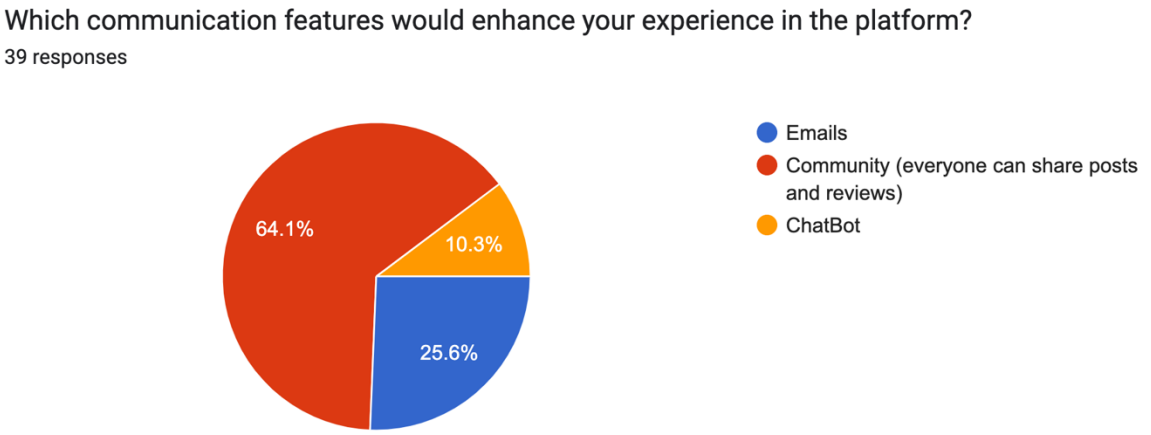


Figure 85: Question 7

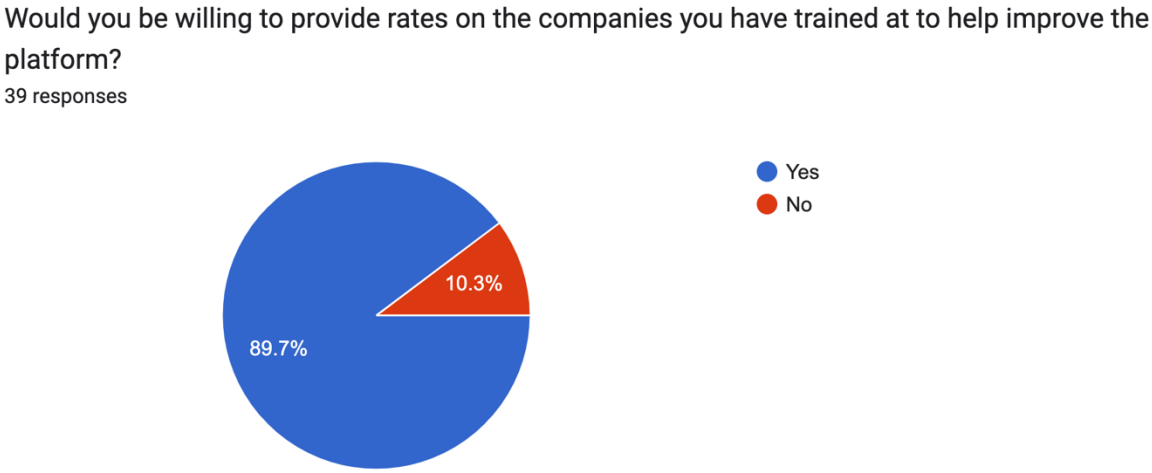


Figure 86: Question 8

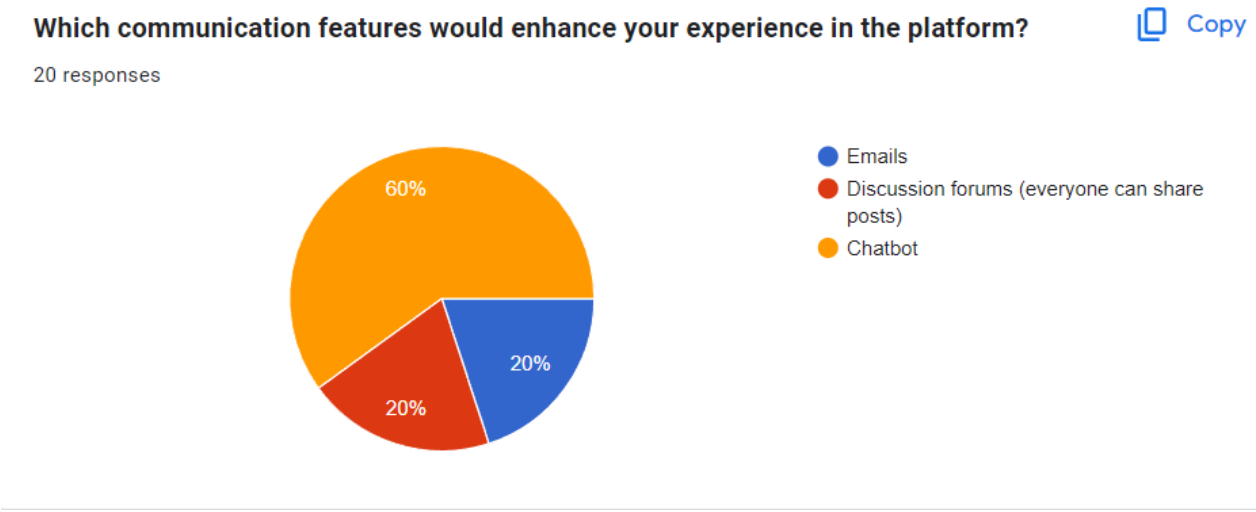


**Figure 87: Question 9**

- **Company**

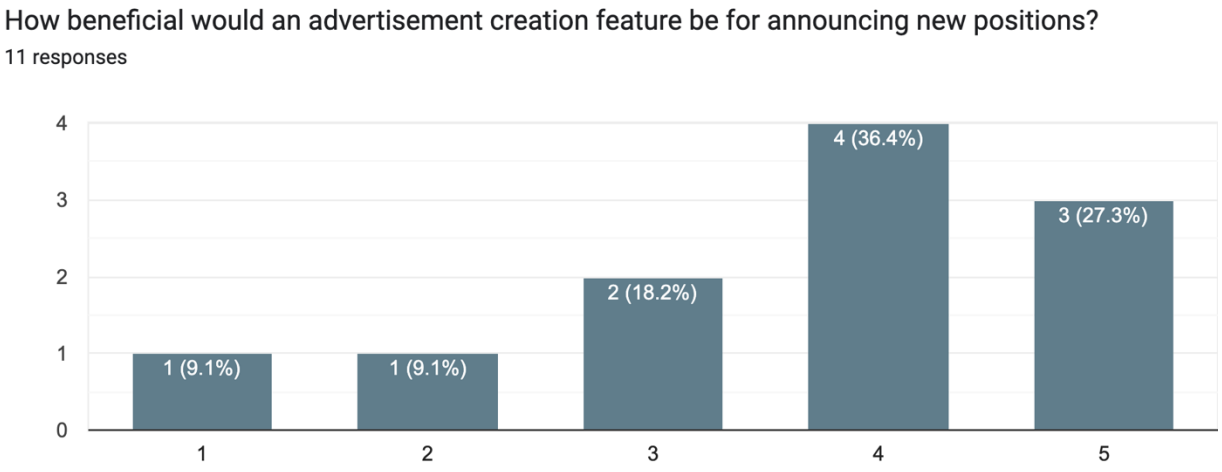


**Figure 88: Question 15**

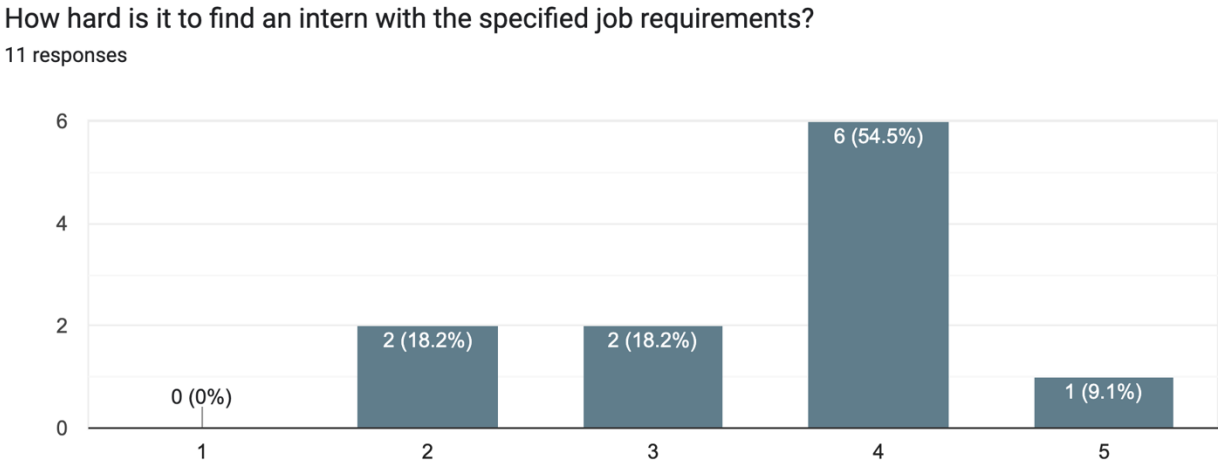


**Figure 89: Question 16**

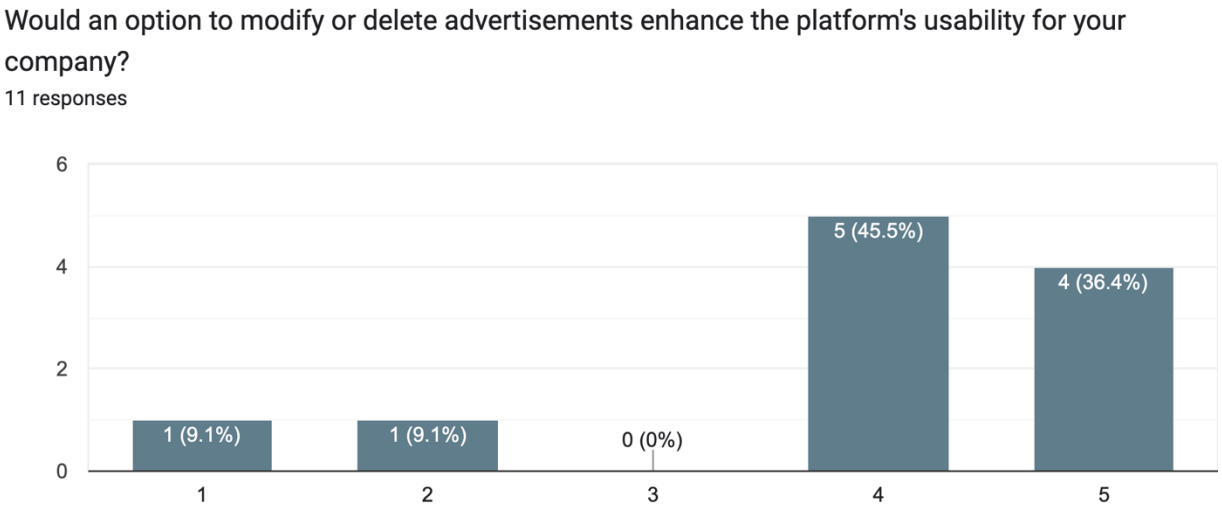


**Figure 90: Question 17**

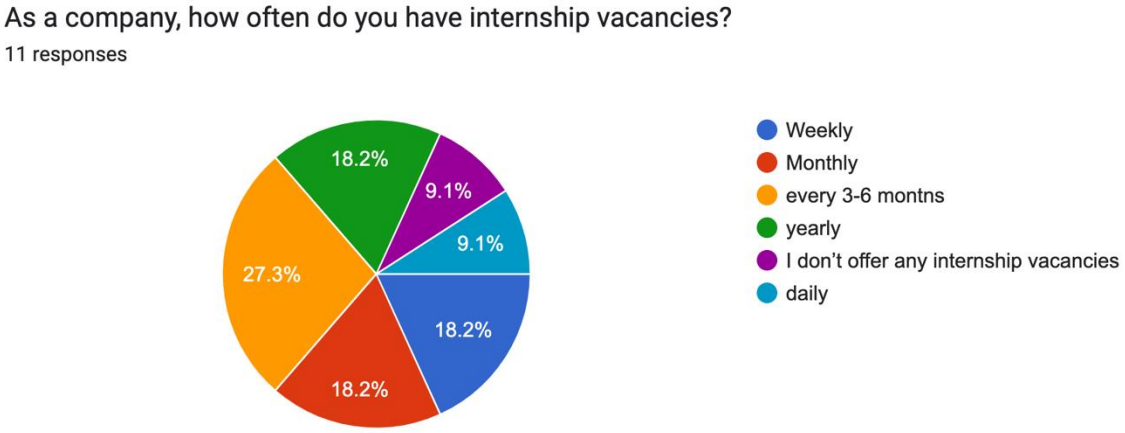


**Figure 91: Question 18**

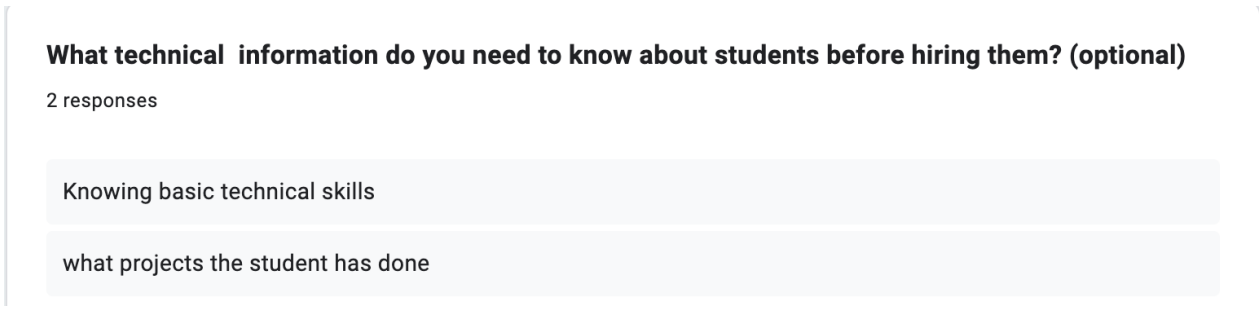


**Figure 92: Question 19**

# APPENDIX B

1. In your opinion, how important is it for students to acquire practical skills that align with industry needs during their academic journey?

✓ Acquiring practical skills that align with industry needs is incredibly important for students during their academic journey. The modern job market values not only theoretical knowledge but also the ability to apply that knowledge effectively in real-world situations. Practical skills ensure that students are not only well-prepared for the workforce but can also contribute meaningfully to their chosen field upon graduation.

2. Could you provide examples of any gaps you've noticed between students' academic knowledge and the practical skills that companies demand?

✓ One notable gap I've observed is that while students might excel in theoretical concepts, they sometimes lack proficiency in using industry-standard software and tools. Additionally, students may struggle with problem-solving in real-world scenarios or

collaborating effectively in teams, both of which are crucial skills in many professional settings.

3. How do you think a web application could enhance the interaction between students and companies for training courses?

✓ A web application can greatly enhance the interaction between students and companies by providing a convenient platform for course offerings, enrollment, and communication. It can streamline the process of finding relevant training courses, enable companies to tailor their offerings to student needs and foster direct communication between students and industry experts, enriching the learning experience.

4. What specific features or functionalities would you consider essential for a web application that aims to bridge the gap between academia and industry through training courses?

✓ Essential features would include a user-friendly course marketplace, personalized recommendations based on student profiles, real-world projects to apply theoretical knowledge, opportunities for direct engagement with industry professionals, and a mechanism for students to provide feedback on courses.

5. How can a web application facilitate your role in overseeing and managing training courses, especially in terms of tracking student behavior?

- ✓ A web application can provide real-time insights into student progress, assignment completion, and engagement levels. It could allow me to track how students are interacting with the course material, identify areas where additional support is needed, and provide timely interventions to ensure successful learning outcomes.

6. Are there any concerns about privacy, data security, or confidentiality that need to be addressed when tracking student behavior within the platform?

- ✓ Yes, ensuring the privacy and security of student data is paramount. Clear guidelines for data collection and usage, robust encryption methods, and obtaining appropriate consent from students are necessary to address these concerns and ensure the protection of sensitive information.

7. What expectations do you have in terms of the ease of use and user-friendliness of the platform, considering both your perspective and that of the students and companies?

- ✓ The platform should be intuitively designed with a user-friendly interface to cater to the diverse needs of students, companies, and instructors. It should be easy to navigate, offer clear instructions, and minimize any technical hurdles to ensure a seamless learning and interaction experience for all stakeholders.

8. How important is real-time communication between students, companies, and yourself for managing training courses effectively?

✓ Real-time communication is crucial for effective course management. It enables quick resolution of queries, clarifications, and discussions, fostering a dynamic learning environment. This type of communication also helps in addressing any immediate concerns or adjustments that may arise during the course, enhancing the overall learning experience.

# Appendix C

## Heuristic Evaluation – A System Checklist

Disclaimer: This list simplified to suit the purpose it is used for, which is to evaluate Tero to identify current problems experienced by the users, which is part of our graduation project submitted to King Abdullah II School for Information Technology, The University of Jordan.

Please fill in the evaluation form below, a form of a checklist, by writing "X" in the appropriate place, which mostly describes the best answer to the corresponding criterion. This form is to be filled after investigating the system interface, i.e., having looked at and examined the interface. The answer to each criterion is either:

- "**0**" means "I don't agree that this is a usability problem at all".

- "**1**" means “The Cosmetic problem only: need not be fixed unless extra time is available on the project”.

- "**2**" means “Minor usability problem: fixing this should be given low priority”.

- "**3**" means “Major usability problem: important to fix, so should be given high priority”.

- "**4**" means “Usability catastrophe: imperative to fix this before the product can be released".

Thank you for your willingness to evaluate this system. Your time and effort are highly appreciated.

## H1. Visibility of System Status

The system should always keep the user informed about what is going on through appropriate feedback within a reasonable time.

| Number | Review Checklist | 0 | 1 | 2 | 3 | 4 | Comments |
|---|---|---|---|---|---|---|---|
| 1.1 | Does every display begin with a title or header that describes screen contents? | ( ) | ( ) | ( ) | ( ) | ( ) | |
| 1.2 | Do menu instructions, prompts, and error messages appear in the same place(s) on each menu? | ( ) | ( ) | ( ) | ( ) | ( ) | |
| 1.3 | Is there some form of system feedback for every operator's action? | ( ) | ( ) | ( ) | ( ) | ( ) | |
| 1.4 | Are response times appropriate to the user's cognitive processing? | ( ) | ( ) | ( ) | ( ) | ( ) | |
| 1.5 | Is there visual feedback in menus or dialog boxes about which choices are selectable? | ( ) | ( ) | ( ) | ( ) | ( ) | |

## H2. Match between system and the real World

The system should speak the users' language, with words, phrases, and concepts familiar to them. Respect real-world conventions by arranging information in a natural and logical order.

## H3. User Control and Freedom

Users should be free to select, and sequence tasks (when appropriate), rather than having the system does this for them. Users often choose system functions by mistake and will need a marked “emergency exit” to leave the unwanted state without going through an extended dialogue. Users should make their own decisions (with clear information) regarding the costs of exiting current work. The system should support undo and redo.

| Number | Review Checklist | 0 1 2 3 4 | Comments |
|---|---|---|---|
| 3.1 | When a user's task is complete, does the system wait for a signal from the user before processing? | ( ) ( ) ( ) ( ) ( ) | |
| 3.2 | Are users prompted to confirm commands that have drastic, destructive consequences? | ( ) ( ) ( ) ( ) ( ) | |
| 3.3 | Are character edits allowed in data entry fields? | ( ) ( ) ( ) ( ) ( ) | |
| 3.4 | If menu lists are long (more than seven items), can users select an item either by moving the cursor or typing a mnemonic code? | ( ) ( ) ( ) ( ) ( ) | |
| 3.5 | If the system uses a pointing device, do users choose either clicking on menu items or using a keyboard shortcut? | ( ) ( ) ( ) ( ) ( ) | |

## H4. Consistency and Standards

Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

| Number | Review Checklist | 0 1 2 3 4 | Comments |
|---|---|---|---|
| 4.1 | Has a heavy use of all uppercase letters on a screen been avoided? | ( ) ( ) ( ) ( ) ( ) | |
| 4.2 | Are icons labeled? | ( ) ( ) ( ) ( ) ( ) | |
| 4.3 | Are there no more than twelve to twenty icon types? | ( ) ( ) ( ) ( ) ( ) | |
| 4.4 | Does each window have a title? | ( ) ( ) ( ) ( ) ( ) | |
| 4.5 | Is vertical and horizontal scrolling possible in each window? | ( ) ( ) ( ) ( ) ( ) | |
| 4.6 | Are menu choice lists presented vertically? | ( ) ( ) ( ) ( ) ( ) | |
| 4.7 | Are menu titles either centered or left-justified? | ( ) ( ) ( ) ( ) ( ) | |
| 4.8 | Are menu items left-justified, with the item number or mnemonic preceding the name? | ( ) ( ) ( ) ( ) ( ) | |
| 4.9 | Do embedded field-level prompts appear to the right of the field label? | ( ) ( ) ( ) ( ) ( ) | |

| | | | |
|---|---|---|---|
| 4.10 | Are attention-getting techniques used with care? | ( ) ( ) ( ) ( ) ( ) | |

## H5. Help Users Recognize, Diagnose, and Recover from Errors

Error messages should be expressed in plain language (NO CODES).

| Number | Review Checklist | 0 1 2 3 4 | Comments |
|---|---|---|---|
| 5.1 | Is sound used to signal an error? | ( ) ( ) ( ) ( ) ( ) | |
| 5.2 | Are error messages worded so that the system, not the user, takes the blame? | ( ) ( ) ( ) ( ) ( ) | |
| 5.3 | Do error messages suggest the cause of the problem? | ( ) ( ) ( ) ( ) ( ) | |
| 5.4 | Do error messages indicate what action the user needs to take to correct the error? | ( ) ( ) ( ) ( ) ( ) | |
| 5.5 | If the system supports both novice and expert users, are multiple levels of error-message detail available? | ( ) ( ) ( ) ( ) ( ) | |

| | | | |
|---|---|---|---|
| 5.6 | If an error is detected in a data entry field, does the system place the cursor in that field or highlight the error? | ( ) ( ) ( ) ( ) ( ) | |
| 5.7 | Do error messages inform the user of the error's severity? | ( ) ( ) ( ) ( ) ( ) | |

## H6. Error Prevention

Even better than good error messages are a careful design that prevents a problem from occurring in the first place.

| Number | Review Checklist | 0 1 2 3 4 | Comments |
|---|---|---|---|
| 6.1 | Are menu choices logical, distinctive, and mutually exclusive? | ( ) ( ) ( ) ( ) ( ) | |
| 6.2 | Are data inputs case-blind whenever possible? | ( ) ( ) ( ) ( ) ( ) | |
| 6.3 | Does the system prevent users from making errors whenever possible? | ( ) ( ) ( ) ( ) ( ) | |
| 6.4 | Does the system warn users if they are about to make a potentially serious error? | ( ) ( ) ( ) ( ) ( ) | |

| | | | |
|---|---|---|---|
| 6.5 | Do data entry screens and dialog boxes indicate the number of character spaces available in a field? | ( ) ( ) ( ) ( ) ( ) | |
| 6.6 | Do fields in data entry screens and dialog boxes contain default values when appropriate? | ( ) ( ) ( ) ( ) ( ) | |

## H7. Recognition Rather Than Recall

Make objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for the use of the system should be visible or easily retrievable whenever appropriate.

| Number | Review Checklist | 0 1 2 3 4 | Comments |
|---|---|---|---|
| 7.1 | For question-and-answer interfaces, are visual cues and white space used to distinguish questions, prompts, instructions, and user input? | ( ) ( ) ( ) ( ) ( ) | |
| 7.2 | Are inactive menu items grayed out or omitted? | ( ) ( ) ( ) ( ) ( ) | |
| 7.3 | Do data entry screens and dialog boxes indicate when fields are optional? | ( ) ( ) ( ) ( ) ( ) | |

| | | | |
|---|---|---|---|
| 7.4 | Are prompts, cues, and messages placed where the eye is likely to be looking on the screen? | ( ) ( ) ( ) ( ) ( ) | |
| 7.5 | Are field labels close to fields but separated by at least one space? | ( ) ( ) ( ) ( ) ( ) | |
| 7.6 | Have items been grouped into logical zones, and have headings been used to distinguish between zones? | ( ) ( ) ( ) ( ) ( ) | |
| 7.7 | Are borders used to identify meaningful groups? | ( ) ( ) ( ) ( ) ( ) | |
| 7.8 | Is color coding consistent throughout the system? | ( ) ( ) ( ) ( ) ( ) | |

## H8. Flexibility and Minimalist Design

Accelerators-unseen by the novice user-may often speeds up the interaction for the expert user such that the system can cater to inexperienced and experienced users. Allow users to tailor frequent actions. Provide alternative means of access and operation for users who differ from the "average" user (e.g., physical or cognitive ability, culture, language, etc.).

| Number | Review Checklist | 0 1 2 3 4 | Comments |
|---|---|---|---|
| 8.1 | If menu lists are short (seven items or fewer), can users select an item by moving the cursor? | ( ) ( ) ( ) ( ) ( ) | |
| 8.2 | If the system uses a pointing device, do users have the option of either clicking on fields or using a keyboard shortcut? | ( ) ( ) ( ) ( ) ( ) | |
| 8.3 | On data entry screens, do users choose either clicking directly on a field or using a keyboard shortcut? | ( ) ( ) ( ) ( ) ( ) | |
| 8.4 | On menus, do users choose either clicking directly on a menu item or using a keyboard shortcut? | ( ) ( ) ( ) ( ) ( ) | |
| 8.5 | In dialog boxes, do users choose either clicking directly on a dialog box option or using a keyboard shortcut? | ( ) ( ) ( ) ( ) ( ) | |

## H9. Aesthetic and Minimalist Design

Dialogues should not contain information that is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

| Number | Review Checklist | 0 1 2 3 4 | Comments |
|---|---|---|---|
| 9.1 | Are all icons in a set visually and conceptually distinct? | ( ) ( ) ( ) ( ) ( ) | |
| 9.2 | Does each icon stand out from its background? | ( ) ( ) ( ) ( ) ( ) | |
| 9.3 | Does each data entry screen have a short, simple, clear, distinctive title? | ( ) ( ) ( ) ( ) ( ) | |
| 9.4 | Are field labels brief, familiar, and descriptive? | ( ) ( ) ( ) ( ) ( ) | |
| 9.5 | Are there pop-up or pull-down menus within data entry fields that have many but well-defined entry options? | ( ) ( ) ( ) ( ) ( ) | |

## H10. Help and Documentation.

Even though it is better if the project can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

| Number | Review Checklist | 0 1 2 3 4 | Comments |
|---|---|---|---|
| 10.1 | Are online instructions visually distinct? | ( ) ( ) ( ) ( ) ( ) | |
| 10.2 | If menu choices are ambiguous, does the system provide additional explanatory information when an item is selected? | ( ) ( ) ( ) ( ) ( ) | |
| 10.3 | Is the help function visible, for example, a key labeled help or a special menu? | ( ) ( ) ( ) ( ) ( ) | |
| 10.4 | Navigation: Is the information easy to find? | ( ) ( ) ( ) ( ) ( ) | |
| 10.5 | Presentation: Is the visual layout well designed? | ( ) ( ) ( ) ( ) ( ) | |
| 10.6 | Conversation: Is the information accurate, complete, and understandable? | ( ) ( ) ( ) ( ) ( ) | |
| 10.7 | Is the information relevant? | ( ) ( ) ( ) ( ) ( ) | |

| | | | |
|---|---|---|---|
| 10.8 | Can users easily switch between help and their work? | ( ) ( ) ( ) ( ) ( ) | |
| 10.9 | Is it easy to access and return from the help system? | ( ) ( ) ( ) ( ) ( ) | |
| 10.10 | Can users resume work where they left off after accessing help? | ( ) ( ) ( ) ( ) ( ) | |