



HIRAL

Hiral

IT 496: Graduation Project Report

Product Release-2

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Hiral

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Abstract (English): Hiral is a Django-based website that addresses the inefficiency of traditional job search methods by connecting job seekers with recruiters. It utilizes keyword scanning to extract skills from job seekers' CVs and continuously expands its skills dictionary using the SkillNer NLP module. By automatically extracting skills from job posts, Hiral ensures its skills database remains up-to-date. The system employs sentence transformers to match recommended candidates with job posts and propose job opportunities to seekers. The purpose of Hiral is to streamline the job search process and improve efficiency. Through its methodology, it automates skill extraction, keeps the skills dictionary relevant, and enables semantic similarity calculations for candidate-job matching. The evaluation of Hiral focuses on accurate skill extraction, dictionary expansion, and successful candidate-job matching, all of which contribute to enhancing the job search experience.

Results demonstrate that Hiral significantly improves the efficiency of the job search process, benefiting both job seekers and recruiters. By providing recruiters with a list of potential candidates closely aligned with job requirements, and suggesting relevant job opportunities to seekers, Hiral saves time and enhances the overall job search experience.

In summary, Hiral, a Django-based website, leverages keyword scanning, SkillNer NLP module, and sentence transformers to connect job seekers with recruiters. By automating skill extraction, expanding the skills dictionary, and facilitating effective candidate-job matching, Hiral improves the efficiency of the job search process, providing value to both job seekers and recruiters.

Abstract(Arabic):

هائرل هو موقع ويب قائم على إطار جانقو يحل مشكلة عدم كفاءة طرق البحث التقليدية عن وظائف من خلال ربط الباحثين عن عمل بأصحاب العمل. يقوم النظام بمسح الكلمات الرئيسية لاستخراج المهارات من سيرة الباحثين عن عمل ويوسع قاموس المهارات باستمرار باستخدام تقنية لتحليل اللغات. عن طريق استخراج المهارات تلقائياً من الوظائف المعلن عنها، يضمن هائرل تحديث قاموس المهارات الخاص به.

يستخدم النظام تقنية ذكاء اصطناعي لمطابقة المرشحين مع الوظائف المعلن عنها واقتراح فرص عمل للباحثين عن عمل. غرض هائرل هو تبسيط عملية البحث عن وظيفة وتحسين كفاءتها. من خلال منهجه، يقوم بأتمتة استخراج المهارات، ويبقي قاموس المهارات ذو صلة، ويمكن من حساب الشبه الدلالي ومطابقة المرشحين للوظائف.

يركز تقييم هائرل على استخراج المهارات الدقيقة، وتوسيع القاموس، ومطابقة المرشحين للوظائف بنجاح، مما يسهم في تعزيز تجربة البحث عن وظيفة.

تشير النتائج إلى أن هائرل يحسن بشكل كبير كفاءة عملية البحث عن وظيفة، مع الاستفادة لكل من الباحثين عن عمل وأصحاب العمل. من خلال توفير قائمة بالمرشحين المحتملين الذين يتماشون مع متطلبات الوظيفة، واقتراح فرص عمل ذات صلة للباحثين عن عمل، يوفر هائرل الوقت ويعزز تجربة البحث عن وظائف بصفة عامة.

في الختام، هائرل هو موقع ويب قائم على إطار جانقو يستخدم مسح الكلمات الرئيسية، وتقنية لتحليل اللغات، وتقنية ذكاء اصطناعي لربط الباحثين عن عمل بأصحاب العمل. من خلال أتمتة استخراج المهارات، وتوسيع قاموس المهارات، وتيسير مطابقة المرشحين للوظائف بفعالية، يعمل هائرل على تحسين كفاءة عملية البحث عن وظائف، مما يوفر قيمة لكل من الباحثين عن عمل وأصحاب العمل.



Keywords:

keywords pertinent to our project include:

- 1- Job Matching
- 2- Skill Extraction
- 3- KeyWord Scanning
- 4-Resume Analysis
- 5-Sentence Transformers



HIRAL

CHAPTER 1

Introduction



1 Introduction

Hiral is a platform designed to address the challenges faced by job seekers and recruiters in the job market. The job search process can be tedious and time-consuming, with millions of people searching for jobs and organizations looking for qualified candidates. Hiral aims to provide a convenient and fast way for job seekers and recruiters to connect with each other, making their search effortless and efficient.

The core problem that Hiral addresses is the inefficiency and complexity of the job market. Job seekers often struggle to find suitable job opportunities among the vast number of available options. Recruiters, on the other hand, face difficulties in identifying the most qualified candidates from a large pool of applicants. Hiral aims to solve these challenges by leveraging advanced technology and algorithms to match job seekers with relevant job openings and help recruiters find the ideal candidates efficiently.

The objectives of building Hiral are to simplify the job search and hiring process for both job seekers and recruiters. The platform will offer a wide range of features, including personalized job or candidate recommendations and an analytical dashboard providing valuable insights and data-driven analytics. Our product vision is to become the go-to platform for job seekers and recruiters, revolutionizing the way they connect and interact in the job market.

The software development process for Hiral involves several stages. We start by collecting data about skills for different Job domains to build our dictionary. then we extract skills from seekers' CVs to later match them with recruiters' job posts. After that we allow seekers and recruiters to search for the most suitable job opportunities/candidates for them. and finally we provide an analytical dashboard to present valuable insights. Throughout the process, we take into account user needs and feedback to continuously improve the platform's user interface and functionality. We follow an iterative and agile software development methodology to ensure efficient development and project management.

The main contribution of Hiral is providing a comprehensive solution that streamlines the job search and hiring process. By leveraging advanced technology and algorithms, Hiral will significantly reduce the time and effort required for job seekers to find suitable job opportunities and for recruiters to identify the most qualified candidates. This solution has a significant impact on both the local and global community by facilitating employment opportunities and helping organizations find the best talent effortlessly. Hiral differentiates itself by offering a user-friendly platform with personalized recommendations and data-driven analytics, providing a superior experience compared to existing job search platforms.



This report contains an introduction that presents the problem, solution, and product vision. The background section provides information on AI resume tools and semantic matching algorithms. A literature review analyzes competitive products in the market. The system requirements section discusses user analysis, interactions, and the product backlog. System design covers architectural and data design, as well as interface design. System implementation describes the implementation process. System testing includes user acceptance testing and discussion. Conclusions and future work summarize the findings and outline future directions. The references section lists the sources used in the report. Appendices contain additional materials such as questionnaires and interviews.

1.1 The Problem

Finding the right candidate for a position, especially in the digital industry, is a complex and time-consuming process that often poses major challenges.

In today's competitive job market, employers rely on countless resumes, cover letters, and applications to find the ideal candidate with the specific skills and qualifications needed for the job. We are faced with the enormous task of sifting through the digital industry, which has especially increased the complexity of the recruitment process. As technology rapidly evolves and the talent pool continues to expand, employers struggle to find candidates with the knowledge needed to succeed in this dynamic field.

Job seekers spend a lot of time and effort crafting attractive resumes, writing cover letters, and networking in hopes of standing out from the crowd of applicants. However, due to the large number of job applicants, it can be difficult for individuals to get noticed by employers.

The overall result of these challenges is a significant drain on resources for both employers and job seekers. Employers may find themselves spending excessive time and resources on manual resume screening, conducting multiple rounds of interviews, and encountering difficulties in making well-informed hiring decisions. On the other hand, job seekers may experience frustration and a sense of discouragement as they navigate through a competitive job market, facing multiple rejections or struggling to find opportunities that align with their skill sets and career aspirations.

In conclusion, as the digital landscape continues to evolve, addressing these challenges becomes increasingly crucial to ensure efficient and effective talent acquisition processes.



1.2 The Solution

Our aim is to simplify the job search process by leveraging the latest advancements in AI technology, such as sentence transformers. Our innovative platform empowers recruiters to screen CVs (resumes) more efficiently by using AI screening tools, so they can quickly identify the most suitable candidates for a given position. Job seekers, on the other hand, benefit from receiving relevant job proposals that match their skills and experience, thereby saving them precious time and energy. Moreover, our web application provides a personalized analytical dashboard that allows both job seekers and recruiters to tune into their specific interests and preferences, helping them to discover new opportunities that align with their career goals.

In essence, our application revolutionizes the way job searches are conducted by targeting the right candidates and job proposals. By minimizing the time and effort required to find the ideal match, we help both recruiters and job seekers alike to achieve their goals efficiently and effectively.

1.3 Product

1.3.1 Product Vision

According to Hiral's vision statement:

For recruiters and job seekers

who hunt for suitable candidates/look for convenient job opportunities

The "Hiral" is a web application

That proposes a game-changing solution, by making the job search process simple for both recruiters and job seekers

Unlike other job search platforms **Our product** extracts skills from job seekers' CVs then uses AI technologies to proposal the best candidates/job opportunities

Our product revolutionizes the recruitment process by utilizing cutting-edge AI technologies. Instead of relying solely on manual input and keyword searches, our platform leverages advanced algorithms to extract and analyze the skills directly from job seekers' CVs.



1.3.2 Product Roadmap

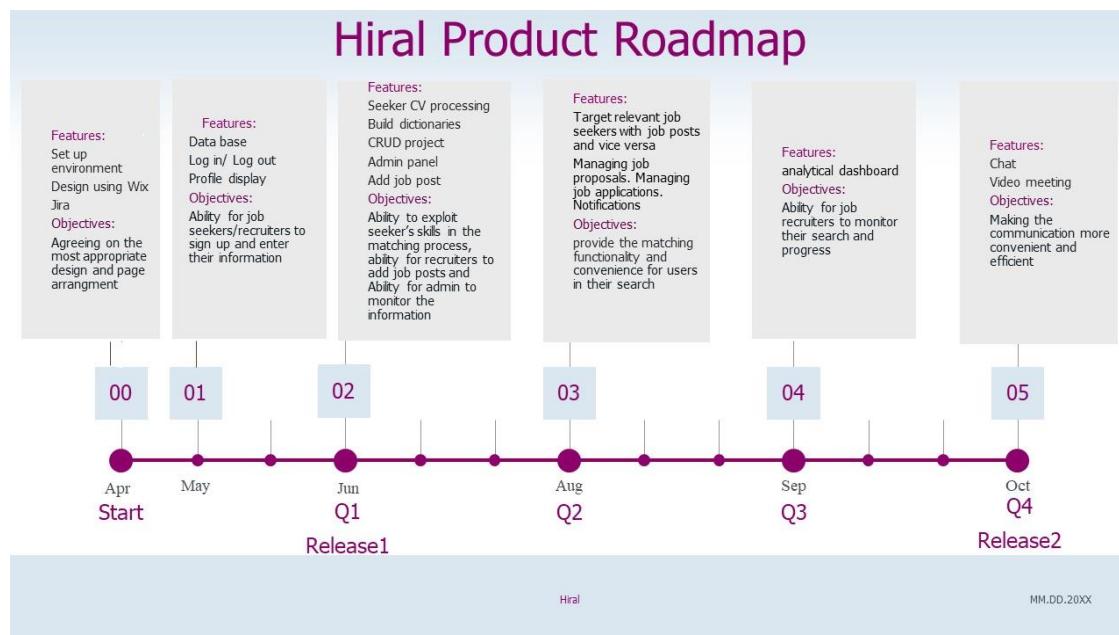


Figure 1 - 1.3.2 Hiral roadmap

1.3.3 Objectives

- Product (customer focus-value):

We are building this product because, at present, searching for good jobs and recruiting suitable candidates is tiresome, exhausting, and time-consuming. Our product will minimize the time and effort to find a qualified employee and the time and effort to find a suitable job for them by allowing the candidate to submit a detailed CV and the recruiter to submit a detailed job description.

The product will permit the following:

1. The job seeker and the recruiter to manage their profiles.
2. Screen CVs and applications to target relevant candidates and job proposals by using AI technologies.
3. Notify the job seekers for relevant job proposals.
4. Target relevant candidates for each job proposal.
5. Send job proposals and job applications.
6. Provide a personalized analytical dashboard related to the interests of the job seeker and those of the recruiter.



Anyone who is searching for a job or recruiting for candidates will benefit from this application.

- Project (solution focus-plan):

To complete this project, several steps must be taken:

1. Set environment to create the web application.
2. Understand user needs.
3. Design database.
4. Build interfaces.
5. Implement basic functions.
6. Collect data.
7. Test model.
8. Integrate model into the web application.

- Learning (student focus):

We learned the following from completing this project:

1. Being familiar with VS CODE.
2. Design SQLite database.
3. Build interfaces using HTML, CSS and UIkits.
4. Connect to the front end with the Django app.
5. Applying sentence transformers in Python.
6. Screen CV using keyword-based AI screening tools using dictionaries.
7. Identify valuable insights and present them to the users in a meaningful dashboard.

1.3.4 Scope

Hiral is a web application that is concerned with helping either recruiters or job seekers who need to find opportunities quickly and effortlessly, Hiral will enable the user to search a large pool of either job postings or candidates that are relevant to each other. Hiral supports the English language.

1.3.5 Hardware/Software Tools and Cost

Table 1 – 1.3.5 Hardware/Software tools

Hardware Tools	
Name and Description	Cost
Computers and smartphone devices	Already available for the team
Software Tools	
Name and Description	Cost
Visual Studio IDE For creating the web application using Django	0
GitHub	0
Jira	0
Text editor	0
Diagram building software	0

1.4 Scrum Team

1.4.1 Skill Set Requirements

Table 2 – 1.4.1 Skill set requirements

Technical Skill Required	What is the current level of the team (<i>beginner-intermediate- advanced</i>) for each skill? How will the gap be bridged? (<i>if necessary</i>) Learning plan
Django framework and Python programming language skills	beginner -Youtube videos -Online Django courses
Sentence transformers knowledge	beginner, -Youtube videos -Online courses
Keyword-based AI screening	beginner, -Youtube videos -Online courses

1.4.1.1 Learning

We will learn to program using the Django framework and learn Python programming language more in depth and how to embed useful AI technologies. In our case they are sentence transformers and keyword-based screening tools. Also, we subscribed to some courses to learn the basics of programming with Django to create a web app.



1.4.2 Roles and Responsibilities

Table 3 – 1.4.2 Roles and responsibilities

Scrum Team	
Product Owner: (list name of the project supervisor)	Dr. Henda Ouertani
Developers: (list student names)	Deema Alfuaim Atheer Alzaid Dana Alsaeedi Norah Alqaht
Scrum Master (SM): (list name of designated SM for the project)	Dr.Hind Alrasheed
Stakeholders: (list names of project stakeholders, include customer names if any)	Examination team



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CHAPTER 2

Background



2 Background

This section aims to provide background information in Artificial Intelligence (AI) techniques that are relevant to our application. Firstly, we will explain what AI screening resumes are and overview the different AI techniques used to screen resumes. Secondly, we will briefly describe the semantic matching algorithm used to compare different text inputs.

2.1 AI resume & job post screening tools

AI resume and job post screening tools are computer programs powered by artificial intelligence that play a vital role in the analysis and evaluation of resumes submitted by job applicants. With their advanced capabilities, these tools assist recruiters and hiring managers in efficiently handling the daunting task of screening and assessing large volumes of resumes. By harnessing the potential of AI algorithms, these tools not only expedite the screening process but also enable the identification of the most qualified candidates, leading to significant time and cost savings within the recruitment process [2].

Resume And job post screening tools typically fit into three categories [3]. Each of these tools is designed to help talent acquisition teams automate the resume screening process.

Keyword-based: In this category, artificial intelligence algorithms analyze resumes or job posts to identify specific words, phrases, and patterns. By focusing on industry-specific terms that match the required skills, recruiters can efficiently identify suitable candidates. Keyword-based screening is particularly helpful for HR professionals seeking to select candidates based on their skills and expertise. This method allows for a relatively straightforward and efficient screening process, as it targets specific keywords directly related to the desired qualifications.

Grammar-based: Machine learning algorithms are employed in grammar-based screening tools to analyze the words and phrases used in resumes or job posts. These algorithms utilize predefined grammatical rules to comprehend the meaning of each sentence. Grammar-based parsing goes beyond simple keyword matching and requires skilled language engineers to manually encode and test the parser to ensure accurate results. While this method is more time-consuming due to its complexity, it proposes a higher accuracy percentage compared to the keyword-based approach. By understanding the structure and context of sentences, grammar-based screening tools can provide a more nuanced evaluation of candidates' qualifications and potential fit for the role.



Statistical-based: Statistical parsing is a technique that employs numerical algorithms to analyze resumes or job posts and decode the meaning of words and phrases. This approach allows for the identification of various elements such as addresses, dates, and entities. Statistical-based screening tools can differentiate between the same word used in different contexts, similar to grammar-based parsers. By utilizing statistical algorithms, these tools can identify patterns and relationships within the data, enabling a more comprehensive understanding of the content. Statistical-based parsing proposes a powerful method for extracting relevant information and making accurate assessments based on the statistical properties of the text.

One of the well-known statistical Natural Language Processing (NLP) tools is SkillNer which uses advanced machine learning algorithms to analyze text and extract relevant information, such as skills and certifications, from job postings and resumes. By using statistical analysis, SkillNer is able to identify patterns and relationships in the data that might be missed by simpler keyword-based approaches. This makes SkillNer a powerful and accurate tool for automating the recruitment process and improving the efficiency of hiring teams.

To illustrate the effectiveness of SkillNer, let's consider a scenario where a company is seeking a software developer. They create a job description that outlines specific requirements, including:

- Bachelor's degree in computer science or related field
- 3+ years of experience in software development
- Proficiency in Java, Python, and SQL
- Experience with Agile development methodologies
- Strong problem-solving and analytical skills

SkillNer NLP can analyze this job post and extract the most important keywords, such as "software developer", "computer science", "Java", "Python", "SQL", "problem-solving," "Agile", and "analytical skills."



2.2 Semantic similarity

Semantic similarity is a concept that measures the degree of similarity between two pieces of text based on their meaning and context, rather than solely relying on spelling or grammar [4]. While spelling and grammar are important for language correctness, semantic similarity takes into account the underlying semantics and relationships between words, phrases, and sentences. In the field of natural language processing and machine learning, semantic similarity plays a crucial role in enhancing algorithms' understanding of language and improving the accuracy of their predictions [4]. By considering the meaning and context of text, algorithms can go beyond basic pattern matching and capture the nuances and subtleties of language usage. An example of the semantic similarity is shown in Table 4.

Table 4 – 2.2 Example of semantic similarity detection

Sentence pair	Similar /non-similar
“How old are you?”	Similar
“What is your age?”	
“How old are you?”	non-similar
“How are you?”	

Semantic similarity helps algorithms understand language better by capturing the small and subtle differences in how words and phrases are used. Sentences are considered semantically similar if they can be answered by the same responses, indicating a shared meaning or intent. On the other hand, if sentences require different responses, they are semantically different [5].



2.3 Semantic matching algorithms

2.3.1 Sentence transformers

Sentence transformers are a type of Natural Language Processing (NLP) model designed to process and analyze human language. Sentence transformers learn from numerous examples to grasp the meaning conveyed by sentences, in a manner resembling human understanding. To facilitate the computer's understanding, sentence transformers create condensed representations called embeddings. These embeddings capture the essence of a sentence's meaning in a concise manner [6]. They encompass all the vital information pertaining to the sentence's intended meaning. These embeddings are highly valuable as they enable us to compare different sentences and assess their similarity or dissimilarity in terms of meaning. This process is similar to our human practice of comparing two sentences to determine if they express similar ideas or discuss distinct subjects. The use of embeddings empowers us to analyze and comprehend the semantic relationships and variances among sentences more effectively [6].

Sentence transformers employ cosine similarity as a means to quantify the similarity between two sentences or documents based on their underlying meaning. It leverages a mathematical formula to compare the words utilized in each sentence or document, ultimately assigning a score that denotes their degree of similarity.

In the process of calculating cosine similarity, we start by representing each sentence or document as a numerical vector. This vector captures the frequency of each word in the sentence or document.

For example, if we have two sentences:

Sentence 1: "I like coffee."

Sentence 2: "I prefer tea."

To represent these sentences as numerical vectors, we assign each unique word in our vocabulary a position in the vector. Each element in the vector represents the frequency of that word in the sentence. Here's the process:

1. Define the vocabulary: ["I", "like", "coffee", "prefer", "tea"]
2. Construct the numerical vector for Sentence 1:
 - "I" appears once in Sentence 1. "like" appears once in Sentence 1.
 - "coffee" does not appear in Sentence 1.
 - "prefer" does not appear in Sentence 1.

- "tea" appears once in Sentence 1.

Therefore, the numerical vector for Sentence 1 is [1, 1, 0, 0, 1].

3. Construct the numerical vector for Sentence 2:

- "I" appears once in Sentence 2.
- "like" does not appear in Sentence 2.
- "coffee" does not appear in Sentence 2.
- "prefer" appears once in Sentence 2.
- "tea" appears once in Sentence 2.

Therefore, the numerical vector for Sentence 2 is [1, 0, 1, 1, 0].

By representing the sentences as numerical vectors, we capture the word frequencies in a structured format. These vectors can be used for further calculations, such as cosine similarity, to measure the similarity between sentences or documents.

To calculate the cosine similarity, we first compute the dot product of the two vectors. The dot product involves multiplying the corresponding elements of the two vectors and summing them up. In our example:

$$\text{Dot product} = (1 * 1) + (1 * 0) + (0 * 1) + (0 * 1) + (1 * 0) = 1 + 0 + 0 + 0 + 0 = 1$$

Next, we calculate the magnitudes (lengths) of the two vectors. The magnitude of a vector is calculated by taking the square root of the sum of the squares of its elements. In our example:

$$\text{Magnitude of Sentence 1} = \sqrt{1^2 + 1^2 + 0^2 + 0^2 + 1^2}$$

$$= \sqrt{1 + 1 + 0 + 0 + 1} = \sqrt{3} \approx 1.73$$

$$\text{Magnitude of Sentence 2} = \sqrt{1^2 + 0^2 + 1^2 + 1^2 + 0^2}$$

$$= \sqrt{1 + 0 + 1 + 1 + 0} = \sqrt{3} \approx 1.73$$

Finally, we divide the dot product by the product of the magnitudes to get the cosine similarity:

$$\text{Cosine similarity} = \text{Dot product} / (\text{Magnitude of Sentence 1} * \text{Magnitude of Sentence 2})$$

$$= 1 / (1.73 * 1.73) = 1 / 2.99 \approx 0.33$$

The resulting cosine similarity value of approximately 0.33 indicates a relatively low degree of similarity between the two sentences. Understanding the significance of vector direction is crucial in interpreting the similarity measure. In our example, even though the individual words "coffee" and "tea" have different magnitudes in their representations, they might have a similar direction as the representation for "morning drinks." This implies that within the context of beverages consumed in the morning, these words share a similar meaning [7].

2.3.2 Jaccard similarity

Jaccard similarity is a way to measure how similar two sets of words are by comparing the number of words they have in common [8]. For example, if we have a resume and a job post, we can compare the words in them to see how similar they are. However, one drawback of Jaccard similarity is that it does not take into account the order of the words. Let's say we have a job post that requires "experience in software development" and a resume that lists "software development experience". Even though the words are the same, their order is different, and Jaccard similarity may not give a high score for this comparison. This can be a problem when measuring the similarity of a resume and a job post, as the order of the words in a resume may not match the order of the words in a job post. Therefore, Jaccard similarity may not be the best choice for measuring the similarity of resumes and job posts.

2.3.3 Euclidean distance

Euclidean distance is a way to measure how similar two words are by comparing their numerical values. For example, if we have two words "cat" and "dog", we can represent them as numbers and calculate their Euclidean distance to see how similar they are [9].

However, Euclidean distance has some drawbacks. It can be affected by outliers, meaning one value can dominate the calculation and make the result less meaningful. It can also be affected by the scale of the numbers, meaning two words with different magnitudes but similar values may have a large Euclidean distance between them. Finally, it may not be the best as it can be computationally expensive to calculate the Euclidean distance.

2.3.4 Conclusion

In conclusion, this background section seeks to provide a comprehensive understanding of the role that AI resume scanning tools and semantic similarity in sentence transformers play in the modern job market, and to identify areas for further research and improvement in this field.



HIRAL



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CHAPTER 3

Literature Review



3 Literature Review

This literature review aims to provide a comprehensive analysis of the current state of research on job hiring apps, examining their benefits and limitations in greater detail. The review begins by highlighting the evolution of hiring methods, illustrating how traditional approaches like newspaper ads and word-of-mouth referrals have gradually been replaced by more modern methods such as online job boards and social media platforms.

Online job boards have become the primary channel for employers to post job openings and reach out to potential candidates. These platforms proposal a convenient and efficient way for job seekers to access a wide range of job opportunities and submit their applications. Social media platforms, on the other hand, have emerged as influential tools for employers to engage with candidates, build relationships, and showcase their company culture.

In recent years, job hiring apps have gained significant popularity due to their ability to streamline the recruitment process. These apps provide a host of features designed to simplify job searching and candidate selection. Job search filters within these apps assist job seekers in refining their search based on specific criteria such as location, industry, and salary.

Automated matching algorithms play a crucial role in job hiring apps by connecting job seekers with relevant job opportunities. These algorithms analyze various factors, including skills, education, and preferences, to identify the most suitable candidates for a given role. By leveraging data-driven insights, job hiring apps can enhance the quality of hires and improve the overall efficiency of the recruitment process.

Research studies have investigated the impact of job hiring apps on recruitment practices. For instance, a study by Lai and Liu (2020) found that job hiring apps can significantly reduce both the time and cost associated with the recruitment process by automating tasks such as resume screening and candidate matching [10]. This automation not only saves time for hiring managers but also improves the chances of finding the right candidate for a job opening.

However, the rise of AI resume screening has introduced new challenges. According to a report by Preptel, AI-driven screening processes have led to a concerning trend where an estimated 75% percentage of resumes being overlooked by human recruiters [11]. To navigate this landscape, job seekers must understand how AI screening works and optimize their resumes accordingly. Tailoring resumes to include relevant keywords and ensuring clear and concise presentation can increase the chances of passing through AI screening filters.



Different types of resume screening tools are available within job hiring apps, each with its own strengths and weaknesses. Key-based tools are user-friendly and require minimal training, making them accessible to a wide range of users. Grammar-based and statistical-based tools, while more complex, proposal more advanced features and can provide deeper insights into candidate suitability. Statistical-based tools like SkillNer NLP excel at analyzing job posts to identify the necessary skills and qualifications for a position, simplifying the screening process.

However, these statistical-based screening tools may face challenges when analyzing CVs, which often contain complex and varied information. CVs typically include details about education, skills, and achievements, making accurate analysis and interpretation more difficult for these tools. This highlights the need for further advancements in AI and NLP technologies to enhance the accuracy and effectiveness of resume screening processes.

In addition to resume screening, job hiring apps leverage advanced technologies such as semantic similarity search and natural language processing (NLP) models for job matching. Sentence transformers, which utilize semantic similarity search, analyze and understand the language used in job postings and resumes to match job seekers with suitable job opportunities. By deriving semantically meaningful sentence embeddings and comparing them using cosine-similarity, these models provide a more accurate and effective approach to job matching compared to other similarity measures like Jaccard and Euclidean similarity [13].

Analytical dashboards within job hiring apps have also emerged as valuable tools for recruiters and hiring managers. These dashboards proposal visual representations of key recruitment metrics, enabling recruiters to identify trends and patterns in their recruitment data. They can quickly determine which job postings attract the most applicants and the degree of relevance between job seekers' resumes and desired positions [14].

By leveraging the insights provided by analytical dashboards, recruiters can make data-driven decisions, optimize their recruitment strategies, and improve the overall quality of the hiring process. Job seekers also benefit from these dashboards as they can assess the quality of their resumes and gauge the relevance of their profiles to specific job postings.

In conclusion, this literature review underscores the significant impact of job hiring apps on the recruitment process. By utilizing advanced technologies such as semantic similarity search, NLP models, and analytical dashboards, these apps have the potential to revolutionize how job seekers find opportunities and how employers identify and select the most suitable candidates. However, challenges related to AI resume screening and the analysis of complex CVs highlight the ongoing need for advancements in these technologies. Overall, job hiring apps have become an essential tool for both job seekers and employers, driving greater efficiency and effectiveness in the hiring process.



3.1 Competitive Product Analysis

This competitive analysis is focused on web applications with similar features to the Hiral application. The goal is to investigate and learn from our competitors to avoid mistakes.

Ziprecruiter  <i>Figure 2 - 3.1 ziprecruiter [15]</i>	<p>Ziprecruiter, is an online employment marketplace that connects millions of job seekers with companies of all sizes. They use AI-matching technology for analyzing billions of user interactions to improve the job search experience for users every month and help businesses of all sizes find and hire the right candidates quickly. Furthermore, they help job seekers with the tools they need to stand out and get hired. Like a personal recruiter. For recruiters, they target the most qualified candidates to apply when a job goes live in their marketplace. to help them get more quality candidates and reduce hiring times.</p>
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Indeed  <i>Figure 3 - 3.1 Indeed [16]</i>	<p>Indeed, is a job search platform. It strives to put job seekers first, giving them free access to search for jobs and research companies. they connect millions of users to new opportunities. A job seeker can post their resume, get career advice, read company reviews, find certifications, browse jobs and get resume help. On the other hand, recruiters can post a job with the job description., find candidates, search resumes, schedule interviews and Monitor and analyze performance.</p>
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Glassdoor  <i>Figure 4 - 3.1 Glassdoor [17]</i>	<p>Glassdoor is a job search platform that aims to elicit for workers and companies to find the perfect match. For job seekers, they simplify their search by filtering millions of jobs and ratings, allowing them to talk to professionals, and then apply. For employees, they amplify their voices so they can enhance their work experience, leave reviews, search and post salaries, and join candid conversations about life at work. For recruiters, they can find job candidates, post jobs, respond to reviews and gain insights to shape their messaging.</p>
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Monster  <i>Figure 5 - 3.1 Monster [18]</i>	<p>Monster is a job search platform, striving to innovate by bringing recruiters and candidates together. For 25 years, Monster has worked to transform the recruiting industry. Today, the company leverages advanced technology using intelligent digital, social and mobile solutions. Job seekers can browse jobs, upload resumes, use salary tools to calculate their salary, get resume help and career advice. Recruiters on the other hand can post jobs and search for resumes.</p>
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Table 5 - 3.1 competitive comparision

features	Ziprecruiter	Indeed	Glassdoor	Monster	Hiral
Ability to apply for a job	✓	✓	✓	✓	✓
Ability to post a job	✓	✓	✓	✓	✓
Scan the job seeker's CV					✓
Use AI technologies to enhance the search	✓			✓	✓
Seeker's ability to make their account private	✓				✓
Dynamic skill dictionary					✓
Provide analytical dashboard	✓				✓



Discussion

Job search platforms are one of the most important applications in today's world. considering the economic growth in most of the countries, which generate more job opportunities and hence stronger demand for the labor force.

With that being said, we studied similar applications to our application (Hiral). We found that all of these applications provide the ability for job seekers to apply for a new job. And the ability for recruiters to post a new job.

However, we found that we were the only platform that provides the feature of scanning the job seeker's CV out of all our competitors in order to find the job opportunities that suit them the best. Which we see as an important feature that will enhance the job search for both job seekers and recruiters.

Furthermore, 2 of the 4 competitors we searched (Indeed and Glassdoor) do not use advanced AI technology to enhance the search process. which makes us conclude that our application would be preferable for users considering AI would help their search in terms of speed and efficiency. Additionally, only one of our competitors (ZipRecruiter) provides the seeker with the ability to make their account private so it won't get recommended to recruiters in case they found a job, which distinguishes our website since it provides a more convenient experience for seekers . Moreover, we found that only (ZipRecruiter) provides the analytical dashboard feature. Finally, we did not find any competitor that has a dynamic skill dictionary to make the matching process more intelligent. which makes our application stand out from all other 4 applications and helps us attract more users.



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CHAPTER 4

System Requirements



4 System Requirements

In this section, we present our use case diagram and requirement elicitation. For requirements elicitation, we collected user needs by using requirements discovery methods which are interviews and questionnaires to elicit the requirements for our application. We conducted an interview to gather information and observe.

4.1 System Users

The users of our application are people who look for convenient job opportunities and recruiters who want to find the best candidates for a job. Their characteristics are as follows, age is 18 and above, educational level is high school and above, familiar with browsing web applications, and know basic English. have a device with a browser to browse our website.

4.2 Requirements Elicitation and Analysis

Understanding our users' needs and behaviors whether they are job seekers or recruiters is a crucial requirement in order for us to develop a platform that meets their needs and guarantees their full satisfaction. In order for us to accomplish that we adopted two methods. First, we created a survey with google forms to survey both job seekers and recruiters. Second, we did 3 interviews. in which two of them were with job recruiters and one with a job seeker.

4.2.1 Survey analysis

We created a survey using Google Forms to survey our target users (job seekers and recruiters), the survey has two main sections: job seeker and job recruiter. In which the job seeker section consists of 9 questions and the recruiter section consists of 8 questions, the survey was distributed via social media channels; 37 (27 job seekers and 10 job recruiters) responses were received to help us understand our users' behavior and how our platform is going to affect their search process. All the questions and their answers are included in Appendix A.



Table 6 - 4.2.1 Job seeker survey

Have you ever tried job search platforms?		How was your experience?	On a scale of 1 to 5 (5 being the highest) How hard do you find it to search for job opportunities that correspond to your skills/capabilities?	Are you having difficulty staying motivated during job search?	Do you take into consideration writing all of the information needed in your CV to make it clear to the recruiters what kind of jobs you're fit for?
Yes: 18 participants	No: 9 participants	Awful Fine Good Hard Not good Stressful	1: 0 participants 2: 1 participant 3: 9 participants 4: 9 participants 5: 8 participants	Yes: 18 participants No: 0 participants Sometimes: 9 participants	Yes: 24 participants No: 3 participants

Do you encounter any difficulties understanding the job requirements?		Have you considered expanding your job search to other industries/locations?	On a scale of 1 to 5 (5 being the highest) How convenient do you find the traditional ways to search for a job like job/company websites...etc?	Using a platform that helps me find job opportunities that suits my skills and capabilities would make my job search process faster and more efficient
Yes: 12 participants No: 2 participants Sometimes: 13 participants	Yes: 10 participants No: 8 participants Maybe: 9 participants	1: 4 participants 2: 11 participants 3: 10 participants 4: 2 participants	Agree: 25 participants Disagree: 2 participants	

We conclude that most job seekers haven't tried a job search platform before, or that they didn't have a pleasant experience, and that most of them are having difficulties finding the right jobs for their skills and capabilities. Also, most of them are keen to write all of the information recruiters need to know what job they're fit for. Furthermore, the majority of them are having difficulties in understanding the requirements recruiters write and are open to expanding their search to other industries and locations.

Table 7 - 4.2.1 Job recruiter survey

Have you ever tried using job search platforms?		How was your experience?	On a scale of 1 to 5 (5 being the highest) How hard do you find it to search for job candidates that correspond to the requirements of a specific job?	Do you provide detailed job descriptions with clear expectations and responsibilities?	Have you implemented a structured hiring process to ensure consistency and fairness in candidate evaluation?
Yes: 7 participants	7	Good Great	1: 0 participants 2: 0 participants	Yes: 8 participants	Yes: 3 participants
No: 3 participants	3	Not bad and not good Bad experience excellent	3: 5 participants 4: 4 participants 5: 1 participant	No: 0 participants Sometimes: 2 participants	No: 2 participants Maybe: 5 participants

On a scale of 1 to 5 (5 being the highest) Are you targeting the right job candidates?	Are you having difficulty narrowing down the list of job candidates?	Using a platform that help me find job candidates that suit my job description would make my candidate search process faster and more efficient
1: 0 participants 2: 0 participants 3: 5 participants 4: 4 participants 5: 1 participant	Yes: 4 participants No: 2 participants Sometimes: 4 participants	Agree: 10 participants Disagree: 0 participants Neutral: 0 participants



We conclude that most of the recruiters have had experience with job search platforms, and that their experiences were mostly positive, although some of them have faced fraud with some information. We can also say that most of them are having difficulties in finding suitable candidates for a specific job. Furthermore, we found that most of them are aware of the importance of providing clear job descriptions. We also found that they are having difficulties in targeting the right candidates.

4.2.2 Interview analysis

The first interview we did was with a HR operations Specialist at the red sea global. We did the interview through LinkedIn on April 7. 2023.

We asked him how he normally assesses whether a job candidate is a good suit for a specific job he's proposing. He said that they need to follow mandated procedures of selection that consists of 5 stages.

Then we asked him if he has ever used an online job search platform to find candidates, and what features were most helpful.

He said that the features that were most helpful include:

1. saving money
2. finding a very large pool of applicants.
3. save time
4. reach “passive” job seekers.

After that we asked him what some common mistakes are, he has noticed in the process of picking candidates that could potentially be addressed through a new job search platform. He said that some of the common mistakes he has noticed include:

1. Distorted candidates' information
2. insufficient pool of candidates.
3. poor candidate information.

Finally, we asked him how important it is to have access to a large pool of potential candidates with capabilities that correspond to the job he's proposing. He said that it's so critical for several reasons:

1. Reduces the Cost of Recruitment
2. Reduce the Time Spent on Hiring

The second interview was with a HR manager at zain. We did the interview in person on April 6, 2023.



First we asked her how she normally assesses whether or not a job candidate is a good suit for a specific job she's proposing. She said that for each job, On the basis of the conditions they evaluate the candidates if they match the conditions or not. and that research and evaluation starts from examining the CV to the personal interview. Then we asked if she has ever used an online job search or recruitment platform to find candidates, and what features were most helpful. She said that the features were:

1- Obtaining the large applicants 2- It guarantees that all applicants are interested in the same job they launched 3- The speed in responding to those interested. After that we asked what some common mistakes are, she has noticed in the process of picking candidates that could potentially be addressed through a new job search platform. She said there are many mistakes, but among these mistakes:

1- Not reading the resume. 2- Examining the resume in depth, which leads to delay. Finally, we asked how important it is to her to have access to a large pool of potential candidates with capabilities that correspond to the job she's proposing.

She said that its success and impact on the recruiters and applicants will be very large.

The third interview was with a worker in alrajhi bank as a product owner, we did the interview in person on April 9th,2023.

First we asked him what challenges he has faced while job searching. He said it was Covid-19 which caused multiple companies to postpone all the coop & training programs. Then we asked what he has done to stay up-to-date on the latest job search trends. He said that uses LinkedIn to share his achievements.

Then we asked him how he uses technology to enhance his job search. He answered that he enhanced his job search by sharing his achievements and certification on an employment focused social platform. Then we asked him if he used social media to find job opportunities. He said yes.

Finally, we asked him if he's open to the possibility of moving to a new city if he had a suitable job proposal. He said he's currently not ready.



4.2.3 Conclusion

In this chapter, we analyzed and compared systems in the market that are similar to the proposed system to give a vision of possible features that could be added. We will propose a web based platform that will help job seekers getting better job opportunities based on the skills and capabilities written in their CV, simultaneously helping job recruiters get better candidates to the job they're proposing based on their job description. With the help of AI technology. Furthermore, we analyzed and got insights from the interviews, and the survey that was distributed through social media channels.



4.3 User Interactions

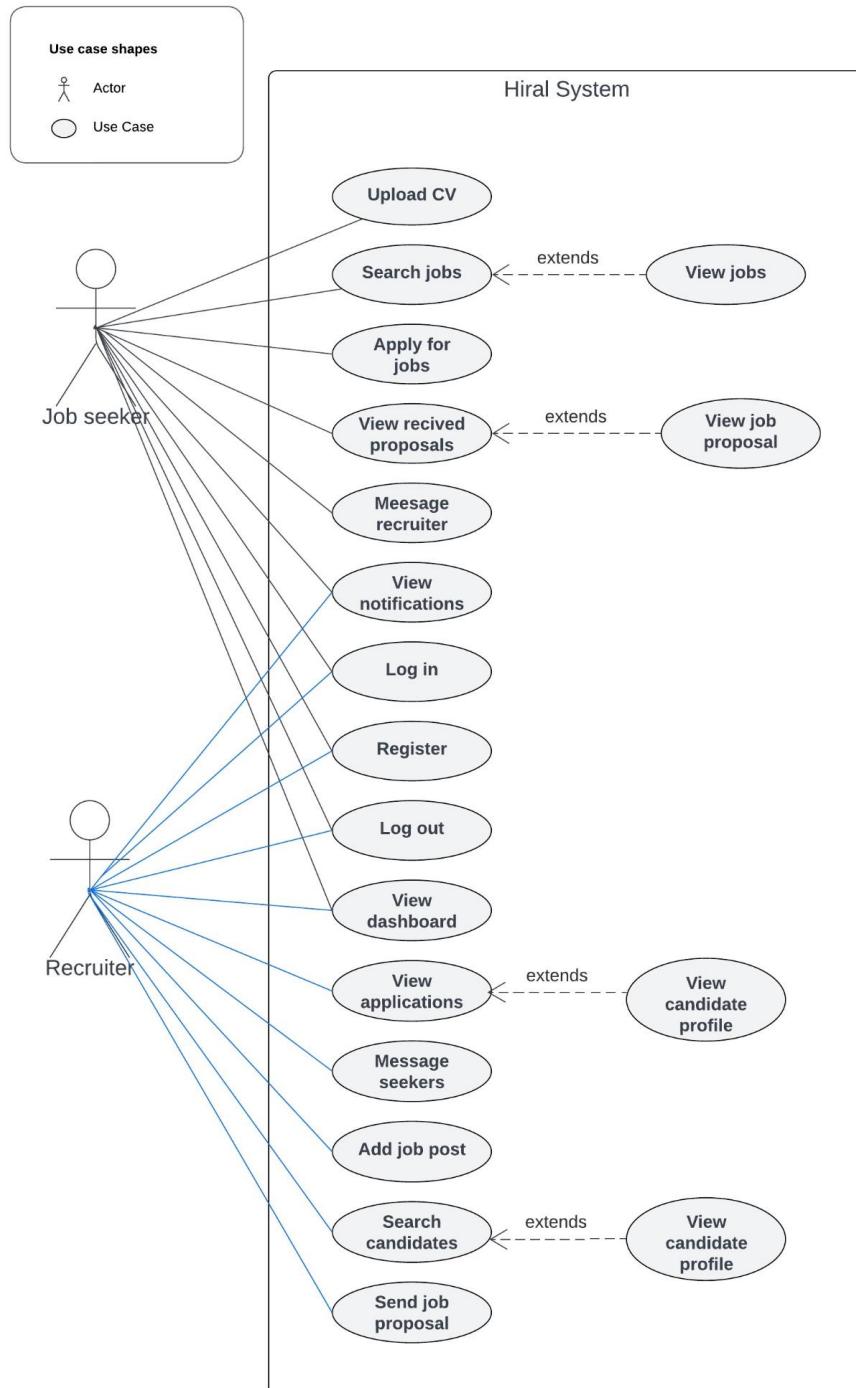


Figure 6 - 4.3 Hiral use case



4.4 Product Backlog

Table 8 - 4.4 Product backlog

ID	PBIs (User Stories)	Size	Type (Feature, defect, technical work, knowledge acquisition)	Status (To do, in progress, or Done)	Acceptance Criteria (The conditions of satisfaction that must be met for that item to be accepted.)
1	As a job provider, I want to add a Job Post so that other users can know about available jobs.	4	Feature	Done	<ul style="list-style-type: none"> - As a job provider, if I go to the My Job page and click on Add Job Post, I will be redirected to a form page. - As a job provider, if I don't fill in a mandatory field, then I will receive an error message. - As a job provider, if I complete the form correctly, I will be redirected to the My Job page, and my post will be saved to the. - As a job provider, if I complete the form correctly, I will be redirected to the My Job page and my post will be saved to the database.
2	As a job provider, I want to activate my job posts so that other users can know about available jobs.	3	Feature	Done	<ul style="list-style-type: none"> - As a job provider, if I click on the Active button, my post will appear for users, and then the user will know if I have an available job.
3	As a job provider, I want to deactivate my job posts so	3	Feature	Done	<ul style="list-style-type: none"> - As a job provider, if I click on the Deactivate button, my



	that they don't appear for users.				post will not appear for employment.
4	As a job seeker, I want to be able to update my availability for job postings so that I receive proposals only when I am available.	4	Feature	Done	<ul style="list-style-type: none"> - As a job seeker, if I register, then my status will be available. - As a job seeker, if I open my profile and click available, then my status in the database will change to unavailable. - As a job seeker, if I click the available button a second time, then my status will change to available in the database.
5	As a job seeker, I want to add my project so that I can display my work.	4	Feature	Done	<ul style="list-style-type: none"> - As a job seeker, if I open my profile and click on the add project button, I will be redirected to the add project form. - As a job seeker, if I don't fill a mandatory field, then I will receive an error message. - As a job seeker, if I fill a field in the wrong format, I will receive an error message. - As a job seeker, if I complete the form correctly, I will be redirected to my profile page and my project will be saved in the database.
6	As a job seeker, I want to edit my project so that I can make the adjustments I desire,	4	Feature	Done	<ul style="list-style-type: none"> - As a job seeker, if I open the view profile page and click on the Edit project then I will be able to edit my project.



7	As a job seeker, I want to delete my project so that I can remove my work that I don't want displayed anymore.	3	Feature	Done	<ul style="list-style-type: none"> - As a job seeker, if I open my profile and click on the delete this project button, a confirmation message will appear. - As a job seeker, if the confirmation message appeared and I clicked yes, then the project will be deleted from the database and my profile. - As a job seeker, if I complete the delete project from the database, I will receive a message. - As a job seeker, if the confirmation message appears and I click no, then I will continue the same page and the record will not be deleted from the database.
8	As a job seeker, I want to be able to add new skills to my skill set so that I can inform users about my new skills.	3	Feature	Done	<ul style="list-style-type: none"> - As a job seeker, if I upload my new/updated CV, then my new skills will be extracted. - As a job seeker, if my new skills are extracted, they will be added to the database. - As a job seeker, if my new skills are extracted, I will be redirected to my Profile page. - As a job seeker, if I am redirected to my Profile page, I will see my new skills in the Skills section.
9	As a job seeker I want to search available jobs that match my skill set so that I	4	Feature	Done	<ul style="list-style-type: none"> - As a job seeker, if I open the search jobs and click on apply for a job, a job



	apply to the suitable job proposals.				application will be sent to the job provider.
10	As a job provider, I want to add job proposals so that I can inform other users about available jobs.	5	Feature	Done	<ul style="list-style-type: none"> - As a job provider, if I open the job proposals page and click on the add button, I will be redirected to an upload file page. - As a job provider, if I upload a file successfully, I will receive a successful message, and my proposal will be saved to the database. - As a job provider, if I upload a file unsuccessfully, I will receive an alert message and continue on the same page.
11	As a job provider I want to search available employees who match the job description in a short time so that I don't waste much time and effort.	5	Feature	Done	<ul style="list-style-type: none"> - As a job provider, if I open the job proposals page and click on the job proposal, then I will find only the available employees that match the job description.
12	As a job provider, I want to view an analytical dashboard so that I can know the job postings that attract the most applicants.	6	Feature	Done	<ul style="list-style-type: none"> - As a job provider, if I open my home page, I will view the analytical dashboard. - As a job provider, if I view the dashboard, then I will know the job postings that attract the most applicants.



13	As a job provider, I want to view an analytical dashboard so that I can know the sources that generate the most qualified candidates.	6	Feature	Done	<ul style="list-style-type: none"> - As a job provider, if I open my home page, I will view the analytical dashboard. - As a job provider, if I view the dashboard, then I will know the sources that generate the most qualified candidates.
14	As a job provider, I want contact with users I might hire via video so we can discuss the job proposal.	7	Feature	To do	<ul style="list-style-type: none"> - As a job provider, if I click on the video button, then a video channel will be established.
15	As a job provider, I want contact with users I might hire via chat so we can discuss the job proposal.	5	Feature	Done	<ul style="list-style-type: none"> - As a job provider, if I click on the chat button, then a chat channel will be established.
16	As a job seeker, I want to view an analytical dashboard so that I can compare the similarity of my resume with the similarity of other resumes in the same category.	6	Feature	To do	<ul style="list-style-type: none"> - As a job seeker, if I open my home page, I will view the analytical dashboard. - As a job seeker, if I view the dashboard, then I will be able to compare the similarity of my resume with the similarity of other resumes in the same category.



17	As a job provider, I want to view the received applications so that I can see who has applied for the position.	5	Feature	Done	<ul style="list-style-type: none"> - As a job provider, if I have opened the job proposals page and clicked on any job proposal, I will be redirected to this job proposal page. - As a job provider, if I am redirected to the job proposal page, then all applications in this job proposal will be displayed.
18	As a job provider I want to be notified when suitable candidates are available for my job description	5	Feature	Done	<ul style="list-style-type: none"> - As a job provider, if there are suitable candidates available, then I will be notified.
19	As a job seeker, I want to view proposals so that I can see job opportunities that match my skill set.	6	Feature	Done	<ul style="list-style-type: none"> - As a job seeker, if I upload my CV, I will redirect to page content job proposals that match my skill set.
20	As a job seeker I want to be able to save the job notifications that suit my qualifications for further pursuits.	5	Feature	Done	<ul style="list-style-type: none"> - As a job seeker, if there are job notifications that suit my qualifications, then I will be able to save these notifications.
21	As a job seeker, I want to receive a notification when there's a job opportunity that matches my skill set so that I can apply faster.	3	Feature	Done	<ul style="list-style-type: none"> - As a job seeker, if there is any job proposal that matches my skill set, then I will receive notification.
22	As a job provider, I want to be notified when there are suitable candidates for my job postings.	4	Feature	Done	<ul style="list-style-type: none"> - As a job provider, if there are suitable candidates for my job postings, then I will be notified.



23	As a job seeker I want to be able to save the job notifications that suit my qualifications for further pursuits.	5	Feature	Done	<ul style="list-style-type: none">- As a job seeker, if there are job notifications that suit my qualifications, then I will be able to save these notifications.
24	As a job provider, I want to be able to edit my profile so that I can update my information.	4	Feature	Done	<ul style="list-style-type: none">- As a job provider, if I open my profile and click on the edit button, I will be able to edit my profile.- As a job provider, if I edit my profile and click on the save button, I will receive a successful message.- As a job provider, if I edit my profile, click on the save button, and my edit doesn't save, I will receive an alert message.
25	As a job provider, I want to edit job proposals so that I can update job information.	4	Feature	Done	<ul style="list-style-type: none">- As a job provider, if I opened the job proposals page and clicked on the update button, I would be redirected to this file page.- As a job provider, if I upload an updated file successfully, I will receive a successful message, and my proposal will be updated in the database.- As a job provider, if I upload an updated file unsuccessfully, I will receive an alert message and continue on the same page.



26	As a job provider, I want to delete job proposals so that I can remove the job proposal.	3	Feature	Done	<ul style="list-style-type: none">- As a job provider, if I open the job proposals page and click on the delete button, a confirmation message will appear.- As a job provider, if the confirmation message appeared and I clicked yes, then the job proposal will be deleted from the database and job proposals page.- As a job provider, if I complete the delete job proposal from the database, I will receive a message.- As a job provider, if the confirmation message appears and I click no, then I will continue the same page and the record will not be deleted from the database.
27	As a job seeker, I want to edit my profile so that I can update my information.	4	Feature	Done	<ul style="list-style-type: none">- As a job seeker, if I open my profile and click on the edit button, I will be able to edit my profile.- As a job seeker, if I edit my profile and click on the save button, I will receive a successful message.- As a job seeker, if I edit my profile, click on the save button, and my edit doesn't save, I will receive an alert message.



28	As a job provider, I want to be able to register on the website so that I have my own account.	5	Feature	Done	<ul style="list-style-type: none">- As a job provider, if I visit the website and click on the register button, I will be redirected to the registration form page.- As a job provider, if I don't fill in a mandatory field, then I will receive an error message.- As a job provider, if I fill a field in the wrong format, I will receive an error message.- As a job provider, if I complete the form correctly, I will be redirected to the home page.
29	As a job seeker, I want to be able to register on the website so that I can have my own account.	5	Feature	Done	<ul style="list-style-type: none">- As a job seeker, if I visit the website and click on the register button, I will be redirected to the registration form page.- As a job seeker, if I don't fill a mandatory field, then I will receive an error message.- As a job seeker, if I fill a field in the wrong format, I will receive an error message.- As a job seeker, if I complete the form correctly, I will be redirected to the home page.



30	As a job provider, I want to be able to login so that I can access my account.	5	Feature	Done	<ul style="list-style-type: none"> - As a job provider, if I visit the website and click on the login button, I will be redirected to the login page. - As a job provider, if I don't fill a mandatory field, then I will receive an error message. - As a job provider, if I fill a field in the wrong format, I will receive an error message. - As a job provider, if I enter the wrong credentials, then I will receive an error message. - As a job provider, if I complete the form correctly, I will be redirected to the home page.
----	--	---	---------	------	--



31	As a job seeker I want to be able to login, so that I can access to my account	5	Feature	Done	<ul style="list-style-type: none"> - As a job seeker, if I visit the website and click on the login button, I will be redirected to the login page. - As a job seeker, if I don't fill a mandatory field, then I will receive an error message. - As a job seeker, if I fill a field in the wrong format, I will receive an error message. - As a job seeker, if I enter the wrong credentials, I will receive an error message. - As a job seeker, if I complete the form correctly, I will be redirected to the home page.
----	--	---	---------	------	---



32	As a Job seeker I want to log out of my account so that I can leave the account.	3	Feature	Done	<ul style="list-style-type: none">- As a job seeker, if I click on the log out button, then a confirmation message will appear.- As a job seeker, if the confirmation message appeared and I pressed yes, then I will be redirected to the home page.- As a job seeker, if the confirmation message appeared and I pressed no, then I will continue to be logged in.- As a job seeker, if the confirmation message appears and I press yes, I will leave my account.
33	As a provider, I want to log out of my account so that I can get myself off the website.	3	Feature	Done	<ul style="list-style-type: none">- As a job provider, if I click on the log out button, then a confirmation message will appear.- As a job provider, if the confirmation message appeared and I pressed yes, then I will be redirected to the home page.- As a job provider, if the confirmation message appeared and I pressed no, then I will continue to be logged in.- As a job provider, if the confirmation message appears and I press yes, then I will leave my account.
Non-functional					



34	As a user, I want the application's response time to be between 3 to 30 seconds given a good internet connection so that I don't become annoyed and try another application[20]. (Performance)	—	Feature	Done	
35	As a user, I want the website to be secured by authenticating user email and password so that unauthorized users cannot log in to the application[19]. (Security)	—	Feature	Done	-
36	As a ussr I want the website to be user-friendly and easy to learn without any guidance so that I don't get discouraged[20].(Learnability)	—	Feature	Done	-

In our backlog, we've still got to do a couple user stories: stories 14 and 16 are in the "To do" status.

14 is: As a job provider, I want to be able to video chat with potential hires so we can discuss the job opening.

16 is: As a job seeker, I want a dashboard that analyzes my resume against others in my field so I can see how they compare.

In User Story 15, we had loads of programming issues while working on User Stories 12, 13, and 16, which ended up putting us in a tough spot with User Story 14 still on the to-do list.

With User Story 16, bugs just kept cropping up non-stop right up until the deadline. So we had to push it back and leave it on the to-do list for later.



HIRAL



HIRAL

CHAPTER 5

System Design



5 System Design

5.1 Architectural Diagram

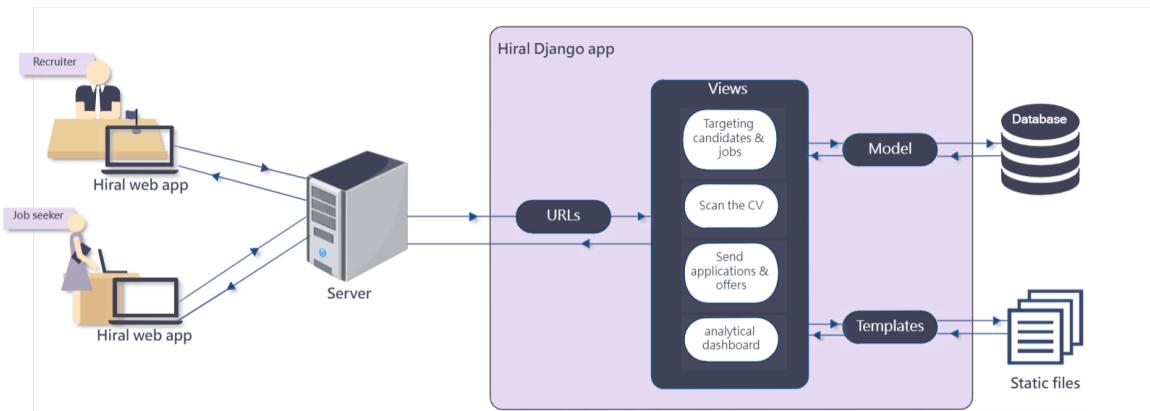


Figure 7 - 5.1 Hiral system architecture

Here is a high-level overview of our MVC architecture:

The MVC architecture incorporates the Model, View, and Controller components. The Model handles data and business logic, the View manages the user interface, and the Controller (templates) coordinates actions between the Model and View.

The job seeker would interact with the system through a user interface, which would allow them to enter their resume by category and submit it for processing then the text would be screened for keywords that are relevant to the category next text would be encoded using sentence transformers, which are deep learning models that can encode sentences and words into high-dimensional vectors to measure cosine similarity between the encoded resume and the encoded job proposals. After that the cosine similarity between the encoded resume and the encoded job proposals would be calculated. The resulting value would be a measure of the cosine of the angle between the two vectors and would indicate the degree of similarity between the resume and the job proposal. The resumes would be matched with the job proposals based on their cosine similarity scores, highest scores would be considered the best matches for the job proposals.



Overall, this MVC architecture would involve several components working together to preprocess, screen, encode, and match resumes with job proposals. By using advanced natural language processing techniques, such as sentence transformers and cosine similarity, the system would be able to identify the best matches between job seekers and job proposals, making the recruitment process more efficient and effective.

5.2 Class Diagram /DFD

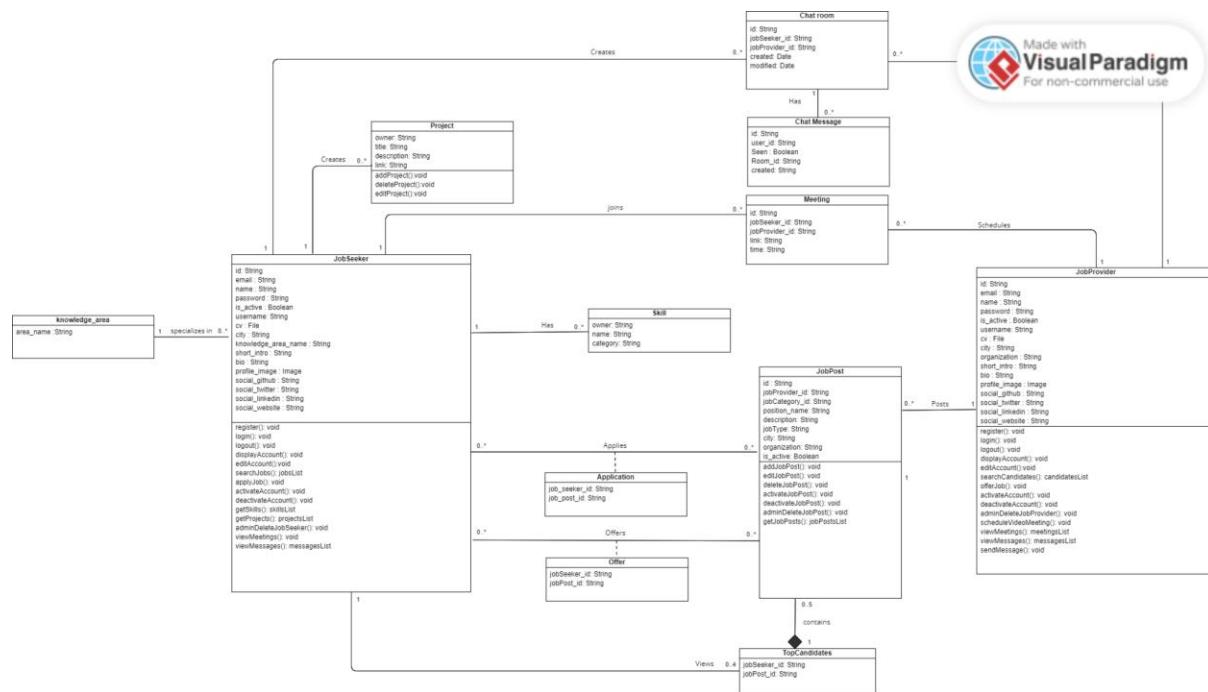


Figure 8 - 5.2 Class Diagram

5.3 Component Level Design

Edit account:

Classification: function

Definition: the user will be able Edit account information

Constraints:

Pre-condition: The user is logged in

Post-condition: The system updates user's account information with the changes they made



Flowchart:

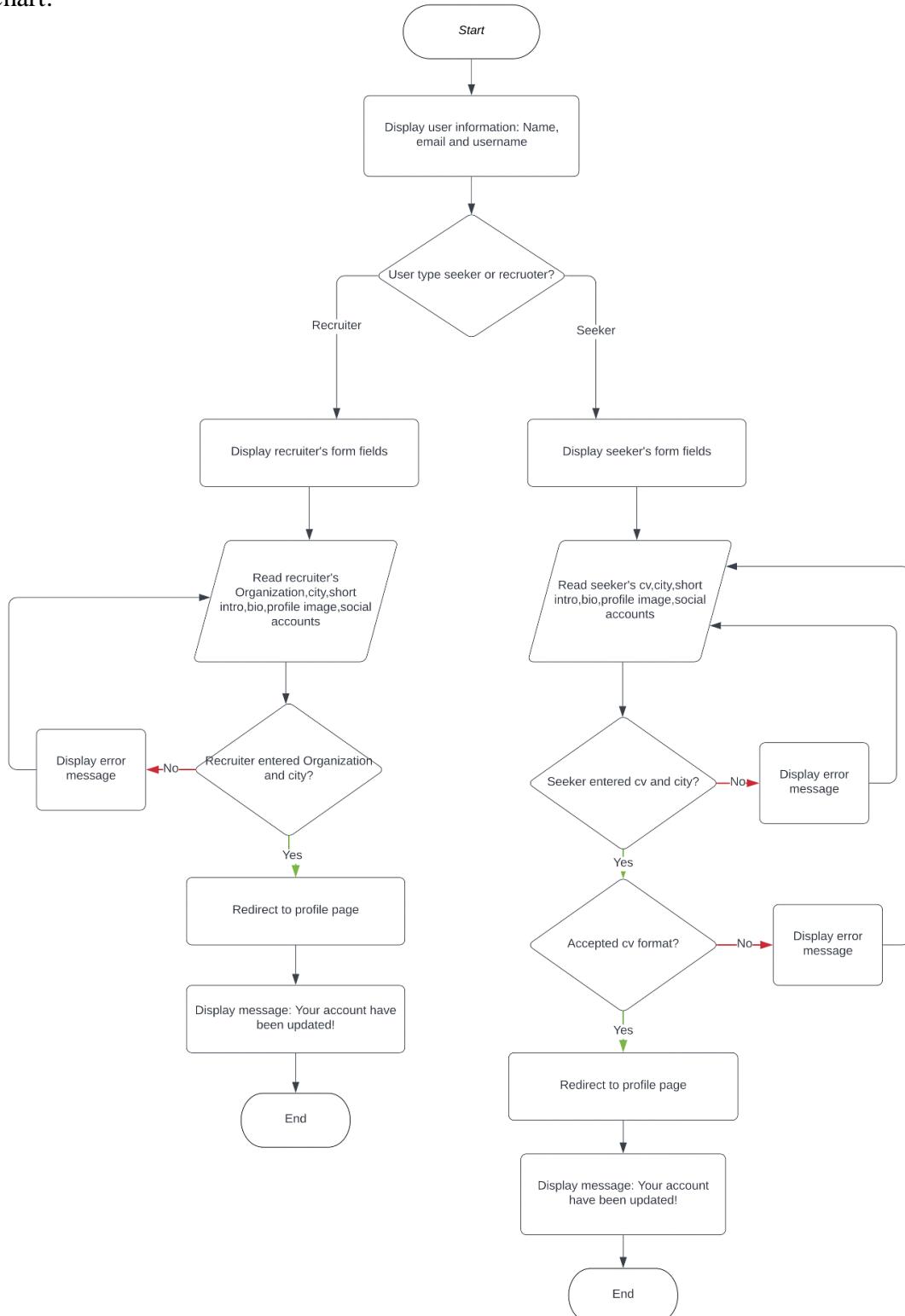


Figure 9 - 5.3 Edit account Flowchart



Extract seeker's skills

Classification: function

Definition: the system will extract seeker's skills from their CV and add them to the database

Constraints:

Pre-condition: The user is logged in

Post-condition: The system updates user's account information with the changes they made

Flowchart:

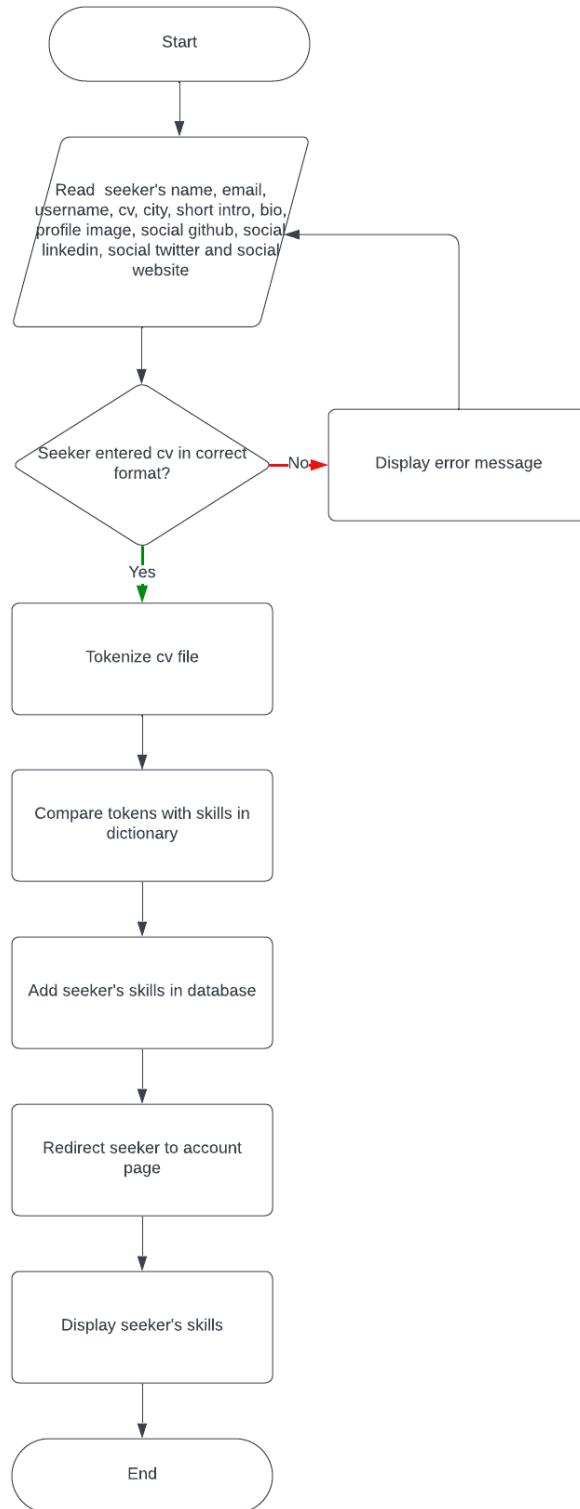


Figure 10 - 5.3 Extract seeker's skills Flowchart



Seeker set account to active:

Classification: function

Definition: the seeker will be able to set their account to active so that their profile will appear to the job recruiters when they search for candidate

Constraints:

Pre-condition: The seeker is logged in.

Post-condition: The system set the is_active field to true

Pseudocode:

- 1.BEGIN
- 2.When the seeker is on profile page:
- 3.Display a check button labeled "Activate"
- 4.IF the seeker clicks the "Activate" button:
 - 5.Set the "is_active" field in the database to "True"
 - 6.IF the seeker unclicks the "Activate" button:
 - 7.Set the "is_active" field in the database to "False"
8. END



Seeker adds, edit and delete project:

Classification: function

Definition: the seeker will be able to Add, edit and delete their projects so that the recruiter can view them when they visit their page

Constraints:

Pre-condition: The seeker is logged in.

Post-condition: The system Adds, modifies and deletes projects from the seeker's profile

Pseudocode:

1-BEGIN

2-When the seeker is on profile page:

3-Display section “past projects”

4-FOR each project in the seeker's past projects:

5-Display the project's title and description and link

6-IF the seeker clicks the “Add project” button:

7-Display a form to add a new project with fields for the project's information

8-IF the seeker submits the form with valid data:

9-Add the new project to the seeker's past projects

10-IF the seeker clicks the “Edit” button next to the project:

11-Display a form to edit the project with field for the project's information

12-IF the seeker submits the form with valid data:

13-Update the project with the new data

14-IF the seeker clicks the “Delete” button next to the project:

15-Display a confirmation message to the seeker

16-IF the seeker confirms the deletion:

17-Remove the project from the seeker's past projects

18-END



Recruiter add, edit and delete job post:

Classification: function

Definition: the recruiter will be able to Add, edit and delete their job posts

Constraints:

Pre-condition: The recruiter is logged in.

Post-condition: The system Adds, modifies and deletes job posts from the recruiter's "My jobs" page

Pseudocode:

1-BEGIN

2-When the recruiter is on "My jobs" page:

3-Display "Add job post" button

3-Display recruiter's job posts

4-FOR each job post:

5-Display the job post's title and description and search button and view button

6-IF the recruiter clicks the "Add job post" button:

7-Display a form to add a new job post with fields for the job post's information

8-IF the recruiter submits the form with valid data:

9-Add the new job post to the recruiter's job posts

10-IF the recruiter clicks the "Edit" button next to the job post:

11-Display a form to edit the job post with field for the job post's information

12-IF the recruiter submits the form with valid data:

13-Update the job post with the new data

14-IF the recruiter clicks the "Delete" button next to the job post:

15-Display a confirmation message to the recruiter

16-IF the recruiter confirms the deletion:

17-Remove the job post from the recruiter's job posts

18-END



Recruiter search for employees:

Classification: function

Definition: the recruiter will be able to search for qualified employees for a specific job post based on job description

Constraints:

Pre-condition: The recruiter is logged in and the job post status is active

Post-condition: The system suggests qualified candidates for the job post based on job description

Pseudocode:

1-BEGIN

2-When the recruiter is on “My jobs” page:

3-Display recruiter’s job posts

4-FOR each job post:

5-Display the job post’s title and description and search button and view button

6-IF the recruiter clicks the search button:

7-Display message “Searching for candidates”

8-Redirect recruiter to the home page

9-Display the qualified candidates’ profiles to recruiter

10-Display message “Qualified candidates for “Job title””

11-END



Seeker Search for job posts:

Classification: function

Definition: the seeker will be able to search for suitable job posts based on their skills

Constraints:

Pre-condition: The seeker is logged in and the account status is active

Post-condition: The system suggests suitable job posts for the seeker based on their skills



Flowchart:

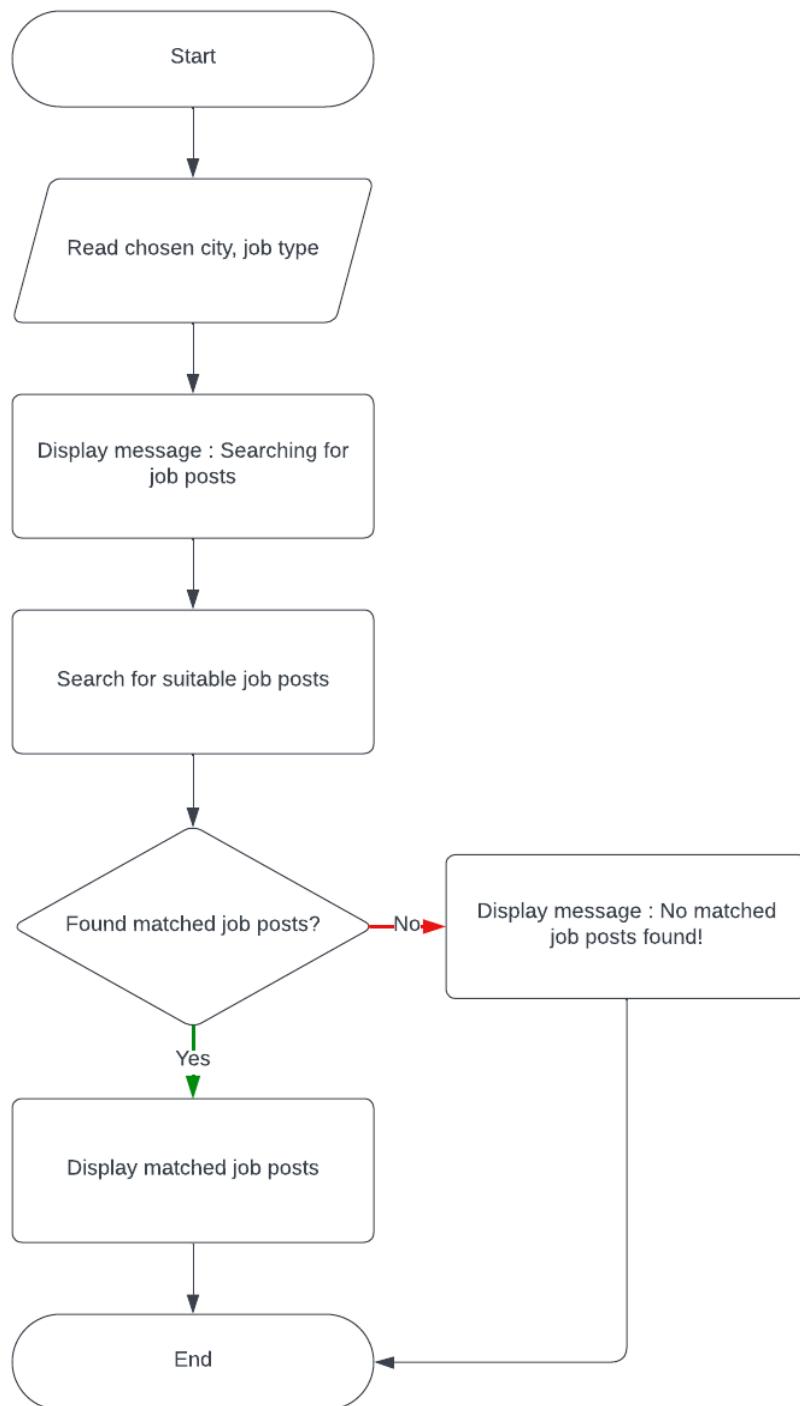


Figure 11 - 5.3 Seeker Search for job posts Flowchart



Seeker Receive Job proposals:

Classification: function

Definition: the seeker will receive job proposals based on their set of skills

Constraints:

Pre-condition: The seeker is logged in and the seeker status is active

Post-condition: The system suggests appropriate job proposals based on the seeker's skills

Pseudocode:

1-BEGIN

2-IF the system found new job post that correspond to seeker's skills:

3-SEND notification message to seeker in website

4-SEND notification message to seeker in email

5-When the seeker is on "activities" page:

6-Display section "Received proposals"

7-Display all job proposals with the new job proposal

8-END



View analytical dashboard:

Classification: function

Definition: the recruiter will be able to view their analytical dashboard to monitor their progress in finding candidates

Constraints:

Pre-condition: The user is logged in

Post-condition: The system Displays the analytical dashboard to user

Pseudocode:

1-BEGIN

2-IF user type is recruiter:

3-WHEN recruiter is on profile page:

4-Display recruiter's Dashboard

5-END



5.4 Data Design

5.4.1 Data Models

Describe the data structure and contents.

5.4.1.1 ER Diagram

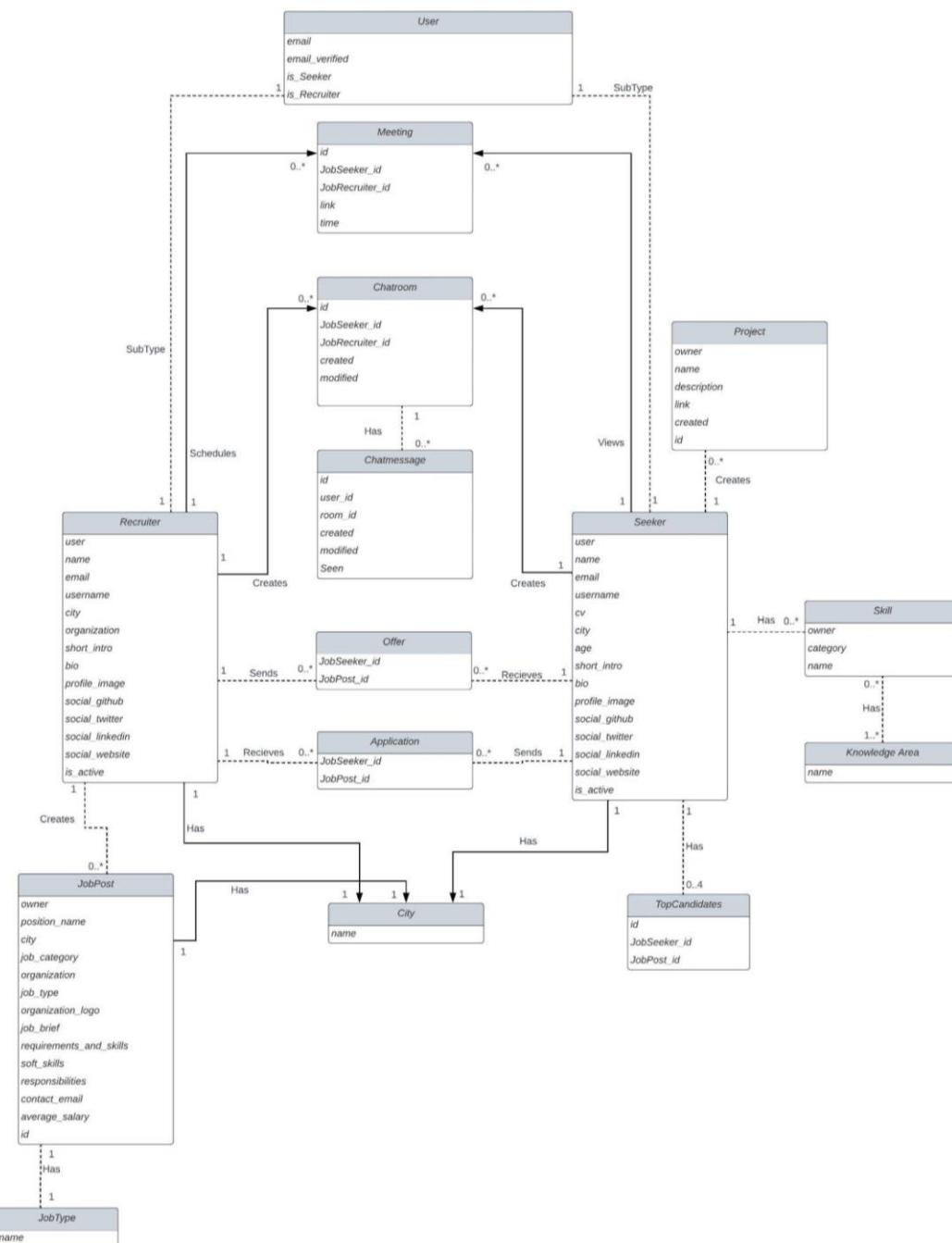


Figure 12 - 5.4.1.1 ER Diagram



5.4.1.2 Relational Schema

Project {id, owner, title, description, link}

Primary Key: id

Skill {id, owner, name, category}

Primary Key: id

Seeker {id, email, name, password, is_active, username, cv, city, knowledge_area_name, short_intro, bio, profile_image, social_github, social_twitter, social_linkedin, social_website}

Primary Key: id

Knowledge_area {id, area_name}

Primary Key: id

Meeting {id, jobSeeker_id, jobProvider_id, link, time}

Primary Key: id

Foreign Key: jobSeeker_id, jobProvider_id

Message {id, jobSeeker_id, jobProvider_id, From, To, Text}

Primary Key: id

Foreign Key: jobSeeker_id, jobProvider_id

Admin {email, password}

Application {job_seeker_id, job_post_id}

Foreign Key: job_seeker_id, job_post_id

Offer {job_seeker_id, job_post_id}

Foreign Key: job_seeker_id, job_post_id

JobPost {id, jobProvider_id, jobCategory_id, position_name, description, jobType, city, organization, is_active}

Primary Key: id

Foreign Key: jobProvider_id, jobCategory_id

Recruiter {id, email, name, password, is_active, username, cv, city, organization, short_intro, bio, profile_image, social_github, social_twitter, social_linkedin, social_website}

Primary Key: id

TopSeekersSearchResult {id, jobSeeker_id, jobPost_id}

Primary Key: id

Foreign Key: jobSeeker_id, jobPost_id



TopJobsSearchResult {jobSeeker_id, jobPost_id, category}

Foreign Key: jobSeeker_id, jobPost_id

5.4.1.3 Data Dictionary

Table 9 - 5.4.1.3 Data dictionary

Entity	Attribute	Description	Data Type	Length	Req.	Multi-valued	Default value	PK
Project	id	Project's id	int	100	Y			Y
	owner	Project's owner	var	100	Y			
	title	Project's title	var	150	Y			
	description	Project's description	text	50,000				
	link	Project's link	var	200	Y			
Skill	id	Skill's id	int	1,000	Y			Y
	owner	Skill's owner	var	100	Y			
	name	Skill's name	var	100	Y			
	category	Skill's category	var	100	Y			
Seeker	id	Seeker's id	var	1,000	Y			Y
	email	Seeker's email	var	150	Y			
	name	Seeker's name	var	100	Y			
	password	Seeker's account password	var	50	Y			



	is_active	Seeker availability	bool	1	Y		Y	
	username	Seeker's username	var	100	Y			
	cv	Seeker's CV	file	10MB	Y			
	city	Seeker's city	var	200	Y			
	knowledge_area_name	Seeker's knowledge area	var	150	Y			
	short_intro	Short intro about seeker	var	200				
	bio	Seeker's bio	text	100,000				
	profile_image	Seeker's profile image	img	1MB				
	social_github	Seeker's GitHub link	var	200				
	social_twitter	Seeker's Twitter link	var	200				
	social_linkedin	Seeker's LinkedIn link	var	200				
	social_website	Seeker's website link	var	200				
Knowledge_area	id	Knowledge_area's id	int	1,000	Y			Y
	area_name	Knowledge_area's name	var	150	Y			

Meeting	id	Meeting's id	var	10,000	Y				Y
	jobSeeker_id	Seeker's id	var	1,000	Y				
	jobProvide_r_id	Provider's id	var	1,000	Y				
	link	Meeting's link	var	200	Y				
	time	Meeting's time	var	5	Y				
Message	id	Meeting's id	var	10,000	Y				
	jobSeeker_id	Seeker's id	var	1,000	Y				
	jobProvide_r_id	Provider's id	var	1,000	Y				
	From	The sender	var	100	Y				
	To	The receiver	var	100	Y				
	Text	Message's text	text	50,000	Y	Y			
Admin	email	Admin's email	var	150	Y				
	password	Admin's account password	var	50	Y				
Application	job_seeker_id	Seeker's id	var	1,000	Y				
	job_post_id	Provider's id	var	1,000	Y				
Offer	job_seeker_id	Seeker's id	var	1,000	Y				



	job_post_id	Provider's id	var	1,000	Y			
JobPost	id	Post's id	var	1,000	Y			Y
	jobProvide_r_id	Provider's id	var	1,000	Y			
	jobCategory_id	Category's id	var	1,000	Y			
	position_name	Job's position name	var	500	Y			
	description	Job's description	text	50,000	Y			
	jobType	Type of job	var	100	Y			
	city	Job location	var	100	Y			
	organization	Job organization	var	500	Y			
	is_active	Job availability	bool	1	Y		Y	
Recruiter	id	Provider's id	var	1,000	Y			Y
	email	Provider's email	var	150	Y			
	name	Provider's name	var	100	Y			
	password	Provider's account password	var	50	Y			
	is_active	Provider availability	bool	1	Y		Y	

	username	Provider's username	var	100	Y		
	cv	Provider's CV	file	10MB			
	city	Provider's city	var	200	Y		
	organization	Provider's organization	var	150	Y		
	short_intro	Short intro about provider	var	200	Y		
	bio	Provider's bio	text	100,000			
	profile_image	Seeker's profile image	img	1MB			
	social_github	Provider's GitHub link	var	200			
	social_twitter	Provider's Twitter link	var	200			
	social_linkedin	Provider's LinkedIn link	var	200			
	social_website	Provider's website link	var	200			
Top Seekers Search Result	id	TopSeekers SearchResult's id			Y		Y
	jobSeeker_id	Seeker's id	var	1,000	Y		
	jobPost_id	Provider's id	var	1,000	Y		



TopJobs Search Result	jobSeeker_id	Seeker's id	var	1,000	Y			
	jobPost_id	Provider's id	var	1,000	Y			
	category	Job category	var	150	Y			



5.4.2 Data Collection and Preparation

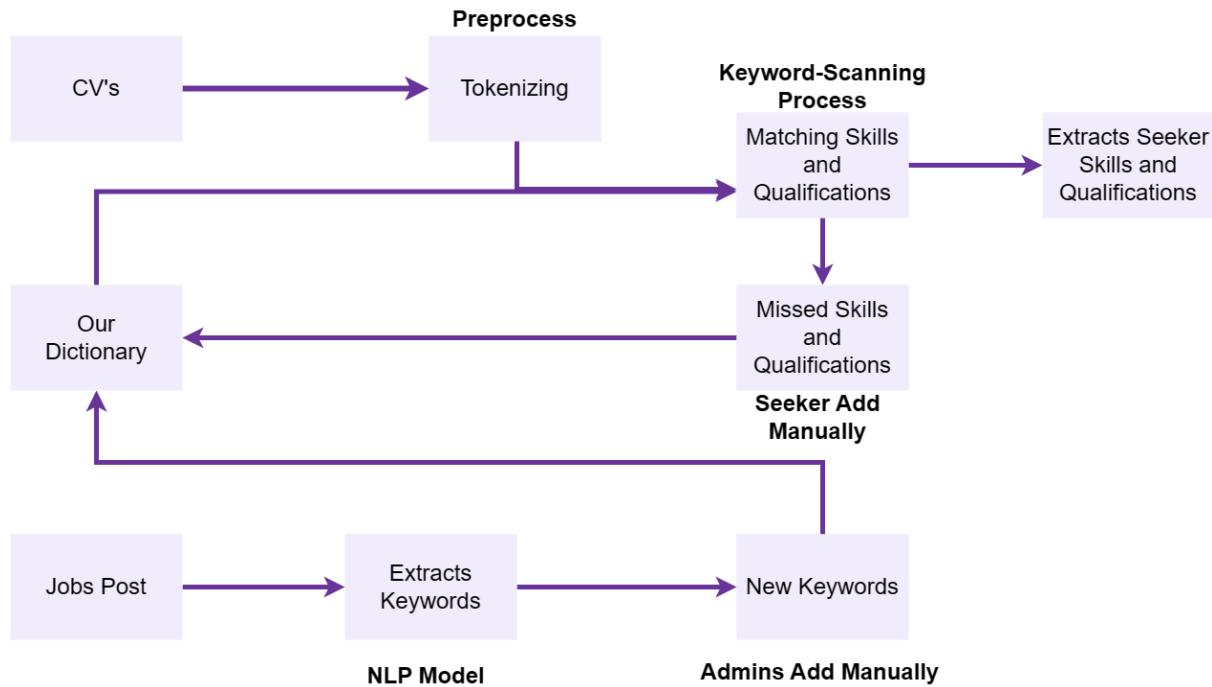


figure 13 - 5.4.2 Data Collection and Preparation

In order to test the Hiral system, we collected public CVs online and from our friends. This helps us to evaluate the effectiveness of the keyword-scanning algorithm and ensure that the app is accurately matching job seekers with relevant job postings.

To collect public CVs for testing, we searched for CVs that are publicly available on job boards and social media platforms that allow us to use them. We made sure we follow all rules and obtain permission where necessary.

For CVs from our friends, we reached out to them and asked for permission to use their CVs in our testing process. We ensured that their personal information is kept confidential and that their CVs are only used for testing purposes.

Once we collected a sufficient number of CVs, we ran them through the keyword-scanning algorithm and evaluated the results.

To improve the accuracy of the keyword-scanning algorithm, we preprocessed job seekers' CVs using a tokenizer. This involved breaking down the text into individual tokens, which were then matched against relevant keywords and phrases in our dictionary.



We use a dictionary in our keyword-scanning that contains relevant skills and qualifications to match them with job seekers' CVs. The algorithm scans through the CVs, identifies the matching skills and qualifications. By using a dictionary to guide the keyword-scanning process, we ensure that the algorithm is accurate and efficient in identifying the most relevant skills and qualifications for each job posting.

When a recruiter posts a job, we use an NLP model to automatically extract keywords, and update our dictionary with any new terms that are not already included. The administrators must approve any newly added keywords. Additionally, if a job seeker uses keyword-scanning but some relevant skills are not detected, they are permitted to manually add those skills to the dictionary. This approach enables us to continuously improve the accuracy and efficiency of the job matching process by ensuring that our system is always up to date with the latest skills and qualifications in demand.

By preprocessing the CVs in this way, we were able to more accurately identify and highlight the most relevant skills and qualifications mentioned in the CVs.

We will also manually review the matches to ensure that they are accurate and relevant. Overall, collecting public CVs online and from our friends will help us to thoroughly test the job search app system and ensure that it is functioning as intended.



5.5 Interface Design

- Job seeker navigation hierarchy

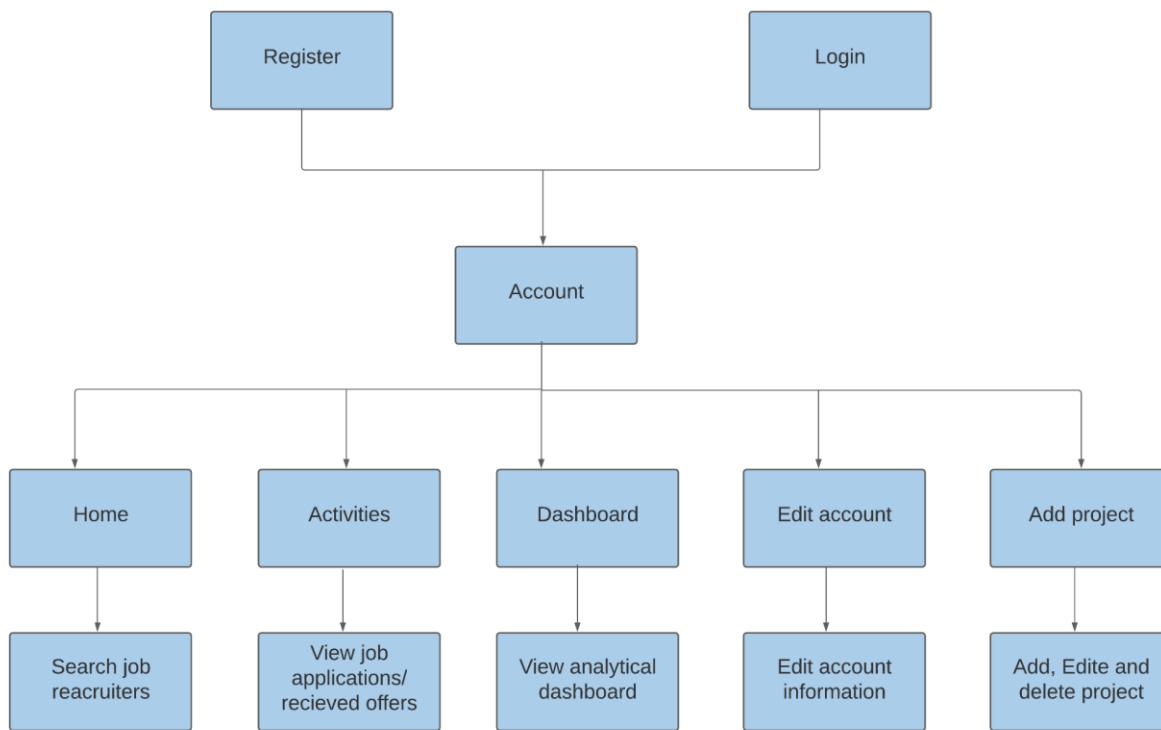


Figure 14 - 5.5 Seeker navigation hierarchy



- Job recruiter navigation hierarchy

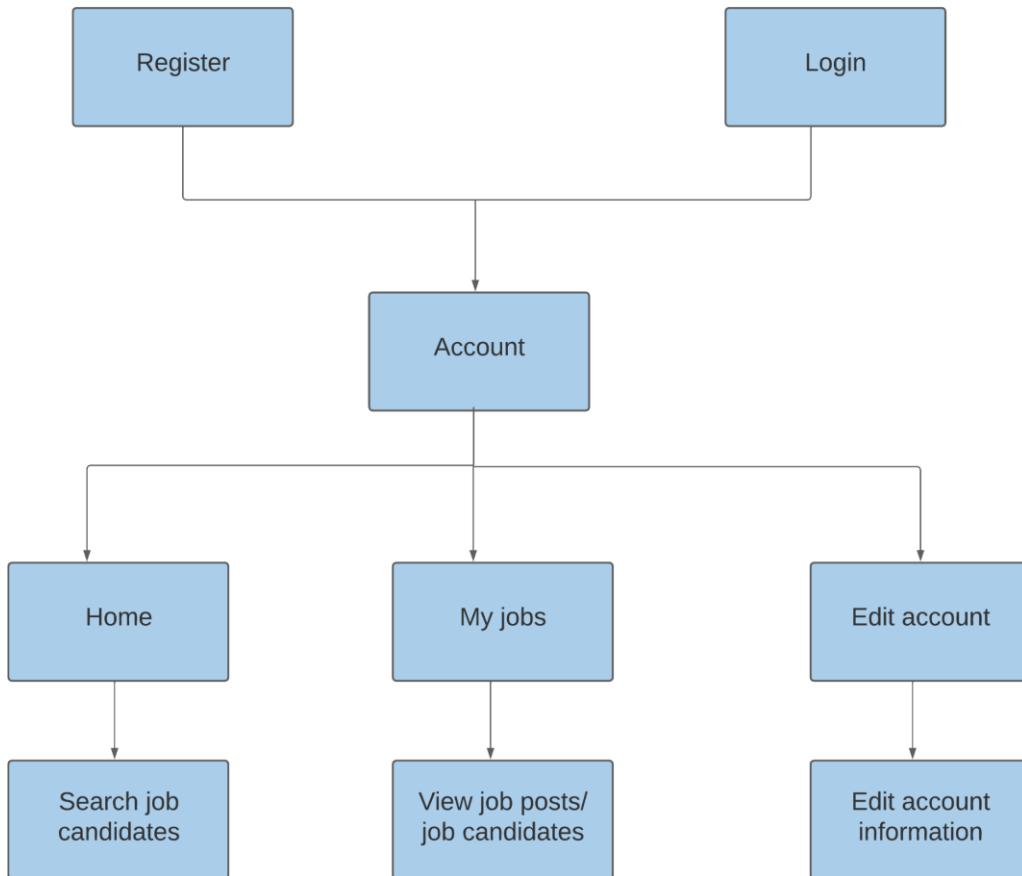


Figure 15 - 5.5 Recruiter navigation hierarchy

- UX guidelines incorporated while designing our interface:
 - Visibility in system status.
 - Error prevention.
 - Simplify navigation.
 - Make relevant information easy to find.
 - Use familiar fonts.



- User Interfaces

The screenshot shows the 'Account Login' page. At the top center is a magnifying glass icon with a person silhouette. Below it, the title 'Account Login' is displayed in bold. A welcome message 'Hello, Welcome Back!' follows. There are two input fields: 'Email:' containing 'atheernew' and 'Password:' containing several dots. A 'Log In' button is positioned below the password field. At the bottom, links for 'Don't have an Account?' and 'Sign Up' are visible.

Figure 16 - 5.5 Login interface

The screenshot shows the 'Account SignUp' page. At the top center is a magnifying glass icon with a person silhouette. Below it, the title 'Account SignUp' is displayed in bold, with a subtitle 'Create a new account'. There are six input fields labeled 'Name', 'Email', 'Username', 'Password', 'Password confirmation', and 'User type'. The 'User type' field has a dropdown menu showing 'Seeker'. A 'Sign In' button is located at the bottom left.

Figure 17 - 5.5 Signup interface



HIRAL

Home Activities Dashboard Account Logout

Name: amal

Email: 441201404@student.ksu.edu.sa

Username: amall2

Cv: Currently: uploads/coolfreecv_resume_en_06_n_1_1Bfb2H7.docx
Change: لغز بختر اى ملف

Accepted file formats: .docx, .txt, .rtf

City: Riyadh

Short intro:

Figure 18 - 5.5 Seeker Edit account interface (a)

Bio:

Profile image: Currently: user-default.png
Change: لغز بختر اى ملف

Social github:

Social linkedin:

Social twitter:

Social website:

Figure 19 - 5.5 Seeker Edit account interface (b)

ABOUT ME

you don't have bio.

TECHNICAL SKILLS

- management 0
- web design 0
- programming languages 0
- java 0
- python 0
- javascript 0
- php 0
- html 0
- css 0
- code 0
- programming 0
- sql 0
- c 0
- mysqI 0
- zend 0
- quality assurance 0
- project management 0

SOFT SKILLS

- spanish 0
- chinese 0
- innovative 0
- focused 0
- intuitive 0

PAST PROJECTS

MERN stack project
created a website that allows you to measure your need for calories using MERN stack ↗

Add Project Edit Delete

Figure 20 - 5.5 Seeker profile interface

HIRAL

Home My jobs Account Logout

Name: abeer

Email: atheerhalzaid0@gmail.com

Username: aberl234

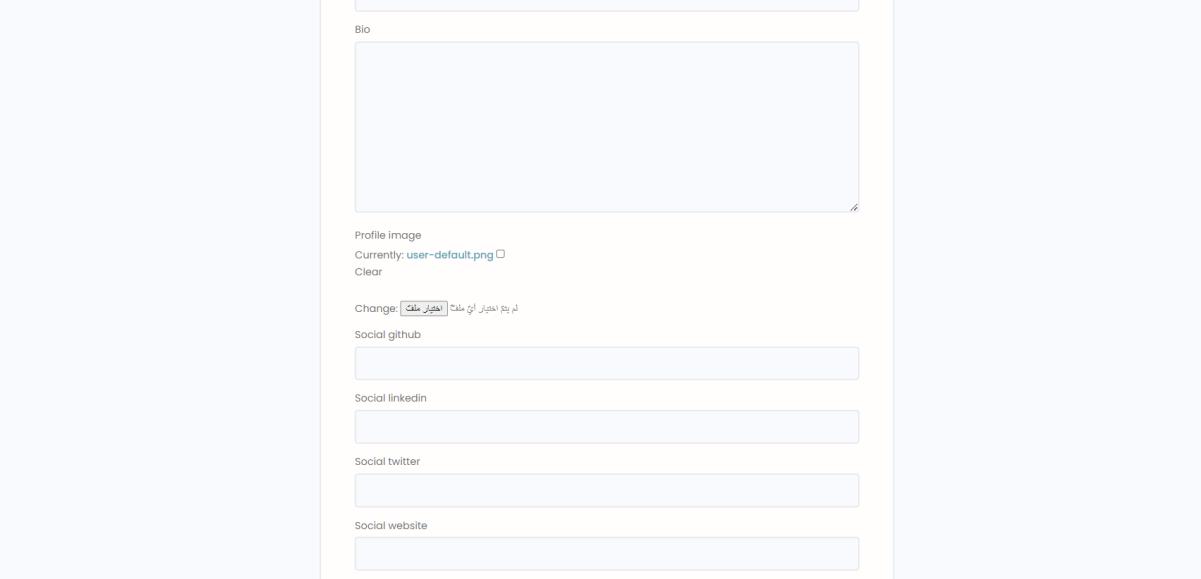
Organization: KSU

City: Riyadh

Short intro:

Bio:

Figure 21 - 5.5 Recruiter Edit account interface (a)



This screenshot shows the 'Edit account' interface for a recruiter. It includes fields for Bio, Profile image (with a placeholder for 'user-default.png'), and various social media links (Social github, Social linkedin, Social twitter, Social website). There is also a 'Change' button with the text 'لم يتم اختيار أي ملف' (No file selected).

Figure 22 – 5.5 Recruiter Edit account interface (b)

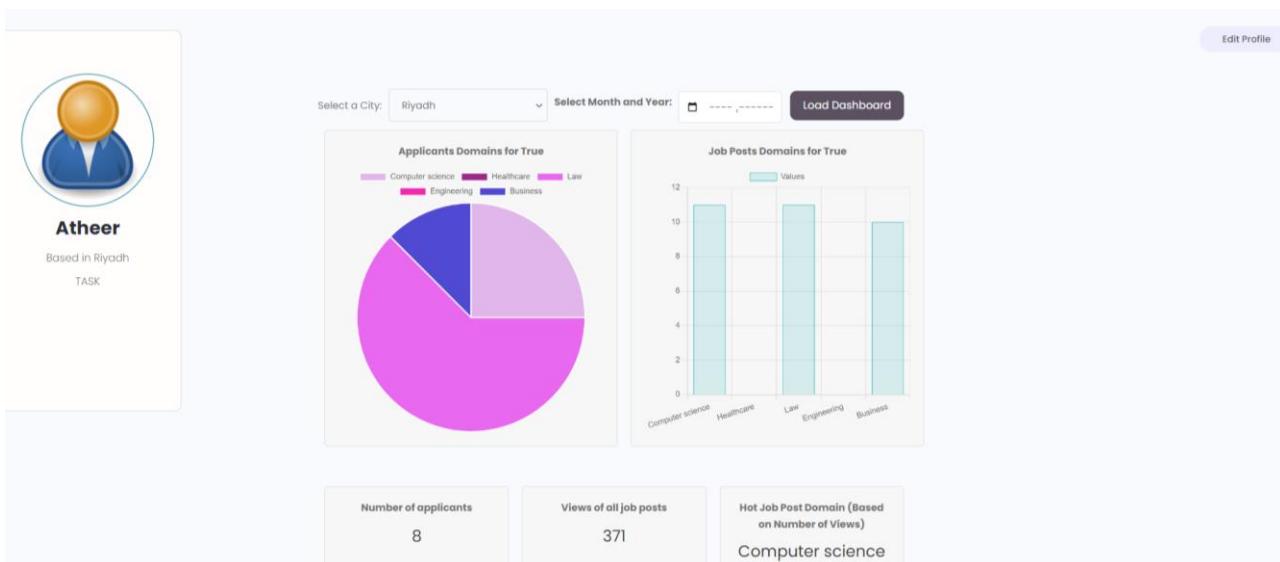


Figure 23 – 5.5 Recruiter profile interface



Position name: Controller

Job brief: We are looking for a Controller to develop accounting policies and oversee all financial procedures.

Responsibilities:

- Document, monitor and update accounting policies
- Ensure all payments are completed on time (including accounts payable and bank deposits)
- Review quarterly and annual budgets for all departments
- Analyze costs and profits
- Set and track financial KPIs
- Build risk assessment models to evaluate investments
- Report on financial status on a regular basis and create ad-hoc reports when needed
- Maintain accurate and up-to-date filing systems
- Perform internal audits and assist with external audits
- Ensure compliance with accounting and tax regulations

Technical skills:

- Work experience as a Controller or similar role
- Thorough knowledge of accounting principles, procedures and legislation
- Hands on experience with general ledger accounts payable and accounts receivable functions
- Experience with cash management and risk assessment

Figure 24 - 5.5 Add job post interface (a)

Technical skills:

- Work experience as a Controller or similar role
- Thorough knowledge of accounting principles, procedures and legislation
- Hands on experience with general ledger accounts payable and accounts receivable functions
- Experience with cash management and risk assessment
- Good knowledge of accounting software
- Attention to detail
- Ability to work with tight deadlines
- BSc or MSc in Accounting or Finance
- CPA or CMA preferred

Soft Skills:

- Arabic
- English
- Communication
- Leadership

City: Riyadh

Job Category: Computer science

Figure 25 - 5.5 Add job post interface (b)



organization
STC

Organization logo
Currently: jobpost.jpg

Change: No file chosen

Job type

Contact email
cuastula@gmail.com

Average salary
20000

Figure 26 - 5.5 Add job post interface (c)

HIRAL

Inbox Home Activities Posted jobs Notifications Account Logout

POSTED JOBS

Compliance Counsel Manager
The purpose of the Legal Department is to defend the interests of RATP Dev group, its executive employees, and contribute to its development by implementing relevant legal expertise.

Legal Counsel
The position requires a lawyer experienced in the Kingdom of Saudi Arabia with a proven track record in advising, structuring, and implementing complex projects in KSA

Legal Counsel Graduate
As a Legal Counsel, you will be responsible for evaluating different risk factors regarding business decisions and operations, and manage engagements with external counsel

Senior Legal Counsel
you will have a crucial role in supervising and handling legal affairs for data centers globally. This will involve offering strategic legal guidance and assistance for the data center activities

Figure 27 – 5.5 job posts interface

🔍 HIRAL
[Inbox](#)
[Home](#)
[Activities](#)
[Notifications](#)
[Account](#)
[Logout](#)



Legal Counsel

By Ather
Based in Riyadh
Full-time
Medtronic
30000
[medtronic@gmail.com](#)

[Send message](#)

JOB BRIEF

The position requires a lawyer experienced in the Kingdom of Saudi Arabia with a proven track record in advising, structuring, and implementing complex projects in KSA.

RESPONSIBILITIES

Provide strategic guidance and commercially-oriented operational legal support to management/business units/functions in KSA.

Advise on a wide array of strategic projects on the corporate and commercial side, including the set up of new presences and the evaluation /implementation of new business models.

Counsel business clients practically and strategically on legal issues relating to the businesses/operations and projects in question.

Manage the implementation and supervision of the Distributor Policies, including review and approval of distributors, negotiation of distributor agreements, advising on renewals and terminations and conducting the Distributor Monitoring Program.

Draft and negotiate commercial contracts with third parties, such as suppliers, hospitals, HMOs and healthcare providers.

Advise on legal matters, such as drafting, review and negotiation of a wide range of commercial and non-commercial agreements.

Figure 28 - 5.5 Job post interface (a)

Provide operational support on the daily activities of the local operations, including rendering support to the various functions (HR, Pricing, Regulatory).

Prepare and conduct meetings and training sessions with employees and distributors on Medtronic policies and procedures.

TECHNICAL SKILLS

- Legal Research Tools
- Document Management Systems
- E-Discovery Software
- Contract Management Software
- Case Management Systems
- Electronic Signature Platforms
- Legal Analytics Software
- Data Privacy and Protection Tools
- Online Legal Databases
- Legal Project Management Tools
- contract law
- contract drafting

SOFT SKILLS

- Fluency in Arabic and English.
- solid judgment and integrity.
- Strong written and verbal communication skills.
- Analytical thinking.
- People management skills/experience.
- Ability to work on various projects at same time; good priority setting skills.
- Positive and proactive approach, including driving processes in a complex environment.
- Ability to deal with ambiguity and making decisions and taking leadership in such situations

Figure 29 - 5.5 Job post interface (b)



RECEIVED PROPOSALS

- Legal Head**
The position will be directly responsible for the ...
Provide analysis and counsel on legal, policy, compliance, transactional, commercial, or Pharmaceutical development issues—integrating legal knowledge with sound business understanding. Anticipate and proactively support the prevention and management.
- Compliance Counsel Manager**
The purpose of the Legal Department is to defend t...
Responsible for corporate law in all the companies within the Middle East & North Africa Area (i.e. to date, Saudi Arabia, UAE, Qatar, Egypt, Morocco) in coordination with the Management teams of the relevant companies and the Legal Department Inv.
- Contracts manager**
As a Contracts Manager, you will be responsible fo...
1. Assist in the collaboration with the legal department and other required to support in negotiation of claims variation change and disputes with contractors. 2. Advance knowledge on FIDIC and Bot contracts. 3. Working with different levels of pe

SENT APPLICATIONS

- Contracts manager**
As a Contracts Manager, you will be responsible fo...
1. Assist in the collaboration with the legal department and other required to support in negotiation of claims variation change and disputes with contractors. 2. Advance knowledge on FIDIC and Bot contracts. 3. Working with different levels of pe
- Accountant**
Finance and Accounting Manager...
Manage all accounting transactions. Cash & Funds Management. Prepare payroll and deduction and WPS as per KSA Laws. Must have knowledge of banks arranging finance facilities, business Loans and TB & PB. Prepare budget forecasts. Handle monthly, qua
- Bank Accountant**
Financial Accountant...
Prepare the cash status reports of the bank periodically. Prepare monthly statement of the bank. Handle periodic audits with external auditors and their requirements. Prepare monthly closing reports. Perform on-time recording of all the banking tr

[View all proposals](#) [View all applications](#)

Figure 30 - 5.5 Seeker Activities interface

RECEIVED APPLICATIONS

- Hamed Alshaya**
Legal Counsel
Applied To : Contract Manager
a dedicated and results-driven Legal Counsel with a strong background in drafting legal documents, providing expert advice, and managing legal risks. Based in Riyadh, Saudi Arabia, I bring a solid academic foundation in law, complemented by practical...
- Mohammed alrjhi**
Highly skilled and motivated legal professional
Applied To : Contracts manager
I am a highly skilled and motivated legal professional based in Riyadh, Saudi Arabia. With a comprehensive understanding of corporate law and a strong background in contract management and risk assessment, Mohammad brings valuable expertise to the to...
- Gala Alageel**
Legal advisor
Applied To : Legal Counsel
An experienced Legal Specialist who is capable of team management and risk management. Professional in areas such as Dispute Resolution, Legal Documentation, Corporate Governance, Contract Drafting And Legal Advisory. Meticulous and hardworking with ...

SENT PROPOSALS

- Mohammed alrjhi**
Highly skilled and motivated legal professional
Job Proposed : Contracts manager
I am a highly skilled and motivated legal professional based in Riyadh, Saudi Arabia. With a comprehensive understanding of corporate law and a strong background in contract management and risk assessment, Mohammad brings valuable expertise to the to...
- reem**
Legal Director
Job Proposed : Compliance Counsel Manager
Results-driven Associate Legal Director with expertise in legal and compliance management within the Middle East region. Skilled in contract negotiation, governance, and providing practical legal solutions. Demonstrated ability to lead and manage leg...
- Amani**
I am a MERN stack developer
Job Proposed : Compliance Counsel Manager
–

[View all applications](#) [View all sent Proposals](#)

Figure 31 - 5.5 Recruiter activities interface



HIRAL

The screenshot shows the 'Notifications' section of the HIRAL platform. At the top, there is a navigation bar with links: Inbox, Home, Activities, Notifications (which is highlighted in blue), Account, and Logout. Below the navigation bar, the title 'NOTIFICATIONS' is displayed. Two notifications are listed:

- New job Proposal** from Athir for Legal Counsel. A 'View' button is to the right.
- New job Proposal** from Athir for Compliance Counsel Manager. A 'View' button is to the right.

Figure 32 - 5.5 Seeker notification interface

The screenshot shows the 'Notifications' section of the HIRAL platform. At the top, there is a navigation bar with links: Inbox, Home, Activities, Posted jobs, Notifications (which is highlighted in blue), Account, and Logout. Below the navigation bar, the title 'NOTIFICATIONS' is displayed. Five new application notifications are listed:

- New Application** From Mohammed alrifi for Compliance Counsel Manager. A 'View' button is to the right.
- New Application** From Mohammed alrifi for Legal Counsel. A 'View' button is to the right.
- New Application** From Mohammed alrifi for Legal Head. A 'View' button is to the right.
- New Application** From Mohammed alrifi for Contract Manager. A 'View' button is to the right.
- New Application** From Mohammed alrifi for Contracts manager. A 'View' button is to the right.

Figure 33 - 5.5 Recruiter notification interface



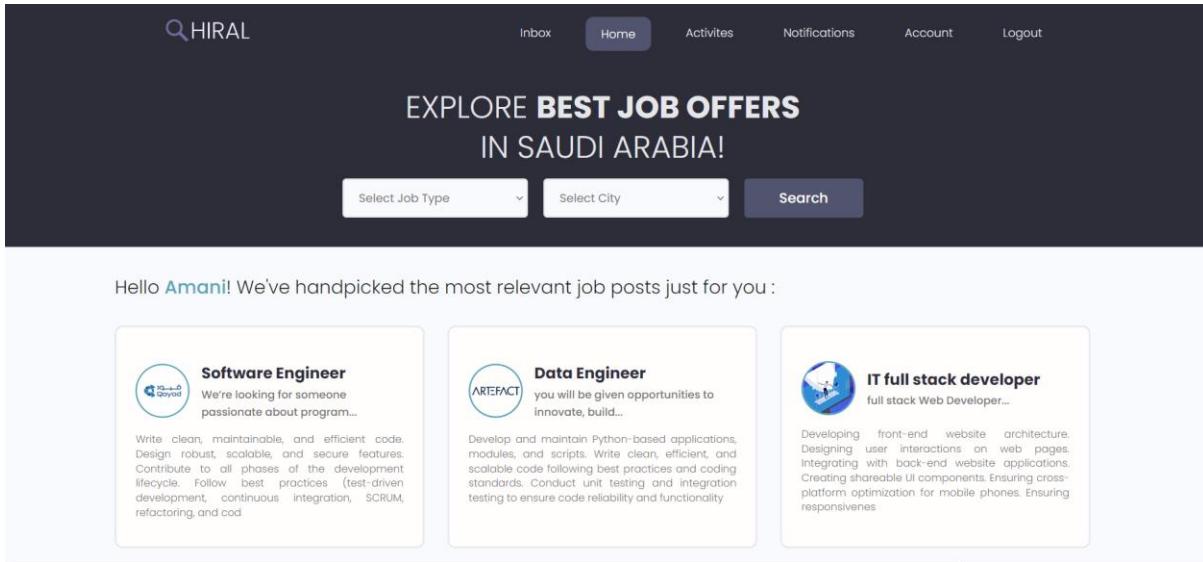
HIRAL

The screenshot shows the HIRAL inbox interface. At the top, there is a search bar labeled "Search..." and a navigation bar with links for "Inbox", "Home", "Activities", "Posted jobs", "Notification", "Account", and "Logout". Below the search bar, the title "Messages" is displayed. On the left, a sidebar lists user profiles with their names, status (e.g., offline), and profile pictures. On the right, the main area displays messages from "Mohammed alrjhi" and "Hamod Alshaya". A message from "reem" is also visible. At the bottom, there is a text input field labeled "Type your message" and a blue "Send" button.

Figure 34 - 5.5 Inbox interface

The screenshot shows the HIRAL seeker home interface. At the top, there is a search bar labeled "HIRAL" and a navigation bar with links for "Inbox", "Home", "Activities", "Notifications", "Account", and "Logout". Below the navigation bar, a large banner reads "EXPLORE BEST JOB OFFERS IN SAUDI ARABIA!". Underneath the banner are three dropdown filters: "Full time", "Riyadh", and a "Search" button.

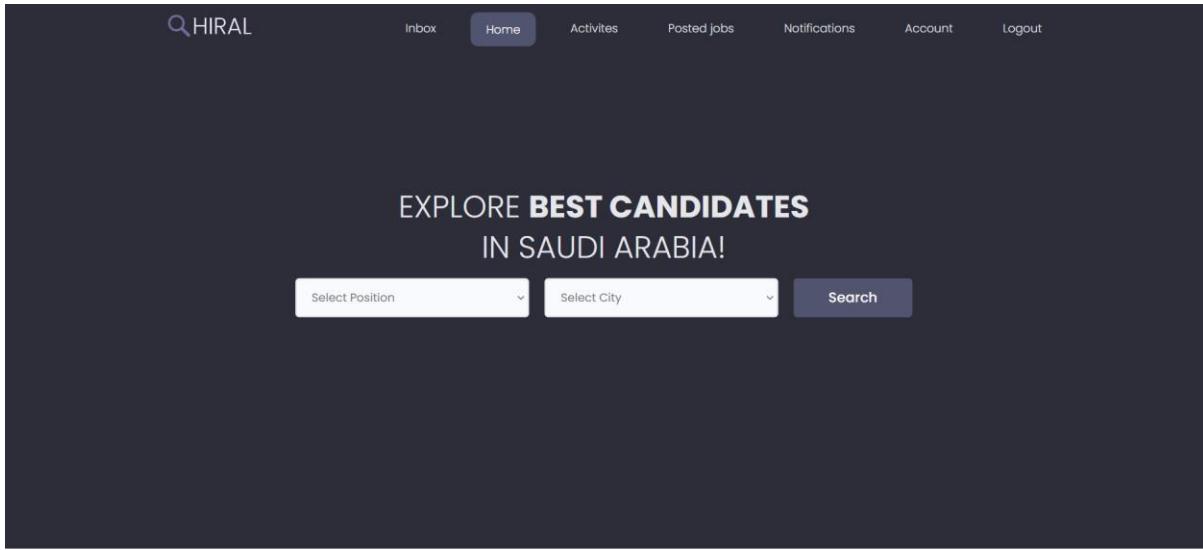
Figure 35 - 5.5 Seeker home interface (a)



The screenshot shows the HIRAL Seeker home interface. At the top, there is a navigation bar with links for Inbox, Home (which is highlighted in blue), Activities, Notifications, Account, and Logout. Below the navigation bar, a large banner reads "EXPLORE BEST JOB OFFERS IN SAUDI ARABIA!" with three search input fields: "Select Job Type", "Select City", and a "Search" button. A message below the banner says "Hello Amani! We've handpicked the most relevant job posts just for you:". Three job posts are listed in cards:

- Software Engineer**: We're looking for someone passionate about program...
Write clean, maintainable, and efficient code. Design robust, scalable, and secure features. Contribute to all phases of the development lifecycle. Follow best practices (test-driven development, continuous integration, SCRUM, refactoring, and cod...
- Data Engineer**: You will be given opportunities to innovate, build...
Develop and maintain Python-based applications, modules, and scripts. Write clean, efficient, and scalable code following best practices and coding standards. Conduct unit testing and integration testing to ensure code reliability and functionality.
- IT full stack developer**: full stack Web Developer...
Developing front-end website architecture. Designing user interactions on web pages. Integrating with back-end website applications. Creating shareable UI components. Ensuring cross-platform optimization for mobile phones. Ensuring responsiveness.

Figure 36 - 5.5 Seeker home interface (b)



The screenshot shows the HIRAL Recruiter Home interface. At the top, there is a navigation bar with links for Inbox, Home (which is highlighted in blue), Activities, Posted jobs, Notifications, Account, and Logout. Below the navigation bar, a large banner reads "EXPLORE BEST CANDIDATES IN SAUDI ARABIA!" with three search input fields: "Select Position", "Select City", and a "Search" button.

Figure 37 - 5.5 Recruiter Home interface (a)



HIRAL

The screenshot shows the HIRAL platform's home page for recruiters. At the top, there is a navigation bar with links: Inbox (with a red dot), Home (selected), Activities, Posted jobs, Notifications (with a red dot), Account, and Logout. Below the navigation bar, a banner reads "EXPLORE BEST CANDIDATES IN SAUDI ARABIA!" with dropdown menus for "Select Position" and "Select City", and a "Search" button. The main content area displays three candidate profiles:

- Noura Aljumiah** (Proposal sent): Legal professional with a deep understanding of corporate law. Description: Highly skilled and motivated legal professional with a deep understanding of corporate law and a contract management system, risk assessment, and utilization of management tools. Demonstrated expertise in advising, structuring, and implementing contracts.
- Ahmed Alqahtani** (Contracts Manager): Contracts Manager with Analytical Thinking and Problem-Solving Abilities, providing expert Risk Assessment and Mitigation, and Contract Administration. Based in Riyadh, Saudi Arabia. Description: Contracts Manager with Analytical Thinking and Problem-Solving Abilities, providing expert Risk Assessment and Mitigation, and Contract Administration. Based in Riyadh, Saudi Arabia. I bring a solid academic foundation in Compliance and Ethics, comp
- Mohammed alrjhi** (Proposal sent): Highly skilled and motivated legal professional. Description: I am a highly skilled and motivated legal professional based in Riyadh, Saudi Arabia. With a comprehensive understanding of corporate law and a strong background in contract management and risk assessment, Mohammad brings valuable expertise to the team.

Figure 38 - 5.5 Recruiter Home interface (b)



HIRAL



HIRAL

CHAPTER 6

System Implementation



6 System Implementation

This chapter covers the system implementation in details. It discusses the software tools used to develop the application, the system implementation, and the challenges.

Hiral was developed using an iterative process shown in figure 28 that involved several key stages. In the analysis phase, we identified project goals, selected user stories, and conducted market research. In the design phase, we created the user interface, determined app functionalities. The implementation phase involved writing back-end code, developing the front-end user interface, and creating an SQLite database. In the testing phase, we tested each task, evaluated the system's performance, and gathered user feedback. Finally, in the documentation phase, we documented changes made and conducted code reviews. This iterative process helped ensure that the final product met project requirements and allowed for continuous improvement throughout the development process.

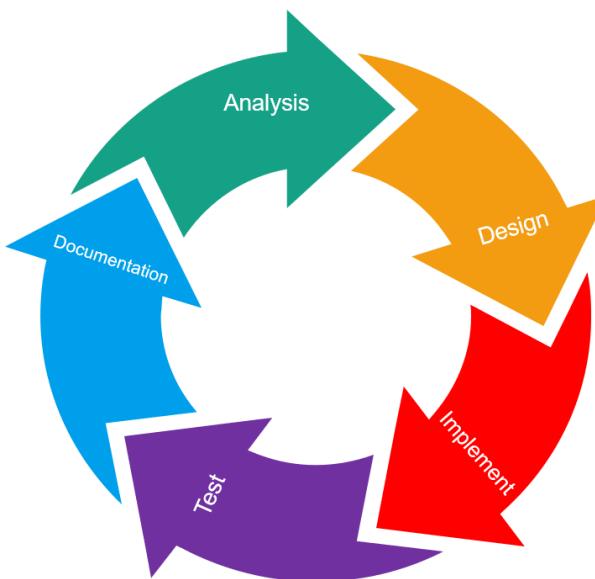


Figure 39 - 6 Hiral iterative development

To Develop and implement a software application such as Hiral and ensure the successful implementation of the app, we followed a series of steps, as illustrated in the accompanying figure.



Figure 40 - 6 System implementation steps

Step 1: User Stories and Task Breakdown

The first step in developing the job search app was to select the user stories that we would work on during the sprint. We then broke these user stories down into smaller tasks to make the development process more manageable.

Step 2: Tools and Programs

Once we had our task list, we downloaded the necessary tools and programs to build the system. This included Visual Studio Code as our text editor, Python as our programming language, and the Django web framework to build our app.

Step 3: Front-End Development

With our tools in place, we started building the front-end of the app using HTML, CSS, and UI kits. This involved designing and coding the user interface that job seekers and recruiters would use.



Step 4: Back-End Development

Next, we created an SQLite database using Django models and migrated it to the system. This allowed us to complete the development of the back-end functionalities. We then wrote the back-end code using the Django framework.

Step 5: CV Tokenization and Keyword-Scanning

To prepare CVs for keyword-scanning using our automated dictionary, we first tokenized the text. This involved breaking down the CV into individual tokens. We then used our dictionary to match these tokens against relevant keywords and phrases. This process allowed our system to accurately identify and highlight the most relevant skills mentioned in the CV.

Step 6: Job Post Keyword Extraction

Our approach involves using NLP models to extract keywords from job postings, which will then be added to our automated dictionary to increase automation. This will help us to more accurately and efficiently match job seekers with relevant job postings.

Step 7: Jobs and Candidates matching:

To enhance the job search app's matching capabilities, we conducted extensive testing of various models. After careful evaluation, we determined that the STSB-RoBERTa-Large model provided the best results. Therefore, we integrated this model into our job and candidate matching system. By utilizing the advanced capabilities of the Sentence Transformer model and employing cosine similarity as the metric, we were able to effectively measure the semantic compatibility between job postings and candidate profiles. This approach significantly improved the accuracy and precision of our matching algorithm, resulting in better matches between job seekers and relevant job opportunities.

Step 8: Notifications

To implement the notification. We have developed two database models: "proposal" for job posts sent by recruiters to candidates, and "application" for job applications submitted by seekers to job posts. Whenever a recruiter sends a job post to a seeker, we generate a new "proposal" object to display it in the seeker's notification page. Similarly, when a seeker applies to a job, we create a new "application" object to show it in the recruiter's notification page.



Step 9: Dashboard implementation

We have developed a comprehensive dashboard by using Django and JavaScript, specifically designed to assist recruiters in their tasks. This dashboard provides valuable information related to the applicant's domain, my job post domain, the number of applicants, views of all job posts, and identifies the hot job post based on the number of views. We extract the information from the database, apply filters and present them using Chart.js library, so that with just a glance, recruiters can easily assess the performance of different domains and quickly identify areas where they may need to attract more applicants. The recruiter can filter the dashboard by choosing the year and month and by choosing cities to compare the overall performance of job posts and applicants data based on those two factors month and city.

Step 10: Chat Implementation

We implemented a chat feature using Django Channels and the Django Rest Framework. This real-time messaging system enables job seekers and recruiters to communicate instantly within the app. It includes features like real-time messaging, message history, and RESTful endpoints for sending and receiving messages. The chat feature improves communication, coordination, and efficiency in the job search and application process.

Step 11: Testing

As we completed each user story and task, we tested the system to ensure that everything worked correctly. We also tested the keyword-scanning algorithm to make sure that it accurately identified and highlighted the most relevant skills, qualifications, and experiences mentioned in the CV and tested the NLP model to ensure it captures the skills and adds them to our dictionary.

Testing was an integral part of each step in the development process of the job search app. Here's an overview of the testing activities conducted throughout the ten steps:

Step 1: User Stories and Task Breakdown Testing involved reviewing user stories for clarity and completeness, ensuring they accurately captured user requirements.

Step 2: Tools and Programs Testing focused on verifying the proper installation and configuration of development tools and programs.

Step 3: Front-End Development Front-end testing ensured the user interface was visually appealing, responsive, and functioned as intended.

Step 4: Back-End Development Back-end testing involved validating the functionality of server-side components, APIs, and database operations.



Step 5: CV Tokenization and Keyword-Scanning Testing verified the accuracy of the CV tokenization process and the keyword-scanning algorithm's ability manually to identify and highlight relevant skills.

Step 6: Job Post Keyword Extraction The NLP model used for keyword extraction was tested to ensure it accurately identified and extracted relevant keywords from job postings.

Step 7: Job and Candidate Matching Testing focused on measuring the accuracy of the Sentence Transformer model and cosine similarity manually in determining the compatibility between job postings and candidate profiles.

Step 8: Notifications Testing involved verifying that notifications were sent accurately and timely, ensuring users received relevant updates.

Step 9: Dashboard testing ensures that the information provided in the dashboard accurately reflects the information stored in the database. and that it can be filtered by selecting time and city.

Step 10: Chat Implementation Testing involved validating real-time messaging and message history features to ensure smooth communication between job seekers and recruiters.

Throughout the development process, various testing methodologies, including unit testing, integration testing, system testing, performance testing, and user acceptance testing, were employed to identify and address any issues, bugs, or usability concerns. By conducting comprehensive testing at each step, the job search app was refined to deliver a reliable, user-friendly, and efficient solution for job seekers and recruiters.



- Software Tools

Table 10 - 6 Software tools

Software Type	Version	Description
Django	4.2.1	Django is a web development framework that allows developers to build web applications quickly and easily. It provides a wide range of built-in features and tools, making it ideal for building complex, data-driven websites.
Python	3.9.11	Python is an easy-to-learn programming language used for web development, data analysis, artificial intelligence, and scientific computing.
VS Code	1.78.2	Visual Studio Code is a free text editor used to write and debug code. It proposes a range of features, such as syntax highlighting, debugging, and Git integration.
HTML	HTML5	HTML is a standard language used for creating and designing web pages.
CSS	3.37.2	CSS is a style sheet language used to describe the presentation and layout of web pages written in HTML.
SQLite	3.37.2	SQLite is a serverless database engine that can be embedded in applications and accessed through SQL commands.
GitHub	3.7.10	GitHub is a code hosting platform used to manage and integrate source code.
skillNer	1.0.3	A library for named entity recognition of skills.
sentence-transformers	2.2.2	A library for generating sentence embeddings to measure semantic similarity.
channels	3.0.4	A Django library for handling WebSocket communication.



channels-redis	4.1.0	A Redis channel layer backend for Django Channels.
djangorestframework	3.14.0	A powerful and flexible toolkit for building Web APIs in Django.

In conclusion, Hiral was developed using an iterative process that involved selecting user stories, breaking them down into smaller tasks, and testing each component as it was completed. We conducted thorough analysis and documentation throughout the process to identify areas for improvement and ensure that the final product met project requirements. Hiral uses a keyword-scanning algorithm to match job seekers' CVs with relevant job postings, which is made possible by tokenizing the text and using a dictionary to identify relevant keywords and phrases. Furthermore, we use NLP models to extract keywords from job postings, which are included in our dictionary to automate the process. This improves the accuracy of job matching, enabling us to match job seekers with relevant job postings more precisely and efficiently.

The GitHub link for the Hiral application: <https://github.com/Deema1alfuaim/2023-GP1-6>



HIRAL

CHAPTER 7

System Evaluation



7 System Testing

To confirm that Hiral functions as intended, we conducted system testing in this chapter, including user acceptance testing and user surveys. We then analyzed and discussed the results to ensure that the system meets the requirements and expectations of our users.

7.1 User Acceptance Testing

During the user acceptability testing stage of software development, the target audience tests the software to ensure it meets their needs. We selected seven members for the testing, including recent graduates, recruitment professionals, and employees seeking new opportunities. This type of testing is crucial to confirm that the application satisfies the end users' requirements and to identify any areas that may require improvement.

7.1.1 Demographics of Participants

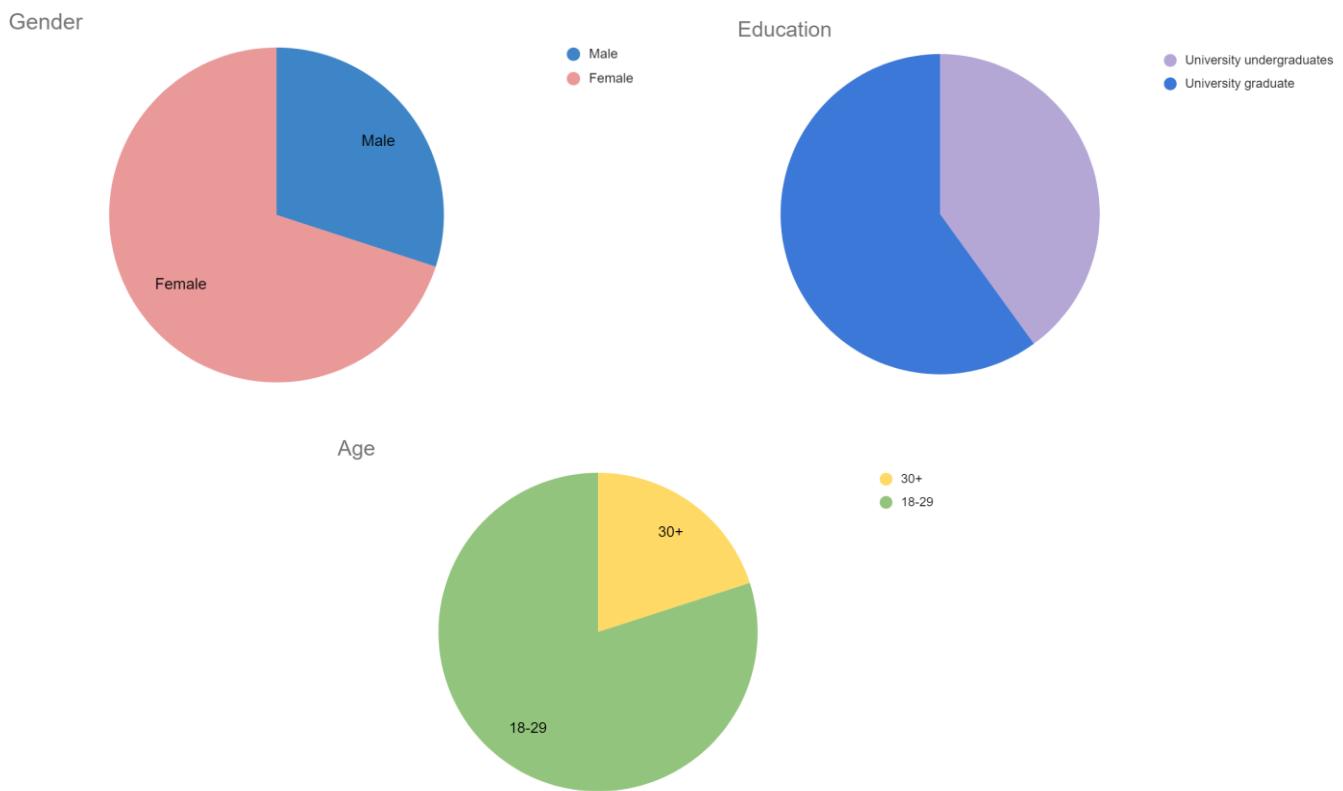


Figure 41 - 7.1.1 Demographics of Participants figure



7.1.2 Questionnaire/Interview Results

We conducted a comprehensive survey using Google Forms to gather feedback from our users. The survey consisted of 15 questions, with 5 questions tailored specifically for recruiters, 5 for job seekers, and 5 for both groups. We received a total of 20 responses, providing valuable insights into the user experience.

For job seekers, we inquired about their satisfaction with the platform's ability to extract skills from their CVs, the relevance of job recommendations provided by Hiral, their thoughts on the job application process, and their experience with communication with recruiters. These questions were rated on a scale of one to five, allowing us to measure their level of satisfaction accurately.

Recruiters, on the other hand, were asked to rate the helpfulness of the information presented on the dashboard, the relevance of candidate recommendations provided by Hiral, their thoughts on the process of adding a job post, and their rating of the communication process with job seekers. Similarly, these questions were also rated on a scale of one to five.

In addition to the specific questions tailored for job seekers and recruiters, we included general questions that were applicable to both groups. Participants were asked to provide their rating on a scale of one to five for the following aspects: design and layout, performance and speed and likelihood of recommending Hiral to friends. Furthermore we asked them to rate the navigation (very smooth, smooth, not smooth) and lastly we asked them to write their future expectations.

and finally we asked general questions for both seekers and recruiters. On a scale of one to five what do you think of the design and layout, On a scale of one to five how would you rate the performance and speed of Hiral, How smooth was the navigation between sections of Hiral, Is there anything you hope Hiral would offer in the future, on a scale of one to five would you recommend Hiral to your friends.

According to our findings, we can better comprehend the many viewpoints' people have expressed through this questionnaire. Moreover, the application satisfies its criteria and it's simple to use and navigating, resulting in a better user experience.



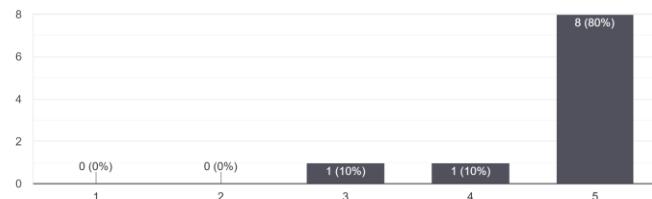
Table 11 - 7.1.2 Questionnaire results

Questions	answers																		
1.Are you a seeker or recruiter	<p>Are you a seeker or a recruiter? 20 responses</p> <p>Recruiter Seeker</p>																		
2.on a scale of one to five did the platform successfully extract the skills on your cv?	<p>on a scale of one to five did the platform successfully extracted the skills on your cv? 10 responses</p> <table border="1"> <thead> <tr> <th>Rating</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0</td> <td>0%</td> </tr> <tr> <td>2</td> <td>0</td> <td>0%</td> </tr> <tr> <td>3</td> <td>0</td> <td>0%</td> </tr> <tr> <td>4</td> <td>4</td> <td>40%</td> </tr> <tr> <td>5</td> <td>6</td> <td>60%</td> </tr> </tbody> </table>	Rating	Count	Percentage	1	0	0%	2	0	0%	3	0	0%	4	4	40%	5	6	60%
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4	4	40%																	
5	6	60%																	
3.on a scale of one to five were the job recommendations provided by hiral relevant to your skills?	<p>on a scale of one to five were the job recommendations provided by hiral relevant to your skills? 10 responses</p> <table border="1"> <thead> <tr> <th>Rating</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0</td> <td>0%</td> </tr> <tr> <td>2</td> <td>1</td> <td>10%</td> </tr> <tr> <td>3</td> <td>0</td> <td>0%</td> </tr> <tr> <td>4</td> <td>3</td> <td>30%</td> </tr> <tr> <td>5</td> <td>6</td> <td>60%</td> </tr> </tbody> </table>	Rating	Count	Percentage	1	0	0%	2	1	10%	3	0	0%	4	3	30%	5	6	60%
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1	0	0%																	
2	1	10%																	
3	0	0%																	
4	3	30%																	
5	6	60%																	
4.on a scale of one to five what are your thoughts on the process of applying to a job?	<p>on a scale of one to five what are your thoughts on the process of applying to a job? 10 responses</p> <table border="1"> <thead> <tr> <th>Rating</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0</td> <td>0%</td> </tr> <tr> <td>2</td> <td>0</td> <td>0%</td> </tr> <tr> <td>3</td> <td>2</td> <td>20%</td> </tr> <tr> <td>4</td> <td>4</td> <td>40%</td> </tr> <tr> <td>5</td> <td>4</td> <td>40%</td> </tr> </tbody> </table>	Rating	Count	Percentage	1	0	0%	2	0	0%	3	2	20%	4	4	40%	5	4	40%
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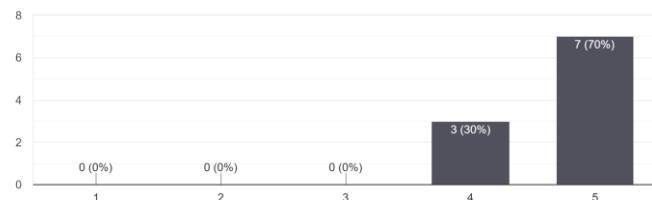
5.on a scale of one to five what are your thoughts in the communication process with recruiters?

on a scale of one to five what are your thoughts in the communication process with recruiters?
10 responses



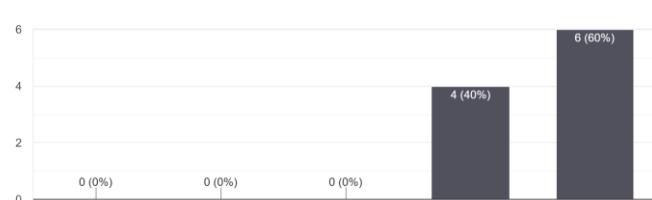
6.on a scale of one to five do you find the information that the dashboard presents helpful?

on a scale of one to five do you find the information that the dashboard presents helpful?
10 responses



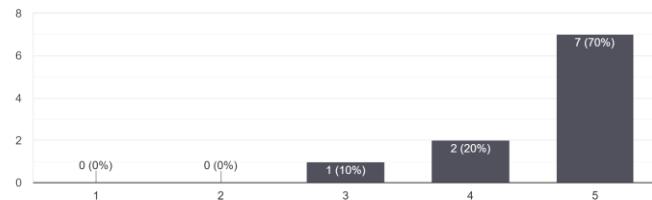
7.on a scale of one to five were the candidate recommendations provided by Hiral relevant to the job post?

on a scale of one to five were the candidate recommendations provided by hiral relevant to the job post?
10 responses



8.on a scale of one to five what are your thoughts on the process of adding a job post

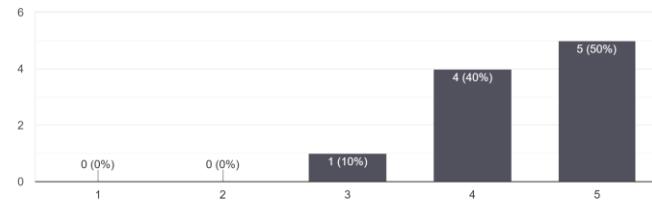
on a scale of one to five what are your thoughts on the process of adding a job post
10 responses





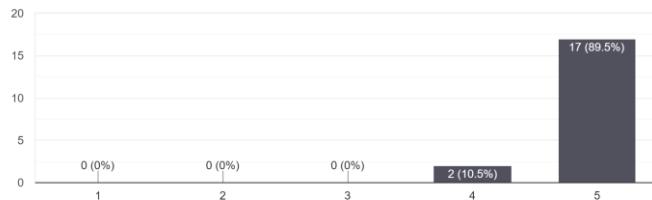
9.on a scale of one to five rate communication process with seekers?

on a scale of one to five rate communication process with seekers?
10 responses



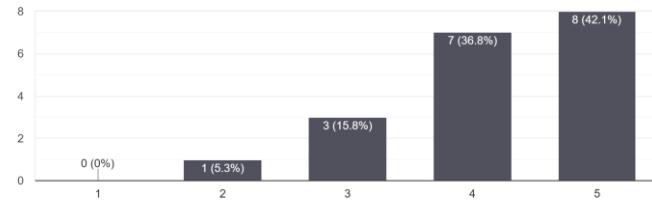
10.On a scale of one to five what do you think of the design and layout?

On a scale of one to five what do you think of the design and layout?
19 responses



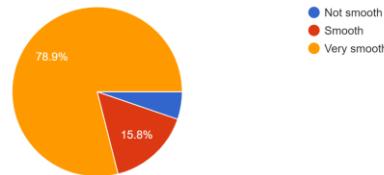
11.On a scale of one to five how would you rate the performance and speed of Hiral?

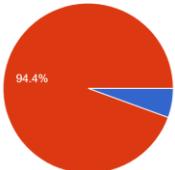
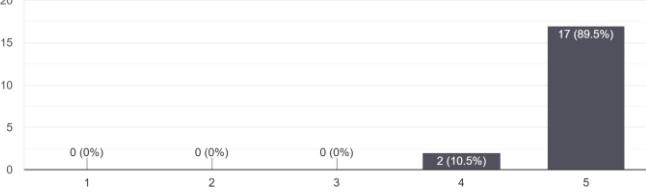
On a scale of one to five how would you rate the performance and speed of Hiral?
19 responses



12.How smooth was the navigation between sections of Hiral?

How smooth was the navigation between sections of Hiral?
19 responses



13.Did you encounter any technical issue, errors while using Hiral?	<p>Did you encounter any technical issue, errors while using hiral? 18 responses</p>  <table border="1"> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>No</td> <td>94.4%</td> </tr> <tr> <td>Yes</td> <td>5.6%</td> </tr> </tbody> </table>	Response	Percentage	No	94.4%	Yes	5.6%												
Response	Percentage																		
No	94.4%																		
Yes	5.6%																		
14.Is there anything you hope Hiral would offer in the future?	<p>Arranging meetings within the app Video Interview via Hiral cover more domains Recommendations of how i can enhance my career as a seeker</p>																		
15.on a scale of one to five would you recommend Hiral to your friends?	<p>on a scale of one to five would you recommend hiral to your friends? 19 responses</p>  <table border="1"> <thead> <tr> <th>Rating</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0</td> <td>0%</td> </tr> <tr> <td>2</td> <td>0</td> <td>0%</td> </tr> <tr> <td>3</td> <td>0</td> <td>0%</td> </tr> <tr> <td>4</td> <td>2</td> <td>10.5%</td> </tr> <tr> <td>5</td> <td>17</td> <td>89.5%</td> </tr> </tbody> </table>	Rating	Count	Percentage	1	0	0%	2	0	0%	3	0	0%	4	2	10.5%	5	17	89.5%
Rating	Count	Percentage																	
1	0	0%																	
2	0	0%																	
3	0	0%																	
4	2	10.5%																	
5	17	89.5%																	



7.3 Quality Attributes (NFR testing)

Nonfunctional Requirements (NFRs) are intended to specify 'system qualities,' various systems attributes that are not directly related to their functionality. These attributes do not tell what the system does but how well it does it. We asked our users to evaluate (security, learnability, and performance) non-functional features.

Table 12 - 7.3 Quality Attributes (NFR testing) table

User Story	Quality Attributes	Measure	Results
As a user, I want the website to be secured by authenticating user email and password so that unauthorized users cannot log in to the application. .	Security: How authorized access to protected data is granted and unauthorized access is actively restricted.	Only verified and authorized users are able to access the website.	Upon registration, users will receive a verification email. During the login process, verifying user credentials against the stored database. If the email and password combination is correct, access is granted; otherwise, it is denied. Users receive a verification email upon registration.
As a user, I want the website to be user-friendly and easy to learn without any guidance so that I don't get discouraged.	Learnability: How fast is it for users to complete the main functionalities once they see the interface.	Users need less than 25 minutes to complete the main functionalities.	We provided the website to users and instructed them to access and utilize it. Prior to usage, we initiated a timer to measure the time it takes for them to learn and become proficient in using the website. Upon accomplishing the main functionalities, we recorded the duration it took to complete them.



User Story	Quality Attributes	Measure	Results
			<p>number of users who completed the task: 20</p> <p>Results:</p> <p>Minimum: 15 minutes</p> <p>Average: 19 minutes.</p> <p>Maximum: 22 minutes</p>



User Story	Quality Attributes	Measure	Results
As a user, I want the website's response time to be between 3 to 30 seconds given a good internet connection so that I don't become annoyed and try another application.	Performance: How responsive is the system and its components?	Users need between 1 to 30 seconds to get the desired response from the system.	We provide the website to users and measure the time it takes for the website to extract features from cv, search for candidates, search for jobs and filter the dashboard. number of users who completed the task: 20 Results: Minimum Response Time: 4 seconds Average Response Time: 7 seconds Maximum Response Time: 15 seconds

7.2 Discussion

Taking into account user feedback, our website has demonstrated itself as an effective and advantageous solution. The display and design received high praise, with almost 90% of users rating it 5 out of 5. The performance and speed were found to be satisfying, and approximately 80% of users reported very smooth navigation. Moreover, an overwhelming 95% of users did not encounter any technical difficulties. Lastly, the users expressed their willingness to recommend Hiral to their friends.

job seekers and recruiters. Job seekers have expressed satisfaction with our platform's ability to accurately extract the skills listed on their CVs. In addition, they have found Hiral's job recommendations to be highly relevant to their skill sets. Furthermore, the ease of the application process and the seamless communication with recruiters have been key factors contributing to their positive experience.



Recruiters, on the other hand, have found the information provided on our platform to be valuable. They have reported that the candidate recommendations suggested by Hiral are highly relevant to the specific job posts. Moreover, recruiters have expressed overall satisfaction with the process of adding job posts and communicating with job seekers, as they have consistently achieved satisfactory results.

Overall, the feedback from users supports the efficacy and value of our platform, and the willingness of users to recommend Hiral to their friends is a testament to its success.



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CHAPTER 8

Conclusions and Future Work



8 Conclusions and Future Work

- Global impact.

Hiral has the power to make a serious global impact. By matching job seekers with job postings that align with their skills and experience, the website can reduce unemployment rates and promote productivity. Plus, by reducing bias in the job search process, Hiral can help to ensure that all job seekers have an equal opportunity to advance in their careers. And let's not forget about the time-saving benefits of automating the matching process. With all these benefits, Hiral website is poised to drive economic growth and prosperity worldwide.

- Local impact

Hiral will help to ensure that all job seekers in Saudi Arabia have a fair shot at landing their dream job. And with the time-saving benefits of automating the matching process, the website can help job seekers and employers in Saudi Arabia to focus on other important tasks, like building businesses and driving innovation.

- Problems and challenges encountered during the software development

When we first embarked on the project, the team members were faced with the daunting challenge of mastering the Django framework and Python programming language, which were unfamiliar to us. Along the way, we encountered a slew of exceptions that left us searching for answers. Despite our best efforts, the available resources for understanding the Django framework weren't clear. Adding to the complexity of the project was the juggling act of studying for other university courses, which made time management a critical factor in our success. But like true professionals, we rose to the occasion, developing our skills and organizing our time with military precision. With a fierce determination to overcome any obstacle, we honed our abilities to tackle even the murkiest of exceptions, emerging victorious with a comprehensive understanding of the Django framework.

- The main contribution of the project

The main contribution of Hiral is that it enables a more efficient and accurate matching process. By leveraging natural language processing and semantic matching algorithms, the website can analyze job seekers' skills and match them with job posts that are the most relevant and promising. This not only saves time for both job seekers and employers but also helps to reduce the likelihood of mismatches between job seekers and job posts.



- Limitation of system and future work.

Hiral is a website that uses a semantic similarity matching algorithm to match job seekers with their dream jobs. But as with any innovative technology, there are some limitations to consider.

First up limited data. Without a robust dataset, the algorithm may struggle to make accurate matches. Additionally, algorithm accuracy can be a challenge, as even the best algorithms can have flaws. Another limitation is that Hiral's NLP models may not always capture all relevant keywords from job postings, which can affect the accuracy of the job matching process.

Future work could focus on developing new data sources to increase accuracy, refining the algorithm to eliminate flaws, and enhancing the dictionary employed in our keyword-scanning process. By honing in on these limitations, we can make sure that job search websites are serving job seekers and employers to the max and making a serious impact on the labor market.

- Conclusion

This document is a detailed account of how we created Hiral, from the very start to the end. beginning with the introduction chapter, which clarifies the idea and gives a general overview of Hiral. The introduction chapter is followed by the background chapter, which is important in preparing the reader to understand Hiral details by providing a brief explanation of knowledge aspects in which Hiral falls. To deliver an application that fills a gap in existing applications, and to specify Hiral features, we examined and discussed academic papers and applications within the same field as Hiral, which were represented in the literature review chapter. After achieving a clear understanding of Hiral features, we began the system analysis and design chapter, which converts Hiral features into a form used to facilitate the implementation of Hiral application and support the understanding of Hiral components. After analyzing our system, we began developing Hiral by using the Django framework and testing it to ensure it was bug free.

In the end, we not only mastered a new technology but also gained invaluable experience in time management and problem-solving. We emerged from the project as battle-hardened professionals, ready to take on any challenge that comes our way.



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CHAPTER 9

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[18] <https://play.google.com/store/apps/details?id=com.jobrapp.jobr&hl=ar>

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[20] <https://www.altexsoft.com/blog/non-functional-requirements/>



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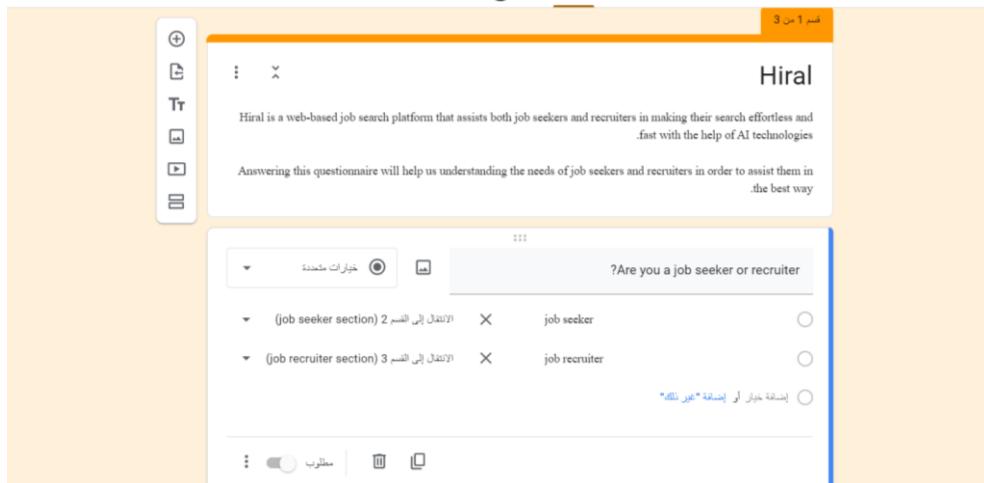
CHAPTER 10

Appendix A

Requirements

Elicitation's Questionnaire

10 Appendix A: Requirement elicitation's questionnaire



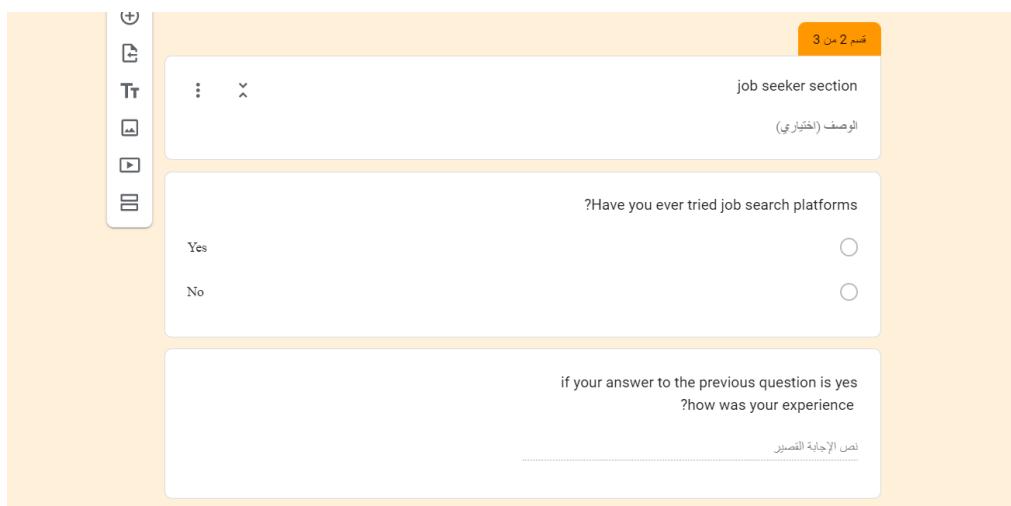
The screenshot shows the first page of a survey titled "Hiral". The page is titled "Section 1 of 3" and contains the following text:

Hiral is a web-based job search platform that assists both job seekers and recruiters in making their search effortless and fast with the help of AI technologies.

Answering this questionnaire will help us understand the needs of job seekers and recruiters in order to assist them in the best way.

A question is displayed: "Are you a job seeker or recruiter?" with two options: "job seeker" and "job recruiter". Below each option is a note in Arabic: "الانتقال إلى النسخة 2" and "الانتقال إلى النسخة 3". There is also a note at the bottom right: "إضافة خيار أو إضافة غير صالح".

Figure 42 - Survey questions



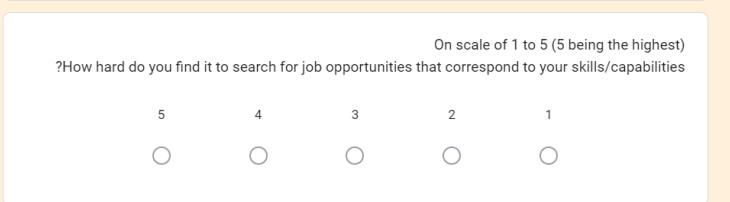
The screenshot shows the second section of the survey, titled "job seeker section". The section is labeled "Section 2 of 3" and contains the following text:

الوصف (اختياري)

A question is displayed: "?Have you ever tried job search platforms" with two options: "Yes" and "No".

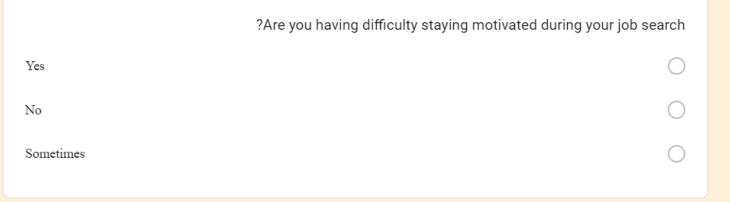
If the answer is "Yes", there is a note: "if your answer to the previous question is yes ?how was your experience" followed by a dotted line for writing.

Figure 43 - Survey questions



On scale of 1 to 5 (5 being the highest)
 ?How hard do you find it to search for job opportunities that correspond to your skills/capabilities

5	4	3	2	1
<input type="radio"/>				



?Are you having difficulty staying motivated during your job search

Yes

No

Sometimes

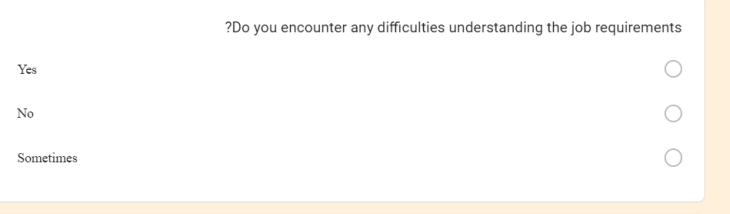
Figure 44 - Survey questions



Do you take into consideration writing all of the information needed in your CV to make it clear to the
 ?job recruiters what type of job you're fit for

Yes

No



?Do you encounter any difficulties understanding the job requirements

Yes

No

Sometimes

Figure 45 - Survey questions

?Have you considered expanding your job search to other industries or locations

Yes

No

Maybe

On scale of 1 to 5 (5 being the highest)
How convenient do you find the traditional ways to search for a job like job fairs, company Websites,
..etc

5 4 3 2 1

Figure 46 - Survey questions

Using a platform that help me find job opportunities that suits my skills and capabilities would make my job search process faster and more efficient

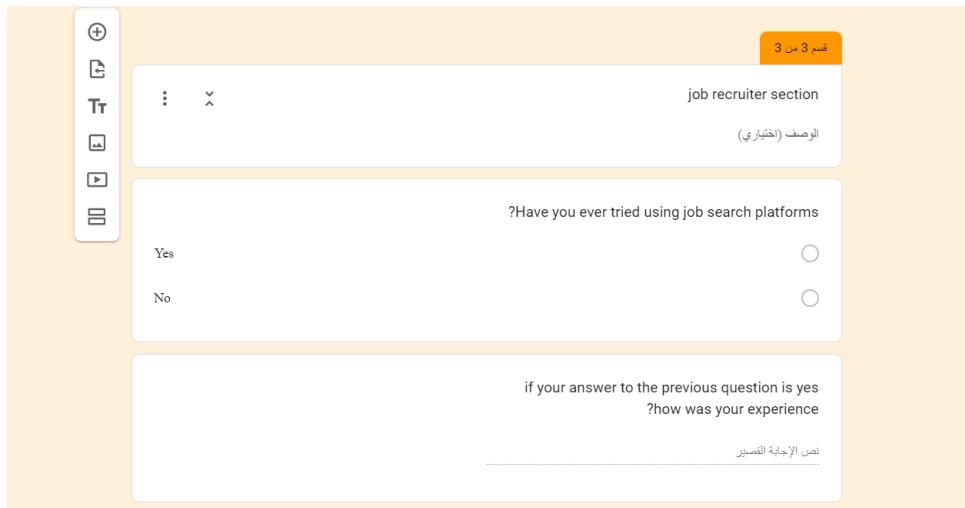
Agree

Disagree

Neutral

بعد القسم 2 إرسال المدونج

Figure 47 - Survey questions



قسم 3 من 3

job recruiter section

لوصف (اختياري)

?Have you ever tried using job search platforms

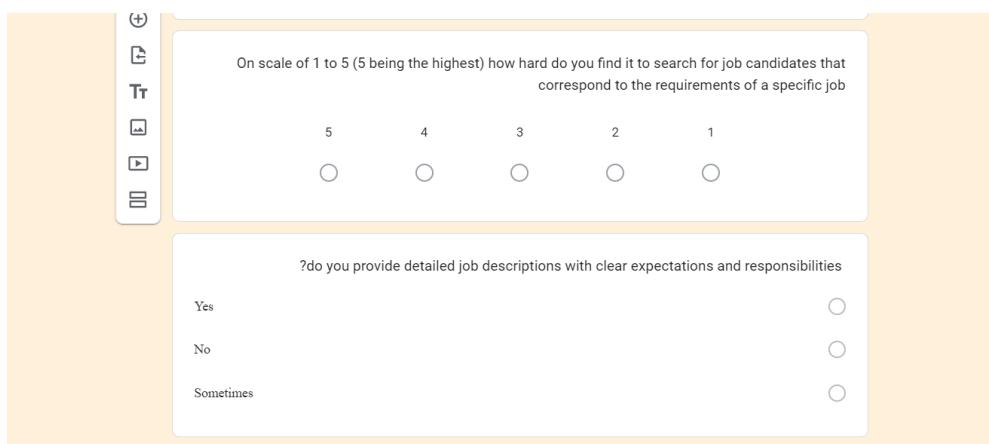
Yes

No

if your answer to the previous question is yes
?how was your experience

نص الإجابة المختير

Figure 48 - Survey questions



On scale of 1 to 5 (5 being the highest) how hard do you find it to search for job candidates that correspond to the requirements of a specific job

5 4 3 2 1

?do you provide detailed job descriptions with clear expectations and responsibilities

Yes

No

Sometimes

Figure 49 - Survey questions



Have you implemented a structured hiring process to ensure consistency and fairness in candidate ?evaluation

Yes

No

Maybe

On scale of 1 to 5 (5 being the highest)
?Are you targeting the right job candidates

5

4

3

2

1

Figure 50 - Survey questions

?Are you having difficulty narrowing down the list of job candidates

Yes

No

Sometimes

Using a platform that help me find job candidates that suits my job description would make my candidate search process faster and more efficient

Agree

Disagree

Neutral

Figure 51 - Survey questions

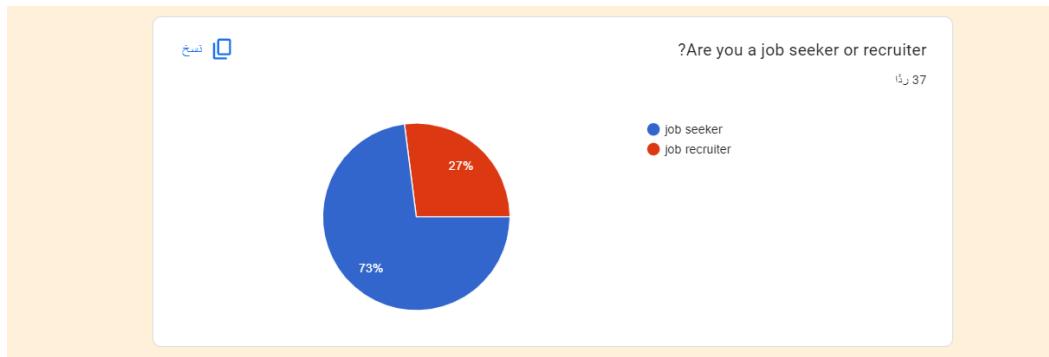


Figure 40 - Survey answers

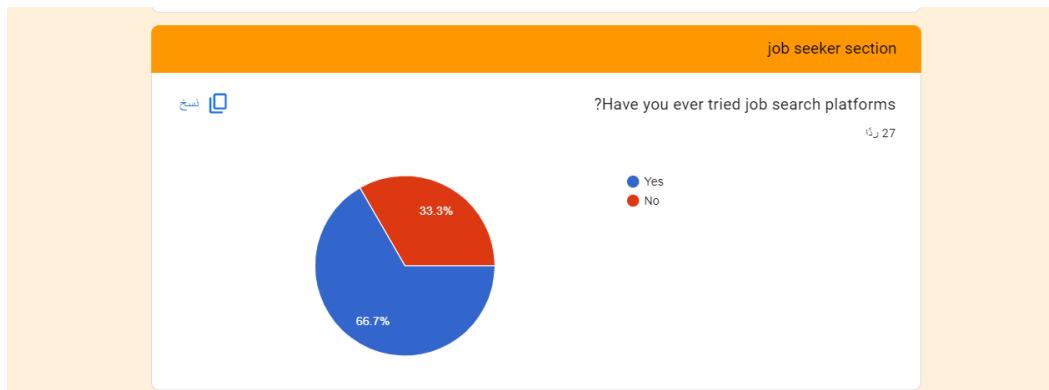


Figure 52 - Survey answers

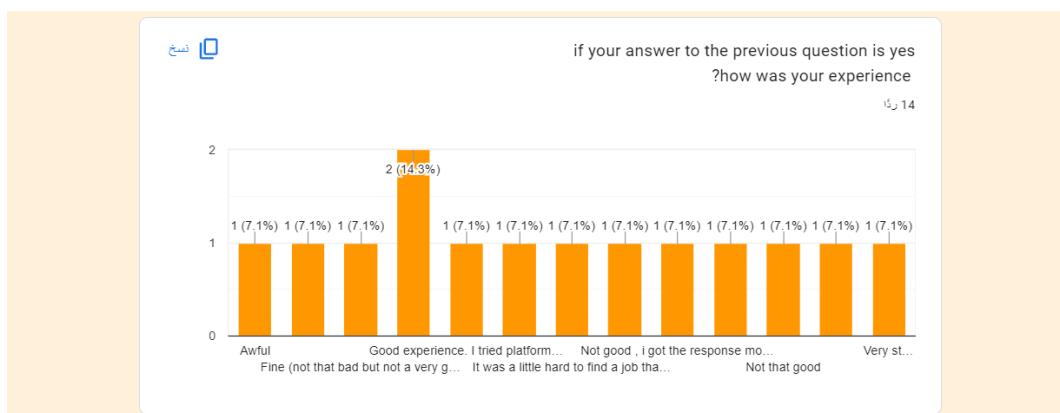


Figure 53 - Survey answers



Figure 54 - Survey answers

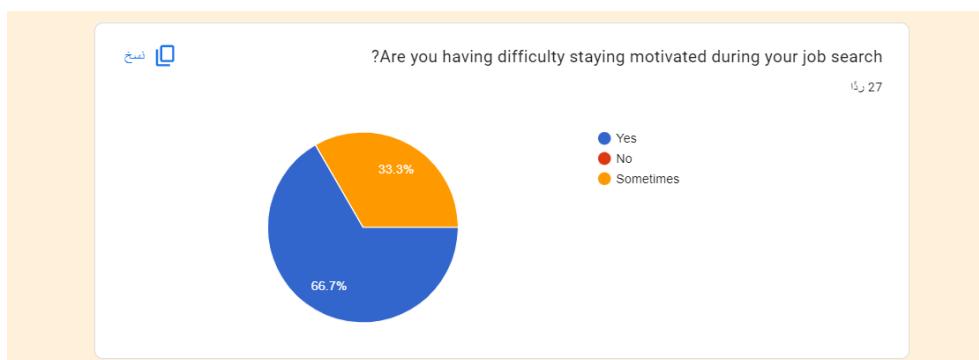


Figure 55 - Survey answers

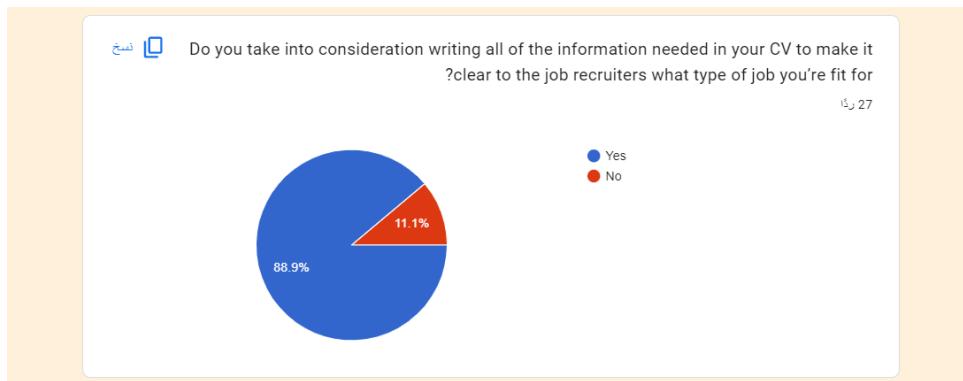


Figure 56 - Survey answers

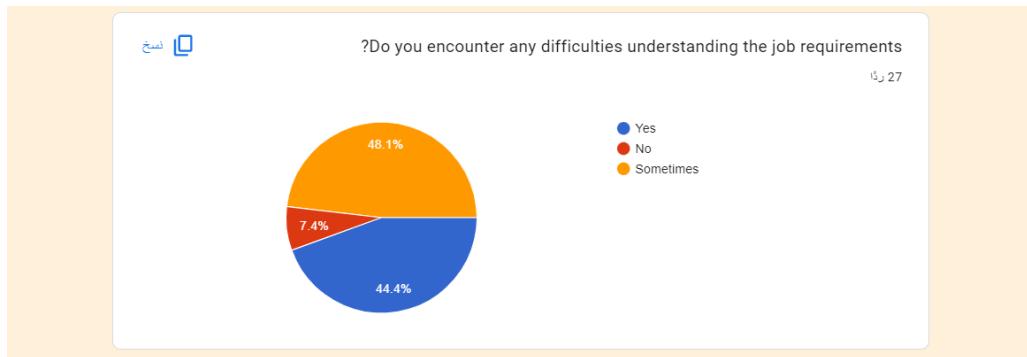


Figure 57 - Survey answers

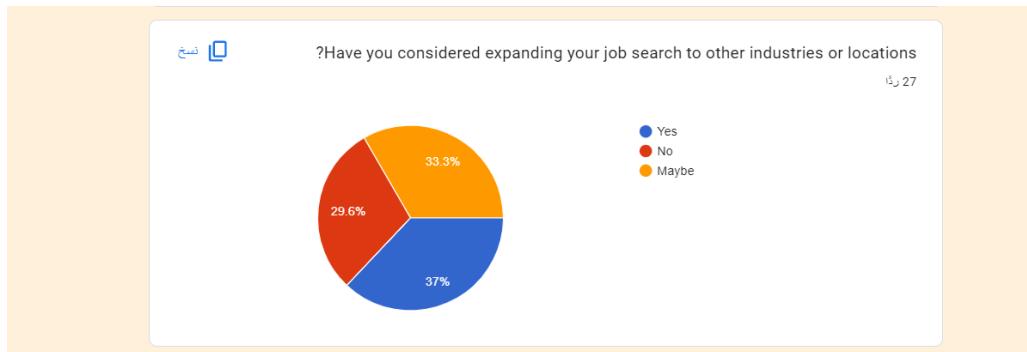


Figure 58 - Survey answers

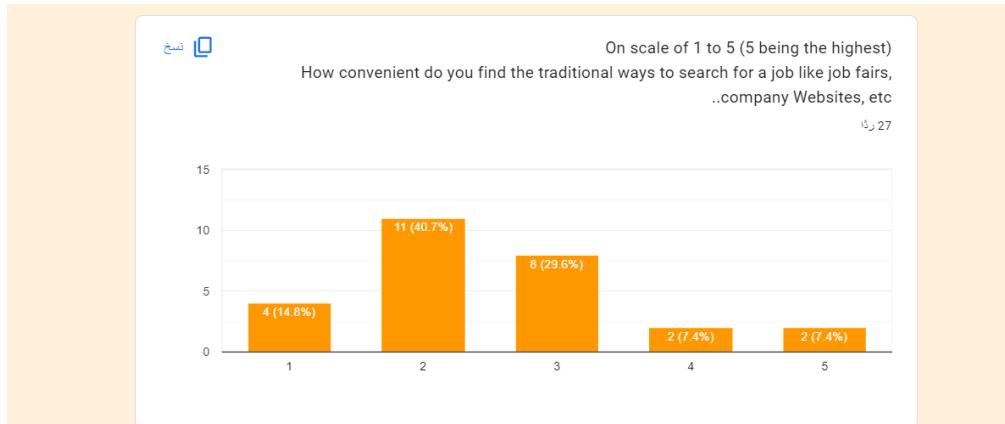


Figure 59 - Survey answers

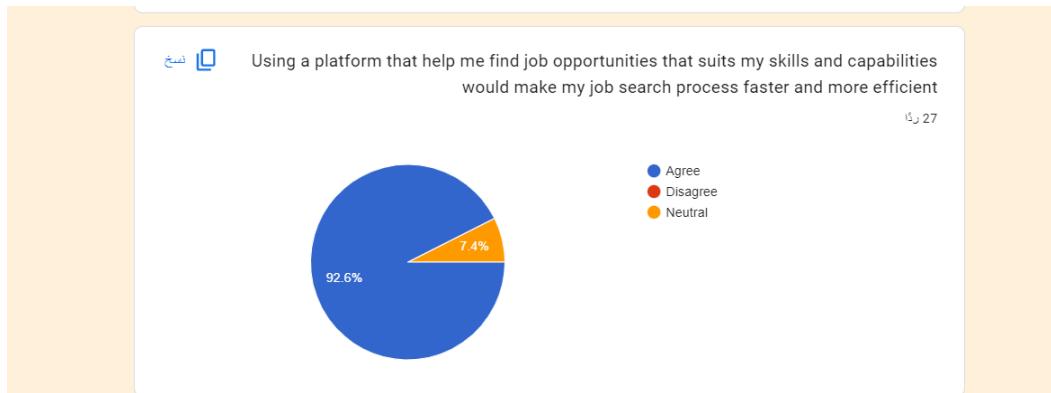


Figure 60 - Survey answers

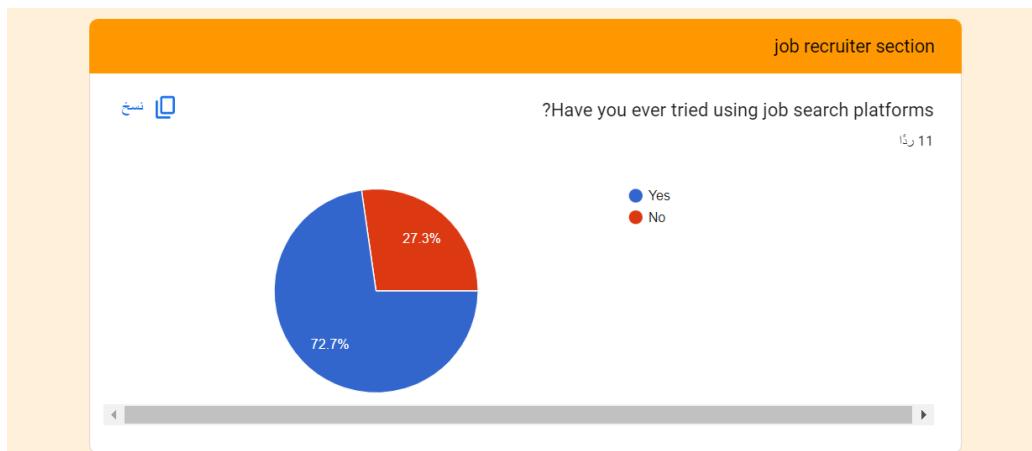


Figure 61 - Survey answers

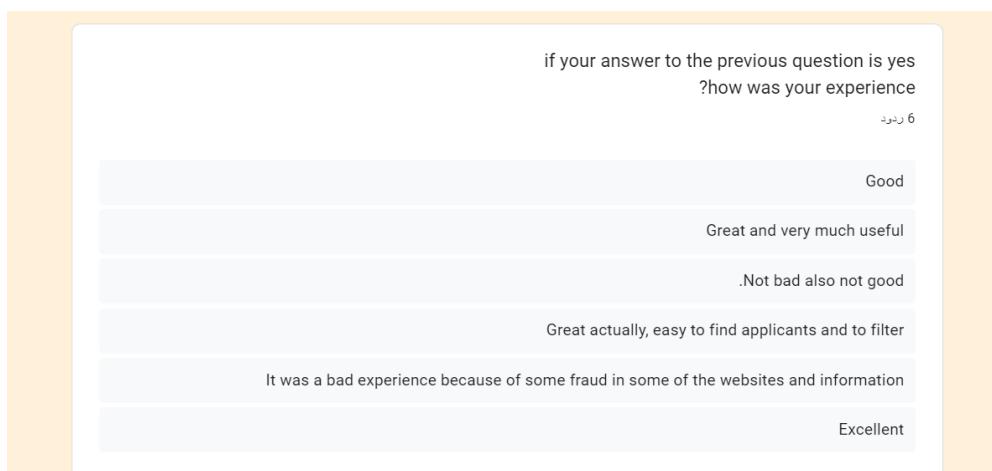


Figure 62 - Survey answers

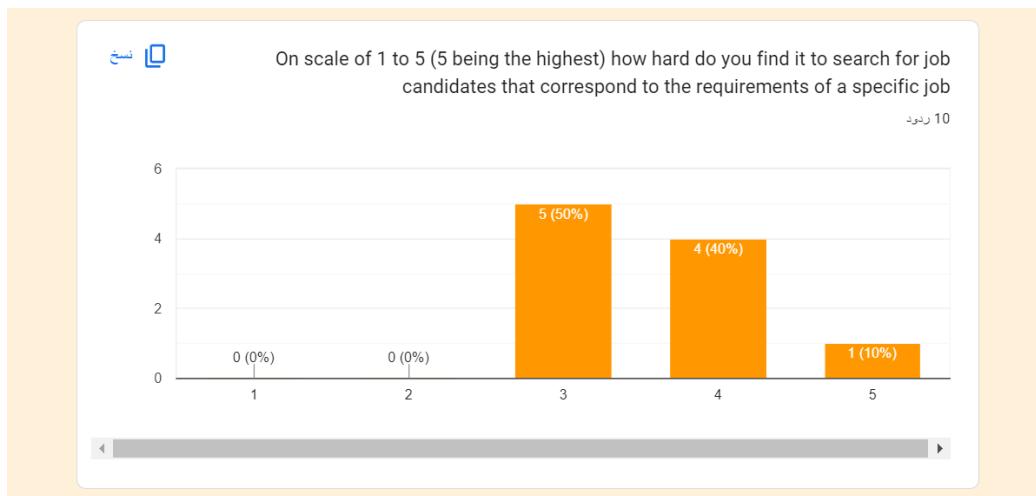


Figure 63 - Survey answers

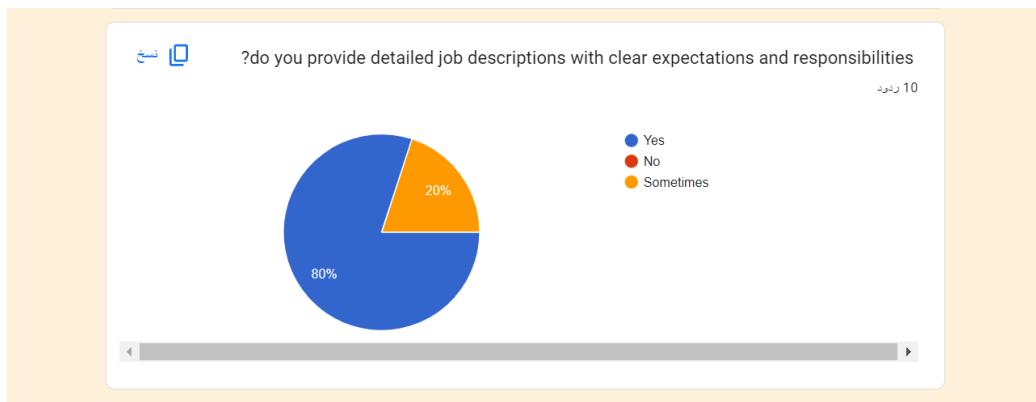


Figure 64 - Survey answers

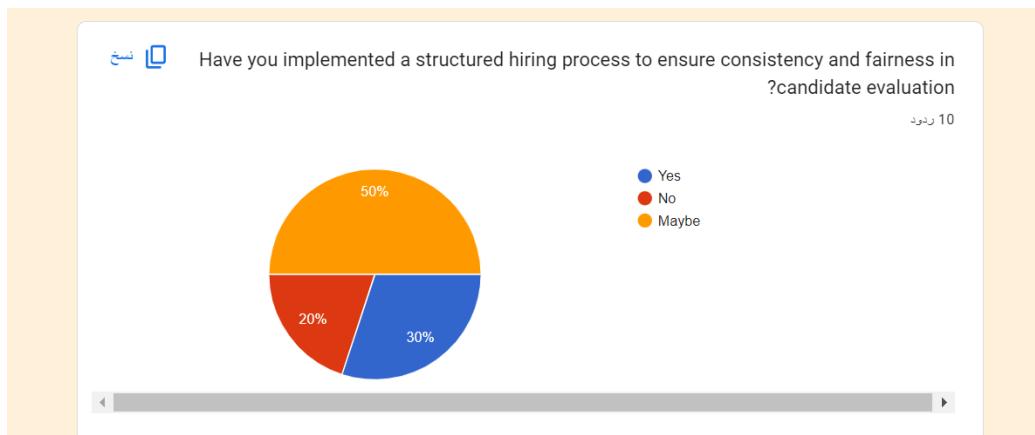


Figure 65 - Survey answers

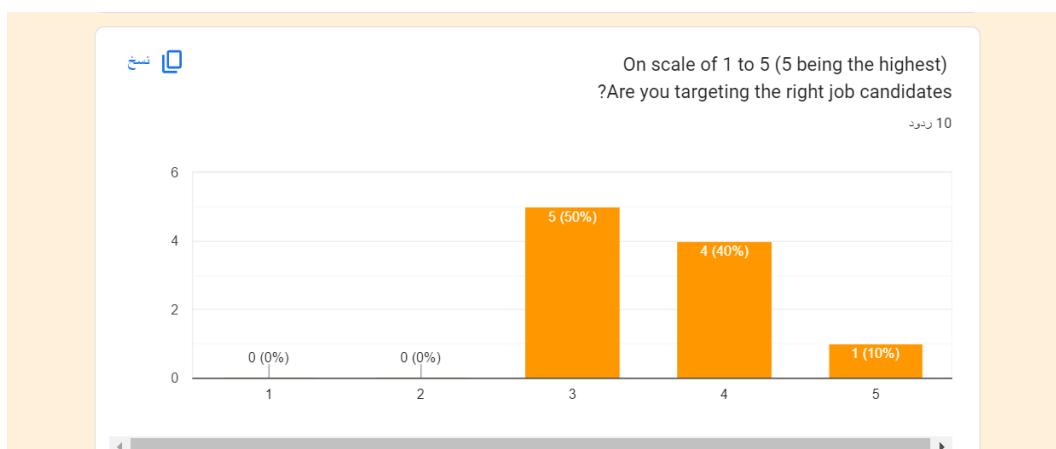


Figure 66 - Survey answers

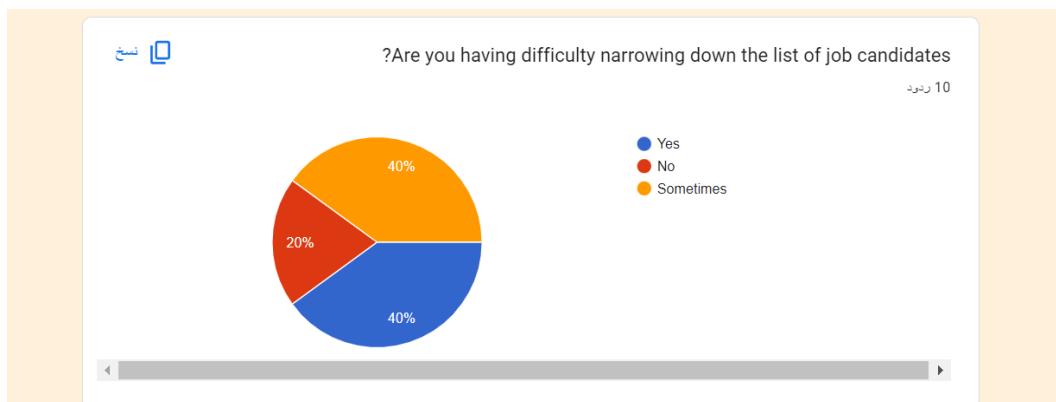


Figure 67 - Survey answers

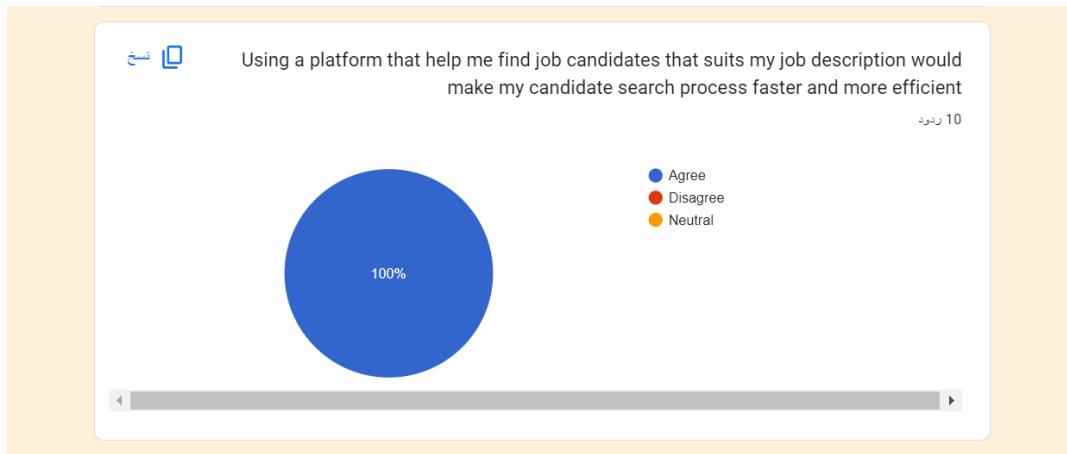


Figure 68 - Survey answers



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CHAPTER 10

Appendix B Requirements Elicitation's Interview



11 Appendix B: Requirement elicitation's interview

- Job recruiter:

1. How do you normally assess whether or not a job candidate is a good suit for a specific job you're proposing?
2. Have you ever used an online job search or recruitment platform to find candidates? If so, what features were most helpful to you?
3. What are some common mistakes you've noticed in the process of picking candidates that could potentially be addressed through a new job search platform?
4. How important is it to you to have access to a large pool of potential candidates with capabilities that correspond to the job you're proposing?

- Job seeker:

1. What challenges have you faced while job searching?
2. What have you done to stay up to date on the latest job search trends?
3. How have you used technology to enhance your job search?
4. Have you used social media to find job opportunities?



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CHAPTER 10

Appendix C

Jira



12 Appendix C: Jira

The screenshot shows a Jira board titled "All sprints" for project "2023-GP1-6". The board has three columns: "TO DO 21 ISSUES", "IN PROGRESS", and "DONE 33 ISSUES".

- TO DO 21 ISSUES:**
 - As a job provider I want to be notified when suitable candidates are available for my job description (GP-17)
 - As a job seeker, I want to view offers so that I can see job opportunities that match my skill set. (GP-19)
 - As a job provider, I want to view the received applications so that I can see who has applied for the position. (GP-16)
- IN PROGRESS:**
 - As a job seeker I want to view my profile so that I can ensure it reflects my information. (GP-28)
 - As a job seeker I want to be able to login, so that I can access to my account (GP-9)
 - As a Job seeker I want to log out of my account so that I can leave the account. (GP-10)
 - As a job provider, I want to be able to login so that I can access
- DONE 33 ISSUES:**
 - As a job seeker I want to view my profile so that I can ensure it reflects my information. (GP-28)
 - As a job seeker I want to be able to login, so that I can access to my account (GP-9)
 - As a Job seeker I want to log out of my account so that I can leave the account. (GP-10)
 - As a job provider, I want to be able to login so that I can access

Figure 69 - Jira sprints

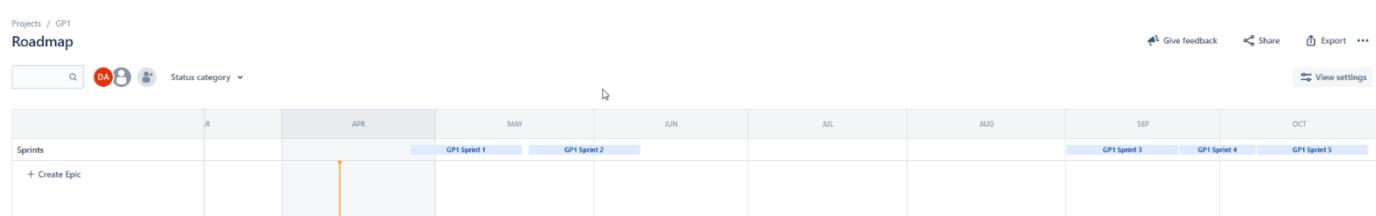


Figure 70 - Jira timeline



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Projects / 2023-GP1-6

Backlog

NA DA DA Epic ▾ Label ▾ Type ▾ Insights

▼ GP1 Sprint 1 26 Apr – 17 May (21 issues)

Issue	Description	Status
GP-28	As a job seeker I want to view my profile so that I can ensure it reflects my information.	DONE ✓ DA
GP-9	As a job seeker I want to be able to login, so that I can access to my account	DONE ✓ DA
GP-10	As a job seeker I want to log out of my account so that I can leave the account.	DONE ✓ DA
GP-8	As a job provider, I want to be able to login so that I can access my account.	DONE ✓ DA
GP-29	As a job provider I want to view my profile so that I can ensure it reflects my correct information.	DONE ✓ DA
GP-7	As a job seeker, I want to be able to register on the website so that I can have my own account.	DONE ✓ DA
GP-11	As a provider, I want to log out of my account so that I can get myself off of the website.	DONE ✓ DA
GP-26	As a job provider, I want to be able to register on the website so that I can have my own account.	DONE ✓ DA
GP-32	Create a table in the database for seeker information	DONE ✓ DA
GP-34	Create error messages and display them	DONE ✓ DA
GP-40	Create seeker Profile form	DONE ✓ DA

Figure 71 - Jira backlog: Sprint 1(a)

Projects / 2023-GP1-6

Backlog

NA DA DA Epic ▾ Label ▾ Type ▾ Insights

Issue	Description	Status
GP-33	Authenticate job seeker	DONE ✓ DA
GP-35	Develop UI element for Login	DONE ✓ DA
GP-38	Create recruiter Profile form	DONE ✓ DA
GP-45	Create Register form	DONE ✓ DA
GP-47	Develop UI for Logout	DONE ✓ DA
GP-49	Develop UI element for recruiter Profile	DONE ✓ DA
GP-48	Develop UI element for seeker Profile	DONE ✓ DA
GP-12	As a job provider, I want to be able to edit my profile so that I can update my information.	DONE ✓ DA
GP-22	As a job seeker, I want to edit my profile so that I can update my information.	DONE ✓ DA
GP-79	As a provider, I want to log out of my account so that I can get myself off of the website.	DONE ✓ DA

Figure 72 - Jira backlog: Sprint 1(b)



Projects / 2023-GP1-6

Backlog

Search NA DA DA Epic Label Type Insights Complete sprint ...

GP Sprint 2 19 May – 9 Jun (12 issues)

Issue	Description	Status	DA
GP-25	As a job seeker, I want to delete my project so that I can remove my work that I don't want displayed anymore.	DONE	DA
GP-59	As a job provider, I want to add a Job Post so that other users can know about available jobs.	DONE	DA
GP-53	Implement the Job Post page UI. (recruiter)	DONE	DA
GP-24	As a job seeker, I want to edit my project so that I can make the adjustments I desire.	DONE	DA
GP-23	As a job seeker, I want to add my project so that I can display my work.	DONE	DA
GP-52	Write a keyword (skills) dictionary.	DONE	DA
GP-64	As a job seeker, I want to be able to add new skills to my skill set so that I can inform users about my new skills.	DONE	DA
GP-63	As a job seeker, I want to be able to update my availability for job postings so that I receive offers only when I am available.	DONE	DA
GP-54	Coding the Job Post page. (recruiter)	DONE	DA
GP-55	Implement AI extraction of the skill from the CV.	DONE	DA

Figure 73 - Jira backlog: Sprint 2(a)

Projects / 2023-GP1-6

Backlog

Search NA DA DA Epic Label Type Insights Complete sprint ...

GP Sprint 2 19 May – 9 Jun (12 issues)

Issue	Description	Status	DA
GP-59	As a job provider, I want to add a Job Post so that other users can know about available jobs.	DONE	DA
GP-53	Implement the Job Post page UI. (recruiter)	DONE	DA
GP-24	As a job seeker, I want to edit my project so that I can make the adjustments I desire.	DONE	DA
GP-23	As a job seeker, I want to add my project so that I can display my work.	DONE	DA
GP-52	Write a keyword (skills) dictionary.	DONE	DA
GP-64	As a job seeker, I want to be able to add new skills to my skill set so that I can inform users about my new skills.	DONE	DA
GP-63	As a job seeker, I want to be able to update my availability for job postings so that I receive offers only when I am available.	DONE	DA
GP-54	Coding the Job Post page. (recruiter)	DONE	DA
GP-55	Implement AI extraction of the skill from the CV.	DONE	DA
GP-61	As a job provider, I want to add a Job Post so that other users can know about available jobs.	DONE	DA
GP-62	As a job provider, I want to deactivate my job posts so that they don't appear for users.	DONE	DA

Figure 74 - Jira backlog: Sprint 2(b)

Link: [GP board - Agile board - Jira \(atlassian.net\)](#)



HIRAL



HIRAL

CHAPTER 10

Appendix D

Testing



13 Appendix D: Testing

Age
7 responses

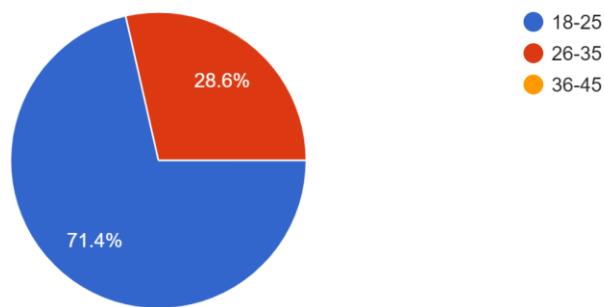


Figure 75 - Testing survey

Gender
7 responses

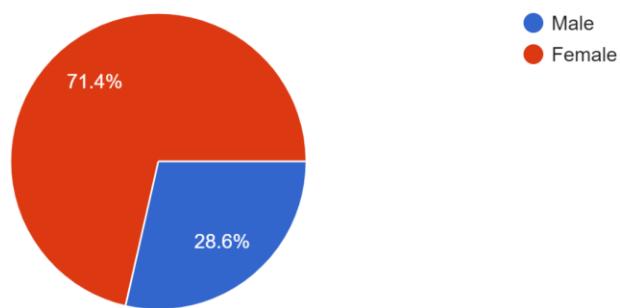


Figure 76 - Testing survey



Educational level

7 responses

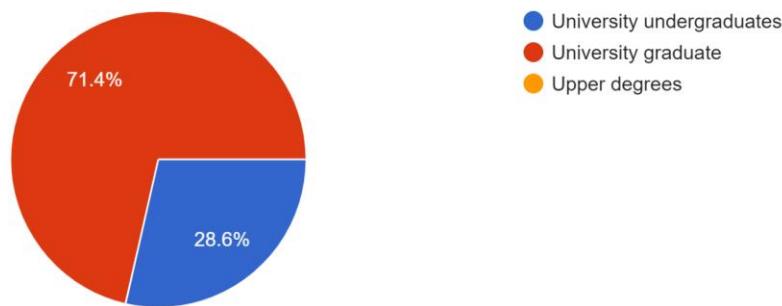


Figure 77 - Testing survey

On a scale from 1 to 5 (1=very slow, 5=very fast), How long did it take for you to complete the registration task?

7 responses

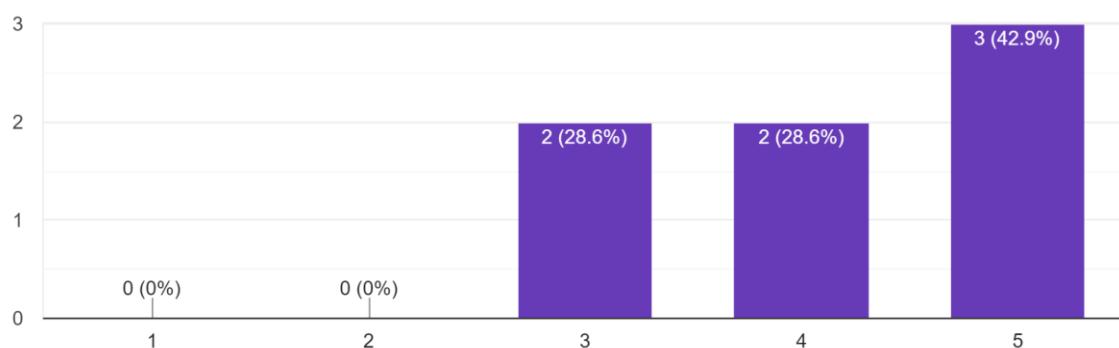


Figure 78 - Testing survey



On a scale from 1 to 5 (1=very hard, 5=very easy), how easy was it to navigate through the application?

7 responses

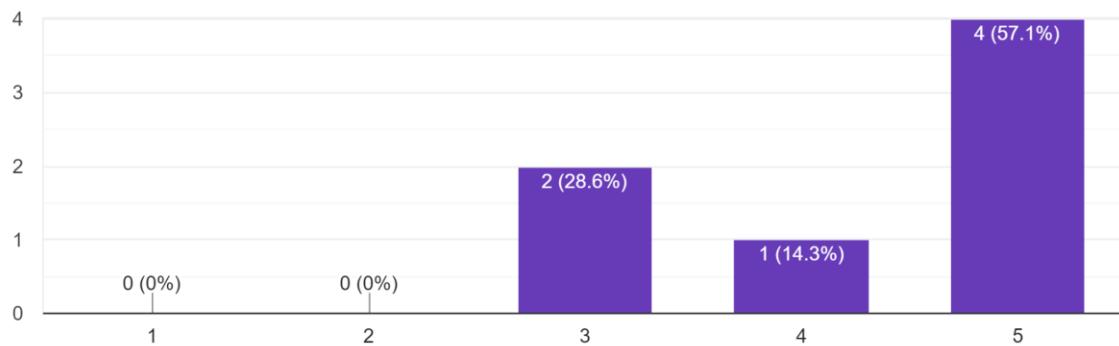


Figure 79 - Testing survey

On a scale from 1 to 5 (1=very bad, 5=very good), What are your thoughts on the design and layout?

7 responses

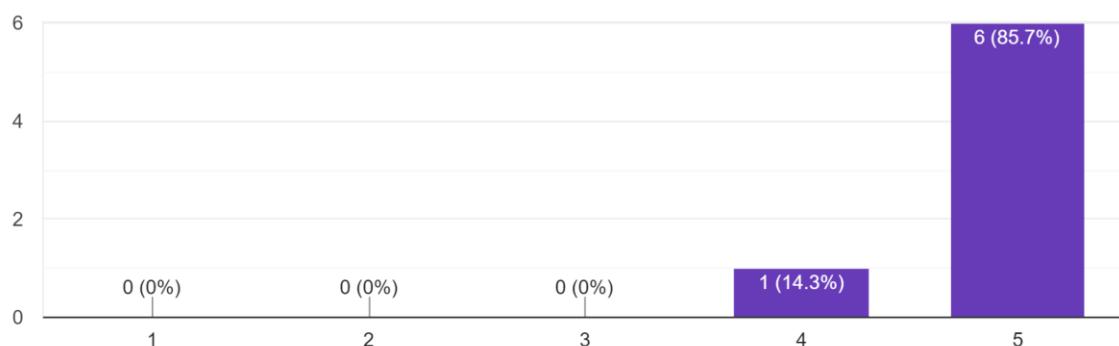


Figure 80 - Testing survey



On a scale from 1 to 5 (1=not at all likely, 5=very likely), how likely are you to recommend this application to a friend?

7 responses

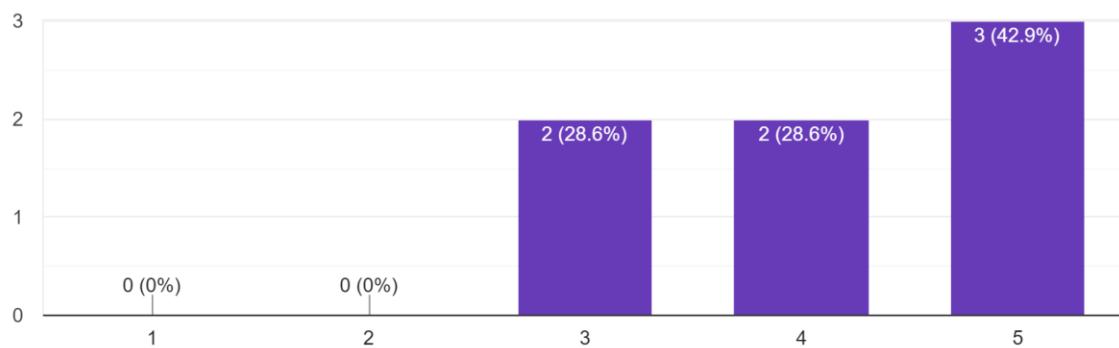


Figure 81 - Testing survey

How would you rate your overall experience with the application?

7 responses

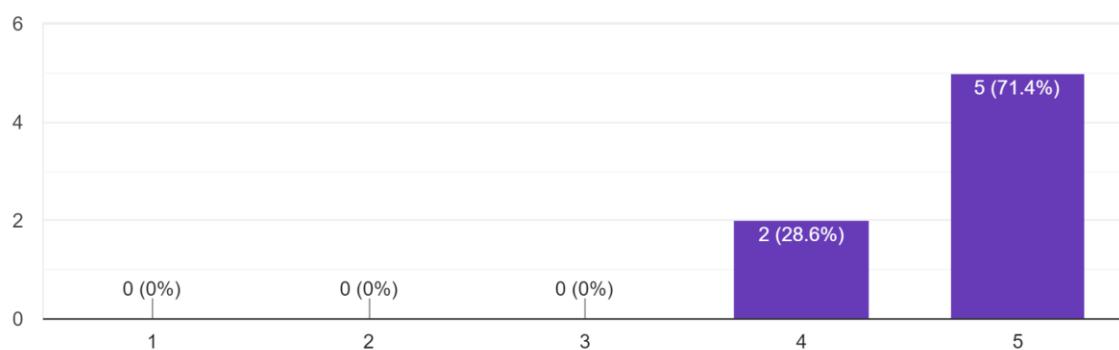


Figure 82 - Testing survey