



King Saud University
College of Computer and Information Sciences
Department of Information Technology
Second Semester 1445H (Spring 2024)



IT 497: Graduation Project Report Product Release-2

Prepared by

Shouq Alyousef, 442201398
Sarah Alhamdi, 442201797
Ragad Alhindi, 442201432
Alhanouf Alsaif, 442201416
Dana Alshathri, 442203321

Supervised by

Dr. Hessah Alsaaran

Table of Contents

Table of Tables	4
Table of Figures.....	5
Table of Equations.....	6
1 Introduction	9
1.1 The Problem	10
1.2 Objectives	11
1.3 Scope	12
1.4 Product Vision	13
1.5 Approach	14
1.6 Solution.....	14
1.7 Report Content.....	16
2 Background and Literature Review	18
2.1 Job Application Process.....	18
2.2 Generative AI	20
2.3 Web APIs and ChatGPT API	22
2.4 Recommendation Systems.....	25
2.4.1 Overview of Recommendation Systems	25
2.4.2 Previous job recommendation systems	27
2.5 Competitive Product Analysis	28
2.5.1 Job Search Platforms Analysis.....	28
• Indeed Platform.....	28
• Glassdoor Platform.....	29
• LinkedIn Platform	30
• Comparison for job search platforms	31
2.5.2 Interview Preparation Platforms Analysis.....	33
• Google's Interview Warm Up Platform	33
• Interviewby.ai Platform.....	34
• Comparison Interview Preparation Platforms	34
3 Watheq's Job Recommendation System	37
3.1 Text Pre-processing	38
3.2 Measuring Similarity Scores	38
3.3 Similarity Scores Usage In Watheq System	42
3.4 Illustrating Watheq's Recommendation System In Practice	43
4 Watheq's Interview Simulation	46
5 System Design and Development	54
5.1 Methodology.....	54
5.2 System Requirements	56
5.2.1 System Users	56
5.2.2 Requirements Elicitation and Analysis	56
• General Questions Section	57
• Job Seekers/ Employees' Questions Section.....	58
• Job Providers' Section.....	61
• Conclusion.....	63
5.2.3 User Interactions	64
5.2.4 Roadmap and Product Backlog	65
5.3 System Design	78
5.3.1 Architectural Diagram.....	78
5.3.2 Class Diagram	79
5.3.3 Component Level Design.....	80
• Interview Simulation Pseudocode	80
• Add Job Offer Pseudocode.....	81
• Job Offer Recommendation Flowchart	82
5.4 Data Design	83

5.4.1	Data Models	83
•	EER Diagram	83
•	Relational Schema.....	84
•	Data Dictionary	86
•	EER considerations	92
5.5	Interface Design.....	94
5.5.1	Sitemap for Watheq Website.....	94
5.5.2	Sitemap for Watheq Mobile Application	95
5.5.3	UX Guidelines.....	95
5.5.4	Design Considerations	101
5.6	Implementation.....	102
5.6.1	Implementation Key Steps	102
5.6.2	Key Elements and Components	103
5.6.3	Major Parts of Watheq's Code	104
•	Job Offer Recommendation Function	104
•	Add Job Offer Function.....	106
•	Interview Simulation Function.....	109
5.6.4	Implementation Challenges.....	112
6	System Evaluation.....	114
6.1	Experimental Results	114
6.2	Quality Testing	117
6.2.1	Recommendation System Testing	118
6.2.2	Interview Simulation Testing	120
6.3	User Acceptance Testing	122
6.3.1	Demographics of Participants	123
6.3.2	Questionnaire/Interview Results	124
6.4	Quality Attributes	130
6.5	Discussion.....	131
7	Conclusions and Future Work	134
7.1	Local and Global Impact	136
7.2	Challenges Encountered During the Software Development	137
7.3	Main Contributions of Watheq.....	138
7.4	Limitations Of Watheq	138
7.5	Future Work.....	139
8	Acknowledgements.....	141
9	References	143
10	Appendix A: Interview simulation example using ChatGPT	146
11	Appendix B: Requirements Survey Questions	149
12	Appendix C: Quality Survey Questions	152
13	Appendix D: Quality Survey Responses.....	158
14	Appendix E: Quality Testing Interview Examples.....	162
15	Appendix F: UAT Survey Questions	169
16	Appendix G: UAT Survey Responses.....	174

Table of Tables

Table 1. Job Search Platforms Comparison	31
Table 2. Interview preparation platforms comparison	35
Table 3. CVs Information and Similarity Scores	44
Table 4. Interview Simulation Example	50
Table 5. CV And Job Offer Details	52
Table 6. The Watheq Platform Product Backlog	66
Table 7. Data Dictionary of Entities	86
Table 8. Data Dictionary of Relationships	87
Table 9. Data Dictionary of Attributes	88
Table 10. Ranking of candidates in different similarity measures	117
Table 11. Tasks average duration	125
Table 12. tasks average duration	127
Table 13. SUS Responses and Score	128
Table 14. NFR testing	130

Table of Figures

Figure 1. Indeed Logo [25].....	28
Figure 2. Indeed Interfaces (From Right: Search Results, Payment for Sponsorship, and Home Page).....	28
Figure 3. Glassdoor Logo [5]	29
Figure 4. Glassdoor Interfaces (From Right: Company Overview, Job Offer Overview, and Blocking Message Asking for a Review).....	29
Figure 5. LinkedIn Logo [26].....	30
Figure 6. LinkedIn Interfaces (From Right: Recommended Job Offers, Blocked Premium Feature, Interview Practice).....	30
Figure 7. Warm Up Logo [27].....	33
Figure 8. Interview Warm Up Interfaces (From Right: Home Page and Answer Analysis Page).....	33
Figure 9. Interviewsby. ai Logo [28]	34
Figure 10. Interviewsby.ai Interfaces (From Right: Job Description Page And Answers Analysis Page)	34
Figure 11. Watheq's Recommendation System Flow	37
Figure 12. General Questions and Responses (Part 1).....	57
Figure 13. General Questions and Responses (Part 2).....	57
Figure 14. Job Seekers/ Employees' Question and Responses (Part 1).....	59
Figure 15. Job Seekers/ Employees' Questions and Responses (Part 2).....	60
Figure 16. Job Providers' Questions and Responses	62
Figure 17. The Watheq Platform Use Case Diagram.....	64
Figure 18. The Watheq Platform Roadmap	65
Figure 19. The Watheq Platform Architecture.....	78
Figure 20. The Watheq Platform Class Diagram	79
Figure 21. Job Offer Recommendations Flowchart	82
Figure 22. The Watheq Platform EER Diagram	83
Figure 23. Sitemap Of Watheq Website	94
Figure 24. Sitemap of Watheq Mobile Application	95
Figure 25. Error Revision Implementation	96
Figure 26. Design Dialog to Yield Closure Implementation.....	97
Figure 27. Informative Feedback Implementation.....	98
Figure 28. Internal Consistency Implementation	99
Figure 29. Reduce Short-term Memory Load Implementation	100
Figure 30. checkcv() Function.....	105
Figure 31. fetchRecommendedOffers() Function	105
Figure 32. Part of AddNewQualification.js	108
Figure 33. Part of validtaion.js	108
Figure 34. Python Script Execution Line.....	110
Figure 3535. Part Of Python Script To initialize the Status Variable	110
Figure 36. Flutter Code That Sends HTTP Requests.....	111
Figure 37. Quality Testing Participants Roles	117
Figure 38. First Example Of Recommended Offers Testing.....	118
Figure 39. Second Example Of Recommended Offers Testing	118
Figure 40. First Example Of Sorting Applications Testing.....	119
Figure 41. Second Example Of Sorting Applications Testing	119
Figure 42. First Example Of Questions Relevance To The Offer	120
Figure 43. First Example Of Questions Relevance To The CV	120
Figure 44. Second Example Of Questions Relevance To The Offer.....	121
Figure 45. Second Example Of Questions Relevance To The CV.....	121
Figure 46. Interview Questions Quality Testing	121
Figure 47. Interview Feedback Quality Testing.....	122
Figure 48. User Testing Participants' Roles and Ages.....	123
Figure 49. User Testing Participants' Experience.....	123
Figure 50. User Testing Participants' Reliant.....	124
Figure 51. Tasks Completion Rate For Employer Role	125
Figure 52. Tasks Completion Rate For Employee/Job Seeker.....	127

Table of Equations

Equation 1. Similarity Function Of City Attribute.....	39
Equation 2. Similarity Function Of Skills	39
Equation 3. Similarity Function of Experience Industry.....	40
Equation 4. Similarity Function Of Experience Years.....	40
Equation 5. Similarity Function Of Experience Job Title	41
Equation 6. Similarity Function Of Experience Attribute.....	41
Equation 7. Similarity Function Of Qualification Degree Level.....	41
Equation 8. Similarity Function Of Qualification Field.....	41
Equation 9. Similarity Function Of Qualification.....	41
Equation 10. Final Similarity Equation	42

Watheq Platform

Shouq Alyousef¹, Sarah Alhamdi², Raghad Alhindi³, Alhanouf Alsaif⁴, Dana Alshathri⁵, and Hessah Alsaaran⁶

Information Technology Department, College of Computer and Information Sciences, King Saud University, Riyadh, Saudi Arabia.

Email: ¹442201398@student.ksu.edu.sa, ²442201797@student.ksu.edu.sa, ³442201432@student.ksu.edu.sa,

⁴442201416@student.ksu.edu.sa, ⁵442203321@student.ksu.edu.sa, ⁶halsaaran@ksu.edu.sa

Abstract (English): In the current job market, scattered job offers listings across social media and websites lead to lengthy search processes. Job seekers often struggle in interviews due to inadequate preparation, and employers globally face challenges finding qualified candidates. Watheq addresses these issues by offering a centralized platform that connects job seekers and providers through a mobile app and web application. Developed using Agile methodology, Watheq streamlines job searches and applications, provides personalized job recommendations, and features personalized interview simulations powered by advanced conversational AI, using GPT3.5. These simulations prepare job seekers for real-world interviews, enhancing their confidence and success rates. For job providers, Watheq simplifies the recruitment process by allowing them to post job offers, specify requirements, and receive notifications about candidate applications. The platform's recommendation system improves reach to most qualified candidates and candidate selection, ensuring efficient matches between CVs and job requirements. Watheq has passed experimental testing for its recommendation system and quality and user acceptance testing for both its recommendations and interview simulations, confirming its effectiveness and user-friendliness for both job providers and seekers.

Abstract (Arabic):

في سوق العمل الحالي، تؤدي إعلانات الوظائف المتفرقة عبر وسائل التواصل الاجتماعي والموقع الإلكتروني إلى عمليات بحث طويلة. غالباً ما يعاني الباحثون عن عمل في المقابلات الوظيفية بسبب عدم الاستعداد الكافي، بينما يواجه أصحاب العمل على مستوى العالم صعوبات في العثور على مرشحين مؤهلين للشاغر الوظيفي. يحل واثق هذه المشكلات من خلال تقديم منصة شاملة تربط الباحثين عن وظائف وجهات العمل من خلال تطبيق الهاتف المحمول وموقع الكتروني. باستخدام منهجية "Agile"، تُؤْرِّ واثق لتسهيل عملية البحث والتقديم على الوظائف، وتقييم توصيات وظيفية مخصصة، وينتَج بتوفير محاكاة للمقابلات الوظيفية مدرومة بالذكاء الاصطناعي المتتطور للمحادثة، باستخدام "GPT3.5". تساهُم هذه المحاكاة في إعداد الباحثين عن عمل للتدريب على المقابلات الواقعية، مما يعزز ثقفهم بأنفسهم ومعدل نجاحهم. بالنسبة لمقدمي الوظائف، يبسّط واثق عملية التوظيف من خلال نشر عروضهم الوظيفية، وتحديد متطلبات الوظيفة، وتلقي الإشارات حول تقديم المرشحين. يسْهَل نظام توصيات واثق الوصول إلى المرشحين المؤهلين واختيارهم، مما يضمن تطابقاً فعالاً بين السير الذاتية ومتطلبات الوظيفة. اجتاز واثق عدة اختبارات تشمل الاختبار التجريبي لنظام التوصيات واختبارات الجودة وقبول المستخدم لكل من التوصيات ومحاكاة المقابلات، مما يؤكد فعاليته وسهولة استخدامه لكل من الباحثين عن وظائف ومقدميها.

Keywords: AI-powered Interviews, Personalized Job Recommendations, Job Providers, Job Seekers, Job offers, Mobile Application, Web Application.

CHAPTER.1

Introduction

1 Introduction

The 2030 vision aims to elevate Saudi Arabia from its current rank of 25 to the top 10 countries on the Global Competitiveness Index, as cited in [1]. This entails enhancing the Saudi job market and generating new job opportunities in private, public, and startup companies to align with global job market shifts and technological advancements. This effort also aligns with the vision's goal of lowering the rate of unemployment from 11.6% to 7% [1].

However, despite the presence of numerous job seekers, extended periods of job vacancies have been noted due to the absence of suitable employees who meet the company's requirements. This situation can have adverse effects on both job providers and seekers. The fundamental question arises: What factors contribute to this gap? One significant aspect is the limited reach of traditional job advertisements, which often fail to reach a broad and diverse spectrum of potential candidates. Furthermore, despite possessing impressive qualifications, a significant number of job applicants may miss out some brilliant opportunities due to suboptimal performance during personal interviews. This is where the Watheq idea emerged!

"Watheq" is an application that brings together job providers and seekers under one platform to expedite the filling of job vacancies as swiftly as possible. Moreover, Watheq stands out by offering virtual Artificial Intelligence driven interviews designed based on the specific job requirements and qualifications of the job seekers, enabling them to practice and present their qualifications more effectively in order to enhance their performance during actual interviews. This helps increase confidence during actual job interviews, which was the reason for naming this application "Watheq" in Arabic which means "Confident" in English. Additionally, Watheq includes a recommendation system that provides many features for both job seekers and providers.

1.1 The Problem

Unemployment poses significant problems and challenges that have far-reaching consequences for individuals, economy, and society. It not only affects individuals' financial stability and their ability to meet their basic needs, but it also negatively impacts their psychological well-being. Unemployment has a profound impact on mental health, evidenced by studies [2] showing an elevated risk of mental illnesses, such as depression and anxiety disorders, among the long-term unemployed.

In order to have a job, job seekers have been tirelessly searching for employment opportunities. They spend hours each day browsing through various job portals, social media platforms, and company websites, all in the hope of discovering the perfect job. However, despite their effort, the absence of a centralized platform for job listings presents a significant challenge for them as it's difficult to stay updated with all available positions, thus missing the opportunity to apply for jobs that could be an excellent match for their skills and qualifications. Furthermore, job seekers often face hurdles in interviews due to insufficient preparation and communication skills. The anxiety and self-doubt associated with interviews can significantly impact their confidence. They may struggle to effectively communicate their skills, experiences, and qualifications during interviews.

On the other side, the global economy is steadily recovering, and hiring demand remains strong. However, job providers are struggling to find suitable candidates with the necessary skills and qualifications for their open positions. Nearly 4 out of 5 employers globally report difficulty finding the skilled talent they need in 2023 [3]. The traditional recruitment process relies on job advertisements on limited channels, which may fail to reach a diverse range of candidates who could be a great fit for the company's requirements. As a result, the number of applicants received may be insufficient or not of the desired quality, ultimately having a negative impact on overall productivity.

1.2 Objectives

The "Watheq" platform addresses significant challenges in traditional job search and hiring methods by combining job seekers and providers in one platform. It enables job providers to easily publish job offers, ensuring high discoverability for potential candidates, while offering job seekers AI-based interview preparation to enhance their interview skills. The platform ensures that job seekers receive timely notifications about new job offers from providers aiming to bridge the gap between skills and job requirements.

Our aim is to create a streamlined and effective vacancies filling process for both parties. These objectives are achieved through various features provided by "Watheq" which are:

For Job seekers:

- Sign up, Sign in, Sign out and Reset password.
- View profile page
- Fill and Edit CV information.
- Browse job offers.
- View job offer details.
- Search for job offers.
- Filter job offers.
- Apply for a job.
- Cancel a job application.
- Notify the employer when applying for the job offer.
- View job applications history.
- Mock an interview for a job.
- View notification center.
- View job offers recommendations.

For Job providers:

- Sign up, Sign in, Sign out and Reset password.
- View profile page.
- Fill and Edit company information.
- Add a job offer.
- Edit and close a job offer.
- View job offers history.
- View job offer applications.
- View applicants' CVs.
- Sort job applications.
- Change application status.
- Send customized new job offers notifications.
- View notification center.

1.3 Scope

The Watheq platform addresses the needs of both job seekers and job providers. It only supports the English language and offers essential features such as secure sign-in/out, password resetting, and profile editing. The platform is a web-based application following the client-server architecture.

The client side of the application provides user interfaces, including a mobile application for job seekers developed using Flutter, ensuring compatibility with Android devices, and a web application for job providers developed using HTML, CSS, and JavaScript. The server side of the application includes a database for storing information about job seekers, job providers, job offers, and job applications. Additionally, there's an application developed using PHP and Python to handle user requests.

Furthermore, another external system for generative AI, which is ChatGPT [4], is employed to create interview simulations using an API. The system sends information about the job offer and the job seeker's qualifications as parameters to the ChatGPT API. Subsequently, personalized interview questions are generated in text format, and the interview begins with the chatbot assuming the role of an employer. The job seeker responds accordingly in text format. After the interview concludes, a review of answers is generated to enhance the job seeker's responses.

Through Watheq, job seekers can access a user-friendly interface for searching, filtering, viewing recommended job offers, applying for various job offers, sending automatic notifications to the job providers alerting them of a new job application received, tracking the application status, and canceling the application when needed.

Moreover, job providers have access to a dedicated website enabling them to efficiently manage their job offers. They can add, edit, close, and change the status for their offer's applications, while also automatically sending notifications to job seekers who meet the required qualifications by utilizing content-based recommendation system that uses a new customizable similarity measure. The website also facilitates the viewing of applicants for each offer along with their CVs. Moreover, applications for a job position are sorted based on the similarity score to identify the most suitable matches for the job. Looking ahead, future enhancements may involve improved job seeker-provider communication. This feature is not provided in the current version of the application.

1.4 Product Vision

For job seekers and job providers **who** need an efficient recruiting process, **the** "Watheq" platform **is an** innovative and comprehensive mobile and web application for job searching and providing job offers **that** is designed to provide real-time updates on job openings across the market. **Unlike** other recruitment platforms, such as Glassdoor [5], **our product** offers AI-driven interview training to empower job seekers with interview skills.

1.5 Approach

The development of "Watheq" followed an Agile methodology, emphasizing iterative development, collaboration, and flexibility. The process began with a comprehensive understanding of user needs through extensive research and feedback collection. User stories were then crafted to encapsulate these needs, forming the foundation of the product backlog. Development work was organized into sprints, typically spanning 4 weeks, during which the development team selected user stories from the backlog based on priority and dependency. Daily meetings were conducted to ensure alignment within the team, discuss progress, and address any impediments. Continuous integration and testing were crucial components, ensuring the seamless integration of new code and the preservation of existing functionality. At the end of each sprint, a review session was held to assess completed work and gather feedback internally. In developing the recommendation system, we meticulously gathered requirements, designed formulas tailored to our system's attributes to achieve optimal results, and seamlessly integrated the system into our platform, followed by thorough testing to ensure its effectiveness.

1.6 Solution

We introduce "Watheq", a comprehensive solution designed to simplify the job application process by uniting job seekers and providers on a single platform. Watheq includes a dedicated web application for job providers and a mobile app for job seekers, enhancing the user experience and offering valuable features.

Through Watheq, job seekers gain access to a wide range of job opportunities in one place. This saves them time and effort, keeps them updated on the latest relevant job offers, and increases their chances of finding suitable employment. Job seekers can easily search, filter, and apply for positions that match their skills and preferences. They can also track their application status and cancel applications at any time using their smartphones. An additional essential functionality that can provide significant advantages to job seekers in their search for the most appropriate job opportunities is the utilization of a recommendation system that uses a similarity score to provide personalized recommendations for job offers that align with their curriculum vitae (CV).

One of Watheq's standout features is its interview simulation functionality. Job seekers can access personalized interview simulations that prepare them for real-world job interviews. This feature helps job seekers practice and improve their interview skills, boosting their confidence and enhancing their chances of success.

The interview simulations are generated using advanced conversational generative AI, such as ChatGPT, which offers an open API for seamless integration. Thus, ChatGPT will be integrated in Watheq using its API. When a job seeker selects the interview simulation option for a specific job offer, Watheq sends relevant job offer details and the job seeker's qualifications as parameters to the ChatGPT API. ChatGPT, with its extensive training on vast language datasets and its capabilities in understanding language patterns and contextual relationships, it will understand job requirements, desired skills, experience, and any specific criteria set by the job provider. Then it will generate a set of personalized interview questions tailored to the individual job seeker and the specific position they are applying for.

The interview simulation begins with the chatbot, acting as the employer, asking questions to the job seeker through the Watheq platform's interface. The job seeker responds to that question, providing their answers in text format. The AI adapts the next question based on the job seeker's response, creating a dynamic and realistic interview experience for each individual. After the completion of the interview session, the AI generates a comprehensive review of the job seeker's answers, offering valuable feedback for improvement. Appendix A shows an example of an interview generated by ChatGPT, which shows its great potential and suitability for the application as it's a language model optimized for dialogues.

For job providers, Watheq serves as a valuable resource for finding qualified employees. They can effortlessly post job opportunities, specify necessary skills and qualifications, and view application history. Additionally, Watheq assists job providers in identifying suitable candidates by notifying registered job seekers with the required skills whenever a new job offer is posted. This recommendation system utilizes content-based recommender algorithms, to calculate a similarity score. Based on this score, job seekers receive targeted notifications

regarding job offers that are relevant to their skills and qualifications. To enhance the experience, the system can provide more flexibility by incorporating a customizable similarity threshold that allows job providers to set their preferred percentage. For example, a job provider may choose a higher percentage of similarity to ensure that only highly suitable candidates are notified, while another provider may prefer a lower threshold to cast a wider net and consider a broader range of applicants. Furthermore, if multiple job seekers apply for a specific job, then the Watheq recommendation system will facilitate sorting the applications based on the similarity score of the applicants' CVs and the job requirements to identify the ones that best match the job description.

Overall, Watheq's innovative approach, leveraging AI-driven features tailored to both job seekers and providers, sets it apart from existing solutions in the market. Its potential impact extends beyond local communities to the global stage, offering a transformative solution to streamline the job market and enhance employment opportunities worldwide.

1.7 Report Content

This report consists of several chapters that collectively provide a comprehensive view of our project. The initial chapter is the Introduction, where we provide an in-depth exploration of the Watheq concept. Following this, the Background and Literature Review chapter offers a thorough exploration of the necessary domain knowledge. Subsequently, we present the Recommendation System chapter, which outlines the development and implementation of the recommendation system within Watheq. The Interviews chapter follows, detailing our implementation of interview simulations within Watheq. Moving forward, the System Design and Development chapter elaborates on the methodology, system requirements, design, and implementation aspects of the project. Within this chapter, we outline the specific system requirements, present the architectural and detailed design of the Watheq system, and describe the implementation process. The System Evaluation chapter discusses the experimental and quality testing, user acceptance testing, quality attributes testing, and engages in discussions surrounding these evaluations. Finally, we conclude with the Conclusions and Future Work chapter, summarizing the project's key findings, discussing its contributions, and proposing potential avenues for further research and enhancement.

CHAPTER.2

Background and Literature Review

2 Background and Literature Review

This chapter thoroughly examines the background and literature review for the project. It starts by describing the job application process and the major challenges faced by both job seekers and providers. Then, it delves into the concept of generative AI models, with a particular focus on ChatGPT, and discusses the utilization of web APIs, especially the ChatGPT API since it will be used in this project for implementing an interview simulation. Additionally, it provides an overview of recommendation systems since they will be used for new job offer notifications, job recommendations, and sorting job applications. Finally, it presents competitive products to compare Watheq with the most similar available applications. Through the exploration of these key elements, we are establishing the foundation for the development of Watheq.

2.1 Job Application Process

The job application process acts as a crucial bridge, connecting job seekers to potential employment opportunities while aiding employers in discovering the perfect talent. However, this process is often marked by complexity, time consumption, and numerous challenges. In response to these issues, we present "Watheq." In today's ever-changing job market, the need for a platform like Watheq has become increasingly evident.

Job providers often have numerous job vacancies that need to be filled. When they require a new employee, they post the job offer along with its details on various platforms, either those exclusively dedicated to job offers or other platforms. On the other hand, job seekers spend hours navigating through different platforms searching for job offers that align with their qualifications. They must carefully read every job offer they come across to determine if it suits their needs.

Once job seekers find an offer that aligns with their qualifications, they are required to create a formal CV that includes only the information relevant to the job provider. They can then submit the job application through various channels as specified by the company, including the company's website, company email, or other platforms that facilitate job applications for specific job offers. After submitting their applications, job seekers may be contacted by the company for an interview, but only if they meet certain criteria specified for the job. During the interview, job seekers are asked a series of questions designed to assess their suitability for the position.

However, job providers typically rely on dedicated HR employees who review each submitted job application and select candidates for interviews. After the interviews, they choose the most suitable candidate and contact them to discuss contract signing details.

Thus, both job providers and job seekers face a lot of challenges during the employment process. Job providers often struggle to find the ideal candidate with the desired qualifications to fill a position, and the time taken for this process has significantly increased [6]. Job seekers find this process to be time-consuming and overwhelming due to the massive amount of information on these platforms [7]. Additionally, they often encounter challenges, as discussed in [8], related to the suitability requirements of job offers and aligning their skills with the advertised jobs. They also deal with uncertainties, which means handling the lack of clarity or ambiguity in job descriptions. This can create uncertainty about what skills, roles, and responsibilities are actually required for the job. Also, they may miss opportunities during interviews due to various reasons, including inadequate preparation, difficulty effectively conveying their skills and experiences, and nervousness or self-doubt that affects their confidence during interviews [9].

To address these challenges, Watheq empowers job providers to post detailed job offers, enabling us to connect them with qualified seekers. This entails specifying the job title, position, job description, field, and the required qualifications, encompassing education, skills, and experience.

Furthermore, Watheq simplifies the job search, filtering, and application process for job seekers. However, before applying, job seekers need to provide their CV information, covering contact details (full name, phone number, email address, and physical address), a professional summary or objective (typically optional), education history, and work experience in reverse chronological order with its details including job titles, company names, dates of employment, and responsibilities. Moreover, it enables job seekers to include both technical and soft skills, certifications, awards, and projects [8]. These details, combined with comprehensive job offer information, serve as the foundation for creating unique interview simulations employing generative AI models.

2.2 Generative AI

To simulate an interview, Generative AI will be used in this project. According to [10], Generative AI refers to a type of artificial intelligence that generates new content rather than just recognizing patterns or making predictions. It can generate multiple types of data such as text, or images, based on patterns it has learned from existing data. It involves using machine learning models to generate original and creative outputs. Generative AI applications have found diverse uses, including the implementation of chatbots for customer service and language translation. These applications leverage the capabilities of generative models to create interactive conversational agents.

An instance of the application of generative AI models widely employed in chatbots is ChatGPT [4], specifically GPT-3.5, which stands for Generative Pre-trained Transformer 3.5. It's a powerful pre-trained language model developed by OpenAI, specifically designed for conversational purposes. ChatGPT is among the most advanced and largest language models developed to date. GPT-3.5 builds upon the success of its predecessors (GPT, GPT-2, and GPT-3) and represents a significant advancement in natural language processing. GPT-3.5 utilizes a transformer-based architecture, which is a deep learning model that excels in handling sequential data such as text. The transformer architecture allows GPT-3.5 to capture complex relationships, making it highly capable of understanding and generating human-like text given a prompt or an initial input. The model can generate responses, answer questions, write essays, translate languages, and perform various other language-related tasks [11].

According to [12], GPT-3.5 is also known for its enormous size, comprising 175 billion parameters. The large number of parameters enables the model to capture a wide range of language patterns, resulting in more coherent and contextually relevant text generation. It can consider the dialogue history and maintain context over multiple turns of conversation. This enables more engaging and interactive interactions with the chatbot, making it the perfect choice for an interview simulation that will be used in the Watheq app. It can act as an employer and present various types of questions, such as:

- Personal Background Questions: Interviewers usually begin with these questions to learn more about the interviewee's educational and professional history.

- Behavioral Questions: These questions aim to explore past experiences and behaviors to assess how the interviewee might respond to future situations.
- Situational Questions: Similar to behavioral questions, these scenarios present hypothetical situations to test the interviewee's problem-solving abilities.
- Technical or Job-Specific Questions: These questions are designed to assess the interviewee's knowledge and skills relevant to the job they are applying for.
- Culture Fit Questions: In this segment, interviewers aim to determine if the interviewee aligns with the company's culture and work environment preferences.

GPT-3.5 undergoes a two-phase developmental process, as outlined in [11]. In its initial stage, the model is exposed to a vast array of data collected from various segments of the internet, encompassing diverse sources like web pages, literary works, scholarly articles, and more. During this pre-training stage, GPT-3.5 hones its understanding of language structures, including grammar and semantics, by learning to predict subsequent words in sentences based on the context established by previous words. The subsequent phase involves fine-tuning, where GPT-3.5 is further trained on specialized datasets. These datasets are crafted under the guidance of human reviewers adhering to OpenAI's prescribed norms. This fine-tuning phase is crucial as it aligns GPT-3.5's outputs with specific standards and objectives, ensuring its application is both safe and in accordance with OpenAI's intended use parameters.

GPT-3.5 is not the only generative AI model that is used in chatbots. There are many other models that are also used such as Google Bard [13] that uses Google's Pathways Language Model and has been trained on 137 billion parameters which is less than GPT-3.5. It can generate text and offer responses pulled from Google Search making it more suitable as a research tool [14]. Google Bard API is currently private, and it's available as a chatbot and can be accessed from its website as a trial considering that it's still under development and learning.

2.3 Web APIs and ChatGPT API

A web API, or Application Programming Interface, acts as a bridge between different software applications, enabling them to communicate and interact over the internet [15]. It establishes a set of rules and protocols that developers can use to access and manipulate data or functionality from a specific system or service. Web APIs play a critical role in achieving seamless integration between applications, facilitating data exchange, and empowering the development of innovative services and solutions across various platforms and technologies.

The OpenAI ChatGPT API offers a powerful interface for integrating ChatGPT, a state-of-the-art language model, into applications, products, or services. With this API, dynamic conversations with the model become possible, allowing for a wide range of interactive and personalized experiences. To utilize the API, a series of API calls should be made, sending a list of messages as input, and receiving a model-generated message as output.

As mentioned in the OpenAI website [16] each message in the list contains two properties: 'role' (which can be 'system', 'user', or 'assistant') and 'content' (containing the text of the message). Conversations typically begin with a system message to set the assistant's behavior, followed by alternating user and assistant messages. The system message helps guide the model's behavior throughout the conversation and instructs the model to adopt a specific persona or style, which allows us to customize the conversation according to our requirements, while user messages provide instructions or queries, and an assistant message that can be extended to a list of messages to keep the model aware of the previous messages, maintaining context and the history of the conversation.

To interact with the OpenAI ChatGPT API, we need to include the OpenAI Python library in the code using the "import openai" statement. This library provides the necessary functions and methods to communicate with the API. After that, we proceed to construct a conversation by creating a JSON object with a list of messages representing the conversation [17]. Each message in the conversation has two properties, as mentioned before.

Here's an example of a request structure for an interview simulation. The structure of the examples mentioned, including the roles and content of messages, is inspired by and closely resembles examples found in [17, 16]:

```
conversation = [  
    {"role": "system", "content": "Assume the role of an interviewer in this scenario."},  
    {"role": "system", "content": "Job Title: Software Engineer"},  
    {"role": "system", "content": "Job Description: We are seeking a skilled software engineer with experience in web development."},  
    {"role": "user", "content": "Candidate: John "},  
    {"role": "user", "content": "Experience: I have 3 years of experience as a software engineer, specializing in web development."},  
    {"role": "user", "content": "Skills: My expertise includes Python and JavaScript, along with experience in"},  
]
```

In this example, the conversation starts with system messages providing job information, followed by user messages representing the job seeker's information. The interview simulation begins by sending this conversation to the ChatGPT API. Once the conversation is constructed, we can make an API call using the "openai.Completion.create()" method. Provide the model's name, such as "gpt-3.5-turbo", and pass the conversation list as the "messages" parameter [16]. This API call sends the conversation to the ChatGPT model, which generates a response based on the given input.

The API response received from the ChatGPT model is in the form of a JSON object. It contains several properties, including the "object" type, "created" timestamp, "model" used, "usage" details, and "choices" array. The "choices" array contains the generated message from the model, which we can extract using the 'choices' property and accessing the 'message' within it [17]. This extracted response can be further processed and utilized in the application.

Here's an example response structure:

```
{  
  "id": "chatmpl-0000000",  
  "object": "chat.completion",  
  "created": 0000000,  
  "model": "gpt-3.5-turbo",  
  "usage": {  
    "prompt_tokens": 56,  
    "completion_tokens": 31,  
    "total_tokens": 87  
  },  
  "choices": [  
    {  
      "message": {  
        "role": "assistant",  
        "content": "Interviewer: Appreciate your details, John. Let's proceed with the interview.  
          Can you tell me about a challenging project you've worked on related to web  
          development?"  
      }  
    }  
  ]  
}
```

In this example response, the generated message from the model represents the employer's response, asking the candidate to describe a challenging project related to web development. The API offers the flexibility to engage in back-and-forth exchanges with the model by extending the list of messages. This flexibility empowers developers to create dynamic and interactive applications, ranging from chatbots and virtual assistants to content generation systems and more.

2.4 Recommendation Systems

The job market today is highly competitive, making it challenging for job seekers and providers to efficiently find and match suitable opportunities. Additionally, traditional methods of job searching often result in wasted time and effort, leading to frustration among job seekers and inefficient talent acquisition for providers. To overcome these challenges, Watheq implements a recommendation system that leverages machine learning techniques. By analyzing, vectorizing, and comparing the CVs of job seekers and the description of job offers, Watheq generates accurate and personalized job recommendations. It also enables the system to send notifications to job seekers about new job offers that align with their profiles and assists in sorting job applications based on the qualifications of candidates. This enhances the overall experience and increases the likelihood of successful job placements.

2.4.1 Overview of Recommendation Systems

Recommendation systems are software components that utilize statistical analysis and machine learning models to identify the most appropriate items to be recommended to an individual user based on their preferences, behavior, or similarities to other users. It helps users discover new products, services, or content that align with their interests, enabling personalized and targeted recommendations [18].

Recommendation systems are widely used in various domains, including e-commerce, streaming platforms, social media, and more. They help users navigate through the overwhelming number of available choices by providing personalized recommendations tailored to their specific needs and preferences. Netflix is an example of an app that utilizes a recommendation system [19]. By analyzing user viewing history, ratings, and interactions, Netflix suggests personalized movies and TV shows.

There are several types of recommendation systems commonly used in various domains, we present a brief overview of the main 4 types [20] :

- 1. Content-based filtering recommendation systems:** These systems analyze the characteristics and attributes of items or content to recommend similar items to users. They rely on user preferences and item features to establish connections and suggest relevant

items. For example, if a user has shown interest in action movies in the past, a content-based recommendation system may suggest other action movies based on their content similarities [21].

2. **Collaborative filtering recommendation systems:** These systems make recommendations based on the collective behavior and preferences of a group of users. They identify patterns and similarities in user behavior, such as item ratings or past interactions, to recommend items that users with similar tastes have enjoyed [20].
3. **Hybrid filtering recommendation systems:** Hybrid recommender systems combine multiple recommendation techniques to provide more accurate and diverse recommendations. They leverage the strengths of different approaches, such as content-based filtering and collaborative filtering, to overcome limitations and improve recommendation quality [22].
4. **Knowledge-based recommendation systems:** Knowledge-based recommendation systems utilize explicit knowledge and rules to provide personalized recommendations. By relying on a knowledge base or domain-specific expertise, these systems offer suggestions that align with specific user requirements or constraints. The knowledge base serves as a repository of information, including item details, user preferences, and domain-specific rules. Leveraging this knowledge, the recommendation system can analyze user needs and preferences to generate tailored recommendations [20].

Watheq employs a content-based recommendation system due to its reliance on user profiles and the utilization of various models to identify similarities between documents. This approach enables Watheq to provide tailored recommendations based on the seeker CV's and job offer descriptions. Additionally, the system possesses the capability to dynamically adapt the recommendations as the user profile evolves [23]. Moreover, a Comparison Study on Job Recommendation [7] has indicated that the content-based approach is better suited for job recommendation systems when compared to traditional methods such as collaborative filtering.

2.4.2 Previous job recommendation systems

One notable study in the field of job recommendation systems focuses on suggesting job vacancies specifically for Information Technology (IT) professionals in the Brazilian market [24]. The researchers conducted an automatic collection of job seekers' and job offers' data from a Brazilian recruitment website and LinkedIn. They employed a weighted IT terms dictionary to filter the data and implemented various text preprocessing techniques, including stop word removal, tokenization, and lemmatization. To represent the documents effectively, the researchers utilized vector space models such as TF-IDF and Word2Vec. Additionally, they explored different approaches, such as cosine similarity and Word Mover's Distance, to assess the similarity between documents. The study concludes by presenting the results of empirical experiments conducted for each combination of techniques employed within the recommendation system framework.

Another previous job recommendation system [7] involved conducting comparative to evaluate popular recommendation methods, namely content-based, collaborative filtering, and linear-hybrid, for selecting a suitable algorithm to build the system. The study commenced by constructing an experimental dataset by crawling multiple recruiting websites, resulting in 7,623 jobs for experimentation. Each recommendation method was examined in detail, accompanied by pseudo code and mathematical formulas.

The content-based approach was the first method explored in [7], which recommends jobs based on users' profiles. Job content and user profiles were represented as vectors estimated using TF-IDF, and the similarity between them was measured using cosine similarity. The study then proceeded to the collaborative filtering approach, where jobs were recommended to users based on the preferences of similar applicants. Similarity was measured using both cosine similarity and Pearson correlation.

Lastly, in [7], the linear hybrid method was introduced, aiming to leverage the strengths and mitigate the weaknesses of the previous approaches. The performance of each method was evaluated using various measures, including precision, recall, and mean average precision. The experiment results were thoroughly discussed, ultimately indicating that the content-based method was the most suitable for the recommendation system.

2.5 Competitive Product Analysis

Watheq provides two core services that are not found in combination in any other applications: job searching and application processes, as well as AI interviews. Therefore, we need to analyze both platforms that provide job search functions and platforms for interview preparation to gain more insight into our competitors.

2.5.1 Job Search Platforms Analysis

- **Indeed Platform**



Figure 1. Indeed Logo [25]

Indeed [25] is an online hiring platform that serves both job seekers and providers through web and mobile applications. It offers a wide range of features for job seekers, including the ability to upload or create a CV, search for job offers, utilize advanced filters, and allow job seekers to specify their preferences to customize their job offer search process. It also facilitates communication between job seekers and providers through the app. For job providers, Indeed allows them to manage company profiles, post, edit, and close job offers, manage job applications, and schedule interview appointments.

Indeed, does have some certain limitations. Job seekers need to manually subscribe to job notifications, which send them emails to notify them about job offers based on their search history within the app. Additionally, some job offers may require payment, referred to as a "recommended budget" to enhance their discoverability. Notably, not all job offers can be applied for directly on Indeed, and the information about job providers is not always sufficient. Figure 2 shows some of the main interfaces of Indeed.

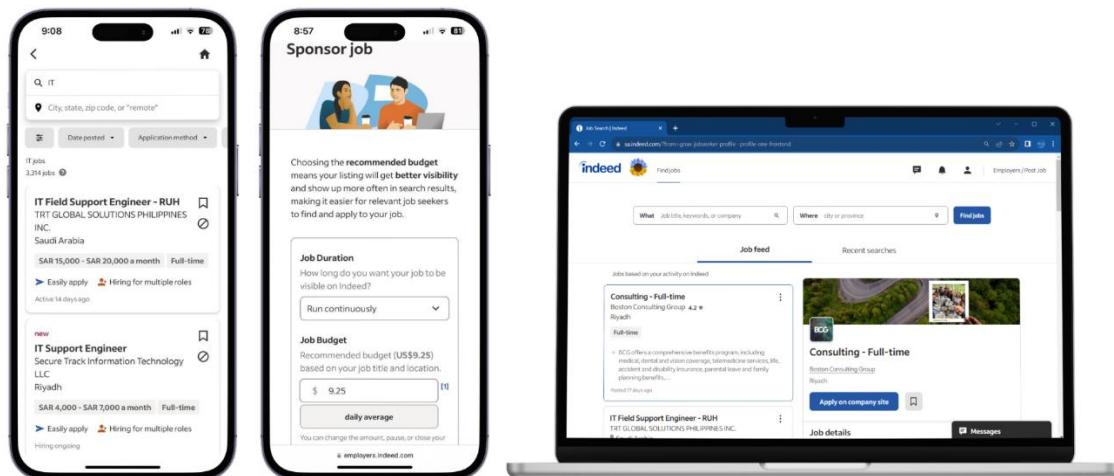


Figure 2. Indeed Interfaces (From Right: Search Results, Payment for Sponsorship, and Home Page)

- **Glassdoor Platform**



Figure 3. Glassdoor Logo [5]

Glassdoor [5] is an online platform that serves job providers through a web application and job seekers through web and mobile applications. What sets Glassdoor apart is its unique blend of job listings and company reviews. The platform provides a space where current and former employees can anonymously share their experiences and opinions about companies. This includes insights into company culture, salary information, and interview processes. Among the features it offers to job seekers are the ability to upload their CVs, search for job offers (based on job titles, keywords, company names, and locations), utilize advanced job filtering options, and submit job applications through the app. However, it's important to note that not all job offers support direct applications through the platform. On the job providers' side, Glassdoor allows them to manage company profiles, post or edit job offers, and view or interact with reviews on their profiles.

Glassdoor does have some limitations, including the accuracy and authenticity of user-generated content in regard to their experience and opinions about companies. Users are forced to share some information about their own workplace experiences to access full details about other companies. Moreover, not all companies have comprehensive profiles or reviews on the platform, limiting its usefulness in certain industries or regions. The job notifications require manual subscriptions for email notifications to receive every new job offer or job offers in a specific field specified by the seeker. Lastly, it's worth noting that certain advanced features may require payment, such as competitor analysis. Figure 4 shows some of the main interfaces of Glassdoor.

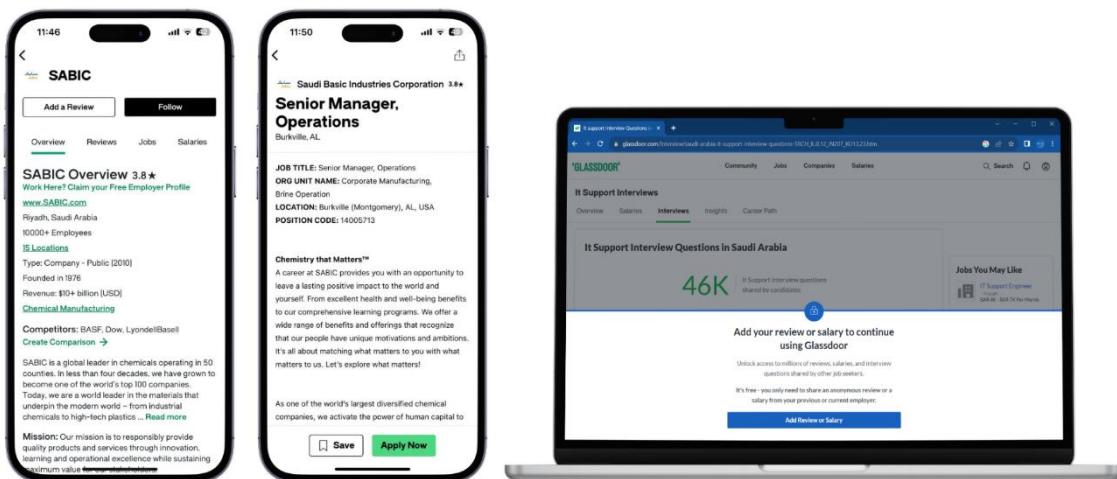


Figure 4. Glassdoor Interfaces (From Right: Company Overview, Job Offer Overview, and Blocking Message Asking for a Review)

- **LinkedIn Platform**



LinkedIn [26] is a professional networking platform that caters to employees, job seekers, and job providers. It serves users through both web and mobile applications, allowing them to create comprehensive professional profiles and connect with colleagues and industry professionals. For job seekers, LinkedIn provides the opportunity to showcase their work experience, education, skills, and certifications on their profiles, effectively establishing a digital representation of their professional identity. Despite its primary focus on networking, LinkedIn also assists users in their job search efforts by offering features such as job offer searching and filtering, recommending job offers based on user profiles, and sending job offer notifications that match user-specified preferences via email. Users can also submit job applications through LinkedIn; however, it's important to note that not all job offers support direct applications through the platform. For users who act as job providers, LinkedIn enables them to post job offers and streamline the hiring process by searching for candidate profiles based on their field, education level, keywords, and more. Additionally, it facilitates communication between job seekers and providers.

LinkedIn's limitations include that some features, such as more accurate job recommendations, are limited to paid premium subscriptions. Additionally, LinkedIn profiles may contain inaccurate or outdated information, highlighting the need for users and employers to verify credentials. Furthermore, LinkedIn does provide interview preparation, but it is constrained to predefined categories and questions, with answer evaluations reliant on feedback from users within the network of job seekers. Figure 6 shows some of the main interfaces of LinkedIn.

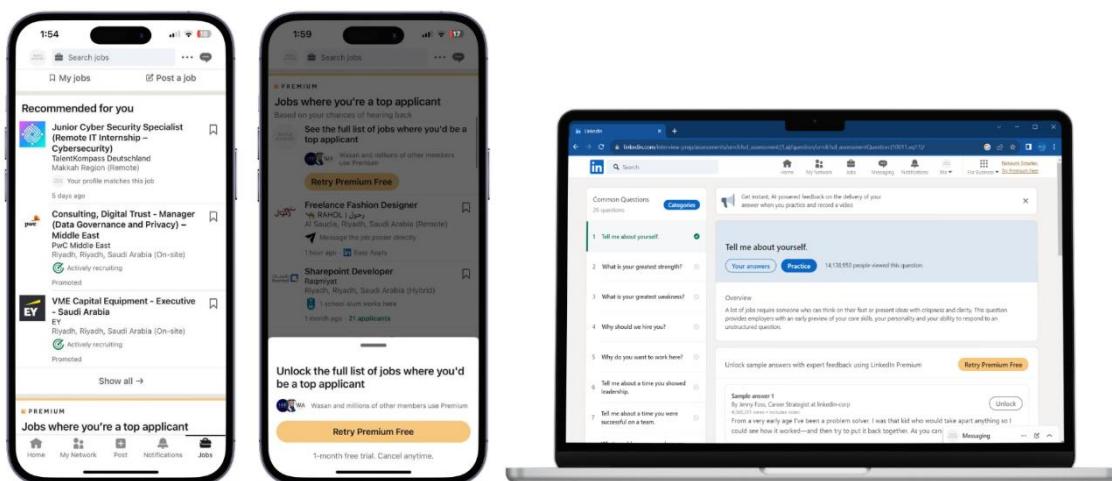


Figure 6. LinkedIn Interfaces (From Right: Recommended Job Offers, Blocked Premium Feature, Interview Practice)

- **Comparison for job search platforms**

Table 1 provides a comparative analysis of the three previous applications and Watheq, focusing on nine crucial features. These features encompass the capability for job providers to post new job offers, the capability of job seekers to search and filter job offers, submit job applications through the application, and then track the status of those applications, whether they are accepted or rejected. Additionally, it compares the systems' proficiency in facilitating communication between job seekers and providers, recommending job offers based on the similarity between the qualifications of the seekers and the requirements of the job offer, sending notifications for these recommendations, and offering AI interview simulation for practice.

Table 1. Job Search Platforms Comparison

Features	GlassDoor	Indeed	LinkedIn	Watheq
Post Job Offers	✓	✓	✓	✓
Search for Job Offers	✓	✓	✓	✓
Filter Job Offers	✓	✓	✓	✓
Submit Job Applications Through the App	✓	✓	✓	✓
Track Application Status	✗	✗	✗	✓
Job Seeker-Provider Communication	✗	✓	✓	✗
Job Offer Recommendations	✗	✗	✓	✓
Automatic Recommendation Notification	✗	✗	✓	✓
AI Interviews Simulation	✗	✗	✗	✓

Watheq stands out among job searching platforms by innovatively combining the job searching and employment processes with AI-based interview preparation under one platform. While platforms like Indeed and Glassdoor offer job listings, searching, filtering, and manual subscription to job notifications, Watheq goes beyond by utilizing a recommendation system to recommend job offers based on a similarity score between the job offer's requirements and the candidate's CV. Furthermore, Watheq uses this recommendation system to send automatic notifications of new job offers, ensuring that users are promptly updated on relevant employment opportunities. It also uses this system to sort job applications for job providers. In addition, Watheq steps ahead of LinkedIn by offering a unique personalized interview simulation that allows job seekers to practice and improve their interview skills. Unlike the mentioned applications, which don't guarantee the ability to apply for a job directly from the platform, Watheq ensures that users can submit applications and even track the status of their applications.

Providing a communication mechanism between job seekers and providers is an important feature in this type of application. However, due to the limited time available for this project, Watheq does not provide this feature. Thus, communication will depend on using contact information.

2.5.2 Interview Preparation Platforms Analysis

- **Google's Interview Warm Up Platform**



Figure 7. Warm Up Logo [27]

Google's Interview Warm Up [27] is a website designed to assist candidates in preparing for technical interviews. Candidates can choose from six predefined fields: general, cyber security, E-commerce, IT support, UX design, and data analytics. The data analytics field is further subdivided into three specific areas of focus. Once candidates have made their selection, they are presented with five questions in both vocal and written formats, allowing them to respond either by voice or text. After each response, an overview highlights the key terms, most repeated words, and talking points included by the candidate. The questions encompass a range of topics, including technical, situational, and background related. Candidates have the option to practice the same questions or explore new ones across various fields. It's worth noting that machine learning analyzes answers but does not generate questions.

However, there are some limitations to consider. Google's Warm Up Interview may have browser compatibility issues, primarily with Safari and Chrome. Additionally, it offers only six predefined job fields, and the interview questions lack personalization. Speech-to-text conversion errors are possible, but candidates have the ability to edit these errors. Figure 8 shows some of the main interfaces of Interview Warm up.

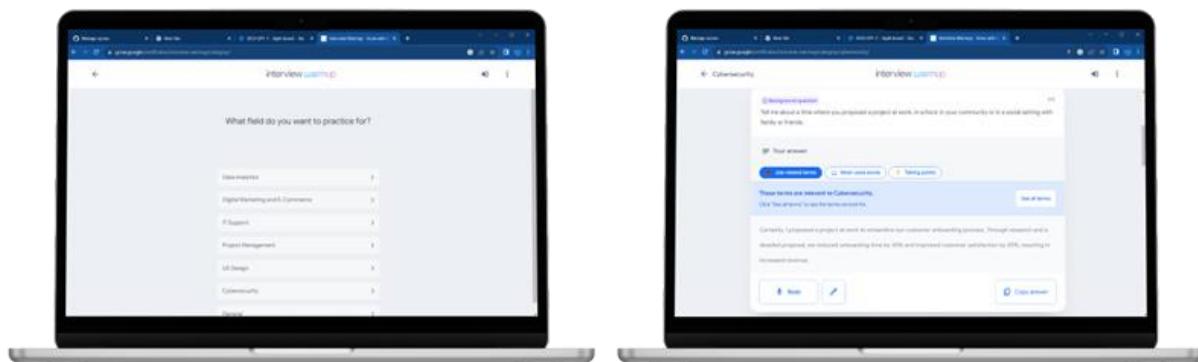


Figure 8. Interview Warm Up Interfaces (From Right: Home Page and Answer Analysis Page)

- **Interviewby.ai Platform**



Figure 9. Interviewsby. ai Logo [28]

Interviewsby.ai [28] is a website that leverages AI to simplify the interview preparation process. Users begin by entering a job title and description, which can either be chosen from predefined options or created by the user. The platform then generates interview questions based on this input, and users provide their answers through spoken responses. It's important to note that once an answer is recorded, edits cannot be made. Users receive feedback on each answer and an overall review upon completion, with AI being used for question generation and answer analysis. However, the limitation is that only spoken answers are supported. Figure 10 shows some of the main interfaces of Interviewsby.ai.



Figure 10. Interviewsby.ai Interfaces (From Right: Job Description Page And Answers Analysis Page)

- **Comparison Interview Preparation Platforms**

Table 2 provides a comprehensive comparison of the two previous websites, Warm up and Interviewsby.ai in addition to LinkedIn, and Watheq, focusing on six key features: the system's ability to generate interview questions based on the job description using AI, its capacity to tailor these questions to job seekers' unique backgrounds, experiences, skills, and qualifications, its capability to generate interview questions for practice across a wide array of job roles, the option for interviewees to edit their interview answers before submission, the system's capacity to provide AI interview answers analysis, and, finally, its ability to offer AI feedback after the interview concludes, suggesting points of enhancement for the interviewee.

Table 2. Interview preparation platforms comparison

Features	Warm Up	Interviewsby.ai	LinkedIn	Watheq
Interview Questions Generated by AI	✗	✓	✗	✓
Personalized Interview Questions	✗	✗	✗	✓
Interview Questions for any Position	✗	✓	✗	✓
Edit Interview Answers Before Sending	✓	✗	✓	✓
Provide AI Interview Answers Analysis	✓	✓	✗	✓
Provide AI Feedback After the Interview Concludes	✗	✓	✗	✓

Watheq stands out by offering an AI interview simulation that adapts to the candidate's information and the specific job position they plan to apply for. In contrast, Google's Interview Warm Up focuses only on preparing for technical interviews. Watheq's interviews are AI-driven, meaning that questions are not predefined, which distinguishes it from LinkedIn and Google's Interview Warm Up. While interviewsby.ai generates interview questions based on job descriptions, Watheq goes a step further by tailoring the interview to match the candidate's information. Both interviewsby.ai and Watheq provide feedback to help candidates enhance their skills after the interview concludes.

CHAPTER.3

Watheq's Job Recommendation System

3 Watheq's Job Recommendation System

To bridge the gap between job seekers and providers and streamline the process of discovering and matching job opportunities, Watheq employs a content-based recommendation system. The content here is the CVs for job seekers and job offer details for job opportunities, and the system computes the similarity between them to generate the recommendations. This system utilizes natural language processing (NLP) techniques to analyze the text in job seekers' CVs and job offers' descriptions, enabling the generation of accurate and precise recommendations.

This chapter starts by describing how the system compares between a job offer and a job seeker's CV to generate a similarity score. The flow of this process is shown in Figure 11. First the used parts are extracted which are: city, skills, qualifications, and experiences. Then NLP is used to pre-process the textual fields to convert them into word sets, as described in Section 3.1. Finally, Section 3.2 shows how similarity scores are computed. This chapter then describes the application of these scores in Watheq platform and ends with an illustrative example.

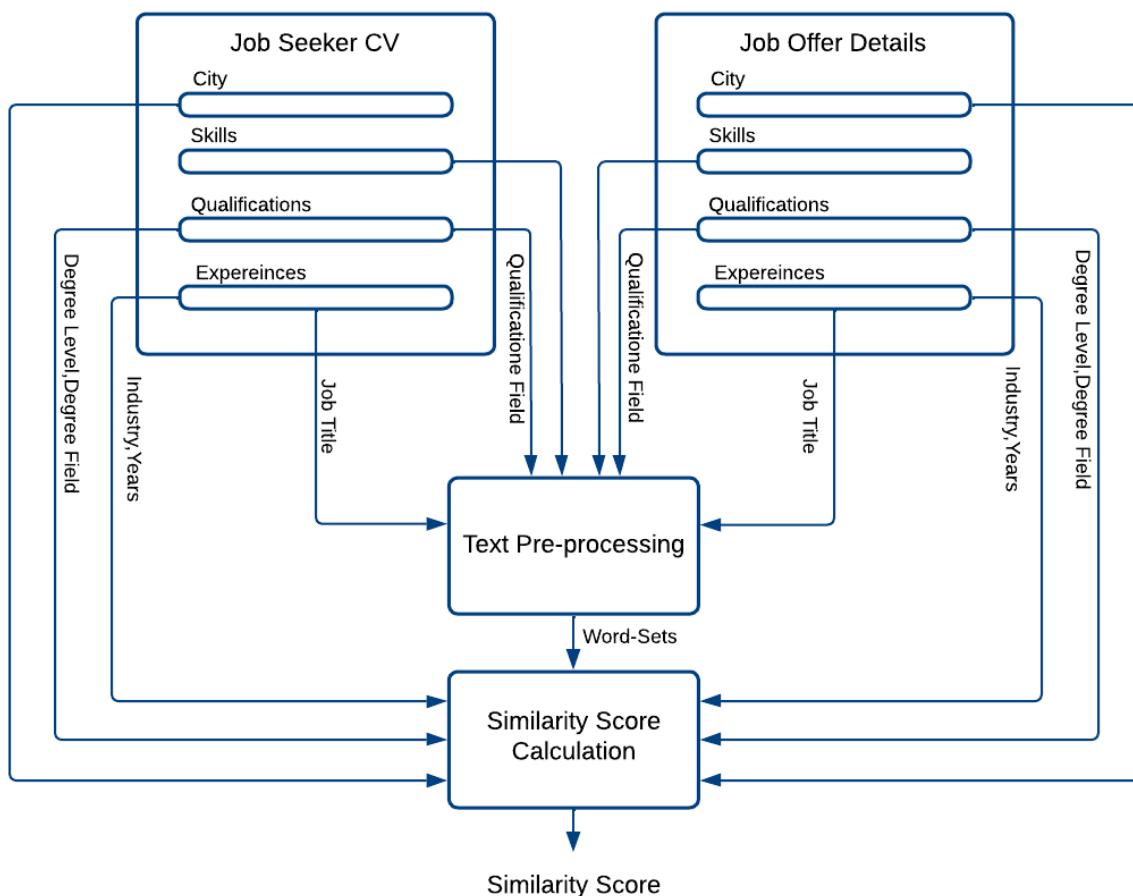


Figure 11. Watheq's Recommendation System Flow

3.1 Text Pre-processing

To ensure the highest quality recommendations, several preprocessing techniques are applied to text in both job seekers' CVs and job offer descriptions. These techniques are implemented using the NLTK library [29], a natural language toolkit designed for processing human language data. We have set up NLTK on our Bluehost server by connecting to the SSH network [30]. Once NLTK is installed, we created a Python file named "Pre-processing.py" on our server. This file handles all preprocessing tasks, and it is used by other files within the Watheq platform that require text preprocessing by sending their data to it to retrieve preprocessed text.

The "Pre-processing.py" file uses a series of preprocessing techniques. The first technique is the removal of stop words, which eliminates common words that do not significantly impact the comparison process. By eliminating these words, the system can focus on the most relevant and informative content. The second critical technique is Porter stemming [31], which standardizes words to their root forms by removing suffixes and prefixes, allowing the system to treat different word variations as identical to the base word, thereby recognizing commonality between words.

Additionally, we employed other preprocessing methods including tokenization, lemmatization [31], removing punctuation, extra spaces, digits, and converting text to lowercase. Tokenization breaks the text into individual words or tokens, facilitating more granular analysis. Lemmatization, on the other hand, converts words to their base or dictionary forms, considering a word's context and grammatical relationships to accurately determine its base form. The final output is a word set representing the input text.

3.2 Measuring Similarity Scores

In many previous work, word vectors with word frequencies were used to represent documents and compute the similarities between them. However, regarding this project, we don't think that it is suitable for this application due to the nature of CVs and job offer details. For a certain CV or job offer, words usually are not repeated many times. For example, a job seeker will mention a skill once in the skills section and a degree once in the qualification section. As a result, the word vector will be sparse and not very helpful. Thus, we created a new similarity measure more suitable for the compared data, and its details are described in this section.

Following the initial text preprocessing, the next step in Watheq's system involves assessing similarity across shared attributes between job offer details and CVs. This assessment concentrates on four primary attributes: City, Experience, Skills, and Qualifications. For each attribute, a separate similarity measure is computed —denoted as S_{City} , $S_{Experiences}$, S_{Skills} , and $S_{Qualifications}$ — between the specified job offer details and the CV. Then, the final similarity score is the weighted sum of the attribute similarities.

In determining the similarity scores, various functions are utilized, depending on the type of attribute. For single-valued attributes with predefined values like city, simple matching is the best method and provides quick results. Equation 1 illustrates the potential outcomes of the comparison between $City_{JobOffer}$ and $City_{CV}$, which can result in a score of either 0 or 1. The intuition here is that job seekers are more likely to seek jobs in their cities. With this measure, if the job offer is in the same city as the job seeker, then it will result in a higher similarity score.

$$S_{city}(city_{JobOffer}, city_{CV}) = \begin{cases} 0, & \text{if they don't match} \\ 1, & \text{if they match} \end{cases}$$

Equation 1. Similarity Function Of City Attribute

The skills attribute is textual data entered by users, which requires preprocessing to generate representative word sets. So the similarity measure for skills will compare between the word sets to determine common words. The measure is shown in Equation 2, and it is a variant of the well-known Jaccard Index for set comparisons, so that this measure is not symmetric. Jaccard Index is symmetric for any given two sets, and it is calculated as the size of the intersection divided by the size of the union of the two sets. The intuition here for using a variant in this application is that usually job seekers list many skills in their CVs, and some may not be relevant to the specific job offer, so we don't want to penalize the score when the CV contains more skills than the required skills in the job offer. Thus, we want to use an asymmetric measure by making the denominator in the equation the size of the skills set for the job offer only, while the numerator is the intersection of words found in both the job offers' and the CV's skills.

$$S_{skills} = \frac{|skills_{JobOffer} \cap skills_{CV}|}{|skills_{JobOffer}|}$$

Equation 2. Similarity Function Of Skills

In the context of the experience attribute, the similarity measure is more complex. An offer's experience includes industry, job title, and minimum years required, while a CV lists industry, job title, start date, and end date. In addition, it is multivalued such that a job seeker may list multiple experiences in the CV, and a job provider may list multiple accepted experiences. Thus, in this application, we compare every experience in the job offer with every experience in the CV, then we take the maximum similarity score as the similarity score for this attribute because it is the best match between them. To compare two experiences, we take the average similarity score for all three parts: industry, job title, and years of experience.

The industry, being an attribute with predefined values, simple matching is used for it as done for the city attribute and illustrated in Equation 3. For experience years, job providers specify the minimum years required for a job, while job seekers specify the start and end dates listed in the CV. So first we compute the job seeker's experience duration in years from the start and end dates, then compare between them as detailed in Equation 4. If the experience duration for a job seeker is higher than the minimum years required for a job, then their similarity reaches its max (1). Otherwise, it is the complement of the ratio of the difference between them to the minimum years required for a job. The job title attribute is textual data entered by users, so like skills it also requires preprocessing to generate representative word sets. The similarity measure for this part compares between the two word sets as shown in Equation 5. The similarity between two experiences is the average similarity of the three parts. Given that experience is a multi-valued attribute, which means one offer can have more than one experience, and one CV can have more than one experience, the maximum experience similarity between the experiences listed in the job offer and those in the CV is the final similarity score for the experience attribute, as demonstrated in Equation 6.

$$S_I(e_1, e_2) = \begin{cases} 0, & \text{if industry don't match} \\ 1, & \text{if industry match} \end{cases}$$

Equation 3. Similarity Function of Experience Industry

$$S_Y(e_1, e_2) = \begin{cases} 1, & \text{if } years_{e_2} \geq years_{e_1} \\ 1 - \frac{years_{e_1} - years_{e_2}}{years_{e_1}}, & \text{if } years_{e_2} < years_{e_1} \end{cases}$$

Equation 4. Similarity Function Of Experience Years

$$S_T = \frac{|JobTitle_{JobOffer} \cap JobTitle_{CV}|}{|JobTitle_{JobOffer}|}$$

Equation 5. Similarity Function Of Experience Job Title

$$S_{experiences} = \max_{e_1 \in JobOffer} \left(\max_{e_2 \in CV} \frac{S_J(e_1, e_2) + S_T(e_1, e_2) + S_Y(e_1, e_2)}{3} \right)$$

Equation 6. Similarity Function Of Experience Attribute

Regarding the qualification attribute, it encompasses both the degree level and field. The degree level, being predefined, utilizes a matching function similar to those for city and industry, as outlined in Equation 7, and requires no preprocessing. Conversely, the qualification field, while also predefined, permits user input, and thus necessitates preprocessing prior to calculating the matching score. The field similarity function, similar to those used for skills and job titles, is detailed in Equation 8. Qualification is a multi-valued attribute, and thus requires an additional function to identify the optimal match between the qualifications listed in the job offer and those in the CV, as demonstrated in Equation 9.

$$S_q(q_1, q_2) = \begin{cases} 0, & \text{if they don't match} \\ 1, & \text{if they match} \end{cases}$$

Equation 7. Similarity Function Of Qualification Degree Level

$$S_F = \frac{|Q Field_{JobOffer} \cap Q Field_{CV}|}{|Q Field_{JobOffer}|}$$

Equation 8. Similarity Function Of Qualification Field

$$S_{qualifications} = \max_{q_1 \in JobOffer} (\max_{q_2 \in CV} S_q(q_1, q_2))$$

Equation 9. Similarity Function Of Qualification

Once the similarity measures for each attribute are calculated, they are combined together to calculate the final similarity score between the job seeker's CV and the job offer's details by taking their weighted sum, as shown in Equation 10. Each attribute similarity score is multiplied by two distinct factors: $w_{attribute}$, which indicates the weight of the attribute in the similarity measure (ranging from 0 to 1), and $a_{attribute}$, denoting the presence or absence of the attribute in the job offer details (0 or 1). The weights are customized by the job provider on the 'Add Offer' page to set the preferred distribution of attribute importance, ensuring that the sum of the weights equals 1. The similarity measure is asymmetric and starts from the attributes that are available in the job offer, making it adaptable to missing information. Equation 10 illustrates the finalized similarity measure between a specific job offer and a CV.

$$S = \sum_{attribute \in JobOffer} a_{attribute} w_{attribute} S_{attribute}$$

Equation 10. Final Similarity Equation

3.3 Similarity Scores Usage In Watheq System

These calculated similarity measures are integral to the functionality of Watheq's recommendation system. They are used in three main parts of the application. Job providers can sort received applications based on these similarity scores, ensuring that candidates who most closely match the offer requirements are prioritized on the application list page. Additionally, when a new job offer is posted, automatic notifications are sent to job seekers whose similarity scores surpass the cut-off threshold, which is determined by the job providers on the 'Add Job Offer' form. Furthermore, Watheq enhances its service to job seekers by offering personalized job recommendations, presenting them with the most relevant and promising opportunities to explore and pursue.

3.4 Illustrating Watheq's Recommendation System In Practice

An illustrative example is presented in this section to demonstrate how Watheq's recommendation system revolutionizes the hiring journey by efficiently pinpointing the most qualified candidates. This example shows a specific case about a job offer that specifically targets the role of Cybersecurity Analyst, encompassing essential job details categorized into four attributes crucial for similarity scoring as follows:

1. Based in Riyadh city.

2. Required skills in job offer:

Skill 1: Proficiency in network security protocols and tools.

Skill 2: Strong analytical and problem-solving skills.

Skill 3: Excellent communication and teamwork abilities.

3. Accepted qualifications in job offer:

Qualification 1: Bachelor's degree level in the field of Information Technology.

Qualification 2: Master's degree level in the field of Cyber Security.

4. Accepted experiences in job offer:

Experience 1: A minimum of 5 years of experience in the Information Technology industry with a job title of IT Security Specialist.

Experience 2: A minimum of 2 years of experience in the Administrative and Clerical industry with a job title of Compliance Coordinator.

This specific job offer emphasizes three key attributes, with varying weights assigned to each by the job provider: qualifications and experience are weighted at 40% each, while skills are given a weight of 20%. The city attribute is entirely excluded, with a 0% weight, reflecting the company's focus on candidates' suitability for relocation. To maintain a high standard, a minimum matching threshold of 80% is set by the job provider, ensuring that notifications are only sent to candidates with an 80% or higher alignment with the job requirements.

Table 3 illustrates two job seekers' CVs. The first job seeker's CV closely aligns with the job requirements, receiving a notification due to a 94% match. Notably, the candidate's location in Jeddah is irrelevant, as the city attribute carries no weight in the matching process.

In contrast, the second job seeker applied for the same job offer but had a CV that deviated significantly from the job requirements. Consequently, this candidate received a notably low matching score of 59% during the sorting process conducted by the job provider.

Table 3. CVs Information and Similarity Scores

CV	Attribute	Attribute Value	Attribute Similarity	Final Similarity
CV#1	City	Jeddah	0	94%
	Skills	<ul style="list-style-type: none"> • Powerful In Communication And Teamwork Abilities • Contain Analytical And Problem-Solving Skills • Proficiency In Operating System Security 	0.7	
	Qualifications	<ul style="list-style-type: none"> • Bachelor's degree level in the field of Information Technology. • Master's degree level in the field of Cyber Security. 	1	
	Experiences	<ul style="list-style-type: none"> • 2 years of experience in the Information Technology industry with a job title of IT Security Specialist. • 3 years of experience in the Administrative and Clerical industry with a job title of Compliance Coordinator. 	1	
CV#2	City	Jeddah	0	59%
	Skills	<ul style="list-style-type: none"> • Excellent Communication And Teamwork Abilities • Strong Analytical And Problem-Solving Skills 	0.6	
	Qualifications	<ul style="list-style-type: none"> • Master's degree level in the field of Communication • Bachelor's degree level in the field of Business Administration 	0.5	
	Experiences	<ul style="list-style-type: none"> • 6 years of experience in the Administrative and Clerical industry with a job title of Administrative Specialist. 	0.67	

CHAPTER.4

Watheq's Interview Simulation

4 Watheq's Interview Simulation

The AI-generated interview simulation is a pivotal feature of our system designed to provide a dynamic and interactive interview experience. This feature is particularly focused on enabling job seekers to practice interview scenarios by engaging in a conversational interface where they interact with an AI assistant that simulates an interviewer. The system simulates interactive interview scenarios that adapt dynamically to user responses based on their CVs and job descriptions, enhancing the realism and relevance of each simulated interview. This chapter outlines the implementation details, technology stack, the approach used, and the libraries and methods employed to realize this functionality.

The front end, developed in Flutter, serves as the interactive interface for users. It handles inputs such as user responses to interview questions and displays questions generated by the AI. This component ensures a smooth user experience by dynamically updating the UI to reflect the conversation's progress. The front end communicates with the PHP backend through HTTP POST requests, sending user responses and receiving subsequent questions in JSON format.

The PHP backend acts as a conduit between the frontend application and the backend Python script responsible for content generation. Upon receiving data from the frontend, the PHP script processes this information and manages the flow of the interview. It retrieves necessary details from the database, such as the user's CV and job offer details, and formats this information into a comprehensive context. This context is then sent to the Python script to generate appropriate interview content.

In the "start" phase of the interview, the PHP script gathers comprehensive data, organizing user qualifications and job requirements into a structured format. For subsequent interactions ("next" and "last" phases), it forwards the user's latest responses along with the interview context to the Python backend, which then prompts the OpenAI model to continue the conversation or conclude it with summative feedback.

The Python backend is critical for interfacing with the OpenAI Assistants API [32] using a specific Assistant ID created via OpenAI. It handles the creation and management of "Threads" and "Messages" within the OpenAI environment, maintaining a coherent and context-aware dialogue throughout the interview. Depending on the interview stage, it adjusts its instructions to the OpenAI API, requesting initial questions, follow-up inquiries, or final feedback based on the full conversation context.

At the core of the system is the Assistant created via the OpenAI API, powered by the GPT-3 model. GPT-3 (Generative Pre-trained Transformer 3) [33] is an advanced language processing AI model known for its ability to generate human-like text.

This Assistant is strategically configured to function as an interviewer and adapt its behavior and responses based on instructions tailored for each stage of the interview process. It is utilized in this system to generate context-aware questions that are relevant to the user's CV and the job description and provide realistic and constructive feedback based on the user's responses throughout the interview.

The interaction with the API is managed through HTTP requests where the body of the request contains the conversation's context, user responses, and specific instructions for the AI to follow. These instructions are following the best practices in prompt engineering to help tailor the AI's responses to fit the simulated interview scenario, ensuring that the questions are pertinent, and the feedback is meaningful.

The Assistant's role extends beyond merely generating responses; it initiates and manages ongoing dynamic conversations through a structured system of Threads and Runs. Within this system, each conversation with a user is encapsulated within a Thread, a continuous dialogue session maintained by the Assistant throughout the interview. This architecture ensures that both user inputs and AI responses are meticulously logged as "Messages" within each Thread, helping to preserve the flow of conversation and maintain context between exchanges.

For each interaction, the system creates a "Run" where the Assistant analyzes the latest message and crafts responses based on the accumulated conversation history. These Runs represent the operational phases during which the Assistant processes all historical and contextual data of the conversation. This structured approach ensures that each response generated by the Assistant is not only informed by immediate inputs but also enriched by the entire conversation history, thus maintaining a coherent and contextually appropriate dialogue throughout the session.

The Python script is a key component of the AI-generated interview simulation system, designed to interact with the OpenAI API for dynamic and context-aware conversations. This script utilizes several Python libraries, including "json" [34] for parsing and constructing JSON objects which are crucial for formatting requests and responses to and from the OpenAI API, "openai" [35] to facilitate interactions with OpenAI's API allowing us to leverage OpenAI's Assistant functionalities using the API Key, "time" [36] for managing delays and timeouts in API interaction, and "sys" [37] for accessing system-specific parameters, particularly for handling command-line arguments that dictate the script's execution flow. These libraries ensure that the script can effectively manage the flow of data and maintain seamless interaction throughout the interview process.

Central to the script's functionality are several functions that manage the interview from initiation to conclusion. The "start_interview" function initiates the interview process by creating a new thread where all interactions are stored and sending an initial context to the AI emphasize starting the conversation formally, using keywords like "greeting" and "introduce yourself," which instruct the AI to prompt the candidate to provide a structured introduction similar to that expected in a real-life interview. This thread creation and message submission are handled by the "create_thread_and_run" function, which not only starts the thread but also manages the ongoing dialogue by setting specific instructions for the AI to frame its responses appropriately.

Sending the messages within the thread is managed through the "submit_message" function, which sends user inputs and specific instructions adjusted dynamically with each call to the Assistant within the created thread. This function is crucial for maintaining the flow of the interview, ensuring that each AI response is contextually aligned with the user's previous inputs and the overall interview scenario.

As the interview progresses, the script handles the flow of questions and responses through the "next_question" function, fetching subsequent questions from the Assistant by submitting the latest user response and waiting for the AI's next question. Here, the instructions are complex and crafted to ensure depth in the interview enriched with keywords such as "CV information," "job offer details," and "HR-related topics." These keywords ensure that the AI's questions are comprehensive and cover essential aspects of a job interview, including probing the candidate's qualifications, understanding their response to the job specifics, and discussing broader HR concerns like strengths and weaknesses.

The synchronization between the AI's processing time and user interaction is meticulously managed by the "wait_for_run_completion" function. This function polls the OpenAI API to check if the AI has completed processing the user's latest input, ensuring real-time responsiveness.

For concluding the interview, the "generate_feedback" function compiles all prior interactions to generate comprehensive feedback. The instructions shift to focus on wrapping up and delivering feedback, using keywords such as 'end the interview,' 'feedback,' 'strengths,' and 'evaluation.' These guide the Assistant to summarize the entire interview, assess the candidate's responses, and provide constructive feedback based on the dialogue, providing crucial insights that can significantly improve their future performance.

Execution of these functions is controlled via command-line arguments, managed through the PHP layer which determines whether to initiate an interview, continue to the next question, or end the interview with feedback. This approach allows the script to dynamically adapt to different stages of the interview based on user input and interaction flow. Each command-line

directive triggers specific functions within the script, making it highly responsive and adaptable to the needs of the interview simulation.

In conclusion, the AI-generated interview simulation feature showcases an innovative use of AI technology to enhance job preparation tools, leveraging OpenAI's powerful GPT-3.5 model to provide a nuanced and valuable tool for job seekers. This system offers a realistic, interactive environment that not only demonstrates the potential of AI in educational and preparatory applications but also enhances the user's ability to perform under interview conditions, thereby improving their chances in competitive job markets. Table 4 shows an example of an interview simulation for a specific job seeker and job offer, while Table 5 contains the details of the job seeker's CV and job offer. Note that Table 5 contains only the important information that we use in the interview simulation code, not all the details of the CV or the offer.

Table 4. Interview Simulation Example

Interview Simulation		
#	The Question	The Answer
1	Hello Ahmed, could you introduce yourself?	I am Ahmed Alsulaiman, a web developer from Riyadh, with five years of experience. I hold a bachelor's degree in computer science.
2	What makes you interested in the Software Developer position we have available?	I am excited because it offers the opportunity to expand my technical skills beyond web development into more diverse and complex software projects.
3	What is the most challenging project you have worked on as a web developer?	The most challenging project I worked on as a web developer was developing a real-time e-commerce platform for a large retail client.
4	How do you handle tight deadlines and pressure in your previous work experiences as a Software Developer?	I handle tight deadlines and pressure as a Software Developer by prioritizing tasks, managing time effectively, and remaining adaptable.
5	How do you plan to leverage your proficiency in Python and JavaScript frameworks in the role of Lead Software Developer in our team?	Well, I guess I'll just do what I know and hope for the best.
6	How do you generally approach learning new technologies or skills in the realm of software development?	I approach learning new technologies in software development through research, hands-on practice, continuous learning, and collaboration.
7	It sounds like you're committed to continuous self-improvement in your developer skills. How do you plan to incorporate React Native into your existing skill set?	I plan to incorporate React Native by learning its fundamentals, building practical projects, and engaging with the community.

8	What experience do you have in managing a team of developers, and how do you plan to apply this experience to the Lead Software Developer position?	I've managed a team of developers before, but it was a bit chaotic. I mean, I tried to keep everyone on track, but it was hard to juggle everyone's schedules and priorities.
9	Given your previous team management experience, how do you plan to address and improve your team coordination and project management skills in this Lead Software Developer role?	I plan to prioritize clear communication, define roles clearly, invest in effective planning, leverage collaborative tools, and foster a culture of continuous improvement.
10	It seems like you have a solid plan to improve team coordination and project management skills in this role. How do you handle feedback and criticism in the workplace to ensure personal and professional growth?	I handle feedback and criticism by staying open-minded, evaluating feedback objectively, seeking input regularly, and learning from mistakes.
Feedback	<p>This is the end of the interview and here is the feedback:</p> <p>Strengths:</p> <p>You effectively highlighted your interest in expanding your technical skills and taking on more diverse software projects.</p> <p>You demonstrated your experience in managing tight deadlines and pressure by prioritizing tasks effectively.</p> <p>You expressed a commitment to continuous learning and self-improvement in the field of software development.</p> <p>You outlined a proactive approach to incorporating new technologies, such as React Native, into your skill set.</p> <p>Areas for Improvement:</p> <p>When asked about handling a chaotic team, it would be beneficial to focus more on specific strategies you employed to bring order and improve team performance.</p> <p>When discussing your interest in the Lead Software Developer role, it would be more beneficial to express confidence in utilizing your current skills and enthusiasm for developing new ones.</p> <p>Suggestions for Future Interviews:</p> <p>Provide more concrete examples when describing your experiences and strategies, showcasing specific achievements and solutions.</p> <p>Emphasize your ability to adapt and learn quickly, along with your passion for taking on new challenges in software development roles.</p> <p>Overall, you have a strong foundation in software development with a clear direction for your professional growth. Keep refining your communication of experiences and strategies to make an even more compelling case for future roles.</p>	

Table 5. CV And Job Offer Details

CV and Job Offer Details	
CV	<p>Name: Ahmed Alsulaiman</p> <p>About Me: I am Ahmed Al-Sulaiman, a web developer from Riyadh, Saudi Arabia, with five years of experience. I hold a bachelor's degree in computer science and am proficient in JavaScript, HTML, CSS, with some knowledge of SQL. I specialize in both front-end and back-end development.</p> <p>Skills: JavaScript, HTML, CSS, AngularJS, Node.Js, Python, React</p> <p>Experience: Information Technology: Software Developer, 2020.01 - Current</p>
Job Offer Details	<p>Job Title: Software Developer</p> <p>Job Description: Seeking an experienced Lead Software Developer to manage a dynamic team working on advanced web and mobile applications. Strong proficiency in Python and JavaScript frameworks required.</p> <p>Required Skills: Python, JavaScript, HTML, React Native, Django</p> <p>Required experience: Information Technology: Software Engineer, 3 years of experience.</p>

CHAPTER.5

System Design and Development

5 System Design and Development

This chapter focuses on describing our system to provide a deeper understanding of its functionalities, its users, and the design and development process. It begins with the methodology section, which presents the general approach used in developing the software. The system requirements section follows, divided into five parts: system users, requirements elicitation and analysis, user interactions, and the project's roadmap alongside the product backlog. The system users section describes our product's general characteristics to clarify whom it serves. The requirements elicitation section explains the techniques used to gather the application's requirements, including a questionnaire distributed to targeted users, with the results presented. The user interactions section displays the use case diagrams for the system. The product roadmap and backlog for the Watheq platform are also discussed. The third section covers the system design, including architectural diagrams, class diagrams, and component-level designs. The fourth section outlines the data design for the database. The fifth section is dedicated to interface design, including the sitemap. The sixth and final section details the implementation of the system.

5.1 Methodology

The Agile approach to software development is used in this project and consists of methodologies that emphasize flexibility and teamwork. It highlights iterative and incremental delivery, adaptive planning, and evolutionary development. Agile encourages adapting flexibly to changes and strongly emphasizes involving the customer throughout the development process.

The Scrum framework, a specialized application of Agile methodology, is extensively utilized in software development, and it is also used in this project. It integrates a coherent set of roles, events, and artifacts to structure project management and execution effectively. The roles within this framework include: the Scrum Master (Dr. Hessah Alsaaran), responsible for guiding the team through the Scrum process and ensuring compliance with Scrum principles; the Product Owner (Dr. Hessah Alsaaran), who champions stakeholder interests and manages the product backlog, and the Development Team (Shouq Alyousef, Sarah Alhamdi, Raghad Alhindi, Alhanouf Alsaif, Danah Alshathri), tasked with delivering functional increments at each sprint's conclusion. This structured approach ensures disciplined, yet flexible execution of development tasks.

For the events, we have the following: Sprint Planning, where the team convenes to outline the tasks for the upcoming sprint; Daily Scrum, a brief daily meeting to discuss progress and plan for the next day; Sprint Review, in which the team presents the work accomplished during the sprint and receives feedback from the Product Owner; and Sprint Retrospective, where the team reflects on the past sprint and identifies opportunities for improvement.

For the artifacts, we have the following: the Product Backlog, a prioritized list of features and requirements for the product; the Sprint Backlog, a selection of items from the Product Backlog that the team commits to completing during the sprint; and the Increment, the outcome of each sprint, comprising a usable and potentially releasable product increment.

Our team diligently applied Agile principles, emphasizing flexibility and adaptability throughout our project's lifecycle. We conducted daily meetings to monitor progress and strategize for the following day. Additionally, our sprint planning and review sessions facilitated detailed discussions about upcoming tasks and served as a platform for receiving feedback from the product owner. We utilized the Scrum framework as our procedural guide, making necessary adjustments to align better with the project's objectives. Through regular sprint retrospectives, we critically assessed our processes and integrated constructive feedback to optimize our workflow.

GitHub¹ and Jira² are essential tools in Agile software development, enhancing team management and workflow tracking. GitHub, a web-based platform for version control and collaboration, centralizes code storage and sharing. It tracks changes and manages code reviews, facilitating effective collaboration. In our project, GitHub stored our codebase, managed branches, and promoted code sharing. Jira, a project management and issue tracking tool, organizes tasks, bugs, and project-related items. It serves as a central hub, enabling seamless collaboration and communication. We used Jira to create and manage user stories, track progress, and plan sprints, boosting team efficiency. Together, GitHub and Jira streamlined our development process.

¹ <https://github.com/WatheqPlatform/2023-GP1-1.git>

² https://jira.external-share.com/issue/101788/2023-1st-gp1_@_board_share

5.2 System Requirements

5.2.1 System Users

Watheq offers its services to two primary user categories: job seekers and job providers.

Job Seekers are individuals aged 18 or older who are actively searching for employment opportunities. The main functions provided for them on the platform include job searching and application submission, viewing recommended job offers, receiving recommended new job notifications, and AI interview simulations. They should be familiar with using mobile applications since the platform primarily serves them through this medium. Additionally, they should have basic English knowledge to use the app effectively.

Job Providers include organizations such as ministries and companies with job vacancies that need to be filled. We provide a web application for this category, so they should be familiar with using it. The primary functions provided to them include posting new job offers, sorting the applications for each offer, and expediting the job vacancy filling process by notifying the most qualified seekers when they post the offer. Additionally, they should have basic English knowledge to use the app effectively.

5.2.2 Requirements Elicitation and Analysis

To gain a deeper understanding of stakeholders' requirements, we designed an online survey using Google Forms, targeting job seekers, job providers, and employees aged 18 or older. Although the target users are job seekers and employers, we included employees to understand the challenges they faced during their job search and what could have helped them. The survey questions were divided into three main sections: the first section consisted of general questions aimed at gathering demographic information from the respondents. Subsequently, respondents were directed to either the job providers' section or the job seekers/employees' section based on their selected type. Both of these sections contained questions intended to gather information about the challenges they encounter in the employment process and to assess their need for specific core functions that Watheq will provide. The survey form is included in Appendix B.

- **General Questions Section**

After creating the survey, we distributed it to our target users through WhatsApp, LinkedIn, and other channels. Additionally, leveraging our network of contacts, we successfully collected responses from job providers such as SABIC, the Ministry of Communication and Information Technology (MCIT), the Ministry of Investment (MISA), and others. In total, we collected 100 responses, with 60% of them being job seekers, 15% employees, and 25% job providers. Our survey data revealed that the largest age group among respondents was 18-22 years old, constituting 56% of the total, followed by 25% of respondents aged 31 or older, then 10% aged 23-25, while the smallest age group was 26-30, accounting for 9% of the responses. Figure 12 shows the responses to the questions.

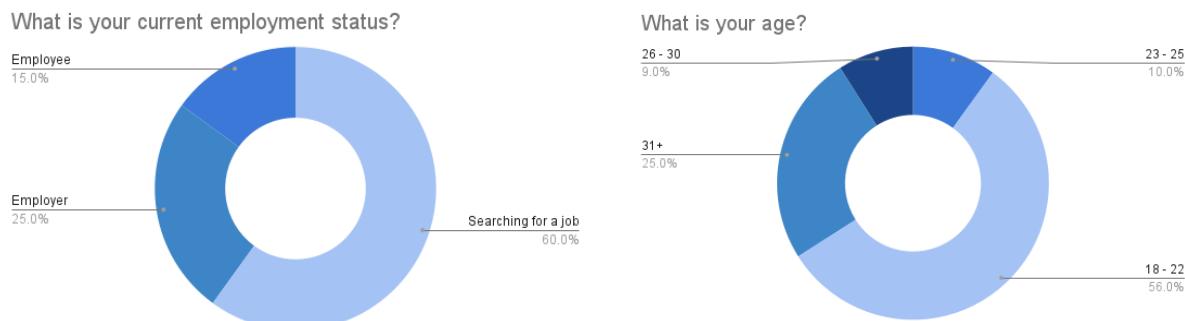


Figure 12. General Questions and Responses (Part 1)

Within the survey, we inquired about two critical attributes for optimizing the use of the Watheq platform as shown in Figure 13. The first attribute was respondents' proficiency in using mobile and web applications, with 71% confirming their ability to use them effectively. The second attribute was their English language proficiency, as Watheq exclusively supports English. Our findings indicated that 53% of respondents possessed an intermediate level of English proficiency, 38% had an advanced level, and 9% had a basic level.

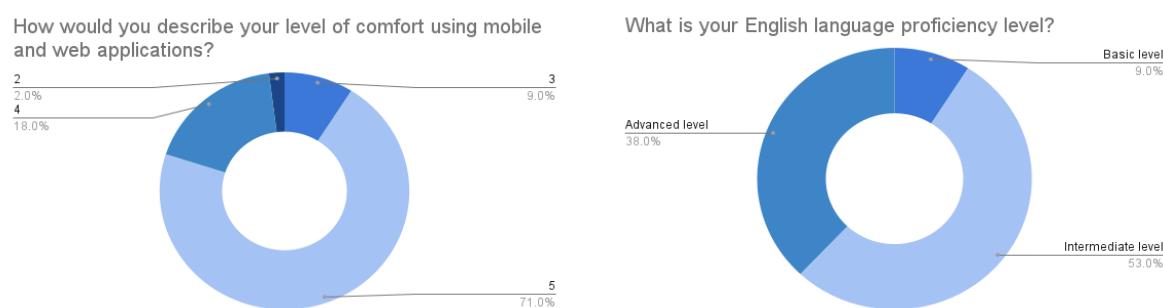


Figure 13. General Questions and Responses (Part 2)

- **Job Seekers/ Employees' Questions Section**

The second section of the survey contained questions for job seekers and employees. In this section, we gathered valuable insights from their responses to eight key questions. Figures 14 and 15 display these questions along with their corresponding responses.

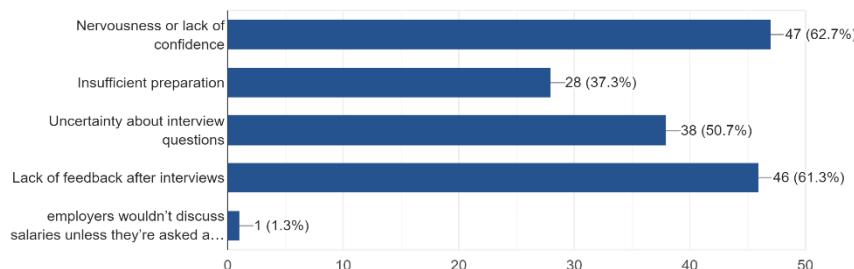
The first question aimed to discover the pain points in the job searching process. Many respondents, constituting 68%, expressed their difficulty in locating appropriate job listings. Additionally, a significant 40% struggled to identify job offers that aligned with their qualifications. Approximately 43% of participants noted that job requirements often lacked clarity, leading to ambiguity during the application process. Furthermore, 60% of respondents shared their frustration regarding the absence of responses after submitting job applications. The second question aimed to gain insights into the challenges faced during job interviews. A substantial 62.7% of respondents reported experiencing nervousness or a lack of confidence during real interviews, which can be attributed to uncertainty about interview questions, as indicated by 50.7% of respondents, and insufficient preparation, as indicated by 37.3%. Furthermore, 61.3% of the responses indicated a lack of feedback after interviews.

Moreover, when we asked about how beneficial they find a platform that offers an AI-driven mock interview, 45.3% found it to be extremely beneficial, indicating a strong desire to enhance their interview skills with technology. Additionally, a substantial 68% believed that an application assisting in job searches would be highly beneficial. Furthermore, 68% expressed that they are extremely interested in features that send job notifications based on their qualifications, and an equal percentage showed enthusiasm for personalized job recommendations. Finally, a significant 81.3% favored using the mobile app version rather than the website. Thus, the most suitable application type for job seekers is a mobile application.

In response to the open-ended question about desired features for a job seeker application, several valuable suggestions emerged. One of the suggestions emphasizes the importance of a user-friendly interface, and Watheq is committed to delivering a well-designed UX/UI to ensure an excellent user experience. Additionally, some respondents expressed a desire for application progress tracking, whether it is pending, accepted, or rejected, and Watheq plans to address this need by implementing an application status-tracking feature. They also requested the implementation of features that are already planned to be part of Watheq platform such as job filtering based on city and interview preparation to enhance their readiness for real interviews. Another suggestion was to facilitate communication between job seekers and employers. While this is an essential feature, due to project time constraints, Watheq will primarily rely on contact information for communication.

What challenges do/did you encounter during job interviews? (Select all that apply)

75 responses



What problem do/did you face when searching for job opportunities? (Select all that apply)

75 responses

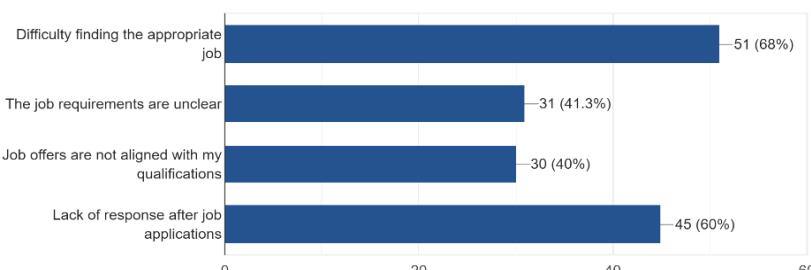
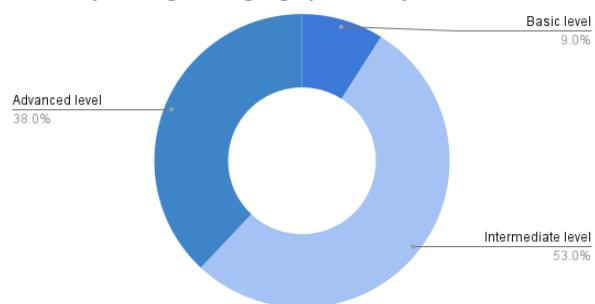
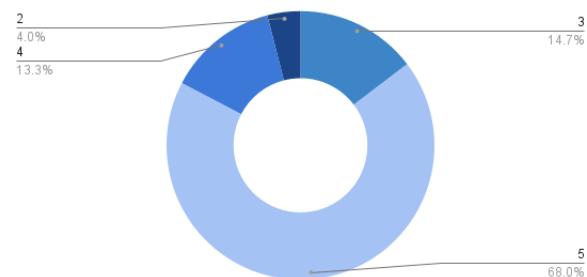


Figure 14. Job Seekers/ Employees' Question and Responses (Part 1)

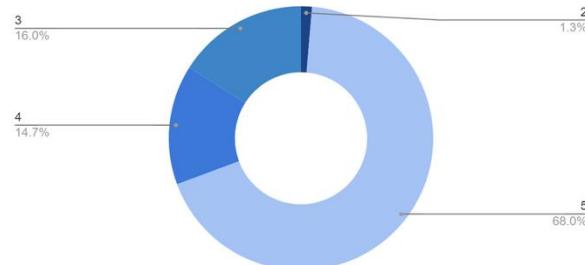
What is your English language proficiency level?



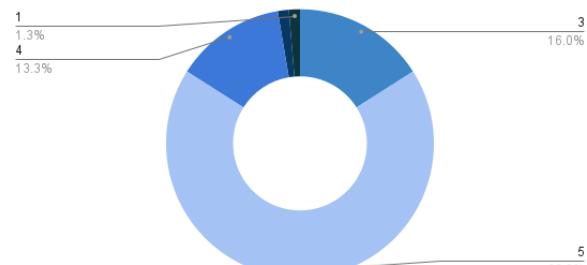
How beneficial do/did you find the idea of an application helping you search for suitable job opportunities?



How interested are you in a feature that sends you notifications about new job offers based on your qualifications?



How interested are you in a feature that recommends some job offers for you based on your qualifications?



Would you prefer to use our application as a mobile app or a Web app?

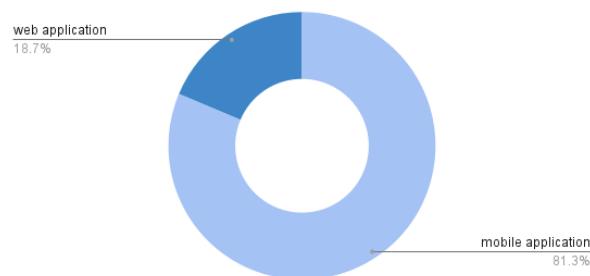


Figure 15. Job Seekers/ Employees' Questions and Responses (Part 2)

- **Job Providers' Section**

The third section of the survey contained questions for job providers from various companies and institutions. In this section, we gathered valuable insights from their responses to six key questions. Figure 16 displays these questions along with their corresponding responses.

First of all, we wanted to learn more about the challenges faced by employers when they have a job vacancy. Results show that 80% of employers had significant difficulties in finding qualified candidates when they had job vacancies. Additionally, 64% of them found the application review process to be time-consuming. A smaller fraction, 12%, expressed uncertainty about applicant qualifications.

Furthermore, managing job applications and reviewing applicants' CVs posed significant challenges for 76% of employers. Afterward, we proposed some of Watheq's features to assess their needs, and they highly agreed on their benefits. When asked about the idea of an application that allows them to sort job applications by the similarity between applicant CVs and job descriptions, a significant 88% of employers found this concept to be extremely beneficial. Similarly, 76% strongly supported the idea of an application that helps them post job vacancies and notify the most qualified job seekers. Lastly, a substantial majority, 96%, preferred using the web application version rather than a mobile application. Thus, the most suitable application type for job providers is a web application.

In response to the open-ended question about desired features for a job provider application, several valuable suggestions were collected. Among the suggestions provided by job providers, one prominent idea was to implement an auto-regret feature for applications that don't match the job requirements. Watheq's approach, however, differs slightly. Instead of auto-regret, Watheq will empower job providers by allowing them to view all job applications sorted by the level of similarity between applicant CVs and job descriptions. This feature enables job providers to make more informed decisions because auto-regret may reject some job seekers who may appear at the end of the sorted list but possess some relevant experience or qualifications that may be valuable to the job provider. Another valuable suggestion was to help job providers prevent additional job applications for a position once they find a suitable candidate. Watheq plans to address this need by allowing job providers to close a job offer.

This feature provides flexibility and control over the application process, allowing employers to manage their job vacancies more efficiently. Additionally, there was a suggestion for a user-friendly interface, and Watheq will provide a well-designed UX/UI to ensure a great user experience.

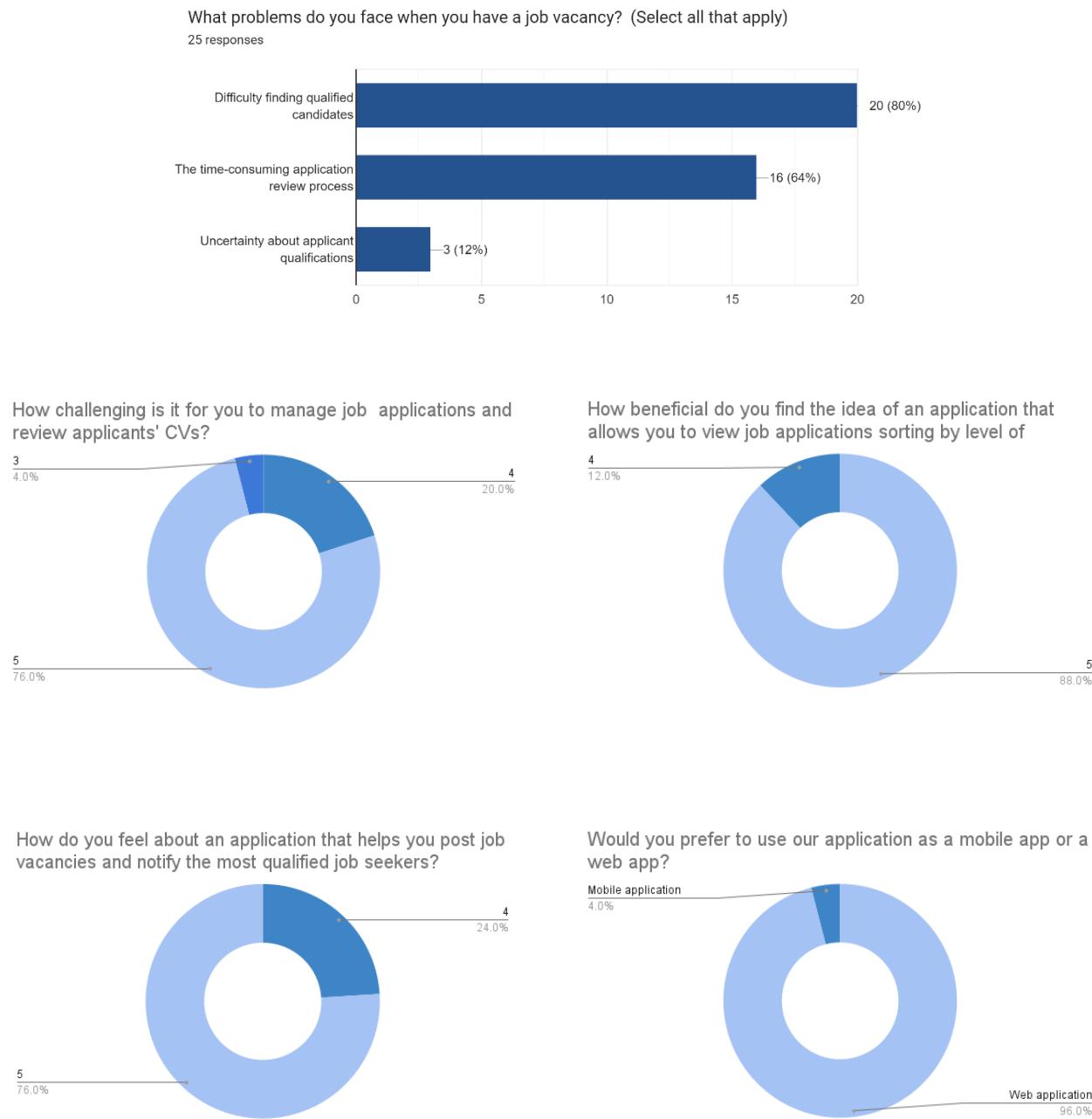


Figure 16. Job Providers' Questions and Responses

- **Conclusion**

In conclusion, the survey results highlight the significant demand for an application like Watheq among job seekers and job providers. Job seekers expressed a strong interest in features that assist in job searching, improve interview skills, and provide personalized recommendations, with a clear preference for using the mobile application. Job providers, on the other hand, showed enthusiasm for tools that simplify the employment process, particularly in job posting and reviewing applicants' qualifications. They also preferred using the web application version. These findings offer valuable guidance for the further development of Watheq, with a focus on addressing the unique needs and preferences of both job seekers and providers. By implementing features such as application progress tracking, AI-driven mock interviews, and advanced sorting options, Watheq aims to enhance the overall job-seeking and hiring experience for all users.

5.2.3 User Interactions

Figure 17 shows the user interactions with the Watheq Platform through the Use Case Diagram.

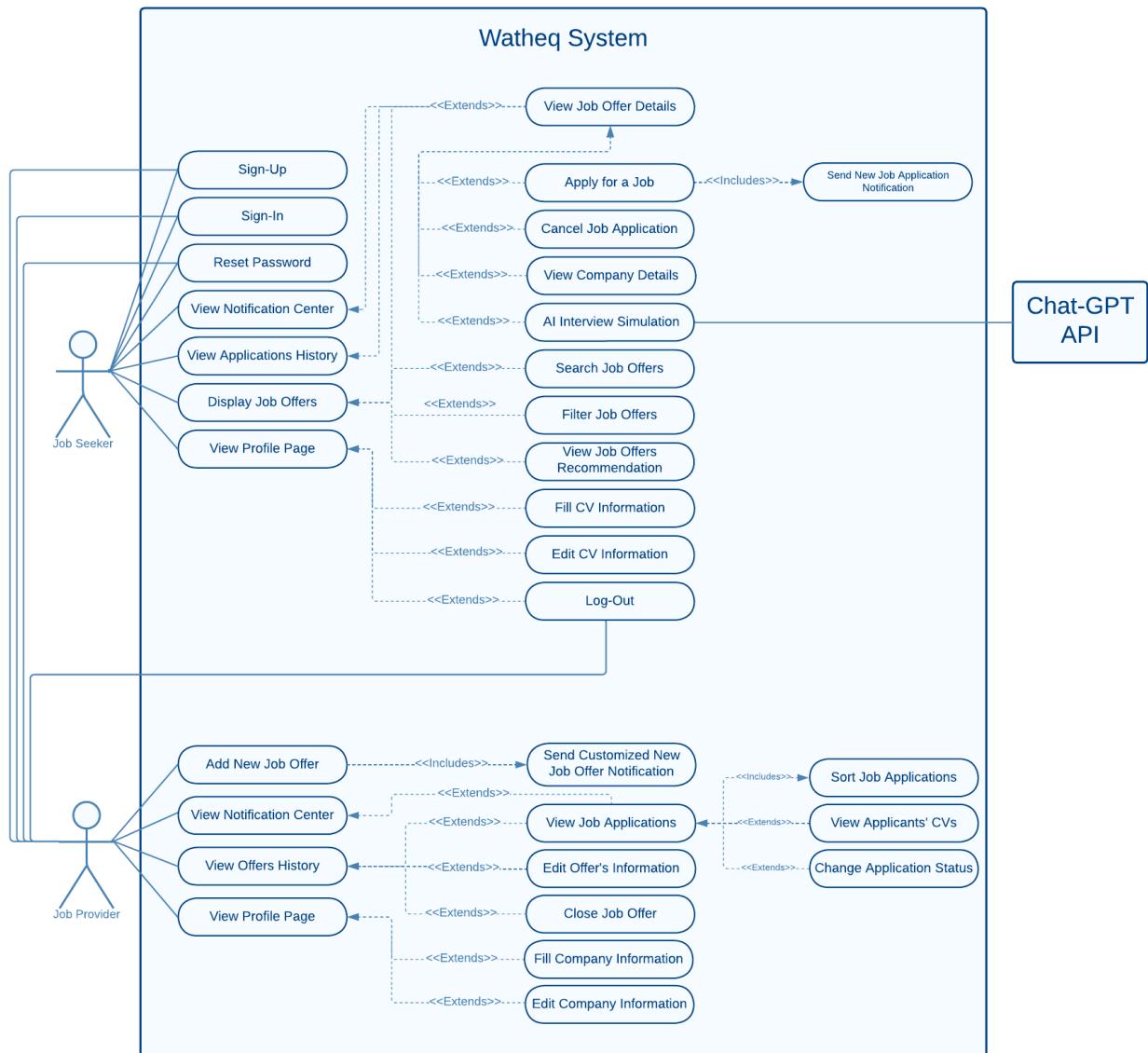


Figure 17. The Watheq Platform Use Case Diagram

5.2.4 Roadmap and Product Backlog

As shown in Figure 18, the product roadmap for the Watheq platform outlines the development timeline and feature releases from October 2023 to May 2024. In October 2023, the focus is on preparing the project report, including background research, system description, and creating a product backlog, alongside setting up tools like required IDEs, GitHub, and Jira. By November 2023, basic authentication, and job-related functionalities for both job providers and job seekers, such as sign-up, log-in, reset password, and job offer management, are implemented. December 2023 marks the first release (R1), introducing features like viewing job applications, updating application status, and enhanced CV management for job seekers. February 2024 adds the main job recommendation system components and capabilities for sending customized job offer notifications and a notification center for job seekers, in addition to sorting for job applications. In March 2024, the focus shifts to profile and company information management, along with AI-based interviews and detailed company views. The second release (R2) in May 2024 includes editing job offer details, viewing notifications, job offer recommendations, and sending new job application notifications, rounding out the feature set for the platform.

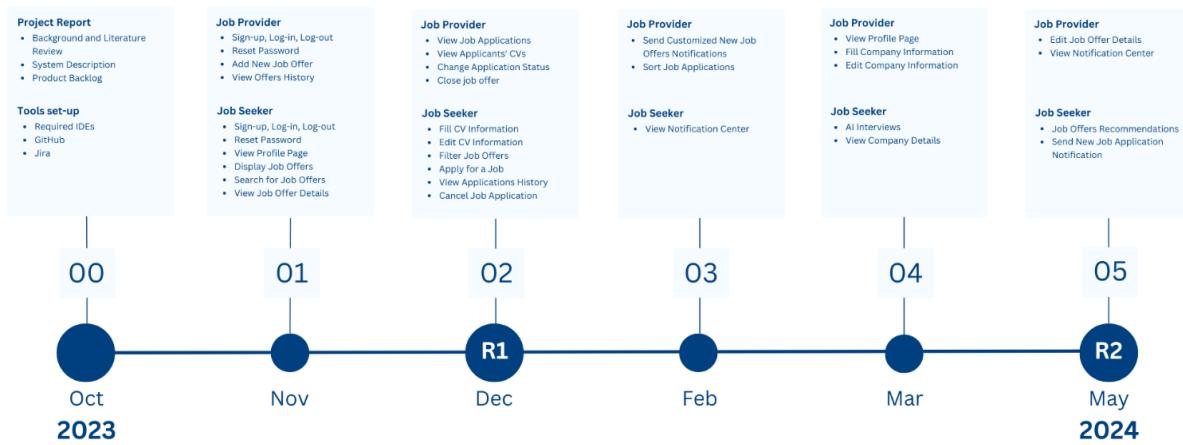


Figure 18. The Watheq Platform Roadmap

Table 6 displays the Product Backlog table for the Watheq platform, and it contains the user stories for functional and non-functional requirements.

Table 6. The Watheq Platform Product Backlog

#	PBI	Size	Type	Status	Acceptance Criteria
1	As a job provider, I want to sign up so that I can have an account to use the website's services.	2	Feature	Done	<p>If the job provider fills in their information, including the name of the company, email, and password, on the registration page, and clicks on the "Sign up" button, then the system should verify whether the user already exists in the database.</p> <p>If the email is new, then a confirmation message should appear, and they should be redirected to the login page.</p> <p>If the email already exists in the database, then a message will be displayed suggesting that they should log in instead.</p> <p>If the job provider fails to fill in any of the required fields. then the system should prompt them to complete all fields.</p> <p>If the job provider enters a password that is less than 8 characters or doesn't contain at least one number, character, capital, and small letters, then an error message should appear.</p>
2	As a job provider, I want to log in so that I can enter my account and use the website's services.	2	Feature	Done	<p>If the job provider enters their information, consisting of their email and password, and clicks on the "log in" button, then the system should verify that the email already exists in the database and that the password is correct before redirecting the user to the home page.</p> <p>If the email does not match any record in the database or the password is incorrect, then an error message will be displayed.</p>
3	As a job provider, I want to log out so that I can exit my account.	2	Feature	Done	If the job provider clicks on the logout button on the home page, then they will exit their account and lose access and privileges until the next login.

#	PBI	Size	Type	Status	Acceptance Criteria
4	<p>As a job provider, I want to be able to reset my password so that I could access my account if I forgot my password.</p>	3	Feature	Done	<p>If the job provider clicks on "Forgot Password?" on the login page, then a password reset form will appear where the user can input their email address.</p> <p>If the job provider submits the email and the email exists in the database, then a unique and time-limited password reset link will be sent to the provided email address.</p> <p>If the job provider clicks the password reset link, then they will be redirected to a secure page for setting a new password.</p> <p>If the job provider enters a password that is less than 8 characters or doesn't contain at least one number, character, capital, and small letters, then an error message should appear.</p> <p>If the job provider enters a new password and clicks "Reset", then a confirmation message will appear, and the password will be updated in the database.</p>
5	<p>As a job seeker, I want to sign up so that I can have an account to use the application services.</p>	2	Feature	Done	<p>If the job seeker fills in their information, including their full name, email, and password, on the registration page and checks the box to indicate agreement with the terms, then the system should verify whether the user already exists in the database.</p> <p>If the email is new, then a confirmation message should appear, and they should be redirected to the login page.</p> <p>If the email already exists in the database, then a message will be displayed suggesting that they should log in instead.</p> <p>If the job seeker fails to complete the required fields or agree to the terms, then the system should prompt them to do so before proceeding.</p> <p>If the job seeker enters a password that is less than 8 characters or doesn't contain at least one number, character, capital, and small letters, then an error message should appear.</p>

#	PBI	Size	Type	Status	Acceptance Criteria
6	As a job seeker, I want to log in so that I can enter my account and use the application services.	2	Feature	Done	<p>If the job seeker enters their information, consisting of their email and password, and clicks on the "Log in" button, then the system should verify that the email already exists in the database and that the password is correct before redirecting the user to the home page.</p> <p>If the email does not match any record in the database or the password is incorrect, then an error message will be displayed.</p>
7	As a job seeker I want to be able to reset my password so that I could access my account if I forgot my password	3	Feature	Done	<p>If the job seeker clicks on "Forgot Password?" on the login page, then a password reset form will appear where the user can input their email address.</p> <p>If the job seeker submitted the email and the email exists in the database, then a unique and time-limited password reset code will be sent to the provided email address and the user will be directed to another page to enter the code.</p> <p>If the user entered the correct code and the reset time didn't expire and clicked on "Verify" button, then they will be directed to another page to set a new password</p> <p>If the code is incorrect or the reset code has expired, then an error message should appear.</p> <p>If the user clicked on "Re-send" button, then a new reset code will be sent.</p> <p>If the job seeker enters a password that is less than 8 characters or doesn't contain at least one number, character, capital, and small letters, then an error message should appear.</p> <p>If the job seeker enters the new password and clicks on "Reset" button, then a confirmation message will appear indicating successful password reset and the password will be updated in the database.</p>

#	PBI	Size	Type	Status	Acceptance Criteria
8	As a job provider, I want to add new job offers so that I can fill the vacancy with qualified candidates.	3	Feature	Done	<p>If the job provider clicks on the "Add Offer" button, then a form will be displayed. This form is used to fill out the following required fields: job title, job description, job industry, job city, job address, employment type, salary range. Other fields are optional, and they consist of starting date, working hours per day, working days, required skills, required qualification level and field, required experience industry, job title and year, and additional notes.</p> <p>If the job provider clicks on the "Submit" button and one of the required fields is not filled, then a message will be displayed to indicate this. Otherwise, a confirmation message will appear. The offer will then be added to the database, and to the job provider's offers history page. Also, it will be visible to job seekers.</p>
9	As a job provider, I want to view my list of job offers so that I can manage the offers.	3	Feature	Done	<p>If the job provider opens the job offers history page, then all the previous job offers will be displayed in a list, showing the job title, description, and its status, which could be either "Active" or "Closed".</p> <p>If the job provider has no offers, then a message will be displayed to indicate this.</p>
10	As a job seeker, I want to display job offers so that I find the most suitable job offer for me.	3	Feature	Done	<p>If the job seeker opens the home page, then a list of available job offers will be displayed, showing the name of the company, the job title, job industry, and the date of the post.</p> <p>If there are no offers, then a message will be displayed to indicate this.</p>
11	As a job seeker, I want to display job offer details so that I make sure it's suitable for me.	3	Feature	Done	<p>If the job seeker clicks on one the arrow button of the job offers, then they will be redirected to another page that contains all the job offer's information and the company name.</p>

#	PBI	Size	Type	Status	Acceptance Criteria
12	As a job seeker, I want to search for jobs so that I can efficiently explore a wide range of job opportunities easily.	3	Feature	Done	<p>If the job seeker searches by company name, industry, or available position, then the matching offers will be displayed.</p> <p>If there's no result, then a message will be displayed to indicate this.</p>
13	As a job seeker, I want to view my profile page so that I can display my information.	3	Feature	Done	<p>If the job seeker clicks on the profile icon, then a page with the information they registered with (their name and email) will be displayed.</p>
14	As a job seeker I want to log out so that I can exit my account.	3	Feature	Done	<p>If the job seeker clicks on the logout button on the profile page, then they will exit their account and lose access and privileges until the next login.</p>
15	As a job seeker, I want to fill my CV information so that my information is available when I apply for job positions.	2	Feature	Done	<p>If the job seeker clicked on "CV Creation" button in the profile page, then a form will appear. This form is used to fill out the following required fields: professional summary, full name, phone number, email, city. Additionally, there are optional fields such as education history, skills, work experience in reverse chronological order (including job titles, company names, dates of employment), certifications, awards, and projects.</p> <p>If the job seeker clicked on the "Save" button and one of the required fields is not filled, then a message will be displayed to indicate this; otherwise, all the information will be saved in the database.</p>

#	PBI	Size	Type	Status	Acceptance Criteria
16	As a job seeker, I want to apply for a job so that I can get an opportunity to obtain the job.	3	Feature	Done	<p>If the job seeker clicks the "Apply" button on the job details page, then a confirmation message should appear, and the application will be sent to the job provider along with the applicant's CV.</p> <p>If the CV has not been filled out already, then a message will be displayed to indicate that the CV should be completed before applying.</p> <p>If the job seeker has already applied to a job and the status is accepted, then the application status for that job will be shown, and the "Apply" button will become disabled, preventing further clicks.</p>
17	As a job provider, I want to view job applications so that I can manage them.	3	Feature	Done	<p>If the job provider selects a job offer from the job offers history page, then they will see the applications for that offer, including the applicant's name, professional summary, phone number, email, and application status.</p> <p>If there's no application to the offer specified, then a message will be displayed to indicate this.</p>
18	As a job provider, I want to view the applicants' CVs so that I can know more information about them.	3	Feature	Done	<p>If the job provider clicks on an application from the job applications page, then the applicant's CV will be displayed.</p>
19	As a job seeker, I want to filter job offers so that I customize the job search experience.	3	Feature	Done	<p>If the job seeker is viewing job offers, then a filter option should be available to filter the job offers based on one of these options: city, company name, job industry, employment type, job title, and experience.</p> <p>If there's no result, then a message will be displayed to indicate this.</p>

#	PBI	Size	Type	Status	Acceptance Criteria
20	As a job seeker, I want to edit my CV so that I can keep my information updated.	3	Feature	Done	<p>If the job seeker already creates a CV and clicked on "Edit CV" button from profile page, then a form will be displayed with all the CV's information.</p> <p>If the job seeker clicks on the "Save" button and one of the required fields is not filled, then a message will be displayed to indicate this; otherwise, all the information will be updated in the database.</p> <p>If the job seeker clicks "Cancel", then the changes will not be saved, and they will be redirected to the profile page.</p>
21	As a job seeker, I want to view my applications history so that I can keep track of them.	3	Feature	Done	<p>If the job seeker opens the application history page and has already applied to at least one job offer, then the list of job applications will be displayed, indicating the company name, job title, job industry, and the application status.</p> <p>If there are no previous applications, then a message will be displayed to indicate this.</p>
22	As a job seeker, I want to be able to cancel any job application I have made so that I can withdraw from opportunities that are no longer interesting to me.	3	Feature	Done	<p>If the job seeker views the application history page, then the "Cancel Application" button will be displayed for each application.</p> <p>If the job seeker clicks the "Cancel Application" button, then a confirmation message will appear showing two options: "Confirm" or "Cancel".</p> <p>If the job seeker selects "Confirm", then the application status will be changed to "canceled" on the job applications history page and the job provider's applications page. Otherwise, nothing will change.</p>

#	PBI	Size	Type	Status	Acceptance Criteria
23	As a job provider, I want the ability to change the application status of applicants so that I can effectively manage and track their applications.	3	Feature	Done	<p>If the job provider is viewing the applications page for a specific job offer, then they should have the ability to change the status of any "Pending" application to either "Accepted" or "Rejected".</p>
24	As a job provider, I want to close a job offer so that I don't receive applications for this offer.	3	Feature	Done	<p>If the job provider closes a job offer from the job offers page, then a confirmation message will appear showing two options: "Confirm" or "Cancel".</p> <p>If "Confirm" is selected by the job provider, then the job offer status switches to "Closed", making it uneditable and marked "Rejected" for pending applicants. The offer is then removed from display. Otherwise, no changes occur.</p>
25	As a job provider, I want to send notifications to the matching job seekers so that the offers reach the qualified candidates.	5	Feature	Done	<p>If the job provider wants to add a new job offer, then they will encounter options for sending notifications to job seekers:</p> <ul style="list-style-type: none"> If they choose to rearrange attributes (City, Skills, Experiences, Qualifications) via drag-and-drop, then the top attributes will be prioritized for matching with seekers' CVs. If they opt for uniform weighting, then all attributes will be treated equally. If they select customized weights, then each attribute will be assigned a weight, totaling 100%. <p>If the job provider sets a minimum matching threshold, then only CVs meeting this threshold will be considered.</p> <p>If the job provider clicks "Add", then a notification will be sent to matched job seekers based on the chosen criteria.</p>

#	PBI	Size	Type	Status	Acceptance Criteria
26	As a job provider, I want the job applications to be sorted so that I can easily choose qualified candidates.	4	Feature	Done	<p>If the job provider selects a job offer to view its applications, then the applications will be sorted by the latest applications by default, and three sorting options will be available for pending applications: sort by the newest, oldest, and best matching.</p> <p>If the job provider selects the best matching option, then pending applications will be sorted with the most matching candidates appearing first, alongside their matching scores displayed next to each application.</p>
27	As a job seeker, I want to view the notification center, so that I can be updated on new job offers.	3	Feature	Done	<p>If a job provider posts a matching job offer, then the job seeker will receive a notification containing the job title, company name, and matching score. Additionally, a notification will be sent if there's a change in application status.</p> <p>If there's no notification, then a message will be displayed to indicate this.</p>
28	As a job provider, I want to view my profile page so that I display my information	3	Feature	Done	If the job provider opens the profile page after creating their profile, then a page containing the details of the company will be displayed, enabling them to view and manage their profile information.
29	As a job provider, I want to fill company information so that I can present our organization's information.	3	Feature	Done	<p>If the job provider opens the profile page for the first time, then a form with registered company information will appear, including required details like About The Company, Company HQ Location, and Contact Email, and optional details like social media URLs and phone number.</p> <p>If the job provider clicks "Create Profile" without completing required fields, then an error message will prompt them to fill in all necessary information. Otherwise, a confirmation message will appear, and all details will be saved in the database.</p>

#	PBI	Size	Type	Status	Acceptance Criteria
30	As a job seeker, I want to have an interview simulation so that I can practice and improve my skills.	5	Feature	Done	<p>If the job seeker opens the job offer details page, then they can click on the "Mock Interview" button to initiate an interview simulation based on that specific job offer.</p> <p>If the job seeker has not created a CV, then a message will appear indicating that the interview cannot start without one.</p> <p>If the job seeker is directed to the interview page, then the interview instructions will be displayed before the AI model initiates the interview by asking questions based on the job seeker's CV and job offer details.</p> <p>If the job seeker clicks on the "Cancel" option, then the interview will be terminated.</p> <p>If the AI has asked 10 questions, then it will end the interview based on the progress and it will review the job seeker's performance and provide feedback.</p>
31	As a job seeker, I want to view company details so that I can gain insights into the organization.	3	Feature	Done	<p>If the job seeker clicks on a job offer and clicks on the company name and the company has a profile, then they can preview the company information.</p> <p>If the company does not have a profile, then a message will be displayed to indicate that.</p>
32	As a job provider, I want to edit the company information so that I keep the information up to date.	3	Feature	Done	<p>If the job provider opens the profile page and they have a profile, then an "Edit" button will be available.</p> <p>If the job provider clicks on the "Edit Profile" button and one of the required fields is not filled, then a message will be displayed to indicate this; otherwise, all the information will be updated in the database.</p>

#	PBI	Size	Type	Status	Acceptance Criteria
33	As a job provider, I want to edit job offer details so that I can keep the offer details updated.	3	Feature	Done	<p>If the job provider opens the job offers history page and clicks on the "Edit" button for an active job offer, then a form will be displayed to edit the offer information.</p> <p>If the job provider clicks on the "Submit" button and one of the required fields is not filled, then a message will be displayed to indicate this; otherwise, all the information will be updated in the database, and they will be directed to the job offers page.</p>
34	As a job seeker, I want to view job offers recommendations that match my skills so that I discover suitable employment opportunities.	5	Feature	Done	<p>If the job seeker opens the job offers page, then they can view the top 5 job offers matching their qualifications, as recommended by the system, under the "Recommended Offers" panel, above the rest of the offers.</p>
35	As a job seeker, I want to send a notification to the job provider when I apply to a job offer so that they can be informed of my application.	3	Feature	Done	<p>If a job seeker applied to a job offer, then a notification will be sent to the job provider specifying the job title and the job seeker's name.</p>
36	As a job provider, I want to access the notification center so that I can stay updated on new job applications.	3	Feature	Done	<p>If a job seeker applied to a job offer, then a notification will appear on the notification center with applicant name and the job title.</p> <p>If there's no notification, then a message will be displayed to indicate this.</p>
37	As a user, I want Watheq platform pages to load within 10 seconds of initiating a request, so that I can access all functions without delays.	3	Feature	Done	<p>If the user is a job provider with a good internet connection, then the website pages should load in less than 10 seconds.</p> <p>If the user is a job seeker with a good internet connection, then the application pages should load in less than 10 seconds.</p>

#	PBI	Size	Type	Status	Acceptance Criteria
38	As a user, I want the system to be available 90% of the time so that I can depend on its continuous accessibility.	3	Feature	Done	If the user used the application for ten minutes a day, then it is expected that the system would be available for at least nine of those minutes.
39	As a user, I want to be able to learn how to use the platform quickly, so that I won't get frustrated.	3	Feature	Done	If the user is using the platform, then the pages layout, error messages, buttons and labels should be clear and well organized.
40	As a user, I want the system to secure my password effectively, so that no one can access my account.	2	Feature	Done	If the user signed up in the platform, then the system should handle and store the passwords securely using a hashing algorithm.
41	As a job provider, I want the Watheq platform to be compatible with different web browsers so that I can access it using my preferred browser.	3	Feature	Done	If the job provider is using the browser to open the website, then the website should be accessible from the following web browsers: Chrome, Firefox, and Safari.

5.3 System Design

5.3.1 Architectural Diagram

The choice of a client-server architecture for the Watheq system, with the inclusion of a third-party component, ChatGPT API, offers several advantages. Firstly, the server-client architecture allows for easy scalability, accommodating potential growth and increased user demand. This is crucial for a system like Watheq, which may experience a significant number of users and transactions. Secondly, the clear separation of concerns between the client-side and server-side components enables efficient maintenance and updates, facilitating enhancements to specific functionalities without impacting the entire system. Additionally, incorporating the ChatGPT API as a third-party component provides the benefit of leveraging advanced conversational capabilities for AI-driven interviews. The client-server model allows for seamless integration of the ChatGPT API.

The system architecture of Watheq is illustrated in Figure 19. The client side comprises two interfaces: a web application for job providers and a mobile application for job seekers. These interfaces allow users to access all functionalities and data within the application. The server side of the application contains the database that stores all the applications' data regarding job seekers, job providers, and job offers, along with the application that access the database and provide the required functionalities and data requested by the users. In addition, it contains the job recommendation system used in the application. The Watheq platform does not rely on any external datasets. Instead, it employs a content-based recommendation system that eliminates the need for a separate dataset for training. This system utilizes the data provided by users, such as job offer details and CVs, to generate personalized recommendations. Also, the ChatGPT API is a pre-learned model that we will use in the application without any extra training, so it does not need any dataset too.

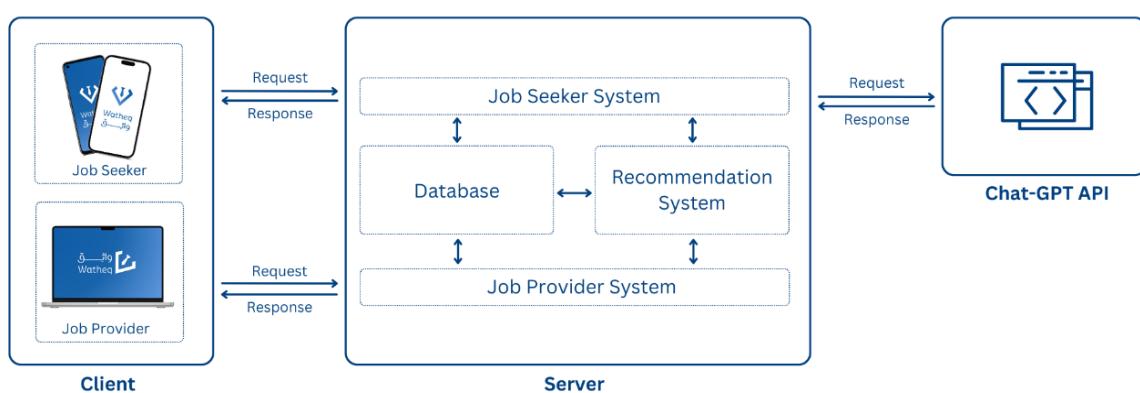


Figure 19. The Watheq Platform Architecture

5.3.2 Class Diagram

Figure 20 displays the Class Diagram of the Watheq platform. There are two user types: job seekers and job providers. Job providers can add, view, close, and edit job offers, as well as view applications and applicant CVs to accept or reject them. They can also create, view, and edit their profiles. Job seekers, on the other hand, can view, search, and filter job offers, view recommended offers, and access detailed job offer information to apply. They can manage their applications, including canceling them, and create or edit their CVs. Additionally, job seekers can view company profiles and conduct mock interviews for any job offer.

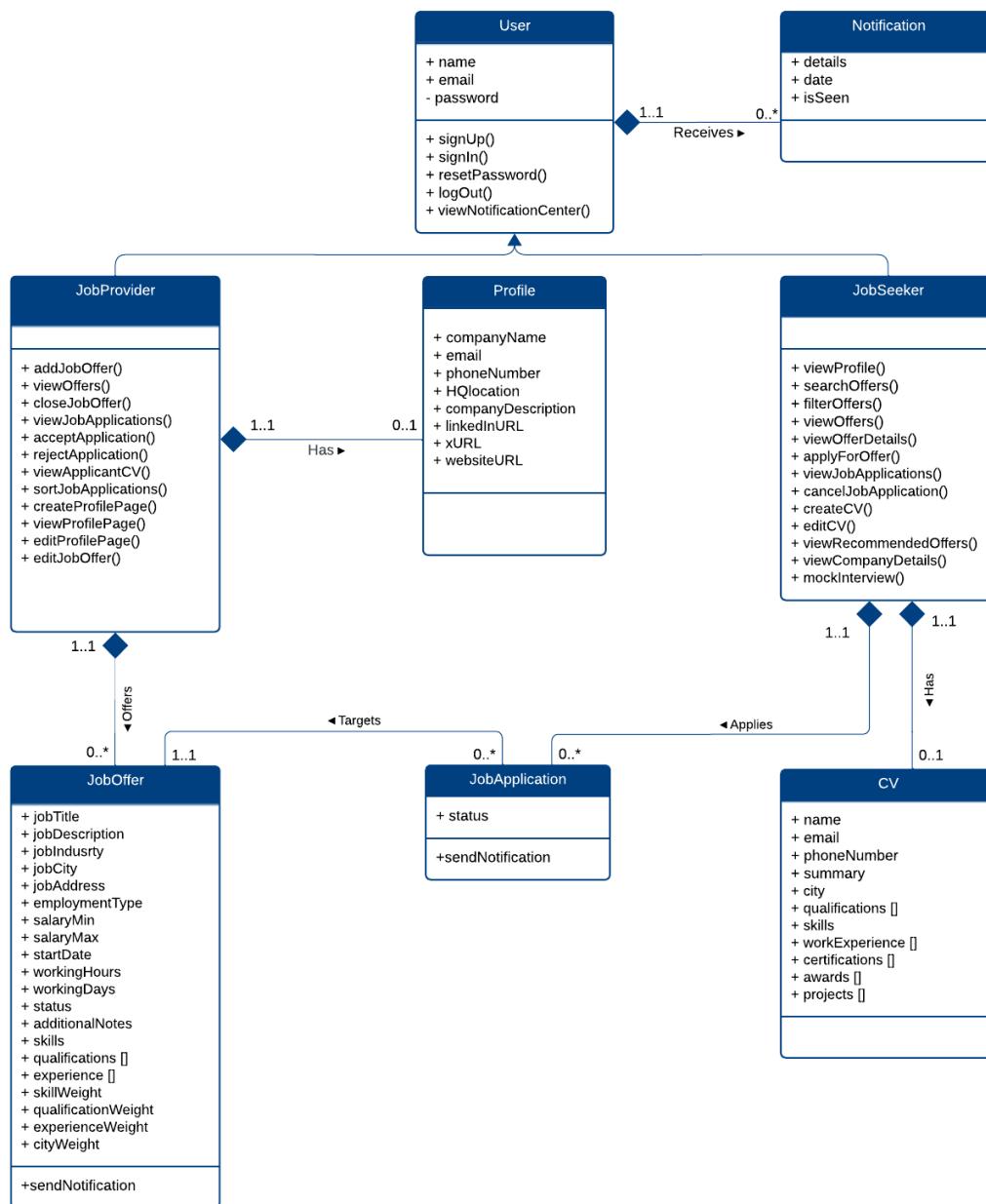


Figure 20. The Watheq Platform Class Diagram

5.3.3 Component Level Design

In this section, we present descriptions of three essential components of our system: Interview Simulation, Add Job Offer, and Job Offer Recommendations functionalities. This includes flowcharts for the job offer recommendations, illustrating the sequential steps and decision-making involved in this operation. For the interview simulation function and adding a job offer, we provide pseudocode explanations because they are more suitable for them. These representations are intended to provide a high-level, clear, and structured overview of how these key features operate within our system.

- **Interview Simulation Pseudocode**

Classification: Function.

Definition: The job seeker can simulate an interview using a structured process that starts with an introductory question, includes questions about their CV or the job offer, requires user input after each question, and ends with feedback after the 10th question.

Pre-condition: The user must be logged in as a job seeker, have a CV, and be viewing the interview simulation page for a chosen job offer.

Post-condition: The system provides feedback based on the user's responses and concludes the interview simulation.

Pseudocode:

```

1.      START
2.      IF user has a CV THEN
3.          Initialize API call with CV info, offer info, and context of the interview
4.          Display interview instructions
5.          Count = 0
6.          WHILE Count <= 10
7.              IF Count == 0 THEN
8.                  Display introduction question
9.                  Wait for user input and read response
10.             ELSE IF Count == 10 THEN
11.                 Generate and display feedback
12.             ELSE
13.                 Generate and display a question related to user's CV or the job offer
14.                 Wait for user input and read response
15.             END IF
16.             Count = Count + 1
17.         END WHILE
18.     ELSE
19.         Display a message to fill out the CV first
20.     END

```

- **Add Job Offer Pseudocode**

Classification: Function.

Definition: The user can add a job offer using a structured process that begins with entering required basic information about the job. It then proceeds to specify optional skills, qualifications, experience, and additional notes, as well as setting required weights and thresholds for sending notifications. User input is required for some fields, and the process concludes with confirming the submission.

Pre-condition: The user must be logged in as a job provider and be viewing the Add Job Offer page.

Post-condition: The system displays a confirmation message after successfully adding the job offer to the database.

Pseudocode:

```

1.   START
2.   Read user input
3.   IF required fields are empty or invalid OR
4.       (at least one qualification field is filled AND NOT all qualification fields are filled) OR
5.       (at least one experience field is filled AND NOT all experience field are filled) THEN
6.       Display error message
7.       RETURN
8.   END IF
9.   IF Same importance checked THEN
10.      Set equal weights
11.   ELSE
12.      Use entered weights
13.   END IF
14.   Insert job offer to database
15.   IF skill field is filled THEN
16.       Insert skills to database
17.   END IF
18.   IF all qualification fields are filled THEN
19.       Insert qualifications to database
20.   END IF
21.   IF all experience fields are filled THEN
22.       Insert experiences to database
23.   END IF
24.   Display success message
25.   Send notification to matching seekers
26. END

```

- **Job Offer Recommendation Flowchart**

Figure 21 displays the flowchart of the Job Offers Recommendation functionality. Job seekers need to have a CV to receive personalized recommendation offers. The system calculates the similarity between the CV and job offers, then retrieves the top 5 matching job offers.

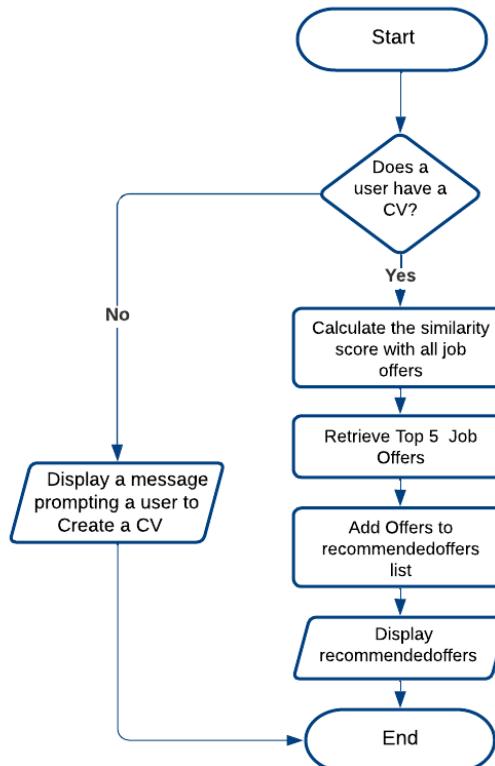


Figure 21. Job Offer Recommendations Flowchart

5.4 Data Design

5.4.1 Data Models

- **EER Diagram**

Figure 22 displays the Enhanced Entity-Relationship Diagram of Watheq platform.

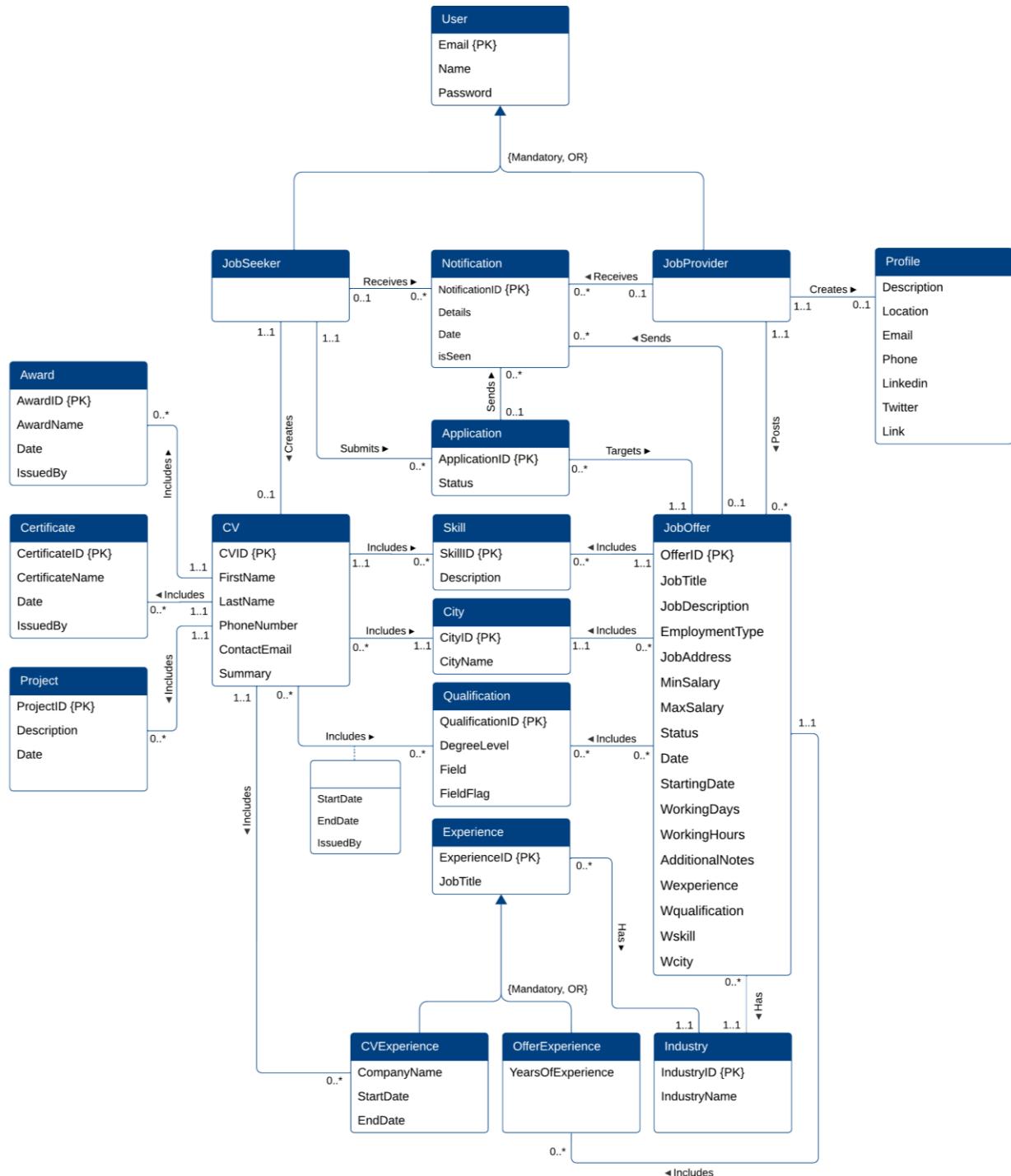


Figure 22. The Watheq Platform EER Diagram

- **Relational Schema**

JobSeeker {JobSeekerEmail, FullName, Password}

Primary Key: JobSeekerEmail

JobProvider {JobProviderEmail, CompanyName, Password}

Primary Key: JobProviderEmail

Profile { JobProviderEmail, Description, Location, Email, Phone, LinkedIn, Twitter, Link}

Primary Key: JobProviderEmail

Foreign Key: JobSeekerEmail

City {CityID, CityName}

Primary Key: CityID

Industry {IndustryID, IndustryName}

Primary Key: IndustryID

CV {CVID, FirstName, LastName, PhoneNumber, ContactEmail, Summary, CityID,

JobSeekerEmail}

Primary Key: CVID

Foreign Key: CityID, JobSeekerEmail

JobOffer {OfferID, JobTitle, JobDescription, EmploymentType, JobAddress, MinSalary, MaxSalary, Status, Date, StartingDate, WorkingDays, WorkingHours, AdditionalNotes, Wexperience, Wqualification, Wskill, Wcity, IndustryID, CityID, JobProviderEmail}

Primary Key: OfferID

Foreign Key: IndustryID, CityID, JobProviderEmail

Application {ApplicationID, Status, OfferID, JobSeekerEmail}

Primary Key: ApplicationID

Foreign Key: OfferID, JobSeekerEmail

Certificate {CertificateID, CertificateName, Date, IssuedBy, CVID}

Primary Key: CertificateID

Foreign Key: CVID

Award {AwardID, AwardName, Date, IssuedBy, CVID}

Primary Key: AwardID

Foreign Key: CVID

Project {ProjectID, ProjectName, Description, Date, CVID}

Primary Key: ProjectID

Foreign Key: CVID

Skill {SkillId, Description, OfferID, CVID}

Primary Key: SkillID

Foreign Key: OfferID, CVID

CVExperience {ExperienceID, JobTitle, CompanyName, StartDate, EndDate, IndustryID,
CVID}

Primary Key: ExperienceID

Foreign Key: IndustryID, CVID

OfferExperince {ExperienceID, YearsOfExperience, JobTitle, IndustryID, OfferID}

Primary Key: ExperienceID

Foreign Key: IndustryID, OfferID

Qualification {QualificationID, DegreeLevel, Field, FieldFlag }

Primary Key: QualificationID

OfferQualification {QualificationID , OfferID}

Primary Key: QualificationID, OfferID

Foreign Key: QualificationID, OfferID

CVQualification{QualificationID, CVID, StartDate, EndDate, IssuedBy }

Primary Key: QualificationID, CVID

Foreign Key: QualificationID, CVID

Notification{NotificationID, Details, Date, isSeen, JobProviderEmail, JobSeekerEmail,
OfferID, ApplicationID}

Primary Key: NotificationID

Foreign Key: JobProviderEmail, JobSeekerEmail, OfferID, ApplicationID

- **Data Dictionary**

Table 7 displays the data dictionary of the entities in the EER diagram.

Table 7. Data Dictionary of Entities

Entity Name	Description	Aliases	Occurrence
User	An individual registered on the platform, can be a job seeker or provider.	-	A user is specialized into job provider or seeker.
JobSeeker	A user looking for employment opportunities.	-	A job seeker can create one CV or none.
JobProvider	A user, such as an employer or recruiter, that offers jobs.	-	A job provider can post one, none or many job offers.
Notification	A notification is a brief message that alerts users about an event or action.		A Notification can be received by one or none job provider.
Profile	Profile page information for the job provider company.	-	A profile page can be created by one job provider.
Application	A job application submitted by a job seeker to a job offer.	-	An application can target only one job offer.
CV	The curriculum vitae of a job seeker.	-	A job seeker can create only one CV.
JobOffer	A detailed description of a job listing posted by a job provider.	-	A job offer can be posted by only one job provider.
City	A Saudi city where a job is situated, or where a job seeker resides.	-	A city can be included by one, none or many job offers.
Industry	A classification of a job offers or experience by industry.	-	An industry can be included by one, none or many job offers.
Award	An honor or distinction listed in a job seeker's CV.	-	An award can be included in only one CV.
Certificate	A formal certification listed in a job seeker's CV.	-	A certificate can be included in only one CV.
Project	Any projects, publications, or patents, completed and detailed in a job seeker's CV.	-	A project can be included in only one CV.
Skill	A specific professional ability or competence required by a job offer or listed in a job seeker's CV.	-	A skill can be included in only one CV.
Qualification	An educational certification required by a job offer or listed in a job seeker's CV.	-	A qualification can be included in one, none or many CVs.
Experience	Past work experience required by a job offer or listed in a job seeker's CV.	-	An experience has only one category (industry).
CVExperience	Work experience detailed in a job seeker's CV.	-	A CV experience can be included in only one CV.
OfferExperience	An experience requirement specified in a job offer.	-	An offer experience can be included in only one job offer.

Table 8 displays the data dictionary of the relationships in the EER diagram.

Table 8. Data Dictionary of Relationships

Entity Name	Multiplicity	Relationship	Entity Name	Multiplicity
User	1..1	Specialized Into	JobSeeker	0..1
	1..1	Specialized Into	Job Provider	0..1
JobSeeker	1..1	Submits	Application	0..*
	0..1	Receives	Notification	0..*
	1..1	Creates	CV	0..1
JobProvider	1..1	Creates	Profile	0..1
	0..1	Receives	Notification	0..*
Notification	0..*	Send By	Application	0..1
	0..*	Send By	Job Offer	0..1
CV	1..1	Includes	Skill	0..*
	0..*	Includes	City	1..1
	0..*	Includes	Qualification	0..*
	1..1	Includes	CVExperience	0..*
	1..1	Includes	Award	0..*
	1..1	Includes	Certificate	0..*
	1..1	Includes	Project	0..*
Job Offer	0..*	Posted by	JobProvider	1..1
	1..1	Includes	Skill	0..*
	0..*	Includes	City	1..1
	0..*	Includes	Qualification	0..*
	1..1	Includes	OfferExperience	0..*
	0..*	Has	Industry	1..1
	1..1	Targeted by	Application	0..*
Experience	0..*	Has	Industry	1..1
	1..1	Specialized Into	CVExperience	0..1
	1..1	Specialized Into	OfferExperience	0..1

Table 9 displays the data dictionary of the attributes in the EER diagram.

Table 9. Data Dictionary of Attributes

Entity Name	Attribute	Description	Data Type	Length	Nulls	Multi-Valued	Default Value	Range	PK
User	Email	Unique identifier for the user.	Varchar	100	N	N	N	-	Y
	Name	Full name of the job seeker or company name of the job provider.	Varchar	50	N	N	N	-	
	Password	Encrypted password of the user.	Varchar	255	N	N	N	-	
Profile	Description	Brief description of the company.	Varchar	300	N	N	N	-	
	Location	Company's headquarters address.	Varchar	300	N	N	N	-	
	Email	Contact email for the company.	Varchar	100	N	N	N	-	
	Phone	Contact phone number for the company.	Int	10	Y	N	Null	-	
	LinkedIn	LinkedIn profile URL.	Varchar	100	Y	N	Null	-	
	Twitter	Twitter profile URL.	Varchar	100	Y	N	Null	-	
	Link	Company website URL.	Varchar	300	Y	N	Null	-	
Application	ApplicationID	Auto-incremented unique identifier for the application.	Int	11	N	N	N	-	Y
	Status	Status of the application (pending, accepted, rejected, canceled).	Varchar	50	N	N	N	-	
CV	CVID	Auto-incremented unique identifier for the CV.	Int	11	N	N	N	-	Y
	FirstName	First name of the job seeker.	Varchar	20	N	N	N	-	
	LastName	Last name of the job seeker.	Varchar	20	N	N	N	-	
	PhoneNumber	Contact number of the job seeker.	Int	10	N	N	N	-	
	ContactEmail	Contact email of the job seeker.	Varchar	100	N	N	N	-	
	Summary	Professional summary of the job seeker.	Varchar	300	N	N	N	-	

Entity Name	Attribute	Description	Data Type	Length	Nulls	Multi-Valued	Default Value	Range	PK
Award	AwardID	Auto-incremented unique identifier for the award.	Int	11	N	N	N	-	Y
	AwardName	Name of the award.	Varchar	50	N	N	N	-	
	Date	Date when the award was given.	Date	-	N	N	N	-	
	IssuedBy	Entity that issued the award.	Varchar	50	N	N	N	-	
Certificate	CertificateID	Auto-incremented unique identifier for the certificate.	Int	11	N	N	N	-	Y
	CertificateName	Name of the certificate.	Varchar	50	N	N	N	-	
	Date	Date when the certificate was given.	Date	-	N	N	N	-	
	IssuedBy	The name of the institution issued the certificate.	Varchar	50	N	N	N	-	
Project	ProjectID	Auto-incremented unique identifier for the project.	Int	11	N	N	N	-	Y
	Description	Description of the project.	Varchar	500	N	N	N	-	
	Date	Date of the project.	Date	-	N	N	N	-	
Skill	SkillID	Auto-incremented unique identifier for the skill.	Int	11	N	N	N	-	Y
	Description	Brief description of the skill.	Varchar	50	N	N	N	-	
City	CityID	Auto-incremented unique identifier for the city.	Int	11	N	N	N	-	Y
	CityName	Name of the city.	Varchar	100	N	N	N	-	
Qualification	QualificationID	Auto-incremented unique identifier for the qualification.	Int	11	N	N	N	-	Y
	DegreeLevel	Academic level of the qualification.	Varchar	50	N	N	N	-	
	Field	Field of study or specialization.	Varchar	100	N	N	N	-	
	FieldFlag	Flag indicating if the qualification was entered by the job seeker or provider, not chosen from a list.	Tinyint	1	N	N	0	-	

Entity Name	Attribute	Description	Data Type	Length	Nulls	Multi-Valued	Default Value	Range	PK
Experience	ExperienceID	Auto-incremented unique identifier for the experience.	Int	11	N	N	N	-	Y
	JobTitle	Title of the job related to the experience.	Varchar	100	N	N	N	-	
CVExperience	CompanyName	Name of the company where the experience was obtained.	Varchar	100	N	N	N	-	
	StartDate	The start date of the experience period.	Date	-	N	N	N	-	
	EndDate	The end date of the experience period.	Date	-	Y	N	Null	-	
OfferExperience	YearsOfExperience	Number of years of experience required.	Int	11	N	N	N	-	
Industry	IndustryID	Auto-incremented unique identifier for the industry.	Int	11	N	N	N	-	Y
	IndustryName	Name of the industry.	Varchar	100	N	N	N	-	
JobOffer	OfferID	Auto-incremented unique identifier for the job offer.	Int	11	N	N	N	-	Y
	JobTitle	Title of the job.	Varchar	25	N	N	N	-	
	JobDescription	Description of the job.	Varchar	300	N	N	N	-	
	EmploymentType	Type of employment (Full-time, Part-time).	Varchar	50	N	N	N	-	
	JobAddress	Location of the job.	Varchar	100	N	N	N	-	
	MinSalary	Minimum salary offered for the job.	Double	-	N	N	N	-	
	MaxSalary	Maximum salary offered for the job.	Double	-	N	N	N	-	
	Status	Current status of the job offer (Active, Closed).	Varchar	50	N	N	N	-	
	Date	Date of job offer posting.	Date	-	N	N	N	-	
	StartingDate	When the job starts.	Date	-	Y	N	Null	-	
	WorkingDays	Days required for work per week.	Varchar	100	Y	N	Null	-	
	WorkingHours	Hours required per workday.	Varchar	50	Y	N	Null	-	
	AdditionalNotes	Any additional information about the job offer.	Varchar	255	Y	N	Null	-	

Entity Name	Attribute	Description	Data Type	Length	Nulls	Multi-Valued	Default Value	Range	PK
	Wexperience	Weight of the experience used in recommendation system.	double	-	N	N	0	-	
	Wqualification	Weight of the qualification used in recommendation system.	double	-	N	N	0	-	
	Wskill	Weight of the skill used in recommendation system.	double	-	N	N	0	-	
	Wcity	Weight of the city used in recommendation system.	double	-	N	N	0	-	
Notification	NotificationID	Auto-incremented unique identifier for the job offer.	Int	11	N	N	N	-	Y
	Details	Details of the notification, such as matching score.	Varchar	100	N	N	N	-	
	Date	Date of the notification.	Varchar	50	N	N	N	-	
	isSeen	Indicator if the notification is unseen (0) or seen (1).	Int	1	N	N	0	-	
Relationship attribute	StartDate	The start date of the qualification program.	Date	-	N	N	N	-	
	EndDate	The end date of the qualification program.	Date	-	Y	N	Null	-	
	IssuedBy	The name of the institution that issued the qualification.	Varchar	50	N	N	N	-	

- **EER considerations**

This section provides justifications for some of the design choices made for Watheq's database.

1. Using the user email as a primary key:

The decision to use the user's email as the primary key in the user table, instead of an ID, is based on the fact that the user's email serves as a natural and unique identifier. Thus, eliminating the need for an additional ID column. Conversely, for entities like city and industry, the use of IDs is more appropriate due to their role in providing structured options and facilitating efficient data retrieval during filtering and searching.

2. Generalization/Specialization in User table:

The decision to use a generalization/specialization relationship in the User table, separating Job Seekers, and Job Providers, is justified by the fact that while they share common attributes, each entity has unique relationships. In addition, by using separate tables, we ensure efficiency during login processes and maintain cleaner data organization.

The email address is unique at each table, but uniqueness is not maintained across both tables. This allows a user to register with the two roles using the same email address. This was a design choice to allow a job provider to register as a job seeker too, and vice versa, to provide flexibility in the application. This is another reason for maintaining two separate tables in the database.

3. Generalization/Specialization in Experience table:

The utilization of generalization/specialization in the Experience table, separating CV Experience and Offer Experience, is justified by the distinct attributes and relationships associated with each type. Combining both experiences into a single table would result in a sparse table with many null values. By using a general entity (Experience) with specialized entities for CV experience and Offer experience, we achieve a more structured and efficient data representation.

4. Qualification Multiplicity with CV and Job Offer:

The decision to apply a many-to-many relationship between the Qualification and CV/Job Offer tables is justified by several factors. Firstly, predefined sets of degree levels and fields are used to create the Qualification table so that it includes all possible combinations of degree levels with the degree fields, ensuring comprehensive coverage. Since many users can have the same values for these attributes, this approach effectively avoids duplicate rows and provides a structured representation of qualifications. Thus, some combinations can be associated with many job offers or CVs, or on the other hand, some combinations may not be associated yet to any of them.

Additionally, Watheq's interface offers a dropdown menu for selecting degree levels and fields of qualifications from predefined lists. Users can add new qualification fields if their desired options are not available, resulting in new entries in the Qualification table. While ensuring security and reliability, a 'FieldFlag' attribute marks user-inserted rows, preventing their display to others. This ensures that only validated qualifications from the predefined list are visible, maintaining data consistency and reliability.

5. City and Industry Tables:

The many-to-many multiplicity in the City and Industry tables is justified by their nature as predefined lists, which are displayed to users during the process of adding an Offer or a CV. Users can only choose from these lists, which cover all possible choices. Some choices may not be selected for an Offer or a CV, and thus need to be stored in separate tables. The application pages retrieve the lists from the database tables, separating data from code for easier maintenance and updates.

6. Project, Award, and Certificate Tables:

Distinct from the Qualification, City, and Industry tables, the decision to not use a predefined list approach for the Project, Award, and Certificate tables is justified by the wide range and diversity of possible entries in these areas. Due to the inherent variability, creating an exhaustive predefined list is not feasible, and thus it is more appropriate to allow users to input their own entries.

5.5 Interface Design

This section outlines the interface design for Watheq Platform, featuring two sitemaps for the job seeker mobile application and the job provider website, as shown in Figures 23 and 24. These sitemaps detail the hierarchical structure of each platform, organizing pages systematically. Along with this, the section covers five UX guidelines integrated into our design to enhance user interaction and satisfaction. It also addresses some key design considerations for Watheq, focusing on responsiveness, and better user experience, ensuring both applications are user-friendly and efficient. The goal is to provide a clear, structured user journey, meeting the distinct needs of job seekers and providers.

5.5.1 Sitemap for Watheq Website

Figure 23 displays the sitemap for Watheq's website for job providers.

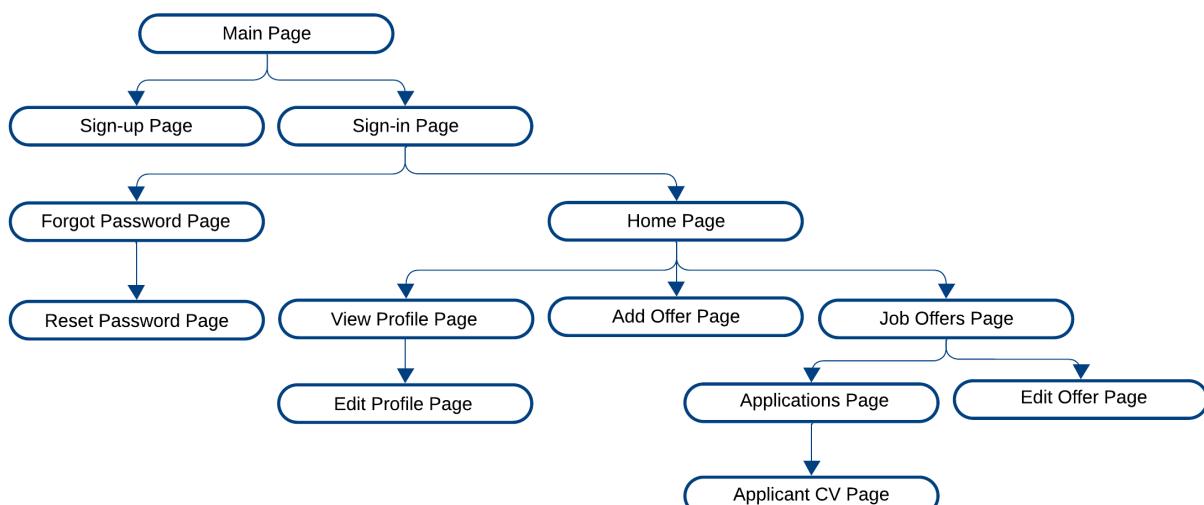


Figure 23. Sitemap Of Watheq Website

5.5.2 Sitemap for Watheq Mobile Application

Figure 24 displays the sitemap for Watheq's mobile application for job seekers.

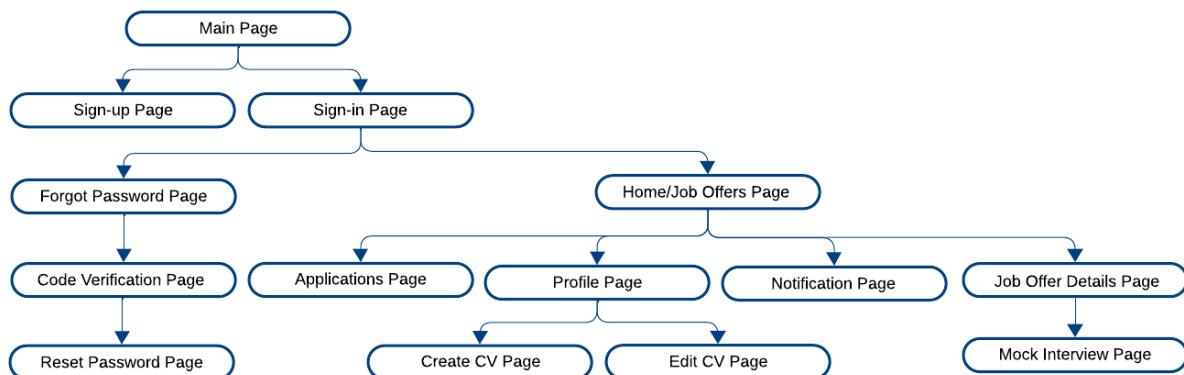


Figure 24. Sitemap of Watheq Mobile Application

5.5.3 UX Guidelines

In developing the Watheq platform, we've carefully integrated five essential UX guidelines to significantly enhance the overall user experience. These are error prevention, design dialog to yield closure, informative feedback, striving for consistency, and reducing short-term memory load. Each of these guidelines plays a vital role:

1. Error Prevention: Aims to minimize user mistakes by providing clear guidance.
2. Design Dialog to Yield Closure: Offers definitive feedback once tasks are completed.
3. Informative Feedback: Keeps users well-informed throughout their interactions.
4. Striving for Consistency: Ensures uniformity in the interface for better navigation.
5. Reducing Short-Term Memory Load: Simplifies the interface to reduce cognitive burden.

We will delve into the specifics of how each of these guidelines has been implemented on the Watheq platform, highlighting their individual contributions to creating a more intuitive and user-friendly experience.

1. Error Prevention

The error prevention guideline ensures that the design minimizes user errors by providing clear instructions and safeguards. We implemented this guideline to ensure that critical decisions are not made by mistake. On the website, when a job provider clicks on "Close" to close a specific job offer, a confirmation message will be displayed. We consider this function critical as all users who have applied for this offer and have a "Pending" status will be automatically rejected. Additionally, job seekers will be asked for confirmation if they click on the "Cancel Application" button for an offer to which they have already applied, since this action will remove their application from the job offer's application page. Figure 25 shows the implementation of error prevention.

Also, to prevent user errors, the design focuses on user input. Required fields in the forms are clearly marked with a red asterisk, ensuring that users provide the necessary information. Date fields have specific conditions; for example, they accept only future dates for start dates, and the end date cannot be before the start date. Additionally, password complexity requirements are displayed when a user enters a simple one. Numeric fields accept only numbers, triggering an error message for any invalid input. These measures enhance both data integrity and the user experience.

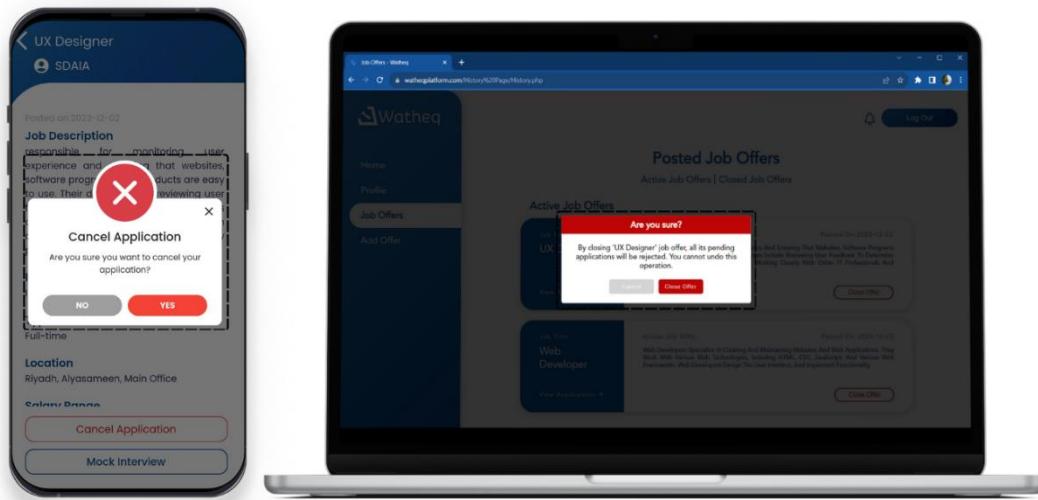


Figure 25. Error Prevention Implementation

2. Design dialog to yield closure

Design dialog to yield closure guideline focuses on giving users a sense of completion after they engage in relatively long or critical tasks. This design philosophy ensures that users receive clear feedback once they have completed an action, providing a sense of accomplishment and clarity. We have implemented this by displaying completion messages at key interaction points. For instance, after a job provider signs up or posts a new job offer, a confirmation message is shown to acknowledge the successful completion of these tasks. Similarly, for job seekers, we display such messages after significant actions like signing up, applying for a job, canceling a job application, creating a CV, and updating their CV. These messages are crucial in making the user experience more satisfying and intuitive, as they confirm that the actions taken have been successfully completed and recorded. Figure 26 shows the implementation of some design dialogs to yield closure.

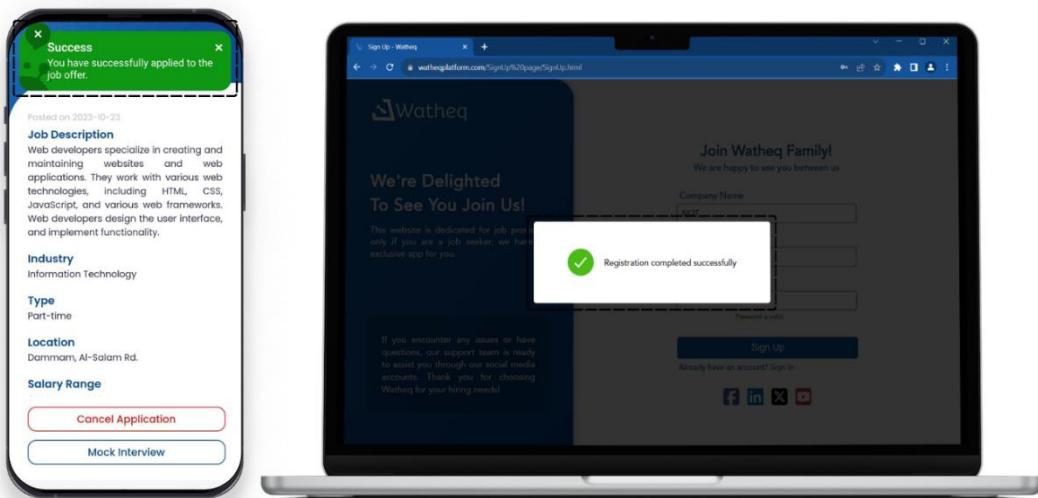


Figure 26. Design Dialog to Yield Closure Implementation

3. Informative feedback

Informative feedback is a crucial aspect of UX design, where users are provided with clear and immediate information about their current position or action within an application. In the Watheq platform, we apply this principle by using a color-coded progress line in our multi-section forms for creating job offers and CVs. Given the extensive nature of these forms, we've segmented them into several sections. The progress line at the top of each form uses color to indicate the user's current section: sections being worked on are highlighted in blue, while the others remain grey. This method offers users a visual guide of where they are in the form, enhancing navigation and making the process more user-friendly by reducing potential confusion and disorientation. Figure 27 shows the implementation of informative feedback.

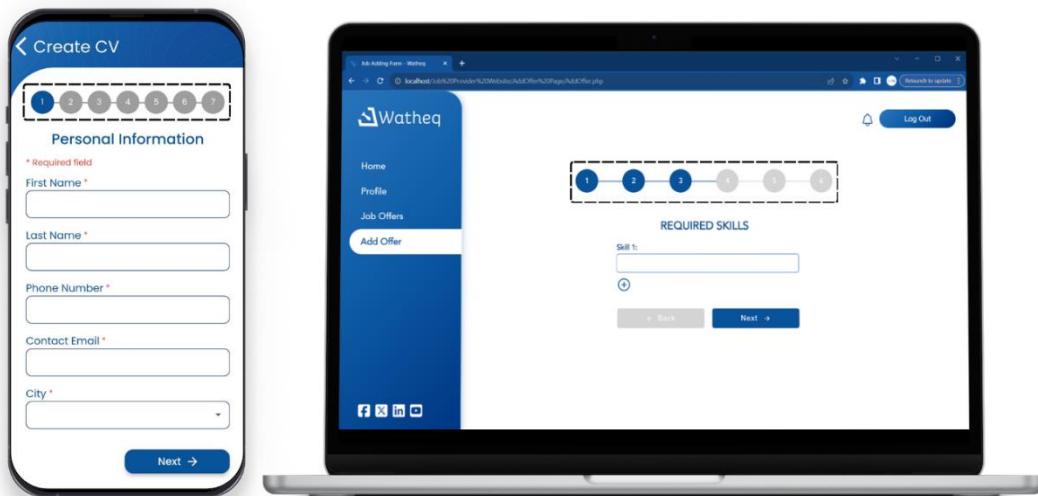


Figure 27. Informative Feedback Implementation

4. Strive for consistency

The principle of striving for consistency emphasizes the importance of maintaining uniformity across a digital platform. This consistency helps users become familiar with the interface more quickly, leading to an intuitive and efficient user experience. In the Watheq platform, we have applied this principle through internal consistency, particularly in the placement of the menu bar. Regardless of the page a user is on, the menu bar is consistently located in the same place in both the application and website. This consistent positioning not only helps users quickly understand where they are within the platform but also enables them to navigate more easily. By maintaining this uniformity, we enhance user orientation and streamline the navigation process, making the overall experience smoother and more user-friendly. Figure 28 shows the implementation of internal consistency.

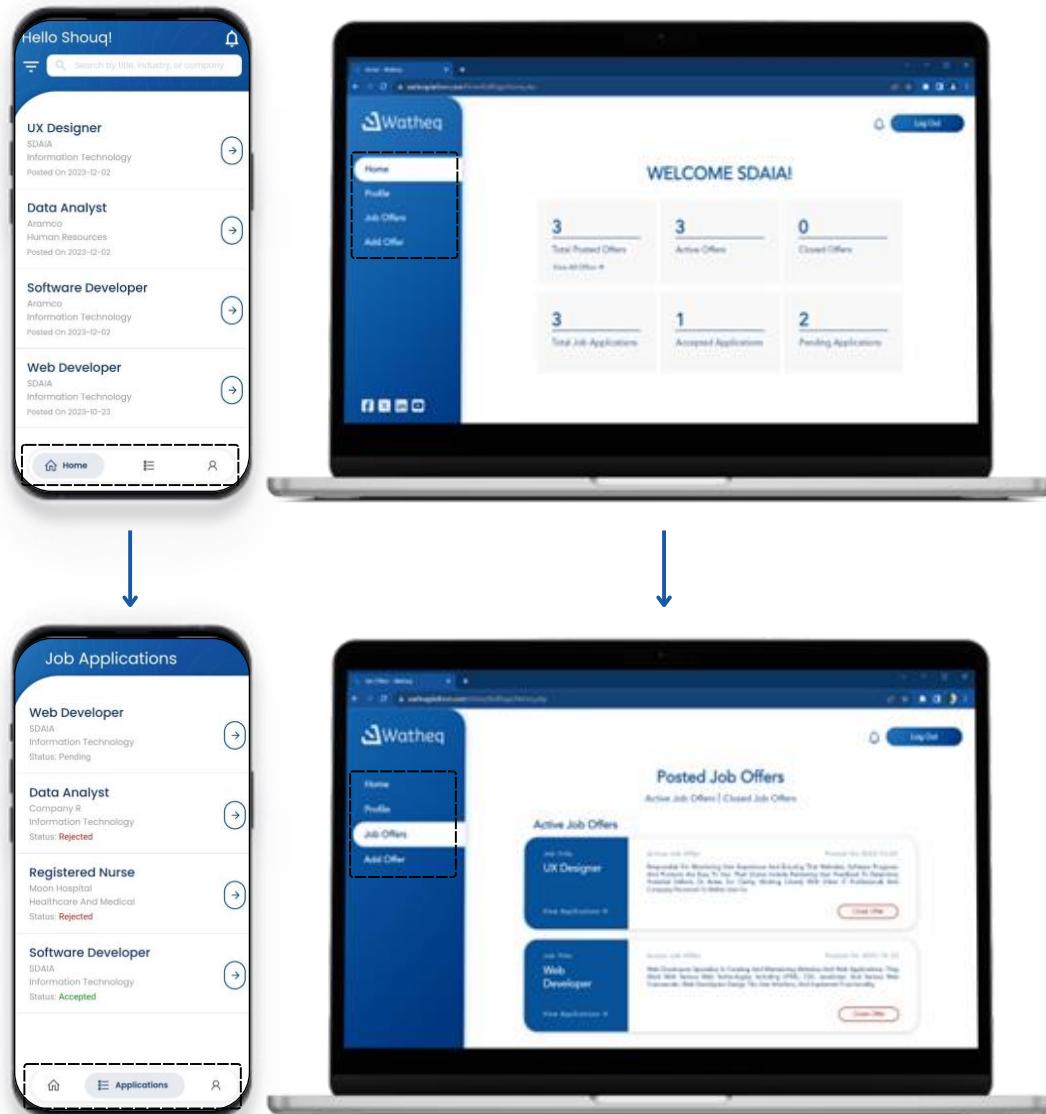


Figure 28. Internal Consistency Implementation

5. Reduce short-term memory load

Reducing short-term memory load is crucial for enhancing user experience, as it focuses on minimizing the amount of information users need to keep in their immediate memory while using a platform. This principle acknowledges that human memory is limited and can be easily overloaded with too much information. On the Watheq platform, we've implemented this concept by utilizing familiar icons throughout the interface. Familiar icons serve as intuitive visual cues that are quickly recognized and understood, eliminating the need for users to remember the function of each element every time they interact with the platform. This strategy not only simplifies the user's cognitive process but also makes navigation more efficient and user-friendly, as it leverages recognition over recall. Figure 29 shows the implementation of reduce short-term memory load guideline through the use of intuitive icons. The home icon represents the home page, the bell icon indicates notifications, the magnifying glass icon represents search functionality, the arrows signify additional information, the filter icon represents the filter functionality, the person icon represents the profile page, and the list icon denotes the applications page.

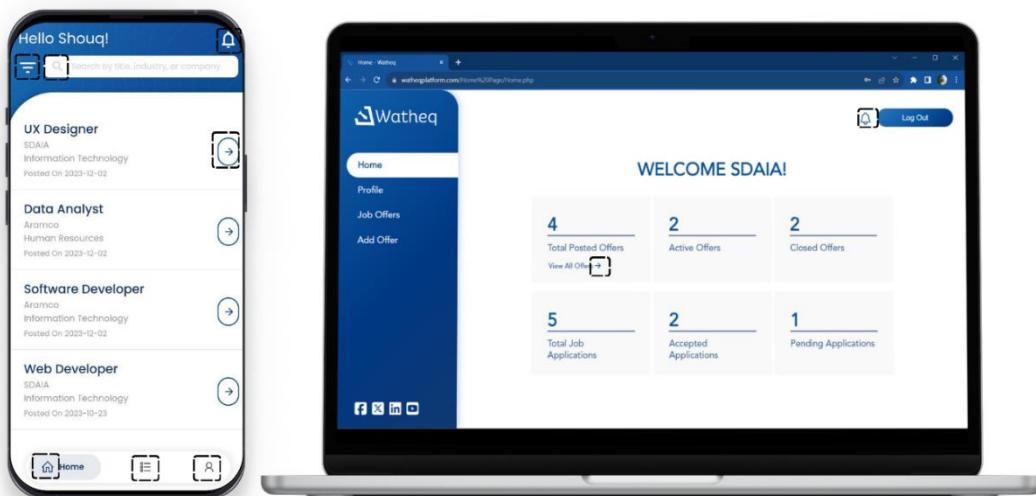


Figure 29. Reduce Short-term Memory Load Implementation

5.5.4 Design Considerations

In the Job Offer and CV Forms, we decided to implement a multi-step form that allows users to navigate between steps without completing all required fields at the outset. This decision is driven by our goal to provide ultimate flexibility and a user-centric experience. This approach enables users to prioritize sections based on their preferences and the information they have readily available. It also makes it easier for users to identify required fields and gather the necessary details before adding a job offer or creating their CV. To reduce the chance of users forgetting to fill out a required field, we use a red asterisk "*", which is universally recognized to indicate required fields. If a user forgets to complete a field and tries to submit the form, they will receive an error message indicating which fields were missed.

5.6 Implementation

The system implementation phase of Watheq involved the development of three key components: a mobile application for job seekers, a website for job providers, and the backend and database for them. In this section, we discuss the key implementation steps and procedures, the software components used, and the major and challenging parts of Watheq's code. We also highlight the challenges we encountered during the implementation.

5.6.1 Implementation Key Steps

The implementation of our application involved several key steps, including:

1. Requirements gathering

First, we needed to gather the requirements to lay the foundation of the development process. This included understanding the business objectives, user needs, and technical requirements.

2. Designing the User Interface

We started by designing the user interface for the website and application, which included sketches and wireframes of various screens and features to lay the groundwork for the next steps.

3. Development

The development phase involves building the application and the website, including the front-end and back-end components:

- **Building the Front-End:** We built the front-end of the application using the Flutter framework. This involved creating the user interface and designing the various screens, forms, and components that users would interact with. For website development, we used HTML, JavaScript, and CSS to ensure an engaging and user-friendly interface.
- **Developing the Back-End:** We started by creating the database. We used phpMyAdmin, a popular web-based database management tool, to manage our SQL database. This allowed us to store and retrieve data efficiently. Then, we developed the back-end using PHP for both the website and the application. This involved creating server-side components such as Database Management, data validation, authentication, and authorization logic. Additionally, the recommendation system and interview simulation were developed using Python.

4. Integrate the system with OpenAI API

Our system integrates seamlessly with the OpenAI API to provide a realistic interview simulation experience. This allows users to engage in interactive mock interviews and receive real-time feedback. The connection is established using secure API calls facilitated by both PHP and Python, ensuring smooth communication between our application and the OpenAI services.

5. Testing and debugging

Throughout the development process, we conducted comprehensive testing and debugging of both the front-end and back-end components. This included user story acceptance testing, integration testing, and after the implementation, user acceptance testing. These tests were carried out to ensure that the application functions as intended and fulfills user requirements.

6. Hosting

Both the job seeker application and the job provider website are hosted on the Bluehost server, which provides reliable and scalable hosting services. The server environment was configured to support the PHP programming language and execute the required server-side scripts seamlessly, as well as Python for the recommendation system and interview scripts.

5.6.2 Key Elements and Components

Watheq consists of several key elements and components, including:

1. Front-end

The front-end is built using the Flutter framework for the mobile application and HTML, CSS, and JavaScript for the website. The front-end includes user interfaces and other elements that users interact with.

2. Back-end

The back-end of the application and the website is built using PHP and Python. It includes the implementation of all functions and validation codes.

3. Database

The system uses a relational database to store users' data, job seekers' CVs, job offers information, and other relevant information.

5.6.3 Major Parts of Watheq's Code

- **Job Offer Recommendation Function**

The recommendation process is designed with multiple steps to effectively deliver personalized job offers. Initially, the system employs the asynchronous checkCV() function to verify whether the job seeker has filled out a CV, as illustrated in Figure 30. This crucial step ensures that tailored recommendations are provided exclusively to candidates who have completed their CVs, thus enhancing the efficiency of matching candidates with suitable opportunities. The function sends a request to the PHP script “checkCV.php” that checks the database for the CV and returns a JSON response. If the job seeker does not have a CV, the system prompts them to create one to proceed with receiving personalized job recommendations.

Upon confirming the presence of a CV, the getID() function is triggered to retrieve the unique CV ID associated with the job seeker. This step is vital for the personalization of job offers.

Once the CV ID is successfully retrieved, the fetchRecommendedOffers(cvId) function is activated. Utilizing HTTP POST requests, this function sends the CV ID and email as parameters to the RecommendationSystem.php for processing. Upon receiving a successful response (status code 200), the system decodes the JSON response body, populating the recommendedOffers list with a curated selection of job opportunities tailored to the information provided in the job seeker's CV, as shown in Figure 31. This integration with server-side processing ensures seamless data retrieval and presentation of job recommendations.

Behind the scenes, the backend process involves preprocessing textual data from both the job seeker's CV and available job offers. This preprocessing step, facilitated by the preprocessing.py script, plays a crucial role in ensuring accurate matching between the candidate's CV and job offers, thereby enhancing the quality of recommendations. Subsequently, within the "Recommendation System.php" file, a PHP script calculates the similarity between the job seeker's CV and all job offers in the database. Utilizing a similarity function described in Chapter 3, this script assigns a similarity score to each job opportunity based on the level of match with the CV. The top 5 offers exceeding a total score of 50% are then compiled into an array for presentation and returned in JSON format, ensuring that the most relevant job opportunities are highlighted for the job seeker.

In conclusion, the job offers recommendation feature guarantees that personalized recommendations are exclusively extended to job seekers with completed CVs. It also encourages others to complete their CVs to receive tailored job offers, thus maximizing the effectiveness of the recommendation system and enhancing the overall user experience.

```
Future<void> checkCV() async {
    // showLoadingDialog(context); // Function to show loading
    try {
        var response = await http.post(
            Uri.parse(Connection.checkCV),
            body: {"JobSeekerEmail": widget.email},
        );
        if (response.statusCode == 200) {
            var result = json.decode(response.body);
            setState(() {
                hasCV = result == "1";
            });
        } else {
            print("Failed to check cv: ${response.statusCode}");
        }
    } catch (e) {
        print("Exception while checking cv: $e");
    } finally {
        // Navigator.of(context).pop(); // Hide the loading dialog
    }
}
```

Figure 30. checkcv() Function

```
Future<void> fetchRecommendedOffers(int? cvId) async {
    _showLoadingDialog();
    try {
        var response = await http.post(
            Uri.parse(Connection.recommendation),
            body: {'cvID': cvId.toString(), 'email': widget.email},
            //'cvID': cvId.toString()
        );

        if (response.statusCode == 200) {
            var data = jsonDecode(response.body);
            setState(() {
                recommendedOffers.addAll(data);
            });
        } else {
            throw Exception(
                "Failed to fetch recommended offers: ${response.statusCode}");
        }
    } catch (e) {
        print("Error fetching recommended offers: $e");
    } finally {
        Navigator.of(context).pop(); // Hide the loading dialog
    }
}
```

Figure 31. fetchRecommendedOffers() Function

- **Add Job Offer Function**

The add job offer function in the job provider website allows users to create and submit job offers through a multi-step form divided into seven sections. The form is designed to provide flexibility to users by allowing them to navigate to subsequent sections without having to fill in the previous sections. This approach simplifies the process and accommodates users who may prefer to complete certain sections before others.

In the form, there are three parts where users can add more than one section. For example, in the skills section, users can add multiple skills by providing a plus sign that will generate an additional field for adding another skill. The same functionality applies to the experience and qualifications sections, where users can add multiple entries if desired. Furthermore, users have the option to delete any added sections at any time. Figure 32 illustrates part of AddNewQualification.js, demonstrating the capability to add and delete new sections of qualifications. The same logic is also employed for adding new sections to skills and experiences.

In the qualification section, it's required to select the "Qualification field" from a dropdown list. However, if users cannot find their specific field in the dropdown, they can click on the "other" option, which will reveal a text field. This text field allows users to manually enter their own qualification field, providing them with the flexibility to specify a qualification that is not listed in the predefined options.

In the final section of the form, the primary focus is to provide recommendations for the most suitable candidates who align with the job offer, based on their CVs. This stage highlights a crucial criterion: the prioritization of attributes which are: City, Skill, Experience, and Qualification. Users can effortlessly arrange these attributes using drag-and-drop functionality, assigning varying degrees of importance to each. They also have the option to either assign equal importance to all criteria or opt for advanced customization, tailoring the arrangement based on the significance of each attribute to the job. It is essential to ensure that the total weight assigned to these criteria adds up to 100%. Following this, users can set a minimum matching score, which triggers the system to notify candidates when a candidate's score meets or exceeds the specified threshold, indicating a suitable match for the job offer.

When the user fills in all the required fields and clicks the submit button, a JavaScript file named "Validation" is triggered to validate the form fields. While the HTML side of the form performs some basic validation, the JavaScript file is responsible for more comprehensive validation. It checks for any potential errors or missing information in the form.

If any validation errors are detected, the user is promptly notified, and the process of adding the job offer is halted until the necessary corrections are made. Validation error messages are displayed to the user, indicating the specific fields that require attention. Figure 33 displays a segment of the validation.js file, showcasing the validation process for experiences, with error messages providing specific details about the errors. The same logic is applied for qualifications validation as well.

On the other hand, if the validation process completes successfully without any errors, all the entered data is gathered and sent to a PHP file on the server side. This PHP file is responsible for handling the data and adding it to the relevant database tables using parameterized SQL statements to prevent SQL injection attacks. Then the PHP script calculates the similarity between the job offer and all the CVs in the database utilizing the similarity measure described in Chapter 3. The owners of the CVs with similarity scores exceeding the user-set threshold are then notified about this new job offer.

By employing a combination of HTML, JavaScript, and PHP, the add job offer function ensures a smooth and secure user experience. The form's flexibility allows users to complete the sections in any order, while the JavaScript validation script ensures that all required fields are properly filled, and any errors are addressed before the data is submitted to the server for further processing and database insertion.

```

$( "#addQualification" ).click(function ( e ) {
    e.preventDefault();
    var qualificationFields = `



<h4> Qualification ${qualificationCount + 1}: </h4>
    <label for="degreeLevel${qualificationCount}">Degree Level</label>
    <select name="degreeLevel${qualificationCount}" id="degreeLevel${qualificationCount}"
            class="input select" onchange="handleDegreeLevelChange(event, ${qualificationCount})">
        <option disabled selected></option>
        <option value="Pre-high school">Pre-high school</option>
        <option value="High School">High School</option>
        <option value="Diploma">Diploma</option>
        <option value="Bachelor">Bachelor</option>
        <option value="Master">Master</option>
        <option value="Doctorate">Doctorate</option>
        <option value="Post Doctorate">Post Doctorate</option>
    </select>
    <label id= "DegreeFieldLabel${qualificationCount}" for="degreeFieldLabel${qualificationCount}">
        Degree Field <span class="MaybeRequiredQualification"></span>
    </label>
    <select name="degree[${qualificationCount}][field]" id="degreeField${qualificationCount}"
            class="input select" onchange="handleDegreeFieldChange(event, ${qualificationCount})">
    </select>
    <span id="EnterMessage${qualificationCount}" style="display: none;" class ="EnterMessage">
        Please enter your qualification field below
    </span>
    <input type="text" id="qualificationOther${qualificationCount}"
           name="qualificationOther${qualificationCount}" class="input" style="display: none;" 
           maxLength="100">
    <ion-icon name="close-circle-outline" class="removeQualification remove"
              data-qualification="${qualificationCount}"></ion-icon>
</div>`;
    $("#qualificationFields").append(qualificationFields);
    loadFieldOptions(qualificationCount); // Load field options for the new qualification
    qualificationCount++;
});

$(document).on("click", ".removeQualification", function ( e ) {
    e.preventDefault();
    var qualificationId = $(this).data("qualification");
    $("#qualification" + qualificationId).remove();
});


```

Figure 32. Part of AddNewQualification.js

```

function checkExperience(experience) {
    if (experience === null){
        return true;
    }
    for (var i = 0; i < experience.length; i++){
        var ex = experience[i];
        if (!ex.Category) {
            alert("Experience Industry is missing.");
            return false;
        }
        } else if (!ex.JobTitle) {
            alert("Experience Job Title is missing.");
            return false;
        } else if (!ex.years) {
            alert("Experience Minimum Years is missing.");
            return false;
        } else if (!ex.years.match (/^\d+$/)){
            alert("Please enter a valid number for Experience Minimum Years");
            return false;
        }
    }
    return true;
}

```

Figure 33. Part of validation.js

- **Interview Simulation Function**

The interview process begins within the Flutter code, when the user clicks on “Mock Interview” button for a specific job offer. Upon initialization, the Flutter Interviews class coordinates the display of instructions to the user, guiding them on how the interview will unfold.

Once the user starts the interview, a variable called questionIndex will be initialized with 0, which acts as a counter for questions, when it is 0 then a request is sent to the backend PHP script, which acts as the intermediary between the Flutter code and the Python code that interacts with OpenAI API. The PHP script receives the initial request with details like the user's email, offer ID, and status indicating the start of the interview. It then leverages database queries to gather relevant information, including the user's CV details and job offer specifics. The retrieved data is then encapsulated into the variable \$context, which contains the retrieved information about the user's CV, job offer details, and the interview scenario.

With the context prepared, the PHP script triggers the Python script, passing along the context as a parameter, along with the status 'start,' as illustrated in Figure 34. The Python script, powered by the OpenAI API, manages the conversation flow with the user. It creates a new thread, simulating the start of the interview session. The AI assistant, facilitated through the API, generates the first interview question based on the provided context within the Python script and sends it back to the PHP script.

Back in the PHP script, the received question is then forwarded to the Flutter code. The user responds to the question through the Flutter interface, providing their answer, and the questionIndex counter will be incremented. This answer is sent back to the PHP script, which in turn relays it to the Python script using the 'next' status as illustrated in Figure 35 and 36. The AI Assistant retains continuity in the interview by associating questions within the same thread and maintaining their sequential order. This is made possible because every HTTP request sent to the API carries the same thread ID initially provided by the API at the start of the interview, as illustrated in Figure 36.

The Python script processes the user's answer, simulating the interviewer's response based on the AI's understanding of the conversation context. It generates the next question dynamically, considering the interview guidelines such as focusing on CV details, job offer aspects, and HR-related questions. This iterative process continues until the questionIndex counter reaches 10.

Towards the end of the interview, when the final question is answered by the user, the AI assistant concludes the conversation by providing feedback. It evaluates the user's answers, highlights strengths, weaknesses, areas for improvement, and offers suggestions for future interviews. This feedback completes the interview experience, providing valuable insights and learning opportunities for the user.

In summary, the interview function seamlessly integrates the Flutter frontend, PHP backend, and Python script powered by OpenAI. It creates a dynamic and interactive interview environment where users can practice and improve their interview skills in a simulated setting.

```
// Execute Python script with status, filtered CV data, and offer data as arguments
$pythonResult = shell_exec("$pythonPath Interviews.py start \"\$context\" 2>&1");
```

Figure 34. Python Script Execution Line

```
if (questionIndex == 0) {
    status = "start";
} else if (questionIndex == 10) {
    status = "last";
    setState(() {
        isInputVisible = false; // Hide the input field after the final question
    });
} else {
    status = "next";
}
```

Figure 3535. Part Of Python Script To initialize the Status Variable

```
if (questionIndex == 0) {
  response = await http.post(
    url,
    headers: {"Content-Type": "application/json"},
    body: json.encode({
      'status': status,
      'offerId': widget.offerID,
      'email': widget.email
    }),
  );
} else {
  response = await http.post(
    url,
    headers: {"Content-Type": "application/json"},
    body: json.encode({
      "status": status,
      "answer": text,
      "thread_id": thread_id, // Send the user's answer
    }),
}
}
```

Figure 36. Flutter Code That Sends HTTP Requests

5.6.4 Implementation Challenges

Through the implementation process, we encountered several challenges and overcame them, including:

- 1. User Authentication and Security:** Implementing a secure authentication system and protecting users' sensitive data.
- 2. User Interface Design:** Creating an intuitive and visually appealing user interface that enhances user engagement and facilitates easy navigation. Also, ensuring a seamless and intuitive user experience often involves simplifying complex security measures, which can potentially compromise the overall system's integrity. Striking the right balance between usability and security required careful consideration.
- 3. Error Handling and Debugging:** Implementing robust error handling mechanisms and effective debugging techniques to identify and resolve issues promptly. Hiring platforms require users to input a lot of information, so ensuring that this information is handled securely and validated correctly can be challenging.
- 4. Managing Database Interactions:** The application and the website interact with the database to store and retrieve information. Ensuring that the database is properly configured and that interactions are handled efficiently and securely can be challenging.
- 5. Hosting Server Selection:** We also faced challenges in finding a suitable hosting server because the university doesn't provide us with servers. It took some time and effort to search for a suitable server.

In conclusion, the implementation of Watheq involved several key steps and challenges that needed to be addressed. By carefully planning and executing the development process, we were able to create a high-quality and reliable hiring platform that meets the needs of users and delivers a positive user experience.

CHAPTER.6

System Evaluation

6 System Evaluation

This chapter focuses on evaluating the system and determining whether the project's final release meets user requirements. Additionally, it aims to identify and rectify any bugs or errors within the code. It begins with experimental testing to assess the recommendation system using a dataset from a relevant academic paper. This is followed by quality testing, which evaluates both the recommendation system and the interview simulation in terms of the quality of recommendations, interview questions, and feedback based on end-user needs. User Acceptance Testing (UAT) is then conducted to verify the usability and user-friendliness of the system for end-users. Additionally, testing of non-functional requirements focuses on the quality attributes of the Watheq platform. The chapter concludes with a discussion analyzing the results to assess the effectiveness of the testing process. This analysis provides insights into the strengths of the Watheq application and identifies areas for potential improvement.

6.1 Experimental Results

To assess the performance of our recommendation system, we employed a case study approach as described in an academic paper [38]. This study focused on a single job offer and five job seekers using a content-based recommendation strategy that emphasizes measurable human resources skills. Up to our knowledge, there are no established benchmarks for evaluating job recommendation systems. Therefore, we utilized the same dataset from this paper to test our system, allowing us to compare the ranking of job seekers and validate the effectiveness of our recommendation system.

The study used vector representations for candidate profiles and job requirements. We adapted this data into a more detailed format that our system could process, ensuring the attributes closely matched those used in the paper but extended to include actual data values for practical application within our system.

The job profile outlined in the study was for a "Computer System Administrator". Required qualifications were a Bachelor of Science (BSc) degree in Software Engineering, Computer Programming, or IT, coupled with four years of relevant IT sector experience, particularly in roles like Systems Analyst or System Programmer. Essential skills included English language proficiency and Oracle developer capabilities.

The candidates' profiles were represented through vectors indicating the presence or absence represented by 0 or 1 of specific attributes:

- Master of Science (MSc) degree requirement
- Bachelor of Science (BSc) degree requirement
- Field of study (Software Engineering, Computer Programming, or IT)
- IT sector experience
- More than four years of experience
- English language proficiency (1-low, 2-medium, 3-excellent)
- Oracle developer skill

In the original study, the city attribute was not included, which is one of the factors in our recommendation system. To neutralize its impact and maintain consistency with the paper, we assigned the same city to all candidate CVs to maintain consistency and eliminate location bias. For the English language proficiency, represented in the study as numerical values (1-low, 2-medium, 3-excellent), were translated into distinct skill categories in our system to mirror the 1-3 rating scale: Low English Language, Medium English Language, and Excellent English Language. A candidate marked as 'excellent' or 'medium' will possess the lower skill levels as well. For instance, a rating of 'excellent' means the candidate CV in our system will contain the low, medium, and excellent English language in order to reflect the effect of the rating scale used in the vectors representation. Other attributes from the study were seamlessly converted into textual descriptions within our system. All the attributes were equally weighted in our similarity measure.

The resultant vector for the job in [38] was [0, 1, 1, 1, 1, 3, 1], indicating no MSc required, BSc required, in a relevant field, IT experience, over four years' experience, excellent English skills, and Oracle skills. The candidates' CVs were represented by vectors as follows: 1st person [0, 0, 1, 0, 0, 2, 1], 2nd person [0, 1, 0, 1, 1, 3, 0]. 3rd person [0, 1, 1, 1, 1, 2, 1], 4th person [0, 1, 0, 1, 1, 2, 0] and the 5th person [1, 1, 0, 1, 1, 1, 0]. For example, the 3rd person's vector [0, 1, 1, 1, 1, 2, 1] signifies that this candidate does not have an MSc but holds a BSc in a relevant field such as Software Engineering, Computer Programming, or IT. Additionally, the candidate possesses IT experience, more than four years of experience in the sector, medium proficiency in English, and Oracle Developer skill.

Our system processed these details, maintaining the integrity of the study's framework while utilizing our advanced sorting feature to assess candidate-job suitability. We integrated these candidate profiles as actual CVs within our system and applied them to the specified job offer. Our sorting feature then assessed the results, providing a clear and consistent ranking of candidates along with similarity scores for each. This allowed us to directly compare our findings to the rankings from the original study.

The paper [38] employed different similarity measures: Cosine, Euclidean, and Jaccard to assess candidate-job alignment. Each measure consistently ranked the candidates in the same order which is 3rd, 2nd, 4th, 1st, and then 5th candidate, showcasing their effectiveness in determining the best fit for a specific job profile based on measurable skills and qualifications.

The outcomes from our system demonstrated a clear and consistent ranking of candidates that aligned with the findings of the paper. Table 10 illustrates how our system's rankings and similarity scores compared with those from traditional similarity measures used in the study. This comparison effectively shows that our system replicated the paper's rankings, confirming the 3rd person as the best candidate, followed by the 2nd, 4th, 1st, and 5th candidate.

This validation underscores the effectiveness of our recommendation engine in accurately assessing and matching candidates to job offers, confirming its robustness by aligning with established measures like Cosine, Euclidean, and New Jaccard. Our system not only replicates traditional rankings but enhances matching precision through adjustable attribute weighting tailored to specific job requirements. This adaptability ensures a dynamic, responsive recruitment tool that aligns with employer needs and job market trends. Successful implementation confirms the reliability of our system, optimizing the recruitment process by providing precise matches that benefit employers and job seekers, thus improving overall recruitment efficiency.

Table 10. Ranking of candidates in different similarity measures.

Cosine Similarity in [38]	Euclidean Distance in [38]	Jaccard Measure in [38]	Watheq Similarity Measure
3 rd person 0.99	3 rd person 1.0	3 rd person 0.94	3 rd person 0.96
2 nd person 0.82	2 nd person 1.41	2 nd person 0.83	2 nd person 0.87
4 th person 0.81	4 th person 1.7	4 th person 0.78	4 th person 0.77
1 st person 0.70	1 st person 2.0	1 st person 0.61	1 st person 0.71
5 th person 0.67	5 th person 2.65	5 th person 0.48	5 th person 0.69

6.2 Quality Testing

To assess the quality of Watheq's major systems, user evaluation was performed. The testing consisted of two systems to test: the recommendation system and the interview simulation. Three types of testers were involved: 10 job seekers and 10 job providers as shown in Figure 37. We collected their answers through a form where the answers are on a scale, with 5 representing "extremely relevant" or "excellent quality" as the highest score and 1 representing "not relevant at all" or "poor quality" as the lowest score. For the recommendation system, the job seekers tested the job offer recommendation function, and the job providers tested the applications sorting function. Each type of tester evaluated the functions of the system that they value more and will be using. All 20 participants tested the interview simulation function. Appendix C includes the questions of the form which includes the recommendation examples provided, while Appendix D includes the form responses.

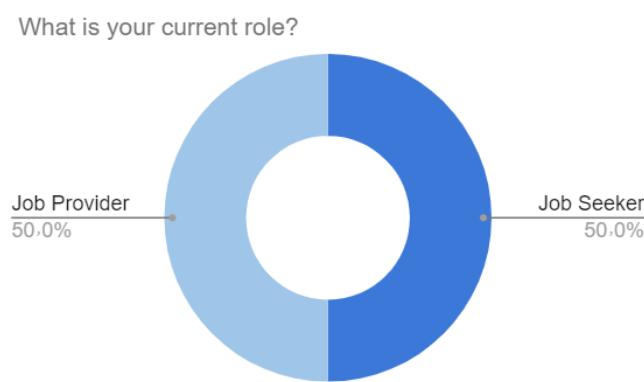


Figure 37. Quality Testing Participants Roles

6.2.1 Recommendation System Testing

The recommendation system was tested through its functions by two types of users. Starting with the job seekers, they tested the job offers recommendation. Given two examples of a CV with the top five recommended job offers for each CV, they were asked about the relevance of each CV with the recommended job offers. The first example got 100% of seekers stating that the recommended offers were extremely relevant as shown in Figure 38. The second example got 90% of seekers stating it was extremely relevant, while only 10% stated it was relevant as shown in Figure 39.

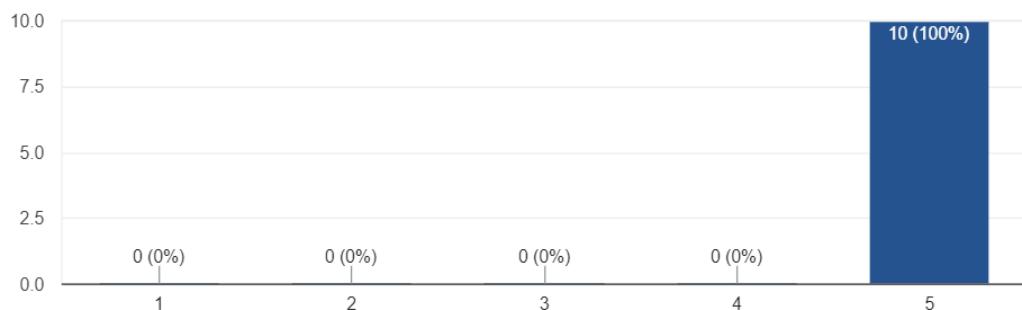


Figure 38. First Example Of Recommended Offers Testing

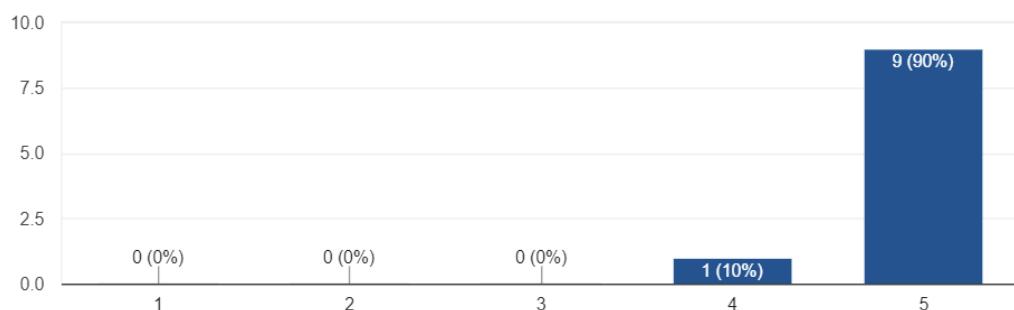


Figure 39. Second Example Of Recommended Offers Testing

For job providers, they were testing the applications sorting functionality, which sorts the CVs of applicants to a specific offer by the matching score between their CVs and the offer details. They were given two examples of one job offer and the sorting result of the applications (CVs), each with their matching score. Both examples received the same percentages: 90% of providers stated the quality of sorting is excellent and only 10% stated it was good as shown in Figure 40 and Figure 41 respectfully.

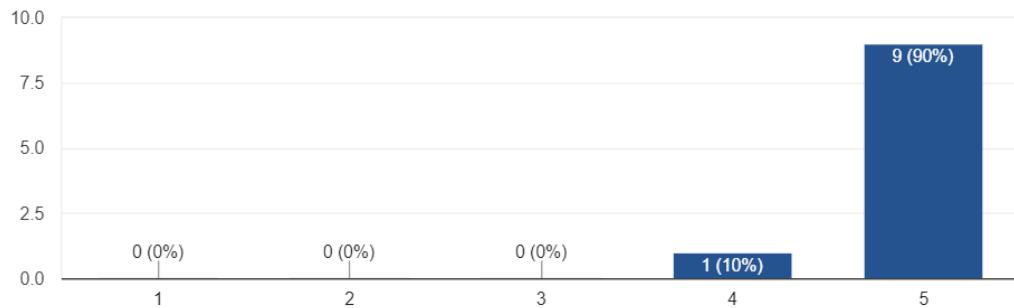


Figure 40. First Example Of Sorting Applications Testing

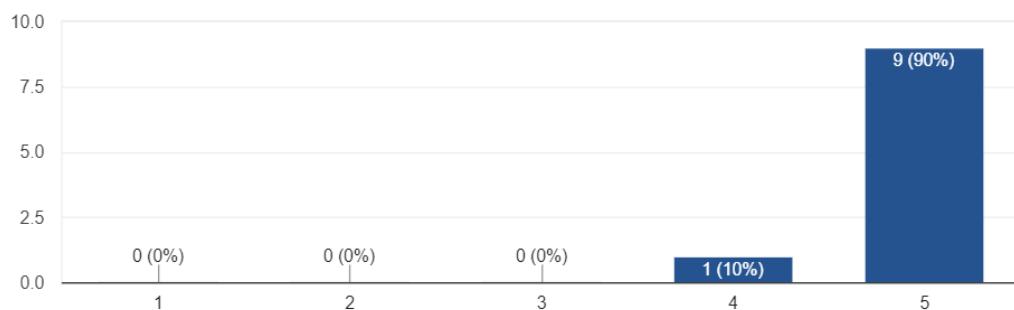


Figure 41. Second Example Of Sorting Applications Testing

This highlights that the recommendation system is high in quality and accuracy, given the average of 4.95 out of 5 for the job offer recommendations function tested by the job seekers. Meanwhile, the sorting function got an average of 4.90 out of 5, considering that 'Extremely Relevant/ High Quality' has a weight of 5 and 'relevant/Good' has a weight of 4.

In conclusion, the recommendation system demonstrated exceptional performance across all user groups. Job seekers and job providers unanimously recognized the system's effectiveness in providing highly relevant and high-quality recommendations and sorting. The consistently high ratings underscore the system's potential to significantly enhance the job matching process, ensuring that job seekers receive pertinent job offers and employers obtain well-matched candidates. The system's robust accuracy and quality metrics validate its utility and reliability in real-world applications.

6.2.2 Interview Simulation Testing

The Interview Simulation section consisted of two interview examples for the same CV, each associated with a different job offer. The first offer did not align well with the CV information, while the second offer closely aligned with the CV information. These examples demonstrated the interview function's ability to generate questions that combined the CV and offer details, as well as answers to previous questions. After each interview, cumulative feedback was generated. The Quality Testing contained questions about the relevance of the questions to the CV and the offer for each interview, and the overall quality of questions and feedback. Appendix E includes the two interview examples along with the CV and the offers' details.

For the first interview, regarding the relevance of the questions to the offer details, 80% of participants stated that it was extremely relevant, while 20% stated that it was relevant as shown in Figure 42. Regarding the relevance of the questions to the CV, 95% chose that it was extremely relevant and 5% chose that it was relevant as shown in Figure 43.

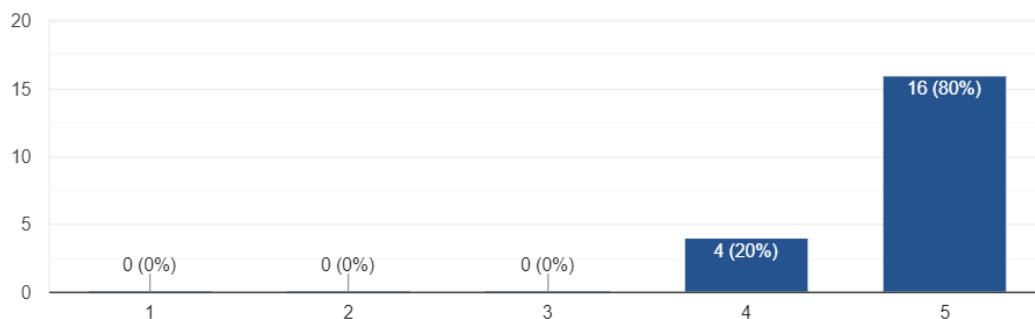


Figure 42. First Example Of Questions Relevance To The Offer

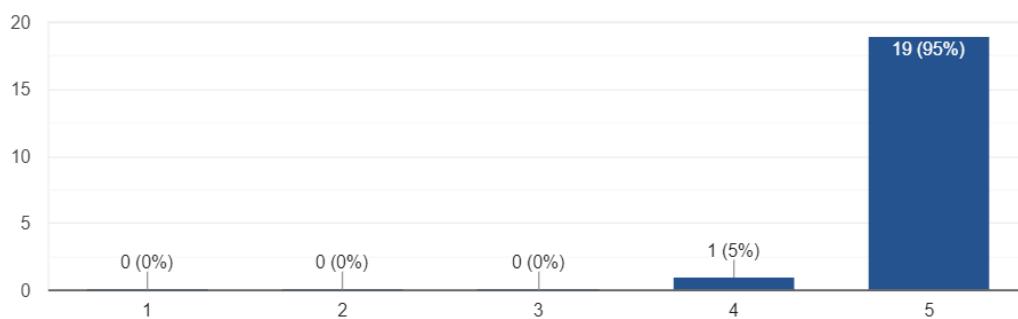


Figure 43. First Example Of Questions Relevance To The CV

For the second interview, 90% of participants stated that the questions were extremely relevant to the offer information, and 10% stated that they were relevant as shown in Figure 44. Additionally, 85% stated that the questions were extremely relevant to the CV information, and 15% stated that they were relevant as shown in Figure 45.

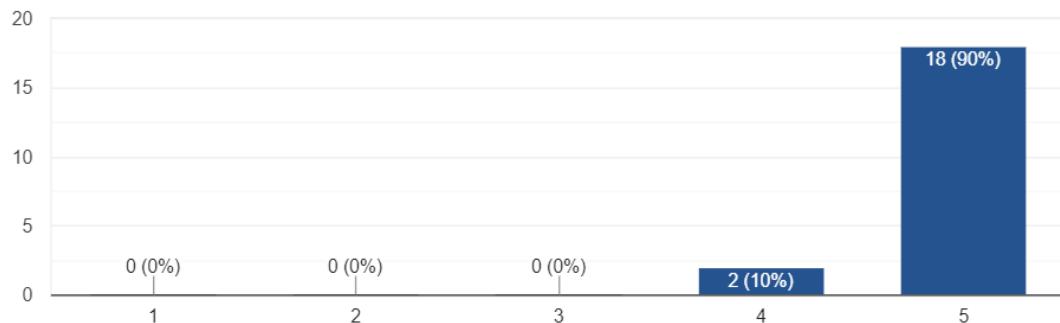


Figure 44. Second Example Of Questions Relevance To The Offer

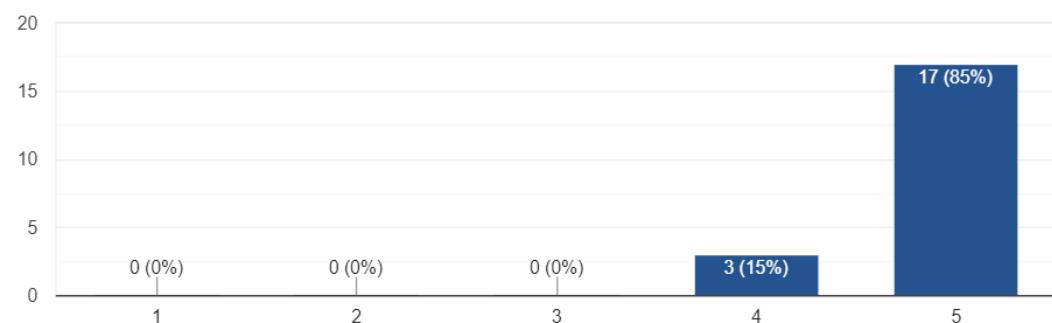


Figure 45. Second Example Of Questions Relevance To The CV

For both interviews, 90% of participants found the question quality to be excellent, while 10% found it to be good. Furthermore, 95% found the feedback quality to be excellent, with only 5% finding it to be good as shown in Figures 46 and 47 respectfully.

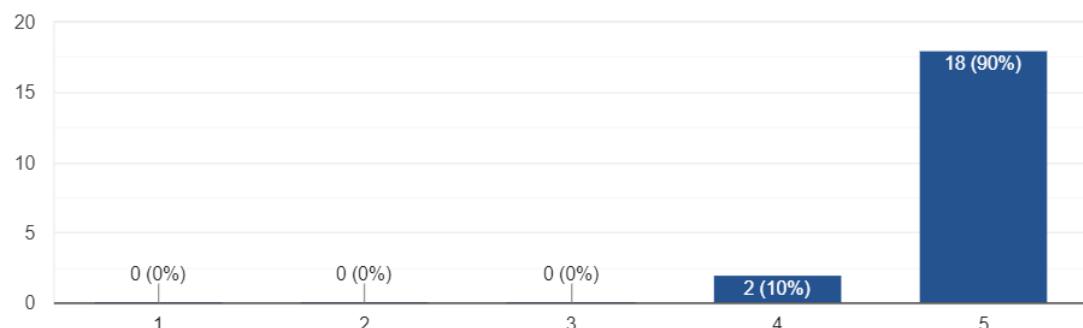


Figure 46. Interview Questions Quality Testing

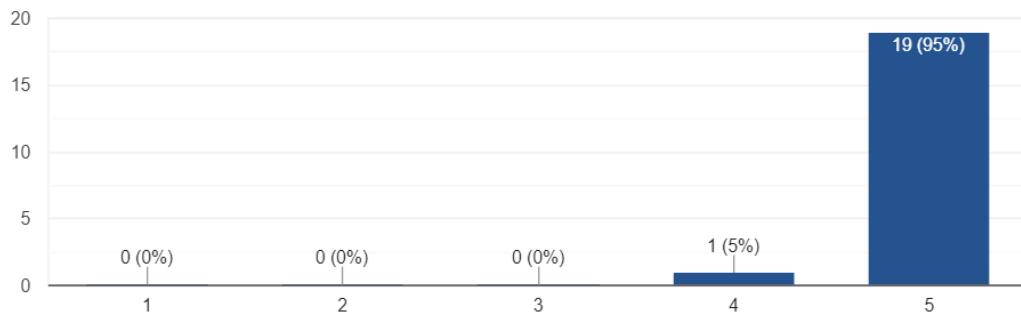


Figure 47. Interview Feedback Quality Testing

These results highlight that the relevance of the questions to the offer and CV is high, with an average score of approximately 4.88 out of 5. The average quality for both the questions and feedback is approximately 4.93 out of 5, considering that "extremely relevant" and "excellent" quality have a weight of 5, while "relevant" and "good" have a weight of 4.

In conclusion, the interview simulation function proved to be highly effective in generating relevant and high-quality questions and feedback. The majority of participants rated the relevance and quality of the questions and feedback as either extremely relevant/excellent or relevant/good. This indicates a strong alignment between the interview questions and the provided CV and offers, demonstrating the system's capability to produce tailored and insightful interview experiences.

6.3 User Acceptance Testing

User Acceptance Testing (UAT) focuses on confirming the system's usability and user-friendliness for end-users, ensuring it aligns with business requirements. The process involves collecting feedback and suggestions from users to enhance the system. Testing was conducted using both web browsers and mobile devices. Ten employers tested the website, while ten employees/job seekers tested the mobile application. Employees were included to leverage their experience with job searches. Additionally, some participants were employed but interested in exploring better opportunities. Participants were tasked with completing a set of actions, responding to usability questions, and sharing their current perspectives on the system.

6.3.1 Demographics of Participants

This test was conducted with 20 target users of the system, and the demographic questions asked during the test are in Appendix F. Figure 48 shows that 50% of the testers were Employees/Job Seekers, while 50% were Employers. Concerning the age of the participants, as depicted in Figure 48, 15% were aged 18-22, 35% were 23-25, 30% were 26-30, and 20% were 31 or older. The majority of testers have a high level of experience with mobile and web applications. As illustrated in Figure 49, 85% have a very high level of experience, while the others have a high level. Regarding reliance on mobile/web applications for job searching and provision activities, Figure 50 indicates that 70% are very reliant, with the remainder being reliant.

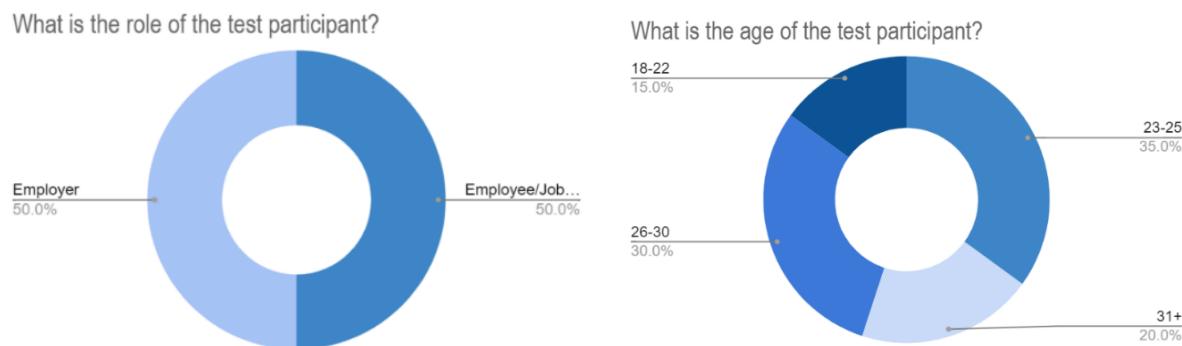


Figure 48. User Testing Participants' Roles and Ages

How would you rate your overall experience in using mobile and web applications?
20 responses

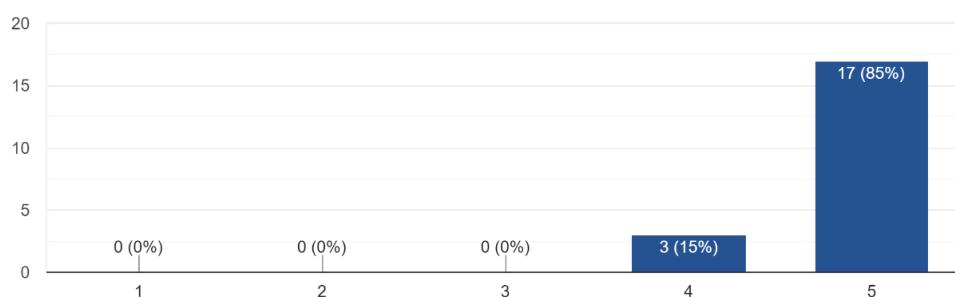


Figure 49. User Testing Participants' Experience

How reliant is the tester on mobile/web applications for activities related to job searching and job provision?
20 responses

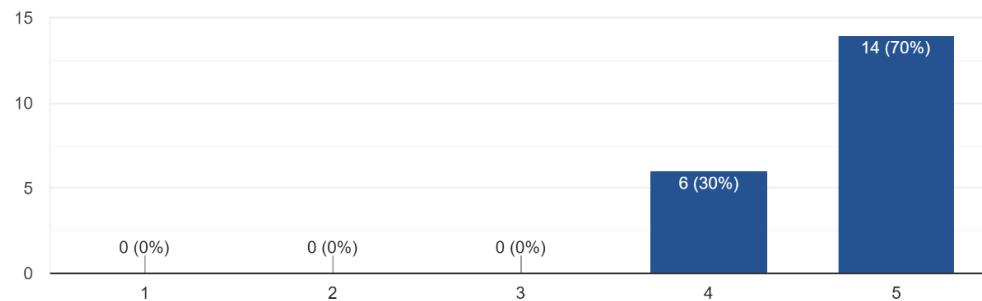


Figure 50. User Testing Participants' Reliant

6.3.2 Questionnaire/Interview Results

The results were derived from multiple parts of the questionnaire. In the initial phase of our user testing, we instructed participants to complete tasks based on their user roles, either as Job Seeker/Employee or Employer. The tasks assigned to Employers during the testing phase on the web application included:

- Sign-up
- Log-in
- Reset Password
- Add New Job Offer and Send Customized New Job Offers Notifications
- View Offers History
- View Job Applications
- View Applications' CVs
- Change Application Status
- Close Job Offer
- Sort Job Applications
- View Profile Page
- Fill Company Information
- Edit Company Information
- Log-out

As shown in Figure 51, all employer tester participants were able to successfully complete the assigned tasks without encountering problems, resulting in a 100% task completion rate for most tasks. However, for specific tasks such as Reset Password, Change Application Status, View Profile Page, and Log Out, the task completion rate was 90%. This was due to one participant not completing these tasks because of the limited time available. in Table 11, each task is listed along with the average time it takes for participants to accomplish it. As can be seen in this table, the time is suitable for each task. Thus, the initial results for the website are good and indicate that the application is user-friendly.

Please select all the task you have accomplished
10 responses

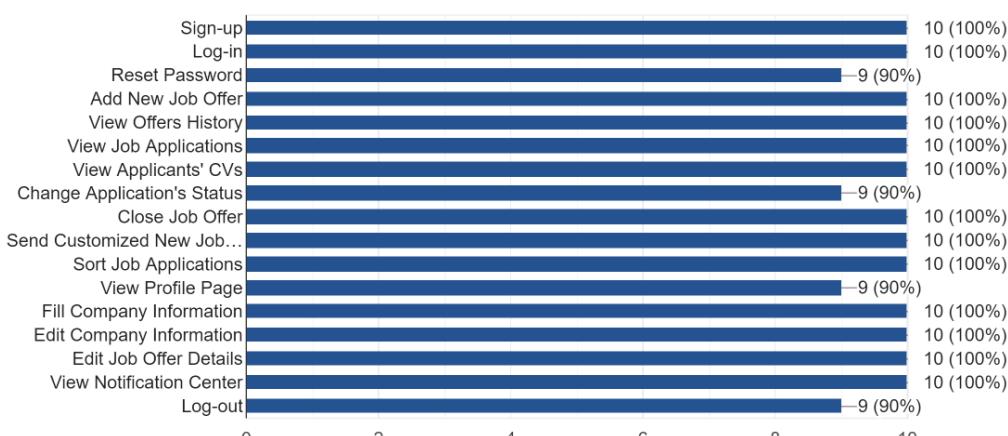


Figure 51. Tasks Completion Rate For Employer Role

Table 11. Tasks Average Duration

Task number	Task	Average Duration
1	Sign-up	60 sec
2	Log-in	25 sec
3	Reset Password	50 sec
4	Add New Job Offer and Send Customized New Job Offers Notifications	180 sec
5	View Offers History	13 sec
6	View Job Applications	10 sec
7	View Applications' CVs	8 sec
8	Change Application Status	12 sec
9	Close Job Offer	8 sec
11	Sort Job Applications	25 sec
12	Fill Company Information	40 sec
13	Edit Company Information	15 sec
14	View Profile Page	7 sec
15	Edit Job Offer Details	95 sec
16	View Notification Center	8 sec
17	Log-out	5 sec

As Watheq provides a mobile application for Job Seekers, the tasks assigned to them during the testing phase on the mobile application included:

- Sign-up
- Log-in
- Reset Password
- View Profile Page
- View All Offers and Recommended Offers
- Search for Job Offers
- Filter Job Offer
- View Job Offer Details
- Fill CV Information
- Edit CV Information
- Apply for a Job and Send Job Application Notification
- View Applications History
- Cancel Job Application
- View Notification Center
- AI Interviews
- View Company Details
- Log-out

As shown in Figure 52, all Job Seeker/Employee tester participants were able to successfully complete the assigned tasks without encountering any problems, resulting in a 100% task completion rate for all tasks. in Table 12, each task is listed along with the average time it takes for participants to accomplish it. As can be seen in this table, the time is suitable for each task. Thus, the initial results for the mobile application are good and indicate that the application is user-friendly.

Please select all the task you have accomplished

10 responses



Figure 52. Tasks Completion Rate For Employee/Job Seeker

Table 12. Tasks Average Duration

Task number	Task	Average Duration
1	Sign-up	45 sec
2	Log-in	23 sec
3	Reset Password	30 sec
4	View Profile Page	2 sec
5	View All Offers and Recommended Offers	9 sec
6	Search for Job Offers	27 sec
7	Filter Job Offer	20 sec
8	View Job Offer Details	22 sec
9	Fill CV Information	240 sec
10	Edit CV Information	150 sec
11	Apply for a Job and Send Job Application Notification	11 sec
12	View Applications History	6 sec
13	Cancel Job Application	15 sec
14	View Notification Center	18 sec
15	AI Interviews	540 sec
16	View Company Details	7 sec
17	Log-out	6 sec

To assess the system's usability, we utilized the System Usability Scale (SUS) [39], a standard test for evaluating usability. The SUS is similar to a Likert scale and contains 10 questions related to the usability of web and mobile applications, answered by users. Participants rate each question from 1 to 5 based on their level of agreement with the statement. A rating of 5 indicates strongly agree, while a rating of 1 indicates strongly disagree, as mentioned in [39]. The SUS questions are available in Appendix F.

The SUS questionnaire was used with all 20 participants. In Table 13, the count of participants' responses, average responses, and satisfaction scores for each question are displayed. Questions with even numbers present negative statements indicating the extent of user dissatisfaction with the system, including the second, fourth, sixth, eighth, and tenth questions. Conversely, questions with odd numbers present positive statements indicating the extent of user satisfaction with the system.

To calculate the satisfaction score, one is subtracted from the average response for each odd-numbered question, while the average response for even-numbered questions is subtracted from five. The final satisfaction score is determined by summing all the satisfaction scores for all questions and multiplying the result by 2.5. These calculations yield the final score out of 100.

As shown in Table 13, the final satisfaction score is 93 out of 100, indicating a very high user satisfaction level. This percentage surpasses the average System Usability Scale score, which is 68 [39]. The participants' responses to the SUS questions are available in Appendix G.

Table 13. SUS Responses and Scores

Question	Response					Average Response	Satisfaction Score
	5	4	3	2	1		
Question#1	16	4				4.8	3.8
Question#2				5	15	1.25	3.75
Question#3	16	3			1	4.65	3.65
Question#4				7	13	1.35	3.65
Question#5	17	3				4.85	3.85
Question#6		1		5	14	1.4	3.6
Question#7	12	8				4.6	3.6
Question#8				2	18	1.1	3.9
Question#9	15	5				4.75	3.75
Question#10				6	14	1.3	3.7
Final Satisfaction Score:						93.125	

In addition, we asked participants feedback questions to gather insights into their preferences and opinions regarding the system. These questions are available in Appendix F.

For the first question, all participants agreed that Watheq effectively addresses the needs of both job providers and job seekers. Some participants mentioned, 'The seekers are able to share their resumes with plenty of providers, while the providers can find the perfect match among the seekers. This proves that Watheq is successful.' Others expressed, 'Yes, I appreciate the system's flexibility, especially how it allows job providers to specify the importance of each attribute when adding a job offer.' Additionally, some participants shared their appreciation for specific features, such as the application sorting feature: 'Yes, the system is particularly helpful, especially in the sorting process. I found it extremely useful as it saves time by filtering out applications that may not be suitable for the job offers I have published.' Another participant said, 'It's a fantastic app! The concept of AI-driven interviews is appealing, and the questions I received were tailored to my CV, the job offer, and my responses. I really enjoyed it!'

For the second question, most users did not encounter any difficulties while testing the system. One of the employee/job seeker tester participants mentioned, 'There are no challenges, but I would prefer to have a speech feature available during the interview.' This enhancement is scheduled for future development on the Watheq platform.

For the third question, every participant expressed their willingness to use the system upon its launch, signaling a positive indication of the need for Watheq. And for the fourth question, all participants found the colors and the interface comfortable, expressing a positive liking for them. They noted that the font size is readable, and the interface is user-friendly. This collective feedback serves as a recognition that the Watheq interface design is considered suitable.

For the last question, the testers provided feedback and suggestions. Some participants suggested adding multiple languages, specifically Arabic, alongside English. However, due to project time constraints, this enhancement is planned for future work. Additionally, using map locations for adding job offer locations is also planned for future development. The users' responses to the feedback questions are available in Appendix G.

6.4 Quality Attributes

In this section, we outline the non-functional requirements (NFRs) for Watheq, covering five key areas: learnability, availability, compatibility, performance, and security. Each of these attributes is vital for the overall effectiveness and user satisfaction of our platform. Table 14 lists each of these requirements along with their measures and testing outcomes. All these requirements have been successfully met according to the testing results, confirming that our platform performs robustly across all specified metrics.

Table 14. NFR Testing

User story	Quality Attribute	Measure	Results
As a user, I want Watheq platform pages to load within 10 seconds of initiating a request, so that I can access all functions without delays.	Performance: How quickly does the page load after a request is made?	Compute the time it takes for all the pages to load from the moment the request is initiated. The response time should be within 10 minutes.	During user acceptance testing for 10 providers and 10 seekers, the maximum loading time recorded across all the tasks was 9 seconds, consistently meeting the user expectation of loading within 10 seconds.
As a user, I want the system to be available 90% of the time so that I can depend on its continuous accessibility.	Availability: How often is the system operational and accessible for use?	As stated in [39] for Bluehost uptime rate.	The platform is hosted on Bluehost, which provides 99.9% uptime rate in a month according to [39]. This far exceeds the user's requirement of 90% availability.
As a job provider, I want the Watheq platform to be compatible with different web browsers so that I can access it using my preferred browser.	Compatibility: Does the platform operate consistently across different web browsers?	Test the platform across a range of commonly used web browsers to ensure it functions correctly in each.	Watheq platform was tested during user acceptance testing across multiple browsers including Google Chrome, Mozilla Firefox, Safari, and Microsoft Edge. The platform performed well in all tested browsers, confirming compatibility, and fulfilling the job provider's need to access the platform with their preferred browser.

<p>As a user, I want the system to secure my password effectively, so that no one can access my account.</p>	<p>Security: How secure is the system in storing passwords?</p>	<p>All passwords must be stored in the database using a secure hashing algorithm</p>	<p>The security testing confirmed that all passwords are hashed before being stored in the database, utilizing the password_hash method in PHP, which according to [40] employs the bcrypt algorithm, and this method is particularly robust as it automatically updates to newer, more secure algorithms as they become available.</p>
<p>As a user, I want to be able to learn how to use the platform quickly, so that I won't get frustrated.</p>	<p>Learnability: How quickly can a user learn to use the system and perform tasks for the first time?</p>	<p>Compute the time it takes the user to complete main actions. Users should need less than 10 minutes to complete each action.</p>	<p>In the user acceptance testing conducted with 10 providers and 10 seekers, we recorded the time they took to complete the main functions. The time was between 4 seconds and 8 minutes, indicating that the platform operates efficiently and meets the designated learnability criteria.</p>

6.5 Discussion

The extensive testing of Watheq platform's development has provided valuable insights into its effectiveness and areas for enhancement. This discussion reflects on the results from the experimental testing, quality testing, User Acceptance Testing (UAT), and testing of non-functional requirements (NFRs), evaluating their implications for the system's performance and user satisfaction, each phase aimed to validate different facets of the system, from functionality and user satisfaction to non-functional requirements.

The experimental testing used a dataset mentioned in [38] to validate the reliability of Watheq's recommendation system. It showed that our system's results in candidates ranking aligned with the results obtained from established similarity measures—Cosine, Jaccard, and Euclidean—mentioned in [38]. This alignment confirms the efficiency and reliability of our similarity measure in providing precise recommendations, underscoring the system's ability to manage real-world complexities in job matchmaking effectively.

Following the experimental phase, the quality testing demonstrated impressive results for both the recommendation and interview simulation features. The recommendation system received an average score of 4.95 out of 5 from job seekers, indicating a high degree of relevance in the job offers linked to the CVs. Similarly, job providers gave the applications sorting functionality an average score of 4.90 out of 5, reflecting satisfaction with the accuracy of the match between CVs and job offers. The interview simulation also performed well, with an average quality score of 4.91 out of 5, highlighting the relevance and high quality of the interview questions and feedback provided to the users.

UAT highlighted excellent usability across web and mobile interfaces, with a satisfaction score of 93.125 out of 100, indicating the system's user-friendliness and efficiency. Feedback from users suggested the addition of more features to enhance the user experience. These suggestions are being considered for future development to ensure continuous improvement of the Watheq platform.

Finally, testing for non-functional attributes verified strong performance across essential metrics, including a 99.9% uptime for availability, quick learnability with tasks completed in under 10 minutes, rapid response times with page loads in less than 10 seconds, and robust security and compatibility. These results ensure a reliable, secure, and efficient user experience on the Watheq platform.

Overall, Watheq has demonstrated considerable strengths as a robust, reliable, and user-friendly job platform, successfully satisfying all its non-functional requirements and affirming its readiness for wider deployment. The evaluation results confirm that the system meets and often exceeds user expectations, with strong usability scores and positive feedback underscoring its potential to effectively streamline the recruitment process. Feedback has been instrumental in highlighting areas for enhancement, which will be addressed in future updates to maintain Watheq's relevance and efficacy in the evolving job market landscape.

CHAPTER.7

Conclusion and Future Work

7 Conclusions and Future Work

Watheq serves as a comprehensive platform that addresses the challenges faced by both job seekers and job providers in the recruitment process. By bringing together job seekers and providers under a single platform, Watheq offers a range of features and functionalities to streamline the job search and hiring process.

Job providers can easily upload job offers, reaching a wide pool of candidates. Also, job providers can efficiently manage job applications. Job seekers can view, search, and apply for relevant opportunities on a single platform. Watheq also offers virtual AI-driven personalized job interviews, saving time and improving interview skills.

Furthermore, the implementation of a recommendation system within Watheq empowers both job providers and seekers to efficiently match job offers with the CVs of potential candidates. This feature utilizes a recommendation system to analyze and compare job requirements with the qualifications and skills outlined in job seekers' CVs, thereby facilitating more accurate and targeted matches, and providing them as job recommendations. In addition, when a new job offer is posted, according to the job offer details, the job seekers that have the most matching CVs are immediately notified in order for job seekers to be up to date with relevant job offers and for job providers to reach the most qualified candidates. This matching mechanism is also used when displaying the applications for a job offer to the job provider so that the applications can be sorted by matching percentage to help in applications management.

In the first stages of the development of the Watheq platform, we have carefully considered the problem statement, which highlighted the time-consuming and challenging nature of the job search process for job seekers, as well as the difficulties faced by job providers in finding suitable candidates. In response, we have designed Watheq as a comprehensive solution to overcome these challenges.

To ensure the success of the project, we carefully defined the scope of the Watheq platform, outlining its key features and functionalities. This helped us focus our efforts on developing a robust and user-friendly solution that addresses the specific needs of job seekers and job providers.

In order to gain a deeper understanding of the concepts and technologies underlying Watheq platform, we conducted an extensive literature review. This review encompassed various areas, including job searching, generative AI, Web APIs, and Recommendation Systems. By examining the existing knowledge and research in these fields, we were able to incorporate best practices and technologies to enhance the functionality and performance of Watheq.

Following the literature review, our project continued with a comprehensive competitive analysis, which aimed to gain insights into the current job search and AI interviews market. This analysis involved a thorough examination and comparison of Watheq with other existing applications in the market. By conducting this analysis, we ensured that Watheq addressed the limitations present in similar platforms, thereby providing a competitive advantage and superior user experience. After conducting the competitive analysis, it is evident that Watheq stands out as a unique job searching platform that combines innovative features such as AI-based interview preparation and personalized job recommendations.

To better understand the requirements and expectations of stakeholders, we designed an online survey. The survey targeted job seekers, job providers, and employees, allowing us to gather valuable feedback and insights. Through the survey responses, we were able to identify key pain points, preferences, and features desired by the users. This information was vital in shaping the development of Watheq, as it guided us in determining the user stories to be implemented and creating a comprehensive product backlog.

The next phase of our project involved showcasing the system design of Watheq. We employed various techniques such as Architectural Diagrams, Class Diagrams, Component Level Design, and Interface and Data Design. These visual representations provided a clear overview of the system's structure, components, and interactions, ensuring a solid foundation for the implementation phase.

Moving on to the system implementation, we documented the key steps involved in bringing Watheq to life. This included discussing the challenges faced during the implementation process and highlighting the major sections of the code. By outlining the implementation steps, we aimed to provide transparency and insight into the technical aspects of Watheq's development. This information also serves as a reference for future maintenance and potential enhancements.

The final phase of development involved comprehensive system testing, which encompassed various methodologies. It began with experimental testing using a dataset to validate the reliability of Watheq's recommendation system in generating accurate rankings and recommendations. This was followed by quality testing to evaluate the performance of the recommendation system and AI-generated interviews from the perspectives of job seekers and providers, confirming its high-quality outputs. Subsequently, quality attribute testing was conducted to evaluate non-functional attributes of Watheq across different measures, including performance, learnability, security, compatibility, and availability. User Acceptance Testing (UAT) was then conducted with targeted users to assess the performance of the Watheq application before its release. The overall satisfaction score of 93.125 out of 100 underscores exceptional user satisfaction and indicates that the system is user-friendly, intuitive, and straightforward, contributing to a positive and engaging user experience. The favorable feedback highlights the users' trust and confidence in the system's capabilities.

7.1 Local and Global Impact

Watheq will have a significant local impact in Saudi Arabia's job searching and hiring practices. Its AI-powered interview capabilities and personalized job recommendations will transform the job search process. Job seekers benefit from tailored opportunities and AI-driven interview simulations, while employers gain efficient application management and valuable insights for hiring decisions. Watheq's advanced technology will make job searching and hiring more effective and convenient in Saudi Arabia.

While Watheq is currently focused only on the Saudi Arabian market, its potential for global impact is significant, particularly in the realm of scientific research. The platform's innovative features, such as AI-powered interview simulations and personalized job recommendations, have the potential to revolutionize the job search and hiring processes worldwide.

7.2 Challenges Encountered During the Software Development

During the implementation of Watheq, several challenges arose. These challenges included:

1. User Authentication and Security

Implementing a secure authentication system to protect users' sensitive data.

2. User Interface Design

Crafting a user-friendly interface that balances engagement and ease of use was a challenge.

We aimed to simplify security measures while maintaining system integrity.

3. Error Handling and Debugging

Implementing robust error handling mechanisms and effective debugging techniques to promptly identify and resolve issues.

4. Managing Database Interactions

Ensuring the proper configuration and efficient and secure handling of interactions between the application, website, and the database for storing and retrieving information.

5. Hosting Server Selection

The challenge of finding a suitable hosting server since the university did not provide servers. It required time and effort to search for an appropriate server.

Despite these challenges, we successfully overcame them by implementing solutions and strategies to address each issue, resulting in the development of Watheq.

7.3 Main Contributions of Watheq

The main contributions of Watheq are:

1. AI-driven Personalized Interviews

Watheq offers job seekers the ability to train themselves through AI-driven personalized interviews, enhancing their preparation for job applications.

2. Content-based Recommendation System

Watheq utilizes a new content-based recommendation system that matches CV information with offer details. This system sends job seekers notifications when an offer is posted that matches their qualifications, helping them stay informed about relevant job opportunities. Also, it's used for applicant sorting for a job offer. It provides a feature for job providers to sort applicants for a job offer based on the best matching candidates. This helps streamline the hiring process by efficiently identifying and prioritizing the most suitable candidates.

7.4 Limitations Of Watheq

Watheq, like any platform, has its limitations, but the team is actively working to address them and improve the platform for the future. Some current limitations include:

1. Language Limitation

The platform currently supports only the English language. This restricts access and usability for individuals who primarily use other languages.

2. Limited Website Support

The website may not be optimized for smaller screens, such as those on mobile phones.

3. Android-Only Application

Currently, the Watheq application is available only for Android users. This limits the availability and reach of the platform to individuals who use other operating systems, such as iOS.

7.5 Future Work

For future work, the Watheq team has ambitious plans to overcome these limitations and enhance the platform. The future work include:

- Expanding the language support, specifically allowing job seekers and providers to use the platform in Arabic language. This would open opportunities for a more diverse user base.
- Optimizing the website to ensure a seamless experience across different screen sizes, including mobile phones. This would enhance accessibility and usability for all users.
- Developing an application for iOS, to cater to a wider range of users. This would improve accessibility and ensure that individuals using different devices can benefit from the Watheq application.
- Enhancing CV Form to provide a more comprehensive job-seeking experience. The team suggest expanding the fields available in the CV form and providing suggestion to improve seeker's CVs.
- Enhance the mock interviews by using video instead of text in order to be closer to real interviews and evaluate the body language.
- Using map locations to easily add locations of job offers to be viewed on an embedded map or map application, and to allow the location to be used as a filter for distance.
- Expanding the Watheq geographic coverage, to connect job seekers and providers from different countries and regions, fostering international collaboration and offering opportunities for individuals seeking employment or talent globally.
- Implementing an authentication feature for job providers on the Watheq platform through integration with Nafith system to enhance security and trust.
- Finally, the team recognizes the importance of facilitating communication between job seekers and providers. We suggest incorporating features that enable direct communication within the platform, allowing for seamless interaction and exchange of information.

By addressing these limitations and implementing future improvements, Watheq aims to create a more inclusive, user-friendly, and robust platform that better serves the needs of job seekers and providers.



CHAPTER.8

Acknowledgements

8 Acknowledgements

We would like to express our deepest gratitude to everyone who supported us throughout our graduation project. This journey would not have been possible without the unwavering encouragement and support of our families and friends. Your faith in us provided the strength and motivation we needed to persevere and succeed. We are forever thankful for your encouragement and confidence in our abilities.

We extend our heartfelt thanks to our supervisor, Dr. Hessah Alsaaran, for her invaluable guidance, insight, and patience. Her expertise and dedication have been instrumental in the successful completion of Watheq.

We also extend our appreciation to everyone who supported the project, participated in the survey of system requirements, and helped in testing it. Your input and feedback were invaluable in shaping the development and success of our project. Thank you for your time, effort, and willingness to contribute to our work.

Lastly, we thank each other, as team members, for the dedication, collaboration, and hard work we have shown throughout this project. Our combined efforts, mutual support, and collective problem-solving have been key to our success. It has been a rewarding experience to work together, learn from each other, and achieve our shared goals.

(وَآخِرُ دَعْوَاهُمْ أَنِ الْحَمْدُ لِلَّهِ رَبِّ الْعَالَمِينَ)



CHAPTER.9

References

9 References

- [1] "2030 VISION," 2022. [Online]. Available: https://www.vision2030.gov.sa/media/rc0b5oy1/saudi_vision203.pdf. [Accessed 25 August 2023].
- [2] "Impact of Unemployment," society for the psychological study of social issues, [Online]. Available: <https://www.spssi.org/index.cfm?fuseaction=page.viewpage&pageid=1457>. [Accessed 15 8 2023].
- [3] "Talent shortage," manpowerGroup, [Online]. Available: <https://go.manpowergroup.com/talent-shortage>. [Accessed 15 8 2023].
- [4] "Introducing ChatGPT and Whisper APIs," OpenAI, 1 March 2023. [Online]. Available: <https://openai.com/blog/introducing-chatgpt-and-whisper-apis>. [Accessed 30 August 2023].
- [5] "Glassdoor," Glassdoor, 2023. [Online]. Available: <https://www.glassdoor.com/index.htm>. [Accessed 28 August 2023].
- [6] K. M. Mohiuddin, S. shahwar and O. Nasr, "An Effective Context Driven Web-Based Application for Professional," 1 January 2023. [Online]. Available: https://www.researchgate.net/profile/Osman-Nasr-2/publication/368988636_An_Effective_Context_Driven_Web-Based_Application_for_Professional_Recruiters_and_Job_Seekers/links/6403313b0d98a97717d9e782/An-Effective-Context-Driven-Web-Based-Application-for-Prof. [Accessed 18 September 2023].
- [7] T. Huynh, "A comparison study for job recommendation," June 2017. [Online]. Available: https://www.researchgate.net/profile/Tin-Huynh-2/publication/318980274_A_comparison_study_for_job_recommendation/links/614e6aed154b3227a8a8b6ec/A-comparison-study-for-job-recommendation.pdf. [Accessed 18 September 2023].
- [8] "purdue university," 2022. [Online]. Available: https://owl.purdue.edu/owl/job_search_writing/resumes_and_vitas/index.html. [Accessed 10 september 2023].
- [9] "how to prepare for an interview," Indeed, 2023. [Online]. Available: <https://www.indeed.com/career-advice/interviewing/how-to-prepare-for-an-interview>. [Accessed 11 September 2023].
- [10] G. Lawton, "generative AI," September 2023. [Online]. Available: <https://www.techtarget.com/searchenterpriseai/definition/generative-AI>. [Accessed 18 September 2023].
- [11] "ChatGPT and Open-AI Models: A Preliminary Review," 26 May 2023. [Online]. Available: <https://www.mdpi.com/1999-5903/15/6/192>. [Accessed 10 September 2023].
- [12] "What is ChatGPT and how was it trained?," Paperpal, 27 April 2023. [Online]. Available: <https://www.paperpal.com/blog/news-updates/what-is-chatgpt-and-how-was-it-trained/>. [Accessed 10 September 2023].
- [13] J. Manyika, "An overview of Bard: an early experiment with generative AI," [Online]. Available: <https://ai.google/static/documents/google-about-bard.pdf>. [Accessed 15 September 2023].

- [14] S. Ortez, "What is Google Bard? Here's everything you need to know," 1 June 2023. [Online]. Available: <https://www.zdnet.com/article/what-is-google-bard-heres-everything-you-need-to-know/>. [Accessed 10 september 2023].
- [15] "Working with APIs: Defining an API," Launch School, [Online]. Available: https://launchschool.com/books/working_with_apis/read/defining_api#whatisanapi. [Accessed 20 September 2023].
- [16] "chat completion api," OpenAI, [Online]. Available: <https://platform.openai.com/docs/guides/gpt/chat-completions-api>. [Accessed 15 September 2023].
- [17] "api refrence," OpenAI, [Online]. Available: <https://platform.openai.com/docs/api-reference>. [Accessed 18 September 2023].
- [18] P. C. a. D. Jannach, "Recommender Systems: A Primer," 2023. [Online]. Available: <https://arxiv.org/pdf/2302.02579.pdf>. [Accessed 18 september 2023].
- [19] C. Dilmegani, "Recommendation system," 17 January 2023. [Online]. Available: <https://research.aimultiple.com/recommendation-system/>. [Accessed 18 September 2023].
- [20] S. Al-otaibi and M. Ykhlef, "A survey of job recommender system," 3 Augest 2012. [Online]. Available: <https://academicjournals.org/journal/IJPS/article-full-text-pdf/B19DCA416592.pdf>. [Accessed 18 September 2023].
- [21] A. Kumar, "Recommender Systems in Machine Learning: Examples," vitalflux, 26 may 2023. [Online]. Available: https://vitalflux.com/recommender-systems-in-machine-learning-examples/#Types_of_Recommender_Systems. [Accessed 21 sep 2023].
- [22] L. D. Kumalasari and A. Susanto, "Recommendation System of Information Technology Jobs using Collaborative Filtering Method Based on LinkedIn Skills Endorsement," February 2020. [Online]. Available: [https://www.researchgate.net/profile/Ajib-Susanto/publication/343256920_Recommendation_System_of_Information_Technology_Jobs_using_Collaborative_Filtering_Method_Based_on_LinkedIn_Skills_Endorsement/links/5f27800ba6fdcccc43a6129a/Recommendation-System-of-](https://www.researchgate.net/profile/Ajib-Susanto/publication/343256920_Recommendation_System_of_Information_Technology_Jobs_using_Collaborative_Filtering_Method_Based_on_LinkedIn_Skills_Endorsement/links/5f27800ba6fdcccc43a6129a/Recommendation-System-of-.). [Accessed 18 September 2023].
- [23] F. I. a, B. Ojokoh and Y. F. b, "Recommendation systems: Principles, methods and," 13 June 2015. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S1110866515000341?ref=pdf_download&fr=RR-2&rr=80b66f86e9524c64. [Accessed 18 September 2023].
- [24] J. Valverde-Rebaza, R. Puma, P. Bustios and N. C. Silva, "Job Recommendation based on Job Seeker Skills: An," March 2018. [Online]. Available: <https://ceur-ws.org/Vol-2077/paper6.pdf>. [Accessed 16 September 2023].
- [25] "Indeed," Indeed, 2023. [Online]. Available: <https://www.indeed.com/>. [Accessed 11 septmber 2023].
- [26] "LinkedIn," LinkedIn, 2023. [Online]. Available: <http://www.linkedin.com/>. [Accessed 10 Sptember 2023].
- [27] "Warm up," Google, 2023. [Online]. Available: <https://grow.google/certificates/interview-warmup/>. [Accessed 11 septmber 2023].
- [28] "interviewsby.ai," 2023. [Online]. Available: <https://interviewsby.ai/>. [Accessed 10 september 2023].

- [29] "NLTK," [Online]. Available: <https://www.nltk.org>. [Accessed 2024].
- [30] "Bluhost," [Online]. Available: <https://www.bluehost.com/help/article/ssh-access>. [Accessed May 2024].
- [31] "Stemming Lemmatization Stopwords and N-Grams in NLP," 26 July 2023. [Online]. Available: <https://jaimin-ml2001.medium.com/stemming-lemmatization-stopwords-and-n-grams-in-nlp-96f8e8b6aa6f>. [Accessed 12 September 2023].
- [32] "Assistants Overview," Open AI, [Online]. Available: <https://platform.openai.com/docs/assistants/overview>. [Accessed 1 May 2024].
- [33] "Open AI Models," OpenAI, [Online]. Available: <https://platform.openai.com/docs/models/gpt-3-5-turbo>. [Accessed 15 April 2024].
- [34] "JSON encoder and decoder," Python, [Online]. Available: <https://docs.python.org/3/library/json.html>. [Accessed 10 April 2024].
- [35] "Libraries," OpenAI, [Online]. Available: <https://platform.openai.com/docs/libraries/python-library>. [Accessed 10 April 2024].
- [36] "Time access and conversions," Python, [Online]. Available: <https://docs.python.org/3/library/time.html>. [Accessed 10 April 2024].
- [37] "System-specific parameters and functions," Python, [Online]. Available: <https://docs.python.org/3/library/sys.html>. [Accessed 10 April 2024].
- [38] M. Y. Shaha Al-Otaibi, "Job Recommendation Systems for Enhancing," January 2012. [Online]. Available: https://www.researchgate.net/publication/323079075_Job_Recommendation_Systems_for_Enhancing_E-recruitment_Process. [Accessed 10 May 2024].
- [39] P. Kandari, "Best Blog Hosting Options in 2024," 30 April 2024. [Online]. Available: <https://www.bluehost.com/blog/best-blog-hosting-options/>. [Accessed 10 May 2024].
- [40] C. Codex, "PHP and Password Hashing: Securely Storing and Verifying Passwords," 28 April 2023. [Online]. Available: <https://reintech.io/blog/php-password-hashing-securely-storing-verifying-passwords>. [Accessed 10 May 2024].
- [41] K. Kargin, "NLP: Tokenization, Stemming, Lemmatization and Part of Speech Tagging," 27 February 2021. [Online]. Available: <https://medium.com/mlearning-ai/nlp-tokenization-stemming-lemmatization-and-part-of-speech-tagging-9088ac068768>. [Accessed 15 September 2023].
- [42] A. Zhu, "Understanding TF-IDF and Cosine Similarity for Recommendation Engine," [Online]. Available: <https://medium.com/geekculture/understanding-tf-idf-and-cosine-similarity-for-recommendation-engine-64d8b51aa9f9>. [Accessed 10 September 2023].
- [43] G.Mahalakshmi1, A. Kumar2, B.Senthilnayaki1 and J.Duraimurugan, "Job recommendation system based on skill set," 8 August 2022. [Online]. Available: <https://ijcrt.org/papers/IJCRT2208099.pdf>. [Accessed 15 September 2023].
- [44] "How to use the system usability scale (SUS) to evaluate the usability," [Online]. Available: <https://usabilitygeek.com/how-to-use-the-system-usability-scale-sus-to-evaluate-the-usability-of-your-website/>. [Accessed 28 11 2023].
- [45] Bluhost, [Online]. Available: <https://www.bluehost.com/help/article/ssh-access>. [Accessed May 2024].
- [46] [Online]. Available: <https://jaimin-ml2001.medium.com/stemming-lemmatization-stopwords-and-n-grams-in-nlp-96f8e8b6aa6f>. [Accessed 12 September 2023].

10 Appendix A: Interview simulation example using ChatGPT

This is an initial trial to showcase the Generative AI capabilities. We can enhance it further by providing additional instructions and details to improve the quality of the interview.

1. Provide the model with Job seeker's qualification and job requirements:

 a job seeker who has a Bachelor's degree in IT, has security+ certificate, has no job experience and is applying for It specialist job, The responsibilities: Regularly evaluating our IT systems to ensure they meet the necessary demands.
 • Assisting with network administration tasks.
 • Ensuring data storage is safe and secure.
 • Resolving all issues coworkers have with their IT systems and software., no requirement for job experience, for the Interview Format you can include introductory questions, technical questions, and behavioral questions. don't ask all the questions at once, make it a real interview and i will answer each question before you go to another question. also, i want you to give me a review of how my answers were and if i have to change any of my answers at the end of the interview.

2. The model starts the interview and ask the questions:

 Interviewer: Welcome to the interview! We're excited to learn more about you. Could you please start by telling us about your educational background and any certifications you hold?

 thank you for having my today. i am Raghad alhindi and i have bachelor degree in IT major.  i am interested in security and that's why i got the security+ certificate.

 Thank you for the introduction, Raghad. It's great to have you here. With your educational background and Security+ certification, you certainly have a strong foundation in IT and security. Let's move on to the next question:

Question 1: Can you explain what network administration tasks you are familiar with and how you would handle them in an IT specialist role? 

 sure, i am familer with Network infrastructure setup and maintenance, Network monitoring and troubleshooting, Network backups and disaster recovery. One significant project i worked on involved upgrading the network switches to improve performance and security. so i am sure i can do this in this role too.

 That's a solid set of skills, Raghad. Your experience with network infrastructure setup and maintenance, monitoring, troubleshooting, and even handling network backups and disaster recovery is impressive. It's great that you've been involved in a project to upgrade network switches, as that demonstrates your practical experience. Now, let's move on to the next question:

Question 2: Tell me about a time when you had to troubleshoot a technical issue for a friend or family member. How did you approach the problem and what was the outcome?

 Last year, my sister encountered a technical issue with her laptop where it suddenly started running very slowly and freezing frequently. She asked for my help, as she knew i had a background in IT and troubleshooting. I approached the problem by following a system process: 1- Gathering information: I asked my sister about any recent software installations or updates. 2- Remote troubleshooting: Since i wasn't physically present with my sister, i used screen-sharing software to remotely access her laptop. 3- Software cleanup: i guided my sister through removing unnecessary programs and disabling startup applications that were not essential. 4- Optimizing performance: i provided guidance on adjusting power settings, clearing temporary files, and running disk cleanup to free up storage space.

 That's a great example, Raghad. Your approach to troubleshooting the issue demonstrates your methodical thinking and technical skills. It's commendable how you used remote access tools to assist your sister even when you weren't physically present. Your steps to gather information, clean up unnecessary software, and optimize performance show a well-rounded approach to problem-solving. Now, let's move on to the next question:

Question 3: Data security is crucial in our IT systems. How would you ensure that data storage remains safe and secure in the systems you manage?

 first Implementing Access Controls: Establish robust access controls to ensure that only authorized individuals can access sensitive data. also Regular Data Backups. In addition i would Implement ongoing security awareness programs to educate employees about Regenerate practices for data security. and for sure Ongoing Monitoring and Continuous Improvement

 You've outlined a comprehensive approach to data security, Raghad. Implementing access controls, regular data backups, and ongoing monitoring are fundamental aspects of maintaining data integrity and security. Your emphasis on educating employees through security awareness programs is also vital, as human factors play a significant role in cybersecurity. Additionally, your focus on continuous improvement shows a commitment to staying up-to-date with evolving security threats and technologies. Well done!

Now, let's move on to the next set of questions:

Question 4: In the IT specialist role, you'll be responsible for resolving issues your coworkers might have with their IT systems and software. Can you describe a situation where you successfully helped a colleague with a technical problem? How did you approach it?

 I don't remember any situation like this. how ever if I countered something like this I would listen to my coworker to understand the problem then analyze the logs, search for possible cause of the problem and then try to solve it with my knowlege.

 That's a practical approach, Raghad. Even if you haven't encountered such a situation in the past, your plan to listen, analyze, and troubleshoot aligns well with effective problem-solving. Being attentive to your coworker's description and utilizing your analytical skills to diagnose the issue are important steps. Your willingness to search for potential causes and solutions demonstrates a proactive attitude that would be valuable in an IT specialist role. Let's move on to the next question:

Question 5: As an IT specialist, you'll need to evaluate IT systems regularly. Can you explain your approach to evaluating and ensuring the performance of IT systems in this role?

 I would follow the following approach: Monitor System Performance, Conduct Regular Performance Analysis, Identify Root Causes, Implement Optimization Strategies, Collaboration and Continuous Improvement: Foster collaboration with other IT teams, stakeholders, and vendors to gather insights, share knowledge, and leverage collective expertise

 Your approach to evaluating and ensuring the performance of IT systems is comprehensive, Raghad. Monitoring system performance is the foundation for identifying potential issues. Regular performance analysis allows for proactive intervention before problems escalate. Your emphasis on identifying root causes rather than just addressing symptoms is commendable, as it ensures long-term stability.

Implementing optimization strategies aligns well with maintaining efficient systems. Collaboration is a key component, demonstrating your understanding of the importance of shared knowledge and collective problem-solving. Lastly, your commitment to continuous improvement reflects your proactive attitude toward enhancing system performance over time.

Let's proceed to the final set of questions:

Question 6: Describe a time when you had to work on a team project. How did you contribute to the team's success, and how did you handle any challenges that arose?

 I played a key role in a university team project focused on analyzing consumer behavior in e-commerce. I contributed through role allocation, conducting research and data analysis, collaborating and brainstorming with team members, problem-solving, managing time and tasks, and delivering a compelling presentation. Despite challenges, such as data collection difficulties, we maintained open communication and a positive team dynamic, resulting in high marks and successful outcomes.

3. The model gives the feedback after the interview:

ok now give me a review about my answers. which were good and which were not and how to enhance my overall responses.

Certainly, Raghad. Let's review your answers and see where you did well and where you might enhance your responses:

Strengths:

1. **Educational Background and Certification:** Your introduction about your Bachelor's degree in IT and Security+ certification is clear and concise. It establishes a strong foundation for your qualifications.
2. **Technical Knowledge:** Your response to the network administration tasks question showcased your familiarity with key aspects of network management, especially your experience with upgrading network switches.
3. **Troubleshooting Scenario:** Your description of helping your sister with her laptop issue demonstrated a structured and systematic approach to problem-solving.
4. **Data Security:** Your explanation of ensuring data storage's security was thorough, highlighting key aspects like access controls, backups, and security awareness progr Regenerate
5. **Performance Evaluation:** Your approach to evaluating IT systems' performance displayed a well-rounded strategy, including regular analysis and collaboration.
6. **Team Project Experience:** Your description of your role in the university project showed strong teamwork, leadership, and adaptability skills, especially in handling challenges.

Areas for Enhancement:

1. **Work Experience Scenario:** You mentioned not remembering a specific scenario for helping a coworker. While this is okay, consider providing a hypothetical example to further illustrate your approach.
2. **Technical Responses:** In some cases, you could provide a bit more depth to your technical responses. For example, providing a specific tool or technique you would use could enhance your answers.
3. **STAR Method:** When answering behavioral questions (e.g., the team project scenario), using the STAR method (Situation, Task, Action, Result) can help you provide a more structured and comprehensive response.
4. **Quantifiable Achievements:** In your team project response, including quantifiable achievements or outcomes could make your impact even more tangible.
5. **Real-Life Examples:** Whenever possible, incorporating real-life examples and specific instances can make your responses more engaging and authentic. Regenerate

Your experience in the university team project demonstrates strong teamwork and problem-solving skills, Raghad. Your involvement in role allocation, research, data analysis, and effective communication highlights your multi-faceted contributions. The ability to handle challenges, such as data collection difficulties, by maintaining open communication and a positive team dynamic is crucial in ensuring project success.

Your mention of successfully delivering a compelling presentation and achieving high marks showcases your ability to not only contribute to the project's execution but also its final impact. Overall, your experience demonstrates your capacity to collaborate effectively within a team and navigate challenges to achieve positive outcomes.

Thank you for your insightful responses, Raghad. You've demonstrated a solid Regenerate

Overall, your responses were solid and demonstrated a clear understanding of the role and its requirements. To enhance your answers, consider providing more specific details, using the STAR method for behavioral questions, and showcasing your achievements and impact.

Remember, practice makes perfect. Rehearsing your responses, whether through mock interviews or self-assessment, can further refine your interview skills. Best of luck with your project and your future interviews, Raghad!

11 Appendix B: Requirements Survey Questions

1. General questions section:

Paving your path to success
in the world of employment

 Watheq واثق

Watheq | واثق

Watheq is a platform developed by Information Technology students at King Saud University. Its primary objective is to enhance the job application process by connecting job seekers and providers under one platform.

By filling out this survey, you help us gather valuable insights and serve your needs better!

watheq.ksu@gmail.com Switch account 
 Not shared

* Indicates required question

What is your current employment status? *

Employer
 Employee
 Searching for a job

What is your age? *

18 - 22
 23 - 25
 26 - 30
 31+

How would you describe your level of comfort using mobile and web applications? *

1 2 3 4 5

Uncomfortable Comfortable

What is your English language proficiency level? *

Basic level
 Intermediate level
 Advanced level

Next **Clear form**

2. Job seekers/employees' questions section:

What problem do/did you face when searching for job opportunities? *
(Select all that apply)

Difficulty finding the appropriate job
 The job requirements are unclear
 Job offers are not aligned with my qualifications
 Lack of response after job applications
 Other: _____

What challenges do/did you encounter during job interviews? *
(Select all that apply)

Nervousness or lack of confidence
 Insufficient preparation
 Uncertainty about interview questions
 Lack of feedback after interviews
 Other: _____

Would an application offering AI-driven mock * interviews be beneficial to you?

1	2	3	4	5	
Not Beneficial at all	<input type="radio"/> Extremely Beneficial				

How beneficial do/did you find the idea of an application helping you search for suitable job opportunities? *

1	2	3	4	5	
Not Beneficial at all	<input type="radio"/> Extremely Beneficial				

How interested are you in a feature that sends you notifications about * new job offers based on your qualifications?

1	2	3	4	5	
Not Interested	<input type="radio"/> Extremely Interested				

How interested are you in a feature that recommends some job offers * for you based on your qualifications?

1	2	3	4	5	
Not Interested	<input type="radio"/> Extremely Interested				

Would you prefer to use our application as a mobile app or a Web app? *

mobile application
 web application

Is there any other feature or aspect you'd like to see in an application for job seekers?

Your answer _____

[Back](#) [Submit](#) [Clear form](#)

3. Job providers' questions section:

What problems do you face when you have a job vacancy? *
(Select all that apply)

Difficulty finding qualified candidates
 The time-consuming application review process
 Uncertainty about applicant qualifications
 Other: _____

How challenging is it for you to manage job * applications and review applicants' CVs?

1 2 3 4 5

Not Challenging at all Extremely Challenging

How beneficial do you find the idea of an application that allows you to * view job applications sorting by level of similarity between applicant CVs and job descriptions?

1 2 3 4 5

Not Beneficial at all Extremely Beneficial

How do you feel about an application that helps you post job vacancies * and notify the most qualified job seekers?

1 2 3 4 5

Strongly Disagree Strongly Agree

Would you prefer to use our application as a mobile app or a web app? *

Mobile application
 Web application

Is there any other feature or aspect you'd like to see in an application as a job provider?

Your answer

[Back](#) [Submit](#) [Clear form](#)

12 Appendix C: Quality Survey Questions

1. Tester type question:

Paving your path to success
in the world of employment |  Watheq

Watheq | واثق

Watheq is a platform developed by Information Technology students at King Saud University. Its primary objective is to enhance the job application process by connecting job seekers and providers under one platform.

By filling out this survey, you're directly aiding us in testing and improving our job recommendation and interview systems to better suit your needs!

ragadwh17@gmail.com [Switch accounts](#) 

Not shared

* Indicates required question

What is your current role? *

Job Seeker

Job Provider

2. Recommended job offers questions:

Recommendation Testing

Below are two examples of CVs along with the top 5 recommended job offers. Please evaluate the quality of the matches based on the information provided.

Example 1

Job Seeker CV:

- **City:** Riyadh
- **Qualification:** Bachelor's Degree in Computer Science
- **Skills:** JavaScript, HTML, CSS, AngularJS, Node.js, Python, React
- **Experience:** 4 years in Information Technology as a Software Developer

Recommended Job Offers:

1. Software Developer

- **City:** Riyadh
- **Qualification:** Bachelor's Degree in Computer Science
- **Skills:** JavaScript, HTML, Django, Python, React Native
- **Experience:** 3 years in Information Technology as a Software Engineer

2. Backend Developer

- **City:** Riyadh
- **Qualification:** Bachelor's Degree in Computer Science
- **Skills:** JavaScript, Node.js, MongoDB, AWS
- **Experience:** 4 years in Information Technology as a Software Developer

3. Web Developer

- **City:** Riyadh
- **Qualification:** Master's Degree in Computer Science
- **Skills:** JavaScript, CSS, HTML, JavaScript
- **Experience:** 5 years in Information Technology as a Developer

4. Full Stack Developer

- **City:** Riyadh
- **Qualification:** Master's Degree in Computer Science
- **Skills:** JavaScript, React, Node.js, SQL
- **Experience:** 4 years in Information Technology as a Developer

5. Database Administrator

- **City:** Riyadh
- **Qualification:** Master's Degree in Computer Science
- **Skills:** Python, Oracle, React, Node.js, SQL
- **Experience:** 6 years in Information Technology as a Developer

In example 1, how relevant do you think the job offers are to the CV? *

1 2 3 4 5

Not Relevant At All

Extremely Relevant

Example 2

Job Seeker CV:

- **City:** Dammam
- **Qualification:** Master degree in Business Administration
- **Skills:** Social Media Management, Market Analysis, Google AdWords, Facebook Ads
- **Experience:** 5 years in Advertising and Marketing field as an Assistant Marketing Manager

Recommended Job Offers:

1. Marketing Manager

- **City:** Dammam
- **Qualification:** Bachelor or Master degree in Business Administration
- **Skills:** Social Media Management, Market Analysis, Google AdWords, Facebook Ads, Marketing Campaigns
- **Experience:** 4 years in Advertising and Marketing field in a Marketing position

2. Marketing Analyst

- **City:** Dammam
- **Qualification:** Master degree in Business Administration
- **Skills:** Market Analysis, Google Analytics, Data Interpretation
- **Experience:** 3 years in Advertising and Marketing field in a Marketing position

3. Marketing Specialist

- **City:** Dammam
- **Qualification:** Bachelor degree in Business Administration
- **Skills:** Social Media Management, Advertisement Analysis, Google AdWords
- **Experience:** 5 years in Advertising and Marketing field in Advertising and Marketing

4. Marketing Analyst

- **City:** Dammam
- **Qualification:** Master degree in Advertising
- **Skills:** Market Analysis, Strategic Planning, Social Media Campaign
- **Experience:** 5 years in Advertising and Marketing field in a Marketing position

5. Social Media Coordinator

- **City:** Dammam
- **Qualification:** Bachelor degree in Advertising
- **Skills:** Social Media Management, Content Creation
- **Experience:** 3 years in Advertising and Marketing field in a Marketing position

In example 2, how relevant do you think the job offers are to the CV? *

1 2 3 4 5

Not Relevant At All

Extremely Relevant

3. Sorted job applications questions:

Recommendation Testing

Below are two examples of job offers and the sorted results for the applicants based on the similarity score. Please evaluate the quality of the sorting based on the information provided.

Example 1

Job Offer Details:

- **City:** Riyadh
- **Job Title:** Software Developer
- **Qualification:** Bachelor degree in Computer Science
- **Skills:** JavaScript, HTML, Django, Python, React Native
- **Experience:** 3 years in Information Technology field as a Software Engineer

Applicants Sorting Based on Similarity Score:

Seeker 1:

- **City:** Riyadh
- **Qualification:** Bachelor degree in Computer Science
- **Skills:** JavaScript, HTML, CSS, Node.js, AngularJS, Python, React
- **Experience:** 4 years in Information Technology field as a Software Developer
- **Matching Score:** 88%

Seeker 2:

- **City:** Riyadh
- **Qualification:** Bachelor degree in Information Technology
- **Skills:** JavaScript, HTML, Python, Django
- **Experience:** 3 years in Information Technology field as a Junior Web Developer
- **Matching Score:** 71%

Seeker 3:

- **City:** Riyadh
- **Qualification:** Bachelor degree in Computer Science
- **Skills:** Project Management, Communication, JavaScript, Python, CSS
- **Experience:** 3 years in Information Technology field as a Developer
- **Matching Score:** 50%

Seeker 4:

- **City:** Dammam
- **Qualification:** Master degree in Business Administration
- **Skills:** Social Media Management, Market Analysis, Google AdWords, Facebook Ads
- **Experience:** 5 years in Advertising and Marketing field as Assistant Marketing Manager
- **Matching Score:** 8%

In example 1, how would you rate the quality of the sorting for these applicants? *

1 2 3 4 5

Poor quality

Excellent quality

Example 2

Job Offer Details:

- **City:** Dammam
- **Job Title:** Marketing Manager
- **Qualification:** Bachelor or Master degree in Business Administration
- **Skills:** Social Media Management, Market Analysis, Google AdWords, Facebook Ads, Marketing Campaigns
- **Experience:** 4 years in Advertising and Marketing field in a Marketing position

Applicants Ranking Based on Similarity Score:

Seeker 1:

- **City:** Dammam
- **Qualification:** Master degree in Business Administration
- **Skills:** Social Media Management, Market Analysis, Google AdWords, Facebook Ads
- **Experience:** 5 years in Advertising and Marketing field as Assistant Marketing Manager
- **Matching Score:** 95%

Seeker 2:

- **City:** Dammam
- **Qualification:** Bachelor degree in Marketing, Master degree in Business Administration
- **Skills:** Digital Advertising (Google Ads, SEO), Social Media Management, Strategic Marketing
- **Experience:** 4 years in Advertising and Marketing field as a Marketing Specialist
- **Matching Score:** 64%

Seeker 3:

- **City:** Dammam
- **Qualification:** Bachelor degree in Business Administration
- **Skills:** Campaign Analysis, Market Research, Media Management
- **Experience:** 2 years in Advertising and Marketing field in a Marketing position
- **Matching Score:** 58%

Seeker 4:

- **City:** Riyadh
- **Qualification:** Bachelor degree in Information Technology
- **Skills:** Communication, Design
- **Experience:** No Experience
- **Matching Score:** 13%

In example 2, how would you rate the quality of the sorting for these applicants? *

1 2 3 4 5

Poor quality Excellent quality

4. Interview simulation questions:

Interview Simulation Testing

Based on the external examples provided for the AI interview simulation, please answer the following questions.

In example 1, how relevant do you think the interview questions to the job offer information provided? *

1 2 3 4 5

Not Relevant At All Extremely Relevant

In example 1, how relevant do you think the interview questions to the CV information provided? *

1 2 3 4 5

Not Relevant At All Extremely Relevant

In example 2, how relevant do you think the interview questions to the job offer information provided? *

1 2 3 4 5

Not Relevant At All Extremely Relevant

In example 2, how relevant do you think the interview questions to the CV information provided? *

1 2 3 4 5

Not Relevant At All Extremely Relevant

In general, how would you rate the quality of the interview questions? *

1 2 3 4 5

Poor Quality Excellent Quality

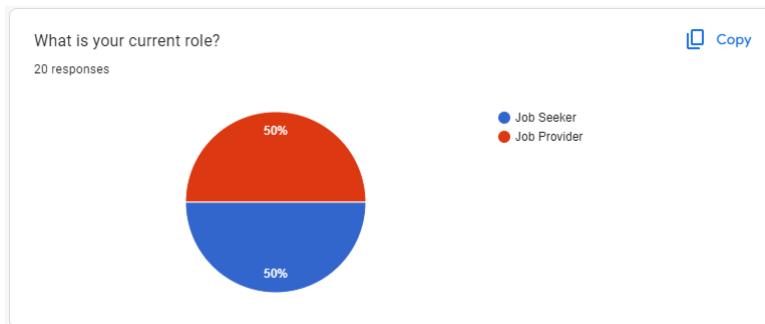
In general, how would you rate the quality of the interview feedback? *

1 2 3 4 5

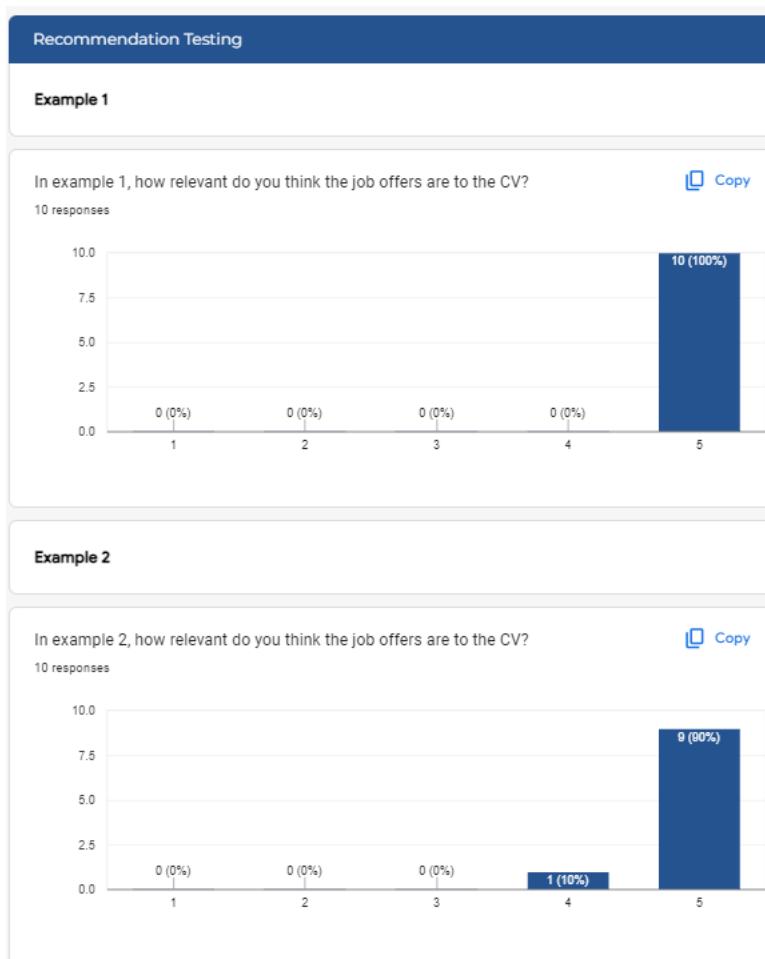
Poor Quality Excellent Quality

13 Appendix D: Quality Survey Responses

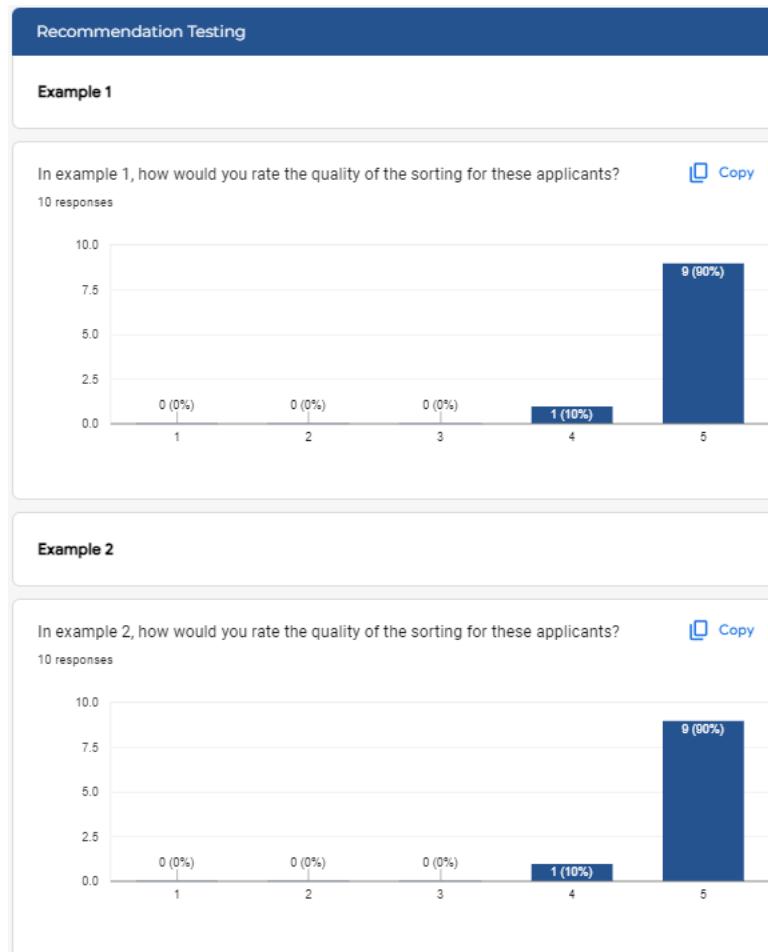
1. Tester type:



2. Recommended job offers responses:



3. Sorted job applications responses:



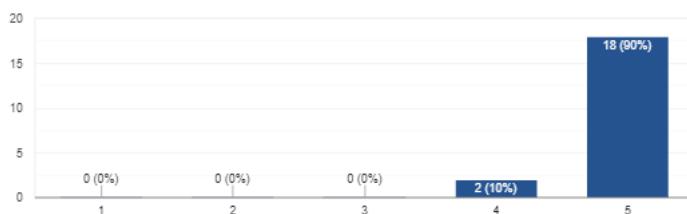
4. Interview simulation responses:



In general, how would you rate the quality of the interview questions?

 Copy

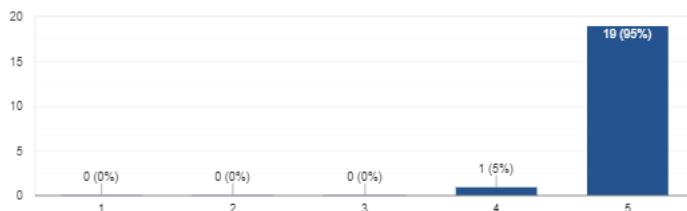
20 responses



In general, how would you rate the quality of the interview feedback?

 Copy

20 responses



14 Appendix E: Quality Testing Interview Examples

1. CV Information

CV Information	
Name	Ahmed Alsulaiman
Phone Number	0501234567
Email	ahmed.sulaiman@example.sa
Address	Riyadh, Saudi Arabia
About Me	I am Ahmed Al-Sulaiman, a web developer from Riyadh, Saudi Arabia, with five years of experience. I hold a bachelor's degree in computer science and am proficient in JavaScript, HTML, CSS, with some knowledge of SQL. I specialize in both front-end and back-end development.
Professional skills	<ul style="list-style-type: none"> • JavaScript • HTML, CSS • AngularJS • Node.Js • Python • React
Qualification	King Saud University Bachelor's degree in computer science 2016.01 - 2020
Experience	Company: Elm Information Technology: Software Developer 2020.01 - Current

2. Job Offer Details for The First Interview Example

Offer #1 Details	
Job Title	Cybersecurity Analyst
Company	CyberGenuis Company
Job Description	We Expect From Our Cybersecurity Analyst To Monitor Network Traffic, Investigate Security Incidents, Enforce Security Policies, Conduct Vulnerability Assessments, And Provide Staff Training.
Industry	Information Technology
Employment Type	Full Time
Address	Riyadh, King Fahad Road
Salary Range	20,000-50,000 SAR
Starting Date	30-5-2024
Required Skills	<ul style="list-style-type: none"> • Proficiency in network security protocols and tool • Strong analytical and problem-solving skills • Excellent communication and teamwork abilities
Required Qualification	<ul style="list-style-type: none"> • Bachelor's degree in information technology • Master's degree in Cybersecurity
Required Experience	<ul style="list-style-type: none"> • Information Technology: Security Specialist, 5 Years Of Experience • Administrative and Clerical: Compliance Coordinator, 2 Years Of Experience
Notes	We Expect From Our Cybersecurity Analyst To Monitor Network Traffic, Investigate Security Incidents, Enforce Security Policies, Conduct Vulnerability Assessments, And Provide Staff Training.

3. First Interview Example

Interview #1

#	The Question	The Answer
1	Hello Ahmed, Could you introduce yourself?	I am Ahmed Alsulaiman, a web developer from Riyadh, with five years of experience. I hold a bachelor's degree in computer science.
2	Ahmed, based on your experience as a web developer, how do you think your skills in JavaScript, HTML, and CSS would benefit you in the role of a Cybersecurity Analyst?	My skills in web languages would benefit me in a cybersecurity role by enabling me to identify web vulnerabilities like XSS and CSRF and implement secure code practices.
3	as a Cybersecurity Analyst, how do you plan to leverage your experience as a Software Developer in ensuring network security, investigating security incidents, and conducting vulnerability assessments as per the job description?	By applying my understanding of coding to identify and fix vulnerabilities, automate security tasks. Also, my coding skills will help me analyze malicious code, and understand attack patterns.
4	what motivates you to transition from a Software Developer to a Cybersecurity Analyst, and how do you think this change aligns with your career goals and aspirations?	This transition is driven by my passion for protecting sensitive data and ensuring system integrity. this change aligns with my goal of making a significant impact in safeguarding digital environments.
5	Ahmed, can you share a specific example of a challenging cybersecurity incident you've encountered in your previous role, and how you resolved it using your problem-solving skills and technical expertise?	To be honest, I didn't encounter any security incidents in my previous role, as i was responsible for software development only.
6	given your limited experience with cybersecurity incidents, how do you plan to bridge the gap in knowledge to effectively monitor network traffic, enforce security policies, and conduct vulnerability assessments as expected in the Cybersecurity Analyst role?	I will learn from professionals around me and maybe get certificates in this area.
7	Ahmed, how do you feel your strong analytical and problem-solving skills, combined with your willingness to learn, will contribute to your success as a Cybersecurity Analyst?	my willingness to learn keeps me updated on the latest trend in security
8	how do you think your background in computer science, coupled with your technical skills in Python, JavaScript, and other languages, can be an asset in understanding and implementing network security protocols and tools in the role of a Cybersecurity Analyst?	My background is not directly related to cybersecurity to implement protocols and tools but it will definitely help me learn the related languages faster.
9	Ahmed, considering your learning agility and adaptability, how do you plan to approach any challenges or gaps in your knowledge related to	By contacting with professionals.

	network security protocols and tools in the Cybersecurity Analyst role?	
10	considering the importance of communication and teamwork skills for the Cybersecurity Analyst role, could you provide an example of a situation where you successfully collaborated with a team to achieve a common goal in your previous work experience as a Software Developer?	I don't remember a specific example but I always work in teams and ensure that every member's voice is heard.
Feedback	<p>This is the end of the interview and here is the feedback:</p> <p>Based on your performance in the interview, your strengths lie in your clear communication style, passion for learning, and willingness to seek guidance from professionals to bridge knowledge gaps. You effectively highlighted your problem-solving skills and ability to adapt to new challenges.</p> <p>Areas for improvement include providing more specific examples to showcase your experiences and skills, especially when linking your web development background to cybersecurity requirements.</p> <p>Enhancing your ability to recall and articulate past scenarios can strengthen your responses. Additionally, demonstrating a deeper understanding of the cybersecurity field through courses or certifications could further support your transition.</p> <p>For future interviews, consider practicing responses that connect your technical expertise to the job requirements more explicitly. Strengthen your responses by incorporating tangible examples to demonstrate your capabilities effectively. Additionally, showcasing your proactive approach to continuous learning and collaboration will further enhance your suitability for roles in cybersecurity.</p> <p>Good luck with your future endeavors!</p>	

4. Job Offer Details for The Second Interview Example

Offer #2 Details

Job Title	Software Developer
Company	Aramco
Job Description	Seeking an experienced Lead Software Developer to manage a dynamic team working on advanced web and mobile applications. Strong proficiency in Python and JavaScript frameworks required.
Industry	Information Technology
Employment Type	Full Time
Address	Riyadh, King Fahad Road
Salary Range	15,000 - 20,000 SAR
Required Skills	<ul style="list-style-type: none"> • Python • JavaScript • HTML • React Native • Django
Required Qualification	<ul style="list-style-type: none"> • Bachelor's degree in computer science
Required Experience	<ul style="list-style-type: none"> • Information Technology: Software Engineer, 3 Years Of Experience

5. Second Interview Example

Interview #2		
#	The Question	The Answer

1	Hello Ahmed, could you introduce yourself?	I am Ahmed Alsulaiman, a web developer from Riyadh, with five years of experience. I hold a bachelor's degree in computer science.
2	What makes you interested in the Software Developer position we have available?	I am excited because it offers the opportunity to expand my technical skills beyond web development into more diverse and complex software projects.
3	What is the most challenging project you have worked on as a web developer?	The most challenging project I worked on as a web developer was developing a real-time e-commerce platform for a large retail client.
4	How do you handle tight deadlines and pressure in your previous work experiences as a Software Developer?	I handle tight deadlines and pressure as a Software Developer by prioritizing tasks, managing time effectively, and remaining adaptable.
5	How do you plan to leverage your proficiency in Python and JavaScript frameworks in the role of Lead Software Developer in our team?	Well, I guess I'll just do what I know and hope for the best.
6	How do you generally approach learning new technologies or skills in the realm of software development?	I approach learning new technologies in software development through research, hands-on practice, continuous learning, and collaboration.
7	It sounds like you're committed to continuous self-improvement in your developer skills. How do you plan to incorporate React Native into your existing skill set?	I plan to incorporate React Native by learning its fundamentals, building practical projects, and engaging with the community.
8	What experience do you have in managing a team of developers, and how do you plan to apply this experience to the Lead Software Developer position?	I've managed a team of developers before, but it was a bit chaotic. I mean, I tried to keep everyone on track, but it was hard to juggle everyone's schedules and priorities.
9	Given your previous team management experience, how do you plan to address and improve your team coordination and project management skills in this Lead Software Developer role?	I plan to prioritize clear communication, define roles clearly, invest in effective planning, leverage collaborative tools, and foster a culture of continuous improvement.
10	It seems like you have a solid plan to improve team coordination and project management skills in this role. How do you handle feedback and criticism in the workplace to ensure personal and professional growth?	I handle feedback and criticism by staying open-minded, evaluating feedback objectively, seeking input regularly, and learning from mistakes.

Feedback	<p>This is the end of the interview and here is the feedback:</p> <p>Strengths:</p> <p>You effectively highlighted your interest in expanding your technical skills and taking on more diverse software projects.</p> <p>You demonstrated your experience in managing tight deadlines and pressure by prioritizing tasks effectively.</p> <p>You expressed a commitment to continuous learning and self-improvement in the field of software development.</p> <p>You outlined a proactive approach to incorporating new technologies, such as React Native, into your skill set.</p> <p>Areas for Improvement:</p> <p>When asked about handling a chaotic team, it would be beneficial to focus more on specific strategies you employed to bring order and improve team performance.</p> <p>When discussing your interest in the Lead Software Developer role, it would be more beneficial to express confidence in utilizing your current skills and enthusiasm for developing new ones.</p> <p>Suggestions for Future Interviews:</p> <p>Provide more concrete examples when describing your experiences and strategies, showcasing specific achievements and solutions.</p> <p>Emphasize your ability to adapt and learn quickly, along with your passion for taking on new challenges in software development roles.</p> <p>Overall, you have a strong foundation in software development with a clear direction for your professional growth. Keep refining your communication of experiences and strategies to make an even more compelling case for future roles.</p>
----------	--

15 Appendix F: UAT Survey Questions

1. Demographic questions:

Paving your path to success
in the world of employment | Watheq

Watheq | واثق

Watheq is a platform developed by Information Technology students at King Saud University. Its primary objective is to enhance the job application process by connecting job seekers and providers under one platform.

By filling out this survey, you help us evaluate the usability of our platform.

watheq.ksu@gmail.com [Switch account](#)

 Not shared

* Indicates required question

What is the role of the test participant? *

Employer
 Employee/Job Seeker

What is the age of the test participant? *

18-22
 23-25
 26-30
 31+

How would you rate your overall experience in using mobile and web applications? *

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

How reliant is the tester on mobile/web applications for activities related to job searching and job provision? *

1	2	3	4	5	
Not reliant at all	<input type="radio"/> Extremely reliant				

[Next](#) [Clear form](#)

2. Task accomplished by employees/ job seekers:

Task a accomplished (Employee and job seeker)	
<p>Please select all the task you have accomplished *</p> <ul style="list-style-type: none"> <input type="checkbox"/> Sign-up <input type="checkbox"/> Log-in <input type="checkbox"/> Reset Password <input type="checkbox"/> View Profile Page <input type="checkbox"/> View Job Offers <input type="checkbox"/> Search for Job Offers <input type="checkbox"/> View Job Offer Details <input type="checkbox"/> Fill CV Information <input type="checkbox"/> Edit CV Information <input type="checkbox"/> Filter Job Offer <input type="checkbox"/> Apply for a Job <input type="checkbox"/> View Applications History <input type="checkbox"/> Cancel Job Application <input type="checkbox"/> View Notification Center <input type="checkbox"/> AI Interviews <input type="checkbox"/> View Company Details <input type="checkbox"/> Job Offers Recommendations <input type="checkbox"/> Send New Job Application Notification <input type="checkbox"/> Log-out 	

3. Task accomplished for job providers:

Task accomplished (Employer)	
<p>Please select all the task you have accomplished *</p> <ul style="list-style-type: none"> <input type="checkbox"/> Sign-up <input type="checkbox"/> Log-in <input type="checkbox"/> Reset Password <input type="checkbox"/> Add New Job Offer <input type="checkbox"/> View Offers History <input type="checkbox"/> View Job Applications <input type="checkbox"/> View Applicants' CVs <input type="checkbox"/> Change Application's Status <input type="checkbox"/> Close Job Offer <input type="checkbox"/> Send Customized New Job Offers Notifications <input type="checkbox"/> Sort Job Applications <input type="checkbox"/> View Profile Page <input type="checkbox"/> Fill Company Information <input type="checkbox"/> Edit Company Information <input type="checkbox"/> Edit Job Offer Details <input type="checkbox"/> View Notification Center <input type="checkbox"/> Log-out 	

4. SUS questions:

The System Usability Scale(SUS)

I think that I would like to use this system frequently. *

1 2 3 4 5

Strongly disagree Strongly agree

I found the system unnecessarily complex.*

1 2 3 4 5

Strongly disagree Strongly agree

I thought the system was easy to use. *

1 2 3 4 5

Strongly disagree Strongly agree

I think that I would need the support of a technical person to be able to use this system. *

1 2 3 4 5

Strongly disagree Strongly agree

I found the various functions in this system were well integrated. *

1 2 3 4 5

Strongly disagree Strongly agree

I thought there was too much inconsistency in this system. *

1 2 3 4 5

Strongly disagree Strongly agree

I would imagine that most people would learn to use this system very quickly. *

1 2 3 4 5

Strongly disagree Strongly agree

I found the system very cumbersome to use. *

1 2 3 4 5

Strongly disagree Strongly agree

I felt very confident using the system. *

1 2 3 4 5

Strongly disagree Strongly agree

I needed to learn a lot of things before I could get going with this system. *

1 2 3 4 5

Strongly disagree Strongly agree

[Back](#) [Next](#) [Clear form](#)

5. Feedback questions:

Feedback Questions

Do you think the system effectively addresses the needs of both job providers and job seekers? Why or why not? *

Your answer

Can you share any specific challenges or difficulties you encountered while using the system you want to change, if any?

Your answer

Would you use the system when it is launched? *

YES

NO

What is your overall opinion about the interface(ex. Font size, Button styles, colors)? *

Your answer

What, if any, improvements would you suggest, and do you have any additional feedback?

Your answer

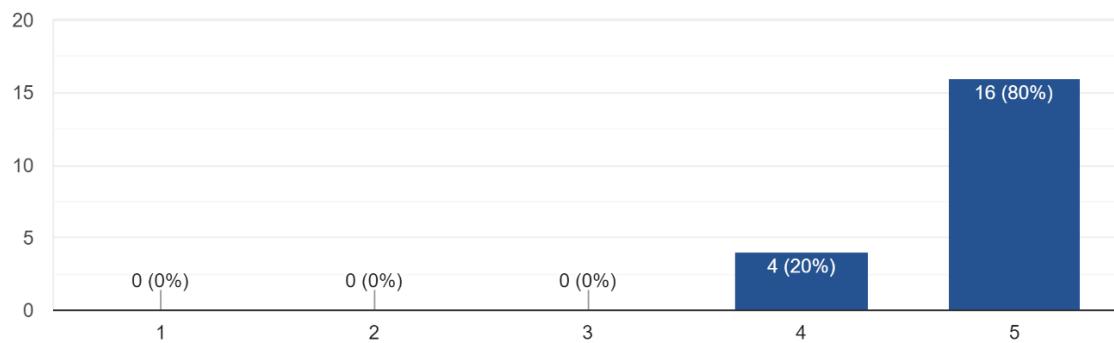
[Back](#) [Submit](#) [Clear form](#)

16 Appendix G: UAT Survey Responses

1. SUS questions responses:

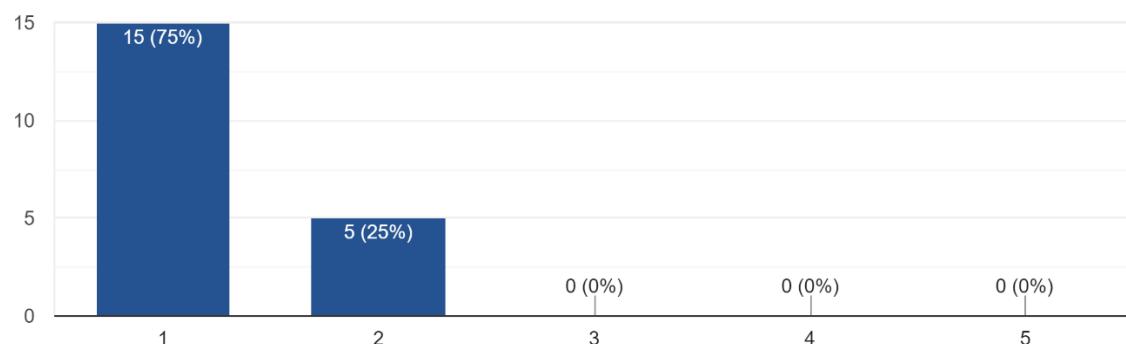
I think that I would like to use this system frequently.

20 responses



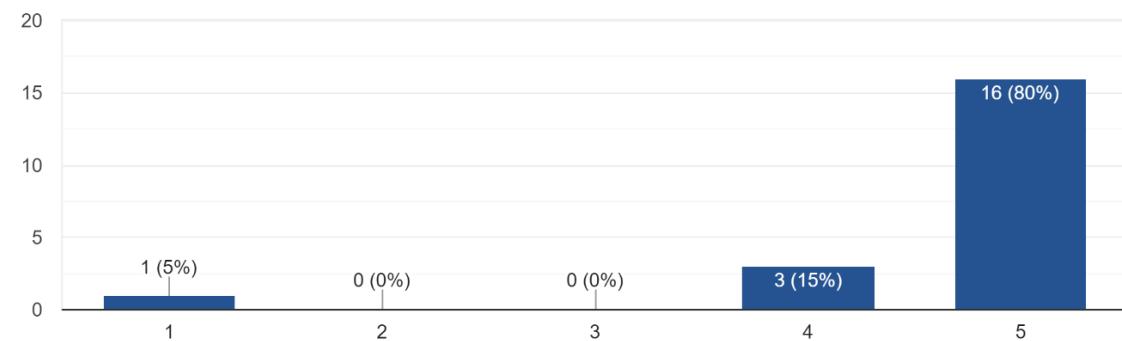
I found the system unnecessarily complex

20 responses



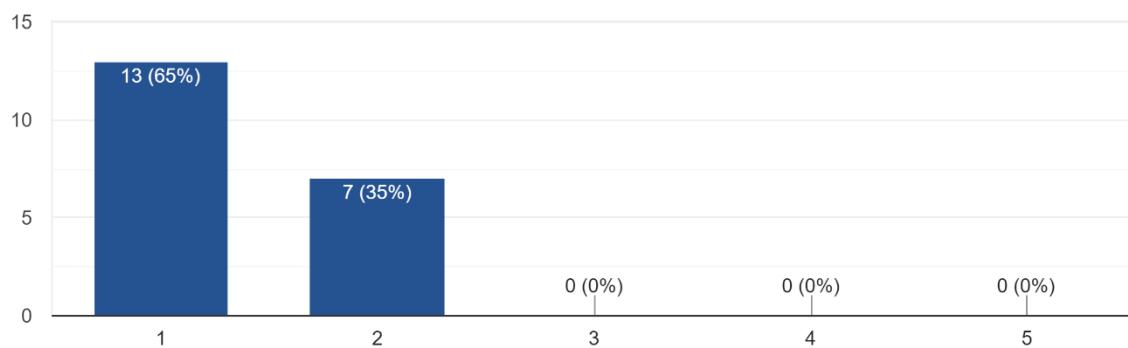
I thought the system was easy to use.

20 responses



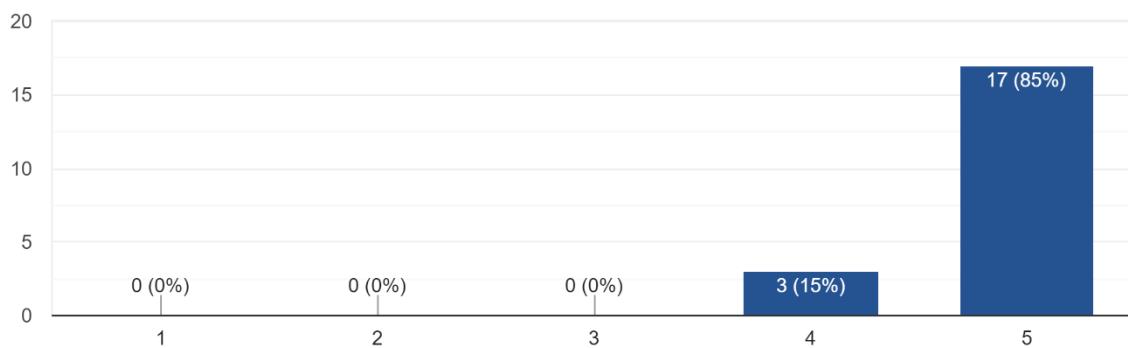
I think that I would need the support of a technical person to be able to use this system.

20 responses



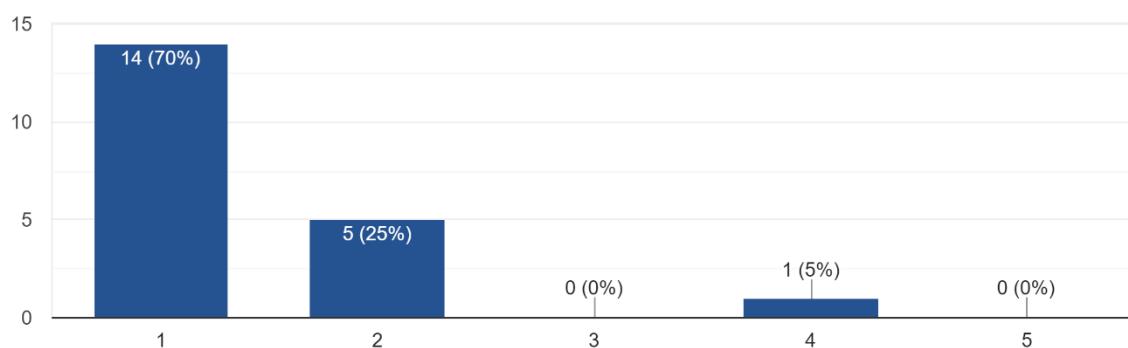
I found the various functions in this system were well integrated.

20 responses



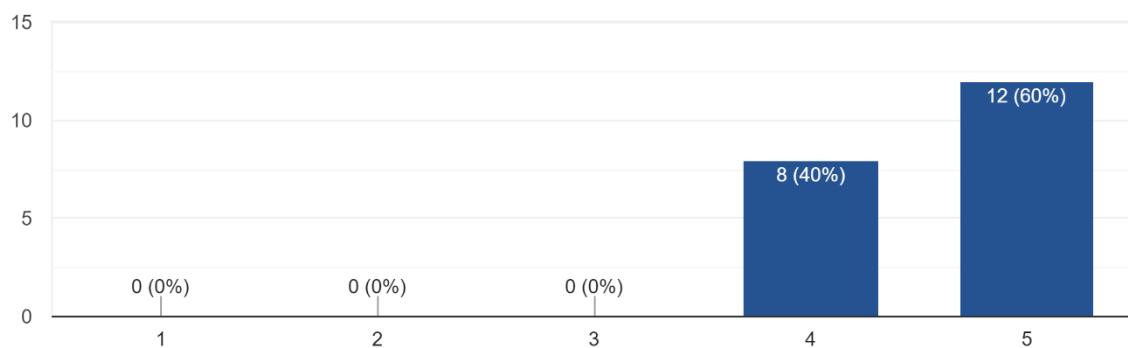
I thought there was too much inconsistency in this system.

20 responses



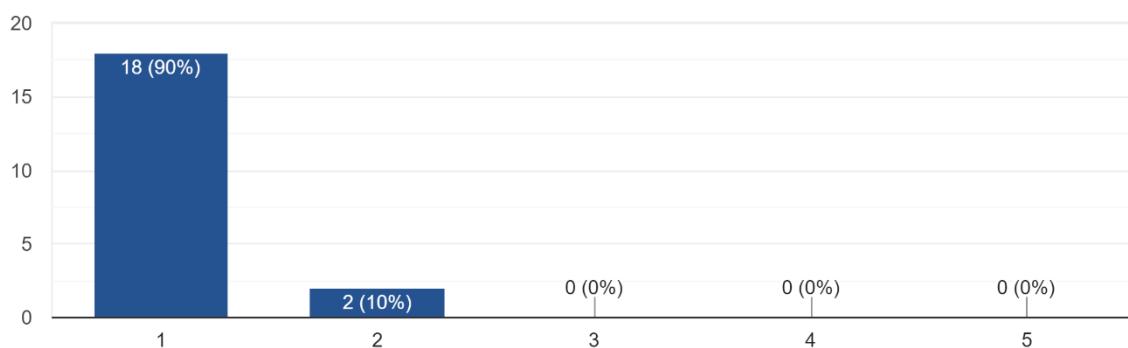
I would imagine that most people would learn to use this system very quickly.

20 responses



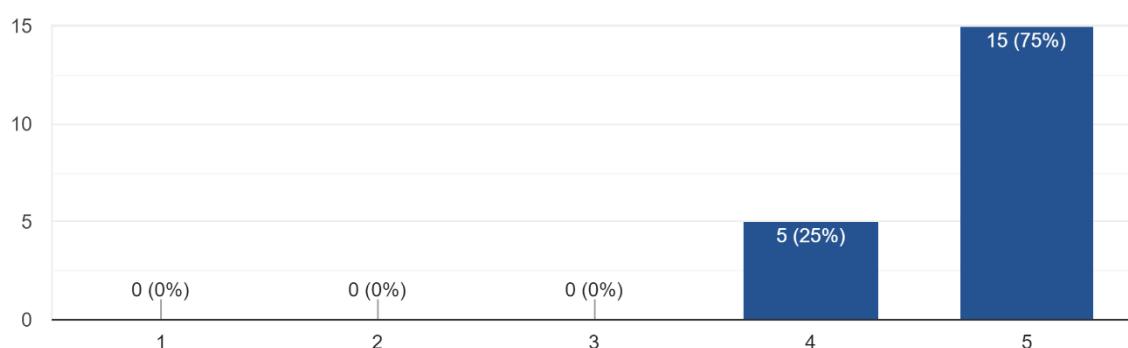
I found the system very cumbersome to use.

20 responses



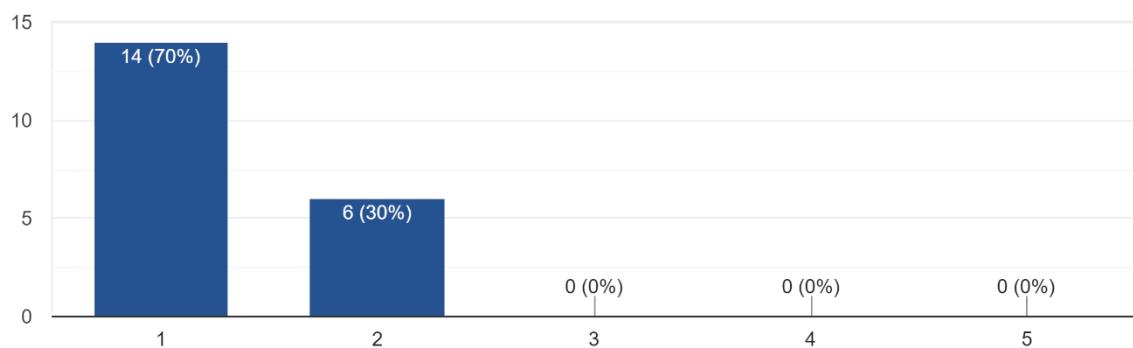
I felt very confident using the system.

20 responses



I needed to learn a lot of things before I could get going with this system.

20 responses



2. Feedback questions responses:

Do you think the system effectively addresses the needs of both job providers and job seekers?
Why or why not?

20 responses

Yes I do. The system combines job offers with interviews preparation and i think that all what i need as a job seeker.

Yes, it has all the needed features to address my need as an employer and I believe it is the same for job seekers

As a job provider tester, I find that the system effectively meets the needs of job providers by streamlining the process of identifying suitable candidates for their job offers.

Yes, the system is particularly helpful, especially in the sorting process. I found it extremely useful as it saves time by filtering out applications that may not be suitable for the job offers I have published.

Yes, I appreciate the system's flexibility, especially how it allows job providers to specify the importance of each attribute when adding a job offer.

Yes, the job provider has the capacity to engage a wide variety of candidates.

it is effective

نعم طريقة سهلة وواضحة للبحث عن الوظائف

It's a fantastic app! The concept of AI-driven interviews is appealing, and the questions I received were tailored to my CV, the job offer, and my responses. I really enjoyed it!

Definitely yes, job providers and seekers can accomplish the full process easily

Yes, both seekers and providers can reach their needs very happily satisfied

Absolutely, as they accurately achieve what expect to be accomplish with no obstacles

Yes, it offers tailored solutions for both users.

Absolutely, it streamlines the matching process efficiently.

The seekers are able to share their resumes to plenty of providers , meanwhile providers are able to find the perfect match of seekers. This proves that Watheq successfully

Yes, I found the job offers recommendation function very helpful in finding the best offers

YES

The system excellently facilitates both job providers in finding suitable candidates and job seekers in discovering the right opportunities.

Yes, I really appreciate the CV section. Crafting an effective CV can be challenging during a job search

Can you share any specific challenges or difficulties you encountered while using the system you want to change, if any?

20 responses

none

The system is very easy to use and simple.

There was not any difficulty

I didn't face any major challenges or difficulties while using the system. The overall user experience was seamless, and all functionalities operated as anticipated.

no difficulties

Everything is flawless.

There are no challenges

There isn't

The system seamlessly addresses user needs without encountering any challenges.

It offers a smooth and intuitive experience without any difficulties.

No challenges are encountered, ensuring a positive and efficient interaction with the system

no difficulty

NO

There are no challenges, but I would prefer to have a speech feature available during the interview.

I didn't face any major challenges or difficulties while using the system.

What is your overall opinion about the interface(ex. Font size, Button styles, colors)?

20 responses

I love it

Was very clear and obvious for all users

Very accurate and clear to all employers and employees

Obvious and perfect to all type of people including with disabilities

The font size is appropriately balanced for readability without being overwhelming.

Button styles are intuitive and easy to distinguish, enhancing user interaction.

Overall, the interface is user-friendly and aesthetically pleasing, facilitating easy navigation and engagement

the overall is great !

Excellent

Very neat, great choice of colours and fonts

The text is readable, and the interface is good

The interface is visually appealing, featuring well-selected font sizes, attractive button styles, and a harmonious color scheme.

The interface is intuitive and easy to navigate.

very clear

Amazing

اللون مريحه

What, if any, improvements would you suggest, and do you have any additional feedback?

9 responses

Keep the good work 🌟

Arabic version would be nice

I recommend adding support for multiple languages.

Everything is clear, but it would be helpful to have the ability to use map locations for easily adding job offer locations.

supporting the Arabic language.

اتصلني تطبيقه للاستفاده من خدماته

I really appreciate the AI simulation; it's extremely helpful. However, adding speech capabilities to the interviews could enhance it further.

none

Would you use the system when it is launched?

20 responses

